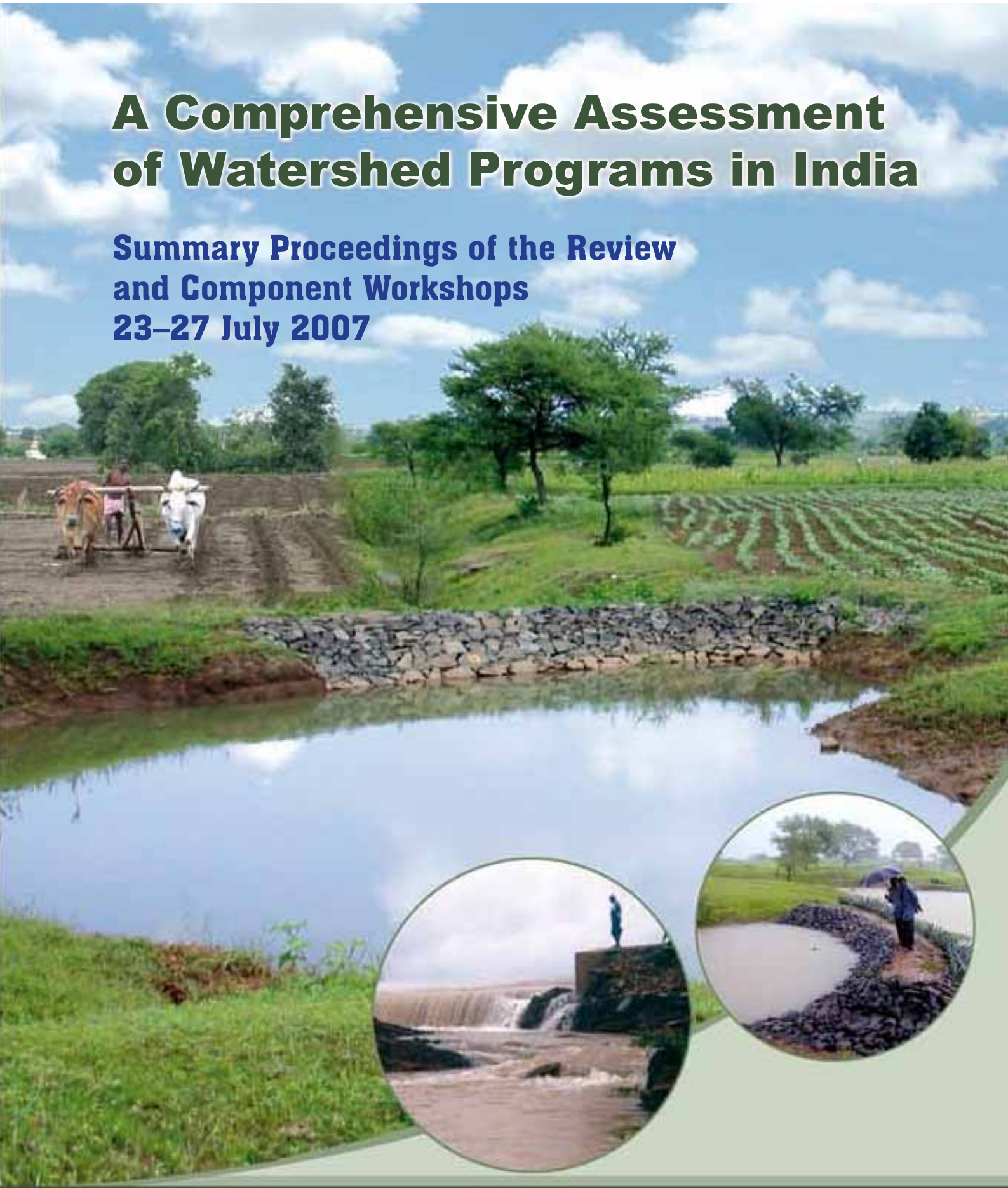
A Comprehensive Assessment of Watershed Programs in India

Summary Proceedings of the Review and Component Workshops 23–27 July 2007



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23-27 July 2007

Editors

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ICRISAT

International Crops Research Institute for the Semi-Arid Tropics

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Contents

Synopsis of the Discussions during the Review and Planning Meeting and Component Workshops of Comprehensive Assessment of Watershed Programs in India

The Review and Planning meeting on 23-24th July and Component Workshops on Impact of Watersheds on Gender and Vulnerable Groups on 25th July and Workshop on Best-bet Management Options on 25-26th July were attended by participants representing Ministry of Rural Development, Government of India; Governments of Andhra Pradesh, Karnataka, and Uttarakhand; NARS partners such as National Centre for Agricultural Economics and Policy Research (NCAP), New Delhi; Central Research Institute for Dryland Agriculture (CRIDA), Hyderabad; Central Arid-Zone Research Institute (CAZRI), Jodhpur; Junagadh Agricultural University (JAU), Junagadh; Indian Space Research Organization (ISRO), Bangalore, Karnataka; Gujarat Institute of Development Research (GIDR), Ahmedabad, Tamil Nadu Agricultural University (TNAU), Coimbatore; GB Pant University of Agriculture and Technology, Pantnagar; Institute for Social and Economic Change (ISEC), Bangalore; TATA Institute of Social Science (TISS), Mumbai; BAIF Development Research Foundation, Pune; Seva Mandir, Rajasthan; NIAS, Bangalore; Watershed Support Services and Activities Network (WASSAN), Secunderabad; PRADAN, Delhi; Watershed Organization Trust (WOTR), Ahmednagar; Central Soil Water Conservation Research and Training Institute (CSWCRTI), Dehradun; and MYRADA, Bangalore.

In his welcome address, Dr CLL Gowda, OIC-DG, on behalf of Director General of ICRISAT highlighted the importance and timeliness of the CA project supported by Ministry of Agriculture and Cooperation and Ministry of Rural Development. Mrs Santhi Kumari, Commissioner, Rural Development, Government of AP, emphasized the impact of APRLP watershed program in A.P. and elaborated the importance of technical support, women community based organizations, and livelihood approach.

Dr SP Wani, Project Leader, CA, appraised the progress in the area of macro studies (meta analysis, use of remote sensing, regional impacts of watersheds, and institutional and policy studies) as well as web page and micro studies to identify drivers of success as well as impediments for enhancing the impacts through case studies in select agroecoregions. Dr Wani also briefed the impact of watershed programs on women and vulnerable groups, best-bet management options manual that are on track and the progress of all studies undertaken.

Mr V Venkateshan, Consultant, Ministry of RD, provided inputs for the best-bet management options as well as for the CA.

A number of detailed presentations covered the progress and future course of actions to complete the assessment. Significant discussions on guidelines and institutional mechanisms adopted in watershed programs like Sujala, APRLP, Indo German Watersheds, Hariyali watersheds provided insights into the success of watershed programs in India. Role of market-led diversification using available water resources efficiently was highlighted for enhancing water use efficiency and incomes. Regional case studies, impact studies as well as use of satellite imageries and GIS showed good potential for concurrent monitoring and evaluation. The need to identify qualitative and quantitative indicators for M&E as well as for impacts and what and when to assess were also discussed.

The preliminary findings emerging from the meeting were as following :

- meta analysis of 627 watershed case studies revealed that B:C ratio ranged from 1:0.82 to 7.3 with an average of 1:2.01, internal rate of return (IRR) varied from 2.03 to 102.7% with a mean of 27.4%. The irrigated area increased by 51.5%, cropping intensity increased by 35.5%, groundwater table improved by 3.2 m, runoff reduced by 13% and generated 154 days ha^{-1} y-1 employment
- increased water availability in watersheds triggered market-led diversification with high-value crops and also more private investments in agriculture, resulting in marketable surplus. Watersheds need to be developed as business model and not as subsistence systems. It also calls for developing market linkages and enabling public private partnerships in the area of watershed development
- there is an urgent need to increase convergence of watershed programs that are implemented by different agencies. The watershed guidelines need to be updated
- different approaches and activities for different agroecoregions (<700, 701-1100, >1100 mm y-1) are needed. Strategic research to develop suitable technologies for low and high rainfall regions need to be undertaken
- technical support from good professional institutions for all watershed development programs is much needed.

Main emerging messages from the mid-term review workshop of the CA were:

- watershed development programs are benefiting rainfed areas with a B: C ratio of 2.01, IRR 21.43%, enhancing rural incomes by 58%, increasing agricultural productivity by 35% and protecting environment. Vast scope exists to enhance the benefits and doubling the productivity of rainfed areas by upgrading watershed programs in the country with substantial and increased investments

- watershed development programs can be upgraded through convergence of activities (holistic approach), promoting cooperation and collective action, sharing new knowledge with the stakeholders, enabling CBOs, policies such as PPP for developing watersheds as a business model through diversification with high-value crops and micro-entrepreneurships
- targeted interventions benefiting women and vulnerable groups enhanced the impact, and sustainability of the programs through development of social capital
- capacity building and knowledge sharing measures and meaningful M&E along with impact assessment need to be strengthened through the use of new science tools such as GIS, RS, participatory approaches and ICT for increased efficiency and transparency
- watershed development programs produce multiple benefits for the society. Strategic research in the area of quantification and economic valuation of such services along with strategies for development of low and high rainfall areas, emerging second generation problems, new tolls in the area of social and biophysical sciences and policies for M&E and IA need to be undertaken
- results from 30 years long-term studies at ICRISAT and yield gap analysis for crops in India revealed that current rainfed farmers' yields in India are lower by 2-5 folds than the achievable potential yields. Vast potential of rainfed agriculture needs to be tapped by adopting integrated watershed management approach on a large scale.
- review of the impact assessment studies showed that watershed programs in India effectively reduced poverty in rainfed areas with increased family incomes as a result of increased area under irrigation due to increase in number of wells as well as availability of water during dry months, resulting in increased crop productivity and cropping intensity (up to 64%). However, in most cases it is difficult to draw sound conclusions from the reported data.

The meeting discussed detailed case studies of successful and not-so-successful watersheds and identified the drivers and disabling factors.

The drivers for improved collective action and participation are:

- tangible economic benefits to individuals through convergence
- knowledge-based empowerment
- equal partnership, trust and shared vision
- good local leadership
- transparency and social vigilance in financial dealings
- equity through low-cost structures
- pre-disposition to work collectively

- targeted activities for landless and women members
- increased drinking water availability
- income-generating activities for women.

The speed breakers for the success are:

- lack of political support to ensure fund flow
- lack of people's participation
- exploitation of groundwater by industries
- lack of local leadership
- involvement of contractors
- lack of technical support.

Some of the other salient findings from the meeting are as follows:

- knowledge-based entry point activity is more effective for better and sustainable community participation than the regular cash back EPA currently adopted in the watershed programs
- meta analysis results showed that watersheds larger than 1200 ha were more effective in achieving the impact and in such a case, development of microwatershed should be undertaken in clusters of 3 to 4 micro-watersheds together without disturbing the social and administrative concerns
- the weakest link in all the watershed programs is sharing the knowledge with all the stakeholders and capacity development. Hence, there is an urgent requirement for technical back-stopping consortium at national and state level for capacity building and sharing the knowledge for enhancing the impact of watershed programs in the country
- for monitoring and impact assessment, not much quantitative and qualitative datasets are available and there is a need to identify a few key indicators to be monitored in all the watersheds for assessing the impact. For monitoring and evaluation, separate indicators need to be tracked by the concerned project managers. In addition to this, there is a need for trained staff to undertake meaningful M & E as well as impact assessment
- with the current allocation of financial resources, the whole watershed is not developed but in pockets. Soil and water conservation measures are undertaken only to saturate the watersheds. Hence, there is a need for more allocation of financial resources per unit of land for adoption of holistic approach including productivity enhancement and livelihood opportunities.

Inaugural Session

Chair: CLL Gowda

Rapporteur: TK Sreedevi

Dr SP Wani welcomed Mrs A Santhi Kumari, Commissioner, Rural Development, Government of Andhra Pradesh, Dr CLL Gowda, OIC-DG, ICRISAT and scientists of ICRISAT and other participants, representing different institutions that are part of the Comprehensive Assessment of Watershed Programs in India (CA). Among the other participating institutions include Central Research Institute for Dryland Agriculture (CRIDA), Central Arid Zone Research Institute (CAZRI), Institute for Social and Economic Change (ISEC), National Centre for Agricultural Economics and Policy Research (NCAP), Gujarat Institute of Development Research (GIDR), Watershed Organization Trust (WOTR), Indian Space Research Organization (ISRO), Central Soil Water Conservation Research and Training Institute (CSWCRTI), BAIF Development Research Foundation, NIAS, GB Pant University of Agriculture and Technology, Junagadh Agricultural University, Tamil Nadu Agricultural University. He explained in brief about the CA project, which is jointly sponsored by the Ministry of Agriculture and Ministry of Rural Development, Government of India. He discussed the objectives of the CA and the approach adopted by the consortium to undertake the task. He emphasized the need to get as many institutions and individuals involved in the CA in different capacities, either as reviewers or contributors. The objective of the workshop was:

- to review the progress and synthesize the findings of the impact assessment conducted by core-group institutions in different areas
- to chalk out a course for future action to complete the assessment
- to study the impact of watershed programs on women and vulnerable groups
- to discuss and finalize best-bet options for integrated watershed management manual.

During the session, Mrs A Santhi Kumari gave a presentation titled 'Watersheds for Improving Livelihoods in Andhra Pradesh'. She stressed on the alleviation of poverty in drought-prone areas of Andhra Pradesh through watershed activities.

The program focused mainly on the impact of Andhra Pradesh Rural Livelihoods Program (APRLP) on the poor and landless, productivity enhancement, promotion of micro-enterprises and capacity building institutions. The session also highlighted the positive impact of watershed programs that include treatment of 2.5 lakh ha in watershed areas, organization of 2.49 lakh poor families into self help groups (SHGs), training of 1.17 lakh people in 2,500

APRLP supported watersheds, generation of a revolving fund of Rs 72 crore by 1.07 lakh poor families, training of 1,898 agriculture and livestock paraworkers, establishment of 80 integrated livestock development centers, production of seeds in 506 villages and development of fodder in 12,000 ha. Among the other significant achievements through the program are about 90% households found increase in income and 37–39% reported increase in annual income (>10,000), the returns from agriculture increased (85%), productivity enhanced (71%), 60% people were trained in institution building and group dynamics and 14% people in enterprise promotion.

CLL Gowda, OIC-DG, ICRISAT, expressed that the ICRISAT's experience in the area of watershed management through convergence and consortium along with community participation can be successfully used as an engine for rural development by doubling the agricultural productivity and incomes of the rural poor in rainfed areas.

He stated that it is a unique initiative undertaken by the Ministry of Agriculture and Ministry for Rural Development jointly to assess the impact of watershed programs in India in order to document the learnings with an objective of enhancing the impact of watershed programs. India is a leader in the area of watershed management as evident from the investments made upto X plan that are in the range of US $ 6 billion. He underscored that this initiative will add much value by integrating learnings form various watershed programs in the country.

He described the initiative as timely, especially when the country is placing the highest priority on rainfed agriculture and the National Rainfed Area Authority (NRAA) has been established by Government of India for converging various initiatives for improving rainfed agriculture in the country.

Technical Session I

Chair: A Santhi Kumari

Rapporteur: Rosana P Mula

Synthesis

The session was moderated by A Santhi Kumari, Commissioner, Rural Development, Government of Andhra Pradesh. Her opening statement was a commendation to ICRISAT for taking the initiative of bringing the key institutions in a forum to synthesize learnings that can be adopted or improved for the benefits of the rural communities. In Andhra Pradesh, for instance, she underscored its success in the establishment and federation of self-help groups (SHGs) and the strong participation of the para youth workers.

Update on the Progress of the Comprehensive Assessment of Watershed Impacts

Presentor: SP Wani

The key message stressed by Dr Wani was regarding the system for research and analysis of the on-going Comprehensive Assessment of Watershed Impacts. He proposed the need to have a common platform for delivering expected outputs of the project, which can be shared and easily accessed by various interest groups. He presented ICRISAT's experiences on various watershed initiatives drivers of success and areas that can still be harnessed to give maximum benefit to communities. As a driver, consortium approach provided the impetus for maximizing resources while the lack of political support and poor local leadership to watershed projects have been impediments. The salient findings of the progress reported were:

- the CA webpage is launched and being uploaded regularly
- meta-analysis with inclusion of more case studies from different regions in the country showed large variability for different parameters of equity, efficiency and environment
- in the consortium approach, tangible economic benefits due to increased productivity for individual farmers enhanced community participation
- knowledge-based entry point activity (EPA) promoted better cooperation from the farmers than the cash/subsidy based EPA
- long-term experiments and yield gap analysis showed that vast potential of rainfed agriculture remains untapped. Moreover, increased productivity of rainfed agriculture can reduce poverty and help the country to meet the millennium development goals (MDGs)

- lack of knowledge sharing and capacity building initiatives are important factors responsible for reduced impact of watershed programs. Efforts to empower all the stakeholders (farmers to policy makers) are needed to enhance the benefits of watershed programs.

Based on number of case studies of suitable institutional arrangements, drivers of collective action and enhanced impacts and means to improve benefits for women and vulnerable groups were also discussed.

In rainfed area, rainwater management is only an entry point for improving livelihoods and through convergence and holistic farming system, income of the rural poor can be increased.

The key issues during the open forum were:

- inclusion of other available literatures in the web site.
- importance of wide-scale dissemination with respect to technologies
- need for systematic documentation
- need for identifying the appropriate indicators. For instance on how the impact of convergence has been captured.

Meta Analysis for Assessing Impacts of Watershed Programs in India

Presentor: PK Joshi

The paper by Dr Joshi was an analysis of meta analysis. The results of meta analysis based on 627 watershed case studies from different regions showed that by using the criteria of efficiency equity and environment, watersheds programs are benefiting the country. The B:C ratio varied from 0.82 to 7.06 with an average of 1.96. The internal rate of return (IRR) varied widely from 1.68 to 10.2% with the average IRR of 26.8%. Watershed programs increased cropping intensity by 35%, horticultural productivity increased by 40.4% and house hold incomes increased by 55%. However, large variability for all the parameters studied amongst the 627 watersheds has a point of concern. Detailed assessment revealed that 74 % of the watershed showed < 2 B:C ratio and there is a need for urgent attention to enhance the impact of watershed programs in India. The main message of the paper was on the need to link watershed interventions with markets. He based his analysis on the emerging role of high-value commodities widely gaining interest among watershed dwellers as a result of the change in consumption pattern of food. High-value crops are cultivated for obtaining higher and regular returns.

The key issues during the open forum were:

- need for developing market opportunities. The niche for high-value crop cultivation is in areas with good water source. Market opportunities should not just be a concern for favorable areas but also in less rainfall (less than 700-1000 mm) areas, which is dominant in India.
- the role of demand-driven intervention. In developing market opportunities, there is a need to understand the dynamics of an intervention (i.e. shift in cropping pattern), whether this is an articulation of the locals or the project since this will have implications on sustainability.

Potential to Enhance Productivity and Rainfall Use Efficiency in the Watersheds of India

Presentor: Piara Singh

The gist of Dr Singh's paper was that different rainfed areas require different technologies and policy support. The modeling research activities, which include yield gap analysis show much potential of increasing the productivity of rainfed areas.

Using simulation models and long-term historical weather records, water balance studies showed the need to use this tool for planning rainwater harvesting strategies in the watershed programs. With specific examples from areas with rainfall of < 500 mm, 500-700 mm, 701-1000 mm and 1001-1500 mm, harvestable surplus runoff can be used as guiding factor for planning number and size of rainwater harvesting structures. Using yield gap analysis approach, it was found that farmers' current crop yields are lower by 2 to 4 folds from the potential yields for major cereal and legume crops grown in the rainfed areas. Results of best-bet practices trials on farmers' fields in different states of India established a strong evidence that with the available technologies, crop yields could be doubled easily.

The key issue during the open forum was:

- the need to address all relevant parameters of rainfed areas. Productivity and rainfall are just a few of the parameters and there is a need for doing more research activities in rainfed areas in order to have a holistic perspective.

Technical Session II

Chair: Sandeep Dave

Rapporteur: KL Sahrawat

Two presentations were made in this session

1. Guidelines for Watershed Program in India: A Review by KV Raju

Dr Raju reviewed the dynamics of guidelines for watershed programs in India implemented since 1995 and that evolved with time and influenced by donors, NGOs, etc.

Guidelines for watershed development from 1995 MORD guidelines upto Niranchal Report; M&E, institutional arrangements; identification of the gaps based on research and review studies that suggest the way forward were discussed.

The other salient points highlighted were:

- need for an institutional mechanism (e.g. village panchayat, etc.) on a more permanent basis for maintaining watersheds even after the withdrawal of the program
- need to build capacity of the panchayat raj institutions
- need for infusing a greater degree of flexibility into the guidelines in view of variability across the eco-regions and local conditions prevailing in the country
- need for the consolidation of ideas on the guidelines for watershed programs, especially on baseline data for impact assessment, timely release of funds and assessment of the village institutions for continuation of the mechanisms on a permanent basis
- focus required on the development of value chain systems for livelihood security and for formulating policy guidelines for coping with drought.
- need for policies for various grazing systems as livestock that play critical role in the livelihoods of rural people in the drier areas
- need for cross-sectoral coordination and coordination across programs implemented by different ministries
- need for aligning policies for watershed development with ongoing institutional processes such as decentralization and use of new approaches in M&E implementation and building multi-institutions for enhancing impact.

2. Institutional Mechanisms in Selected Watersheds in India by TK Sreedevi

A critical analysis was presented on the various institutional mechanisms and their relative strengths and weaknesses in the management of APRLP, Sujala, Indo-German and Hariyali watersheds in Rajasthan.

Ms Sreedevi underscored the role of institutional arrangements in the studied watershed programs along with institutional structure, stakeholder linkage matrix, actor linkage matrices and evaluations, the inadequate role of social institutions in Hariyali Guideline programs and SHGs, the positive impact of higher role of SHGs in the APRLP and IGWDP on vulnerable groups.

It was found that in Sujala, amongst the four programs, the area groups (AG) were influential while in other programs user groups (UGs) were considered important though not influential.

The salient features of her presentation include:

- the importance of gram panchayats in Hariyali program and marginalisation of WDTs, SHGs
- the importance of convergence and the role for line departments in all the programs
- independent M&E agency in Sujala ensured participatory evaluation and was considered effective by primary and secondary stakeholders
- strengthening the role of panchayat raj institutions in the management of natural resources in the villages,
- strengthening linkages between the area groups and PRI
- need for establishment of better coordination between area group (user group) and PRI members, who are also members of the gram sabha, for an inclusive decision making and management of the watershed program in a village.

Technical Session III

Chair: PK Joshi

Rapporteur: Piara Singh

There were total five presentations in this session. In the first presentation, Mr Sandeep Dave gave an overview of his experiences in the Sujala watershed programs in Karnataka. He highlighted the distinct features of the program like private, people and public participation (PPPP) in the project, transparency at all levels, continuous monitoring and evaluation of the project work and application of GIS and IT in the watershed program. He also described new initiatives undertaken in the project such as introduction of O K cards, soil health cards, convergence of schemes, Gopala Mitra, Jala Mitra, pisciculture, farmers' field schools and analysis of the agroclimatic data for farmers. His presentation touched on aspects including:

- integrated approach involving private people, public participation and use of remote sensing and GIS in M&E
- productivity enhancement and income generation initiatives along with soil and water conservation
- the application of science tools like GIS for prioritizing and identifying area boundaries for implementing watershed program
- mandatory coverage of all SC/ST and families holding marginal farms, special emphasis for income generating activities to address gender and equity, special government order for benefit sharing from CPRs, cost relaxation per ha, which are some of the unique characteristics of Sujala watershed program
- positive impacts of Sujala program in terms of reduced soil erosion (10 cum from 21 cum per ha), improved biomass (14%), declined fallow land (15%), increased crop productivity (24%) and household income (20%).

In the second presentation, Dr Suresh Kumar described the impacts of watershed programs in South India and the need for impact assessment. He reviewed the methodological challenges, framework and indicators for impact assessment. He also reviewed the methodological and empirical studies on impact assessment in Tamil Nadu. The other salient aspects covered include:

- an overview of 293 watersheds implemented through various programs in South India and the increase of groundwater recuperation rate of 16.7 to 39 %; water levels in the wells by 0.1 to 1.5 m; irrigated area of 5.7 to 115.1% and yield increase of 5 to 52.4%
- total economic valuation (TEV) from watershed initiatives in upstream and downstream communities located in the watershed, that revealed 58%

of direct benefits are from components of agriculture, agro forestry and alternate land use systems in the upstream communities, whereas it is 17% from agriculture for downstream habitants

- bio economic simulation studies on household income due to soil water conservation across watersheds in South India. The study revealed that average income per household will increase to 6.4%, 5.3% and 41.5% during 10th year in small, medium and large households, respectively.

Dr KP Raverkar presented on 'Impact of Watershed Programs in Uttarakhand'. He described watershed characteristics and management activities in the watersheds of Uttarakhand. He gave an insight into the weaknesses and strengths of working in the mountainous region. He highlighted the gains made so far in terms of changes in land use pattern and economic benefits to the people. His presentation reviewed on:

- impact assessment of Badrigad micro watershed in New Tehri district and Kuriyagad micro watershed in Nainital district of Uttarakhand state, highlighting the insufficiency of per ha cost for implementing the watershed program in hilly tracts
- the success of system diversification with high-value crops especially strawberry cultivation and off season vegetable production under controlled condition
- advantage of surplus water resources and congenial climate in the hilly tracts in the watershed initiatives for bringing sustainable impact on the communities.

Dr GP Juyal in his presentation on 'Impacts of Watershed Programs in High Rainfall Regions' detailed the strengths, weaknesses, opportunities and constraints of the hilly and mountainous regions for watershed development and management. He discussed biophysical and social indicators of impact evaluation. He also touched upon the impact assessment of Fakot watershed in Uttarakhand, lessons learnt and further course of action. The presentation revealed:

- geological and ecological fragility because of severe soil erosion (average of 20 t ha^{-1} yr-1) which is considered as critical limitation in high rainfall and sloppy regions. About 43% of the north western Himalayan regions is under severe soil erosion category with more than 20 t ha^{-1} yr-1
- sustainable watershed development program implemented in Fakot watershed has reduced runoff to 14% from 42% and soil loss to <2 t ha^{-1} yr^{-1} from 11.1 t ha^{-1} yr-1, respectively, before implementing the program
- the potential of collecting runoff through interflow water harvesting structures in the hilly tract. Fakot watershed showed that there was only

4% reduction in net sown area during the drought year 1987 compared to 18% reduction in the untreated area

- the importance of bioengineering measures in catchments areas for reducing the landslide erosion and increasing the base flow, which is an important source of water during lean periods in high sloppy areas.

Dr TK Bhati gave a presentation on the 'Impact of Watershed Programs in Arid Regions'. He described the work done by CAZRI on watershed development in Rajasthan, its impact, project replications, problems and lessons learnt. He mentioned that the Government of Rajasthan (GOR) had a recent policy shift, putting more emphasis on poverty alleviation programs, livestock husbandry, livelihood security, employment generation and biofuel plantations. Dr Bhati emphasized on

- pasture development as an important component in natural resource management (NRM) in arid ecosystem. Approximately 30% (Rs. 4.04 lakhs) of the total cost incurred in NRM was spent on rehabilitating pasture lands over 120 ha, resulting in enhanced fodder (400%) availability and milk yield (it increased to 2 l/day/animal from 1.5 l/day/animal)
- need for extending project period from eight to ten years, especially while implementing in the arid regions
- strengthening of field bund safe disposal of surplus runoff and developing Khadins, Nadies, Tanka and Diggiare as important components in implementing watershed initiatives in arid regions of Rajasthan.

Following points and question were raised during discussion session on the five papers.

- How to deal with the holistic approach rather than the piece meal approach?
- Before assessing the performance of watershed, there is a need to consider whether or not watershed development and implementation was done properly
- How soil fertility index was calculated for impact assessment?
- Watershed performance should also consider agroclimatic conditions/initial conditions before development
- How to maximize the watershed to its best performance considering problems and opportunities?
- Are the fruits and vegetable processors available in the nearby watershed villages in the hilly mountainous region?
- Involvement of local institutions need to be strengthened for sustainability in the Uttarakhand watersheds

- The sustainability and replicability of work in the region considering the success made in Fakot watershed
- What is the influence of infrastructure development on watershed and environment, especially roads?
- The need to do documentation of reverse migration, education, land encroachments, etc.
- Drinking water, biodiversity management, fuel wood and stabilization of sand dunes important for the arid regions
- What is the economics of bio-fuel in arid areas?
- Seed money needed for functioning of SHGs in many watersheds of arid regions
- How are the watershed strategies different for arid regions in terms of resource allocation and use?
- The need to integrate various relevant government programs with watershed programs for best use of resources and to be more effective (eg. NREGS, PPP, UNDP etc.)
- The need to strengthen non-farm skill development to hold the youth in the villages
- How to merge sector plans with the area plans, especially at district level?

Technical Session IV

Chair: Amita Shah

Rapporteur: S Marimuthu

Three papers were presented during the Technical Session IV chaired by Dr Amita Shah from Gujarat Institute of Rural Development

Impact of NWDPRA Program Using RS and GIS - PG Diwakar

PG Diwakar shared the learnings on impact assessment of NWDPRA watersheds implemented during VIII and IX plan period using remote sensing (RS) and geographic Information system (GIS). He also presented webpages developed for posting in CA website and elaborated contents of webpage for 122 watersheds, evaluated across 12 states. His presentation highlighted

- monitoring and evaluation of watersheds through remote sensing by measuring parameters like changes in green cover, surface water, cropped area (cropping intensity) and biomass intensity using normalized differential vegetation index (NDVI)
- the scope for evaluating income generating activities and distribution of services at watershed scale through remote sensing coupled with ground truthing
- the measuring of socio economic indicators like migration of labor, employment opportunities and land value at watershed level.

Monitoring and Evaluation – Approach and Insights – Dr Rosana Mula

Dr Mula presented experiences on monitoring and evaluation of watersheds from mid-term evaluation (MTE) of NWDPRA watersheds and shared methodologies followed for the study. She emphasized the need for defining baseline characterization in the guidelines. She also outlined the indicators for various processes at different levels of evaluation and the importance of proper format for the evaluation studies. The presentation highlighted:

- the need to develop common guidelines for collection of base line data during the inception of watershed program
- the need to implement defined framework for concurrent monitoring of watershed activities.
- the need to develop indicators for mid term evaluation considering the extent of activities in the stipulated period
- difficulties in scaling out of processes and indicators in monitoring and evaluation due to location specific nature of activities.
- the necessity of applying advanced and science tools like GIS and remote sensing in monitoring and evaluation of watersheds.

Impact of Watershed Interventions on Runoff, Soil Loss and Environmental –

Mr P Pathak and Team

Mr Pathak shared the importance of hydrological data for designing stable hydraulic structures. He presented equipment and methodologies for monitoring runoff and soil loss e.g. for GW monitoring. He emphasized that the studies on behavior of soil type for rainfall events are highly useful for framing strategies to utilize supplemental irrigation. He also indicated the importance of documenting problems and failures of structures at different toposeqence, which are helpful for practitioners in the watershed. He addressed the need for data base on hydrology in simple format across agroecoregions that can be used in designing and planning of water harvesting structures.

He spoke on the need for calibrating emperical equations for assessing soil loss before using into wider scale, while responding to a question by Dr Diwaker. During the discussion, Dr Kiran P Raverker suggested for separate guidelines for assessing soil loss as well as cost norms for reclamation of lands in hilly tracts. Mr Pathak suggested that duration of flow can be an indicator for assessing impact in hilly tracts. Dr Amita Shah concluded the session by asking on low-cost participatory method for monitoring watersheds.

His presentation explained:

- the importance of collection and understanding hydrological and soil physical data for designing and sustainability of hydraulic structures. The base hydrological data could be used for assessing the impact of watershed initiatives, reducing the cost of watershed development and extrapolating the technologies in similar situations
- the functioning of simple and automatic hydrological monitoring station for quantifying runoff and soil loss
- the necessity and advantages of installing automatic runoff and sediment samplers in representative watersheds
- the reduction of soil loss (1.56 t ha^{-1} year-1) under improved technologies and appropriate agronomic packages in Vertisol of semiarid tropics compared to traditional system (6.46 t ha^{-1} year-1)
- the need for strengthening participatory monitoring of groundwater in representative watersheds for studying the efficiency of the watershed interventions and the extent of benefits to the communities.

Technical Session V

Chair: S Meenakshi Sundaram

Rapporteur: P Pathak

The Technical Session V was chaired by Mr S Meenakshi Sundarm and Mr P Pathak was rapporteur. In this session, three presentations covering various topics of the comprehensive assessment of watershed programs were made.

The first presentation was made by Dr KV Rao on behalf of Dr YS Ramakrishna, CRIDA, Hyderabad, on Manual on Best-bet Practices for Watersheds. He spoke on various aspects such as bio-physical interventions and their impact; qualitative and quantitative impact, monitoring indicators; policies and guidelines; management, institutions, and capacity building, which is covered in manual. He mentioned that the approach used could be based on Theme Vs Area.

Ms Marcella D'Souza, from Watershed Organization Trust (WOTR), Ahmednagar, made a presentation on 'Going Beyond the IGWDP – Maharashtra, Towards an Equity Based, People Led Development'. She highlighted some of the challenges in search of answers (early '90s) like agency assessment and accreditation; assessment of the demand and needs; and capacity building of agencies; establishing frame actors support and convergence of development projects; and empowering women and gender mainstreaming.

Among the other points that the paper discussed include:

- the concept of participatory operational pedagogy (POP) in watershed program involving selection of partners and area of implementation, capacity building program, instruments of process facilitation and sustainability, transparency and public accountability
- WOTR's Wasundhara approach where each vocational, interest economic and social groups are allowed to articulate their needs and priorities in terms of expected outcomes or solutions in terms of time perspective; groups to be a part and form pan village body, fully in collaboration with gram panchayat to undertake developmental activities; action plan with budget prepared by pan village body, formed for watershed initiative duly supported and supervised by gram panchayat
- tools like bottom upward for forming institutions, setting priorities and envisioning demands, using problem tree approach for implementing Wasundhara approach
- the criteria of the program, which is to address the needs of the poorest 30% in the area while implementing the program.

Dr Amita Shah from Gujarat Institute of Development Research (GIDR), Ahmedabad, made a presentation on 'Watershed Development in Central and Western Region: Some Evidence'. She gave details on the study area in the four states (viz. Gujarat, Rajasthan, Madhya Pradesh and Maharashtra) and highlighted the major focus of the study – spatial coverage, prioritization, convergence among Watershed Development Projects (WDPs) supported by Ministry of Rural Development (MoRD), Ministry of Agriculture (MoA), Ministry of Environment and Forest (MoEF) and donor agencies; impact on bio-physical, socio-economic, and institutional indicators; and the sustainability in the post-project period. She explained the status and findings from the state level review and assessment in four states. The findings from the review (21 districts in Madhya Pradesh) include increase in irrigated area; increase in net sown area; wasteland brought under cultivation; changes in the cropping systems and crops, etc. She highlighted the problems of attribution in the impact assessment. She gave the impact of various other initiatives, and explained some of the missing points under the impact such as absence of clear pattern between increased net sown area and net irrigated area among Drought Prone Area Projects (DPAP) in 21 districts, difficulties in ascertaining and attributing impacts on drinking water; non-availabilty of information on B:C ratio and IRR. She mentioned some of the results from rapid assessment that was conducted in 346 micro watersheds across 20 districts in 8 major agroclimatic zones. This included major benefits viz. increase in water table, irrigated area, tree cover, drinking water and water for livestocks, employment and reduction in soil erosion and status of community institutions (viz. survival rate of USER groups, SHGs and *van samithi*). She pointed that there is no clarity on future management (WDF or *panchayat*).

Presentation was followed by good discussion. Most of the questions/comments were of general nature. Some of the key points raised during the discussions were:

- rapid assessment: More details were asked about the rapid assessment method, which she has used in the impact assessment of watersheds. Also the merits and demerits of this method in the watershed context
- drought mitigation indicators: There was considerable discussion on the possible indicators which could be used for drought mitigation. Several types of drought mitigation indicators were suggested which could be used in assessing the watershed impact
- accuracy of data: Some concerns were expressed about the accuracy of data used for impact assessment. For example, the data on irrigated area available with state government departments generally does not include the area irrigated by check dams and small tanks.

Rapid assessment of 346 watersheds from Madhya Pradesh was reviewed focusing on the nature of process (demand driven), perceived impact, physical verifications and present status of institutions. Increased water table (82%), reduced soil erosion (77%) and increased irrigation facility (57%) were highlighted as the major impacts in the presentation due to watershed program (DPAP) in Madhya Pradesh. The paper also revealed the status of community institutions formed during the implementation watershed program, where 54% of user groups; 23% of self help groups; 88% of *van samiti* and 31% of institutions formed for pasture development survived during post project period across DPAP watersheds in Madhya Pradesh.

Technical Session VI

Chair: SP Wani

Rapporteur: RC Sachan

1. Impact assessment

It would have four types of reports:

(i) meta analysis: Data from 1,100 watersheds, which include 311 watersheds data from earlier Meta analysis, are already available. Data from more watersheds are being collected

(ii) regional impact studies: Impact studies from various eco regions—north, northeast, arid, south, high rainfall, mountainous regions, etc., should be collated to bring out a critical synthesis of the impact of watershed programs

(iii) remote sensing and geographical system (GIS): Impact studies by 12 Regional Remote Sensing Service Centers (RRSSC) and India Space Research Organization (ISRO) wherein application of remote sensed data and GIS, along with socio-economic data were used for the impact evaluation of NWDPRA watersheds and these studies would be part of the impact assessment

(iv) impact studies Focusing on gender and vulnerable groups: Impact studies focusing on emancipation of women through NRM, enhancement of resource access and reduction of drudgery, expanding choices and rightful role in shaping of development options are highlights to be included.

These four types of reports would be coordinated by National Center for Agricultural Economics and Policy Research (NCAP) and Gujarat Institute of Development Research (GIDR). It was decided that the common framework would be circulated by NCAP and GIDR by 30 July 2007.

2. Policy Guidelines and Institutions

The Institute for Social and economic Change (ISEC) would coordinate the output related to the policy guidelines and institutions. It was suggested that the report should not only analyze the present guidelines and institutions but also suggest forward-looking policies and institutional framework and look into their legal aspects. The initial draft was circulated by ISEC and it expects the feedback from members by August 10, 2007.

3. Best-bet Manual

CRIDA has the responsibility in bringing out the manual on best-bet practices for watershed development. Twenty four topics with lead authors and possible cooperating authors were identified. It was suggested that lead authors are at liberty to choose the authors. After discussion, a few more topics such as quality and quantity of water, sanitation, water resource management, etc., were added, totaling it to 30 topics. The topics dealing with best-bet methods would cover all eco regions such as arid, semiarid dry, semi arid wet, sub humid, high rainfall and mountainous, etc. The manual style would be simple, jargon free and guide like. First draft on each topic would be available by August 15, 2007, so that it can be circulated to cooperating authors.

4. Web Page

ICRISAT and RRSSC, Bangalore, have accepted the responsibility of making the web page for Comprehensive Assessment of Watershed Programs in India (CA_WPI). The exercise had been initiated by ICRISAT. About 135 watersheds evaluation reports, policy guidelines, manuals, etc., received by ICRISAT have been included in the web page. RRSSC, Bangalore, handed over the material on use of remote sensing and GIS methodology for planning, monitoring and evaluation studies of watershed programs. The members were requested to provide all public domain material for its inclusion in the web page by 15 August 2007. The query system would be introduced in the web page for referring any study based on rainfall, eco region, state, program type, etc. It was decided that efforts would be made to include all watershed programs related to policy, implementation, monitoring, evaluation, impact, etc. Web page on CA_WPI would be linked with the web page of other government and non- government organizations' web pages related to watershed studies. CRIDA would also join in the effort of improving the web page.

Following points emerged after discussion:

- All reports would be sent to selected referees for their critical comments for improvement. It is intended that the summary findings of CA_WPI should be considered for inclusion in 11th five-year plan, which would begin in April 2008. Therefore, all reports have to be submitted by November 30 so that they are available for referees by December 30 to prepare all reports in final form for submission well within time. Each report will have executive summary and references for suggested readings. Each report would be limited to 80-100 pages
- On the basis of output reports, an executive summary, limited to about 40 pages, would be prepared by ICRISAT. The executive summary would be in simple language and in the presentation format. The executive summary

would be also referred to selected people for critical comments. The summary should be ready by 28 February 2008

- Policy briefs, limited to 4- 5 pages would also be prepared
- Each topic in the best-bet manual, on an average, would be limited to about 5 pages. The examples on success stories could be included as box items. The common format for best-bet topics would include introduction, constraints, strategy and approaches, procedures and practices, recommendations, policy, reference (year, abbreviated journal name, volume and page numbers) and suggested readings and conclusions
- The typical examples of failures should be brought, wherever relevant, so that lessons could be learnt from them
- Regional impact studies should include examples of watersheds with significant impact, which can be replicated in the region.

Planning Next Steps for the CA: Group Discussion.

Output		Coordinator team members	Referee submission by authors	Date for submission	Required action	Executive summary & guidelines	Referee
1. Impact assessment	a) Regional impact studies b) Meta analysis c) Remote sensing d) Gender studies e) Case studies – box items f) Monitoring, learning, frequency, number of sites required	NCAP, GIRD, all others	30 Oct 2007	30 Nov 2007	Common framework by 30 July 2007, formats, commonality, bibliography.	yes	Yes
2. Policy, guidelines & institutional	Suggest forward looking guidelines, & institutions, policy & legal framework, Common guidelines, region specific guidelines	ISEC	30 Oct 2007	30 Nov 2007	Feedback from members till 10th August 2007	Yes	Yes
3. Best-bet manual	24+ chapters – 5 page each Add – a) IWRM, b) sanitation	CRIDA	30 Oct 2007	30 Nov 2007	Simple, jargon free structure, style guide, consultation	Yes	Yes
4. Web page	Provide all outputs in public domain	ISRO, ICRISAT	26 July 2007	15 Aug 2007	Design, content, link up with other govt/ non-govt websites, query system on state, AC zone	yes	
5. Executive summary	Based on all reports Size- 40 pages	ICRISAT	Oct 2007	Feb 2008	Simple, for layman, presentation format		Yes
6. Policy Brief	4 page – policy brief	NCAP					

a) all these will be published later, b) you can add more authors, c) can add more dimensions, d) has to go refereeing process

Concluding Session

Chair: KV Raju

Rapporteur: AVR Kesava Rao

Six presentations were made in this session by the rapporteurs of the technical sessions.

The chairman mentioned that there is a need for consolidation of ideas regarding special needs, watershed guidelines and policy guidelines. He stressed for further involvement of PRI in watershed development programmes and involvement of MoA and MORD in the process of evaluation. He also mentioned his concern on collapse of many of the CBOs after withdrawal of the watershed programme.

Ms TK Sreedevi emphasized that PRI needs to be strengthened as it plays an important role in the implementation of watershed programmes. Dr Suresh Kumar emphasized the need to properly implement the watershed development programmes. Dr KP Raverkar has mentioned that there is a need to advice policy makers about cultivation of *Jatropha* and fruits and stressed the role played by the local institutions. Dr GP Juyal said the replicability of work, infrastructure development and documentation need emphasis. Dr TK Bhatti opined that in arid regions, drinking water, biodiversity, bio-fuels need more emphasis and greater resource allocation is needed in the arid regions. There was also mention of how to merge sector plans with district plans. Dr Marcella D'Souza explained the need for proper exit policies and the role of linkages with gram panchayats. Dr PG Diwakar felt that the document being planned is quite comprehensive.

Dr SP Wani has suggested the various authors that they should synthesize the material, judge the merits and assess the report. He highlighted the need for acknowledging all people, organizations and resources as the data will be kept in public domain. Dr Raju said that mention should be made whether the data is primary or secondary and provide the sources of data. Dr Diwakar suggested on having a committee to review the content for publication.

Summary of the Workshop on "Impact of Watershed Programs on Women and Vulnerable Groups" - *25 July 2007*

Rapporteur : Jyothsna P

Dr Suhas P Wani welcomed the participants and briefed the background of the Comprehensive Assessment (CA)-An Impact of Watersheds in India and updated the Gender workshop participants about the deliberations during Review and Planning Meeting on 23-24 July 2007.

The discussion covered:

- assessment of the impact at macro-level and micro-level
- use of remote sensing at macro-level
- data published by various agencies to assess impacts
- case studies to identify failures in terms of technology and policies
- case studies assessing impact of watersheds in terms of merging micro level and macro level data
- case study in assessing organizational policies, institutional mechanisms
- best-bet management options in simple format which can be implementable.

Amita Shah, Professor from Gujarat Institute of Development Research, spoke on the Impact of WDPs among Women and Vulnerable Groups and stressed mainly on important dimensions like:

- eco-feminism
- participation and decentralizations
- gender mainstreaming
- rights based approach.

She cautioned the participants to take care of the constraints which obstruct equity, including:

- limited resource regeneration besides irrigation
- control and access over land and credit
- perpetuation of low productive work
- absence of basic securities and skills
- links with expanding markets.

The paper underlined the indicators like membership and level of participation in decision making process by women and vulnerable groups; extent of resource access and reduced drudgery and rightful role in the social institution, for

analyzing the needs addressed for women and landless people by watershed program. The paper also highlighted the level of attention paid by watershed program to vulnerable and landless people during implementation phase.

A case study of Vadgaon Lakh (Taluka: Tuljapur, District: Osmanabad) was presented by **Chhaya Datar, Tata Institute of Social Sciences**. No positive discrimination while distributing the loans, loan for women's activities, differing interest rates/without interests, small loan at a time, preference for indigenous livestock and convergence of schemes have been identified as some of the strict rules to be followed to avoid misuse of loans and to achieve goals in the right time. The paper also discussed:

- the learnings from Vadgaon Lakh in Tuljapur taluk, where equal distribution of loans to all self help groups (SHGs), mutual guarantee for the disbursal of individual loans, differing interest rates for productive loans and consumptive loans, disbursing loans only for women activities and fixing loans amounts to individuals, irrespective of their savings or deposits with institution for successful or ensured sustainability of micro financing under watershed perspective
- provision of employment guarantee to women members during the initial phase of asset building while taking loans, which helped in repaying the installments with out defaulting.

TK Sreedevi, ICRISAT, discussed about harnessing gender power for improving livelihoods and strongly supported the argument that women or gender should not be an adding up but it should be as a part of the program as women are key to address household food security as they play a major role in agriculture and livestock development.

Poverty, population pressure, low productivity, climate change and degraded lands were mentioned as the major causes for taking up of watershed program and also described that how and why watersheds have been identified as the growth engines for agricultural development and achieving food security. She indicated the importance of people's participation in development process, sound technical input, role of institutions for enhanced participation, and a need for supporting policy and exemplified it with Adarsha Watershed, Kothapally.

She discussed the findings obtained from three watershed case studies viz., Adarsha watershed, Kothapally, Powerguda and Adarsha Mahila Samakya, Addakal, and urged for micro-enterprises model to benefit landless people. Identifying the drivers of collective action, she expressed the need to have more income in women's hands through commercial micro-enterprises. The salient points of the presentation include:

- women are referred as central target for watershed development as they are key to address household food security because of their role in agriculture and livestock development
- the level of community participation decide the sustainability of the project. Sustainability of the project is directly related with collective action or mode of community participation in the development program
- the existing SHG mechanism is to be followed for women as well as vulnerable groups and to link it to the watersheds
- inclusion of income-generating activities and CPR development in watershed plans, that have substantial impacts on livelihood opportunities for women and vulnerable groups in the watershed.

Mr Shilendra, Seva Mandir, described how to enable the poor to gain and how the long term investment in the community institutions is necessary for undertaking watershed development by altering property arrangements in favour of commons.

The paper highlighted

- the contribution of CPRs towards rural livelihoods, which is about anywhere from 11% to 39%. It is reported that development of common lands has improved the social cohesion among the vulnerable communities
- bottlenecks such as low demand from communities for developing community lands and encroachments over common lands
- a few approaches followed by Seva Mandir in Rajasthan that include high incentives for developing common lands, negotiation with households that have encroached in common lands through compensation and incentive, addressing development initiatives for both private and common lands simultaneously.

Dr Marcella D'Souza from WOTR gave details on how to promote the participation of women in watershed development projects. She gave details on generalized facts that surfaced on re-visiting project villages. She identified key challenges such as ensuring the target group to become the subject but not the object of the developmental intervention. She felt that villagers should take the responsibility for the development of their village as a whole and of their poor, vulnerable and marginalized groups and women. She briefed the learnings from their study on Wasundhara approach that impacts should not be observed at face value and there is a need to take risks and make necessary interventions.

The presentation highlighted:

- that wealth ranking during the early stage inception of watershed program followed by grouping the communities from bottom upward (SHG to UG)

and village envisioning exercise has reported in increasing social inclusion of women and vulnerable groups in the developmental activities

- fuel for cooking and drinking water has a direct relation with sustainability of the watershed development and women centered developmental activities has proved more sustainable in the long run in the program.

Jyotsna Sitling, Aajeevika Project from Uttarakhand, gave a detailed study on 'Gender Inclusiveness in Watershed Development', which included the components like community participation, social forestry, minor irrigation, agriculture, horticulture, livestock, soil conservation, and energy conservation. She discussed about the Shramdan from 1997 to 2000, year wise scaling-up of contribution from stakeholders in minor irrigation component from 1995 to 1998 and the factors contributing to women's involvement in the project.

Her presentation highlighted:

- the activities targeting animal husbandry like community land development. Eg: Bavani watershed, Doon Valley, helped to improve women's participation in the project
- reducing drudgery for woman through the production of fodder grass from community land. For instance in Bavani watershed.
- Necessary interventions like provision of biogas plant for communities that reduced women's drudgery due to less consumption of fuel wood, resulting in saving time and energy in collection of fuel wood.

'Women in Watershed – Is the Intended Client' was addressed by **Dharmistha Chauhan,** Gender Resource Centre, Gujarat. She discussed the rationale for targeting women in watershed, reviewed policy and actual practice (specifically mentioning women as a part of primary stakeholder group by giving examples of cases where women have not been contrastingly involved in Hiware Bazaar (Maharashtra), and Mokasar (Gujarat)) and cases where there has been an inbuilt gender component as in Piprali (Gujarat), and Sorapada (Gujarat)).

She demonstrated strategies to feed into mainstream programme. They include:

- increasing number of women in committees
- promotion of *mahila sabha* with funds
- initiating new avenues for diversification
- recognition of SHGs as part of economic infrastructure
- extending farming systems approach targeted to women.

The paper also highlighted

- ♦ the issue of lacking representation from women and landless people in the committees in watershed initiatives

- ♦ the learnings of watersheds that have inbuilt gender component. For instance, Piprali and Sorapada watersheds in Gujarat have involved women's participation that resulted in improvement in drinking water, providing food and ensuring financial security besides education of children and participation in the program
- ♦ watershed programs that helped women in involving non-stereotype roles like supplying agriculture inputs and maintaining other micro enterprises and also making them increasingly visible at village level.

Facilitating equity through integrated NRM, the report of 30 districts in seven states was presented by **Saroj Mahapatra, PRADAN.** She gave the account of various developmental challenges in operational area such as vulnerable farming systems, high dependence on fast depleting forest resources, low investments either public or private in resource regeneration, very poor resource husbandry, high concentration of extremely poor communities, exclusion of women, scheduled castes and other marginalized families, isolation of tribal communities in the forest fringe villages, high prevalence of food and nutrition insecurity, ill health especially among women and girl children, high incidences of distress migration and indebtedness.

She gave detailed account on the processes for building gender equity. She also mentioned the similar work undertaken in Jharkhand, West Bengal, MP and Bihar with the funding from IFAD- JTDS, Peterbar with NABARD support and in collaboration with panchayats, under NREGA.

The paper highlighted

- integrated NRM activities considering the poor households with a livelihood focus and building capacity of women to take care of NRM institutions
- NRM interventions that are labor intensive and not capital intensive, ensuring an opportunity for the participation of vulnerable groups (landless and marginal communities)
- promise of more investment per household when livelihood is integrated with watershed initiatives
- higher participation of women and lower communities in the decision making forums.

'Watershed Development Projects – Are They a Panacea for Development of Dryland Agrarian Communities? – Evidence from Karnataka' was presented by Mr **Ananda Vadivelu**, Institute for Science and Economic Change, Bangalore.

Way Forward:

- conceptualization of equity has to be placed upfront
- technology choices has to flow from equity considerations
- to address isolation and exclusion of integration of livelihood approach
- for integration of livelihood, more investment per family is needed.

The paper highlighted:

- the comparison of processes and outcomes in NGO implemented and DPAP watersheds in Karnataka, where community participation and organizing social capital were observed after preparing master and action plan. Denser SHG formation was observed in NGO implemented watershed and planning was carried out though transact survey. However, the study underlined more participation from upper reach in NGO implemented watershed for achieving their own task
- the positive outcome in NGO implemented watersheds which enabled women to take leadership roles, claim equal wages, etc.

Summary of the Workshop on "Integrated Best-bet Management Options in Watershed Management" 26-27 July 2007

The workshop on best-bet option was held from 25-27 July 2007. All the participants and contributors presented their draft on best-bet options, write-ups and were discussed in detail as reported earlier in the main review and planning workshop session. Dr Wani presented the model write-up of best-bet options on knowledge-based entry point. The overview of the structure of the manual was briefed by Dr YS. Ramakrishna, Director, CRIDA. The gaps for the best-bet management option manual were identified and included. The list of best-bet management options which were presented during the workshop are given below:

1. Overview of Best-bet practices manual
   YS Ramakrishna
2. Watershed planning (net planning)
   Crispino Lobo
3. Policies and guidelines
   KV Raju
4. Drinking water and sanitation in watershed
   Marcella D'Souza
5. Characterization of natural resource base (agroecological potential, water balance etc.)
   YS Ramakrishna
6. Knowledge-based entry point and other novel options for rapport building
   SP Wani
7. Soil and water conservation measures
   P Pathak
8. Farming systems in watersheds
   BK Kakade
9. Integrated nutrient management options
   SP Wani
10. Integrated pest management options including disease management for crop production
    GV Ranga Rao
11. Rehabilitation of degraded lands
    TK Sreedevi

12. Watersheds and livestock based activities
    Peter Bezkorowajnyj
13. Use of remote sensing and GIS for monitoring and impact assessment
    PG Diwakar
14. Diversification of land use and farming systems
    B Venkateswarlu
15. Institutions and community-based organizations in watersheds
    NK Sanghi
16. Capacity building in watersheds
    A Ravindra
17. Process of watershed selection
    YS Ramakrishna
18. Sustainable cropping systems in watersheds
    TK Bhati

Based on the discussions held during the workshop, the following best-bet options were finalized.

1. Watershed management concepts and practices
   Kanchan Chopra, SP Wani and **YS Ramakrishna**
2. Models of watershed management
   SP Wani, David Radcliffe, Michael Glueck and **TK Sreedevi**
3. Process of watershed selection
   NK Sanghi, DK Marothia and **KV Rao**
4. Characterization of natural resource base (agroecological potential, water balance etc.)
   YS Ramakrishna, AVR Kesava Rao, Piara Singh and **MD Osman**
5. Knowledge-based entry point and other novel options for rapport building
   SP Wani and **Sreenath Dixit**
6. Watershed planning (net planning)
   Crispino Lobo and **Team**
7. Diversification of land use and farming systems
   VN Sharda and **B Venkateswarlu**
8. Soil and water conservation measures
   P Pathak, PK Mishra and **MV Padmanabhan**
9. Sustainable cropping systems in watersheds
   KPR Vittal, Masood Ali, CSWRTI and **S Marimuthu**

10. Farming systems in watersheds
    BAIF (Dr NG Hegde to recommend), G Subba Reddy and **GR Korwar**
11. Integrated nutrient management options
    SP Wani, Ch Srinivasa Rao, Shankar and **DLN Rao**
12. Integrated pest management options including disease management for crop production
    GV Ranga Rao, Suresh Pande, OP Rupela and **S Desai**
13. Watersheds and livestock based activities
    Peter, ILRI and **BAIF, AK Mishra**
14. Livelihood opportunities for vulnerable groups (landless, women and youth)
    Deep Joshi, SP Tucker, R Parthasarathy, (GIDR) and **TK Sreedevi**
15. Drinking water and sanitation in watersheds
    Marcella D'Souza
16. Rehabilitation of degraded lands
    TK Sreedevi, SP Wani and **Mohd Osman**
17. Participatory monitoring and evaluation
    K Palanisami, Amita Shah and **S Nedumaran**
18. Impact assessment methods and practices
    PK Joshi, SP Wani, Rosana P Mula and **RL Shiyani**
19. Policies and guidelines
    KV Raju, PK Joshi, Amita Shah Kanchan Chopra and **SP Wani**
20. Use of remote sensing and GIS for monitoring and impact assessment
    PG Diwakar, RS Dwivedi and **IIRS, (Dehradun), Dadhwal**
21. Sustainable use of groundwater in watersheds
    Tushar Shah and **KN Reddy**
22. Watershed planning for externalities
    RS Deshpande, K Tirupathaiah, Anupam Das (ORLP) and **PV Veera Raju (Sujala)**
23. Capacity building in watersheds
    Ravindra, Crispino Lobo, TS Vamsidhar Reddy and **K Tirupathaiah**
24. Institutions and community-based organizations in watersheds
    Amita Shah, SP Wani, TK Sreedevi and **TS Vamsidhar Reddy**

Glimpses of the Workshop

Participants of Comprehensive Assessment Review Meeting and Component Workshop

Annexure I

A Comprehensive Assessment of Watershed Programs in India

Review Meeting

Program

Monday 23 July 2007

0930–1000	Registration	
Session 1	**Inaugural Session**	
	Chair : *CLL Gowda* *Rapporteur* : *TK Sreedevi*	
1015–1025	Welcome and objectives of the workshop	SP Wani
1025–1040	Watersheds for improving livelihoods in Andhra Pradesh	A Santhi Kumari
1040–1055	Inaugural address	CLL Gowda
1055–1100	Vote of thanks	TK Sreedevi
1100–1130	*Photograph and tea/coffee break*	
Session II	**Technical Session I**	
	Chair : *A Santhi Kumari* *Rapporteur* : *Rosana P Mula*	
1130–1200	Update on the progress of the Comprehensive Assessment of watershed impacts	SP Wani
1200–1225	Meta analysis for assessing impacts of watershed programs in India	PK Joshi
1225–1245	Potential to enhance productivity and rainfall use efficiency in the watersheds of India	Piara Singh
1245–1300	Discussion	
1300–1400	*Lunch*	

Session III	**Technical Session II**	
	Chair : Sandeep Dave *Rapporteur : KL Sahrawat*	
1400–1420	Institutions, policies and guidelines for watershed management in India	KV Raju
1420–1440	Comparative study of institutional mechanisms in select watershed programs in India	TK Sreedevi
1440–1500	Discussion	
1500–1515	*Tea/coffee break*	
Session IV	**Technical Session III**	
	Chair : PK Joshi *Rapporteur : Piara Singh*	
1515–1535	Experiences in Sujala watershed programs for enhancing impact	Sandeep Dave
1535–1555	Impact of watershed programs in Central and Western India	Amita Shah
1555–1615	Impact of watershed programs in South India	Suresh Kumar
1615–1635	Impact of watershed programs from Uttarakhand	KP Raverkar
1635–1655	Impact of watershed programs in high rainfall regions	GP Juyal
1655–1715	Impact of watershed programs in arid regions	TK Bhati
1715–1820	Discussion	
1830	*Workshop dinner*	

Tuesday 24 July 2007

Session V	**Technical Session IV**	
	Chair : **Amita Shah** *Rapporteur* : *S* **Marimuthu**	
0900–0930	Impact of NWDPRA program using remote sensing and GIS	PG Diwakar
0930–0950	Monitoring and Evaluation (M&E): Approach and Insights	Rosana P Mula
0950–1010	The impact of watershed intervention on runoff, soil loss and environmental quality	P Pathak
1010–1030	Watershed case studies from Northeast India	Farhet Shaheen
1030–1045	*Tea/coffee break*	
Session VI	**Technical Session V**	
	Chair : **S Meenakshi Sundaram** *Rapporteur* : **P Pathak**	
1045–1105	Update on best-bet practices manual	YS Ramakrishna
1105–1125	Experiences from Indo-German watershed programs in Maharashtra	Marcella D'souza
1125–1145	Experiences from MPRLP	Jitendra Agrawal
1145–1230	Discussion	
1230–1330	*Lunch*	
Session VII	**Technical Session VI**	
	Chair : **SP Wani** *Rapporteur* : **RC Sachan**	
1330–1530	Planning next steps for the CA: Group discussion	PK Joshi, TK Bhati, KV Raju, GP Juyal, YS Ramakrishna, PG Diwakar, Amita Shah, Suresh Kumar
1530–1600	*Tea/coffee break*	

Session VIII **Concluding Session**

Chair **: KV Raju**
Rapporteur *:* **AVR Kesava Rao**

Rapporteurs' Reports

1600–1605	Technical Session - I	Rosana P Mula
1605–1610	Technical Session - II	KL Sahrawat
1610–1615	Technical Session – III	Piara Singh
1615–1620	Technical Session – IV	S Marimuthu
1620–1625	Technical Session – V	P Pathak
1625–1630	Technical Session – VI	RC Sachan
1630–1635	Vote of thanks	Piara Singh

Workshop on Impact of Watershed Management on Women and Vulnerable Groups

Program

Wednesday, 25 July 2007

0900-0925	Presenting on concept note on "Impact of watershed on women and vulnerable groups	Amita Shah
0925-0950	Women and watershed: Case of Vadgaon Lakh	Chhaya Datar
0950-1015	Harnessing gender power for improving livelihoods	TK Sreedevi
1015-1030	*Tea/Coffee*	
1030-1055	Understanding gender inclusiveness in watershed development through reduction in drudgery of women: A case study from Doon valley watershed management project, Uttarakhand, India	Jyotsna Sitling
1055-1120	Losers and Gainers in a Watershed: Seva Mandirs	Shailendra
	Approach to bring equity through understanding power relations and development of common lands	Tiwari
1120-1145	Promoting inclusiveness in watershed program	Marcella D'Souza
1145-1210	Women in watershed- the intended client? Experiences from AKRSP(I).	Dharmistha Chauhan
1210-1235	Share the experiences of PRADAN	Saroj Mahapatra
1235-1300	Watershed development projects – Are they a panacea for development of dryland agrarian communities? –Evidence from Karnataka	Anand Vadivelu
1300-1400	*Lunch*	

Workshop on Best-bet Options for Integrated Watershed Management

Program

Wednesday 25 July 2007

1400-1430	Overview of best-betpractices manual	YS Ramakrishna
1430-1500	Watershed planning (net planning)	Crispino Lobo
1500-1530	*Tea/Coffee*	
1530-1600	Policies and guidelines	KV Raju
1600-1630	Drinking water and sanitation	D'Souza 7
Marcella	in watershed	

Thursday 26 July 2007

0900-0930	Characterization of natural resource base (agroecological potential, water balance etc.)	YS Ramakrishna
0930-1000	Knowledge-based entry point and other novel options for rapport building	SP Wani
1000-1030	Soil and water conservation measures	P Pathak
1030-1100	*Tea/Coffee*	
1100-1130	Farming systems in watersheds	BK Kakade
1200-1200	Integrated nutrient management options	SP Wani
1200-1230	Integrated pest management options including disease management for crop production	GV Ranga Rao
1230-1300	Rehabilitation of degraded lands	TK Sreedevi
1300-1400	*Lunch*	
1400-1430	Watersheds and livestock based activities	Peter Bezkorowajnyj
1430-1500	Use of remote sensing and GIS for monitoring and impact assessment	PG Diwakar
1530-1530	*Tea/Coffee*	

1530-1600	Diversification of land use and farming systems	B Venkateswarlu

Friday 27 July 2007

0900-0930	Institutions and community-based organizations in watersheds	NK Sanghi
0930-1000	Capacity building in watersheds	A Ravindra
1000-1030	*Tea*	
1030-1100	Process of watershed selection	YS Ramakrishna
1100-1130	Sustainable cropping systems in watersheds	TK Bhati

Annexure II

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Annexure III

PowerPoint Presentations

Objectives

- Review the progress and synthesize the findings from the work done in different areas of impact assessment by core-group institutions
- Chalk out course of future action to complete the assessment
- Study impact of watershed programs on women and vulnerable groups
- Discuss and finalize best-bet options for integrated watershed management – A manual

A Comprehensive Assessment of Watershed Programs in India

Review Meeting & Component Workshops

23–27 July 2007

BUILDING WATERSHED BASED LIVELIHOODS

APRLP EXPERIENCE

A Santhi Kumari
Commissioner Rural Development
Govt. of Andhra Pradesh

Trends in Watershed approach

- Implementation through peoples participation commenced from 1995-1996.
- GoI revised guidelines in 2001 unit cost increased from Rs.4000/ha to Rs.6000/ha.
- APRLP started in 2000 - 01 to focus on watershed based livelihoods.
- Hariyali Guidelines – 2003.
- Process Guidelines were developed by the State in 2004 combining Hariyali Guidelines &APRLP approaches.

APRLP

Project Goal:

Introduction of effective and sustainable approaches to alleviate poverty in drought prone areas of Andhra Pradesh through watershed plus activities.

Components:

- Watershed and Watershed plus initiatives.
- Capacity Building of primary and secondary stakeholders.
- Innovations to enhance the impact of watershed work.

APRLP – At a glance

- Pilot districts – Anantapur, Kurnool, Mahaboobnagar, Nalgonda, Prakasam.
- 500 innovative watersheds.
- Livelihood support to 2500 ongoing and completed watersheds.
- Total project outlay - 319.72 Crores.
- Project period 2000-2007.
- Scaled up to all watersheds and districts in the year 2004.

Salient features

- NRM and off farm livelihoods to go together.
- Landless communities are recognized as imp Stakeholders.
- Cost effective structures with focus on poor people's lands.
- Specific focus on productivity enhancemnt
- Implementation through CBOs

Salient features (cont.....)

- Institutionalization of Capacity Building initiatives
- Gender sensitivity and equity integral to the project.
- Convergence with line departments viz DRDA, IKP, Agriculture, Animal Husbandry, Horticulture, Fisheries, SC & BC corporations etc.

Social Mobilization

- Identification of *peer* and mobilizing into groups
- Formation & Strengthening of User/labour/Self Help groups and Village Organizations
- Developing working relations between Gram Panchayat and VOs
- Convergence with CBO based programmes and institutions
- Consolidation & preparation of CBOs for post project management.

Capacity Building

- APARD as a nodal agency for CB.
- Institutionalization of CB through DCBC, DLRCs & CLRCs.
- Consortium of Resource Organizations.
- CB needs assessment.
- Preparation of annual Training calendars.
- Pool of Resource persons.
- Training Modules and Extension Material.
- Training institutions to have implementation experience.

Natural Resources Management

- Implementation through VOs of Women SHGs.
- Focus on the lands of poor.
- Preparation of action plans by User Groups / Village Organizations (VO).
- Participatory net planning.
- Probation phase for watersheds.
- Cost effective structures.
- Management of Common Property Resources by the poor & usufructory rights.

Productivity Enhancement

- Soil fertility & Micro Nutrient Management.
- Integrated Pest Management.
- Paraworkers in Agriculture & Livestock.
  - Integrated Livestock Development Centers – maintained by line dept.
- Seed Production / Seed Banks.
- Fodder Development.
- Input support through Revolving Fund.

Enterprise Promotion

- Identification of poor and preparation of enterprise promotion plans - farm & non-farm activities.
- Revolving fund for enterprise promotion.
- Skill improvement training for enterprise promotion.
- Bank linkages, Consortium with IKP (VELUGU) and Other Development Agencies.
- Market linkages.
- *Promotion of Jobs for Rural Youth.*

Gender

- Gender sensitization.
- Integration and mainstreaming of gender aspects.
- Preparation of Gender Sensitive Action plans.
- Gender Analysis and Audit.
- Gender disaggregated data base & MIS.

Upscaling of APRLP Approaches

- Extended to all watersheds in the state in 2004.
- Process guidelines developed incorporating Hariyali guidelines and APRLP approaches.
- Thrust areas

  -Focus on the poor & landless -Net planning

  -PE & EP activities

  -CB institutions

Contd...

Physical impact

- 2.5 lakh Ha. of area treated in 300 Project funded watershed.
- 2.49 lakhs Poor families organized into Self Help Groups and federated Village Organizations.
- In 2500 APRLP supported watersheds, 1.17 lakh trainings conducted.
- Revolving Fund of 72 crores accessed by 1.07 lakh poor families.

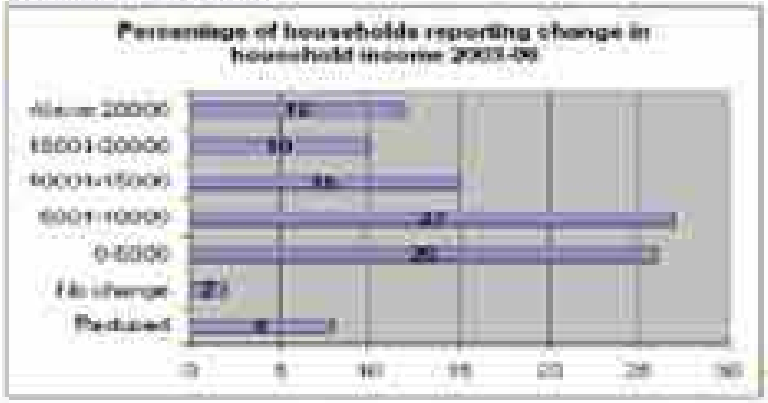
Contd...

Achievements (Cont...)

- Under Productivity Enhancement, Rs.39.00 crores is accessed by 35000 poor farmers.
- 1808 Agriculture & Livestock paraworkers trained.
- 80 Integrated Livestock development Centers established.
- Seed production in 508 villages.
- Fodder Development in 31,000 acres.

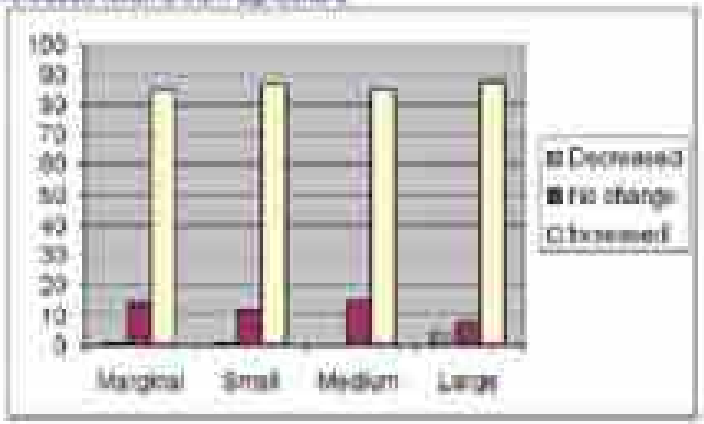
Impact Assessment by TARU Leading Edge

- About 90 percent of households reported increase in income.
- 37 to 39 percent of households reported an annual increase in income greater than Rs.10,000



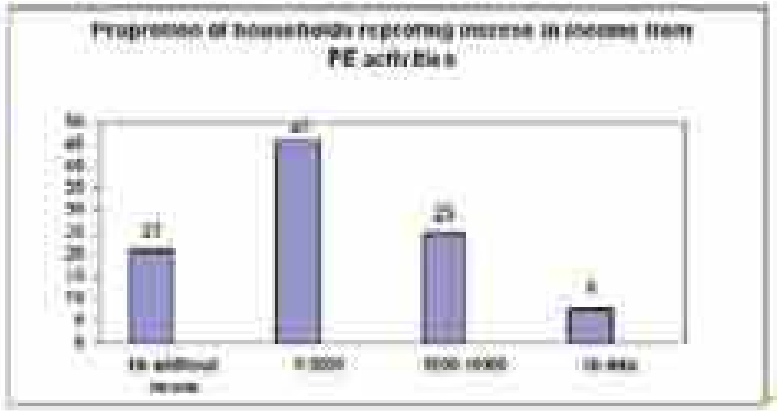
Impact Assessment (Contd...)

- Around 85% of households belonging to all farmer categories reported increased returns from agriculture



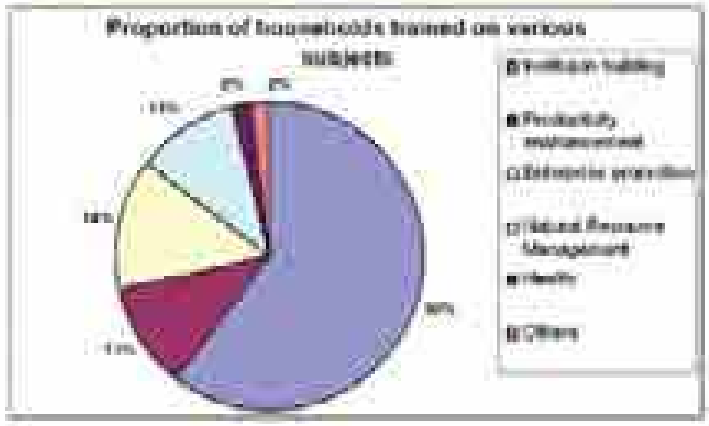
Impact Assessment (Contd...)

- 71% of households reported increased returns from Productivity Enhancement



Impact Assessment (Contd....)

- 48% of households reported trainings in Institution Building and Group Dynamics followed by 14% in Enterprise Promotion



A Comprehensive Assessment of Watershed Programs in India: A Progress Report

Overview

Importance of Rainfed Agriculture in India

It can be strongly argued that rainfed agriculture holds the key for addressing the challenges of poverty, equity, food security and inclusive development

Specific Objectives

- To critically assess the impact of various watershed development programs in India
- To identify the drivers of success from the bright spots in terms of targeted objectives, enabling policies and institutions contributing towards achieving greater impact
- To develop suitable institutional and technical recommendations, policy guidelines and suitable database for sustainable and efficient management of the watershed programs

PESTs are holding back the potential of watershed programs in India

Main Question

The overarching question for the assessment is "How the watershed programs can be made more effective and managed to

- increase agricultural productivity
- help to enhance incomes and reduce poverty
- to protect environment for sustainable development

Approach

- Convergence and consortium
- Macro- and micro-level studies
- Detailed analysis of secondary data
- Detailed case studies
- Use new science tools

Project Inception Workshop at New Delhi, 6-7 June 2006

Workshop Outputs

- Discussed and finalized strategy to undertake CA with partners
- Consortium of voluntary institutions formed
- Proceedings were documented and published

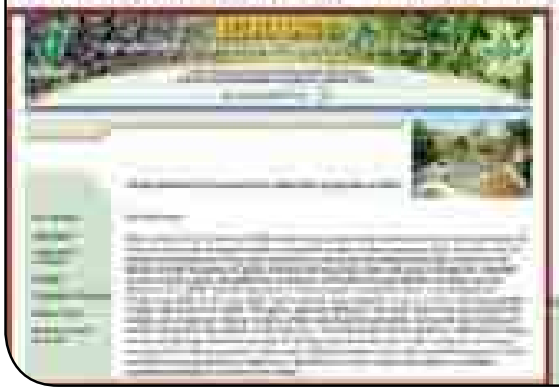
Participating Agencies or Organizations in the CA

Core Group Meeting at ICRISAT, 11-12 July 2006

S.No	State/Region	Organizations responsible
1	1.South (AP, TN, Karnataka, Kerala, Pondicherry)	SRC,**TNAU**,CSWCRTI, **ICRISAT**,CRIDA
2	2.West (Gujarat, Rajasthan, Goa, Maharashtra)	**JAU, GIDR,** ICRISAT, CSWCRTI, SRC, **CAZRI**,SPWD, WOTR
3	3.North (HP, Uttaranchal, Haryana, Punjab, UP)	**NCAP,** IEG, SPWD, GBPIAU, **CSWCRTI,** GBPIEDHE, ICRISAT
4	4.East (Bihar, WB, Jharkhand, Orissa) & NE	CENDRET,XIRD, CSWCRTI, ICAR for NE, **NCAP**
5	5.Central (MP, Chattisgarh)	**GIDR-IGAU,** WALMI,MP, IGAU, ICRISAT

Webpage for the CA Launched

- Guidelines (NWDPRA, DPAP, Hariyali, WDF
- Impact assessment reports (135)
- Mechanism for central data base on watersheds



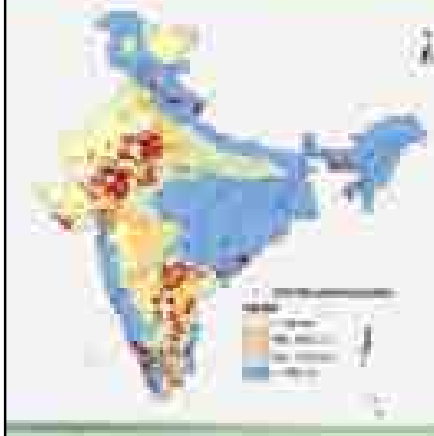
Summary of WSDPs in India upto March 2006

S.No	Ministry / Scheme	Year of start	Area treated	Amount Expenditure
	A. Ministry of Agriculture (Department of Agriculture and Cooperation)			
1				
2				
3				
4				
5				
6				
7				

Summary of WSDPs in India upto March 2006 (Contd.)

S.No	Ministry /Scheme	Year of start	Area treated	Amount Expenditure
	B. Ministry of Rural Development (Department of Land Resources)			
8	DPAP			
9				
10				
11				
	C. Ministry of Environment and Forests			
12				
	D. Planning Commission			
13				
14				
	E. Public-Private Partnership (PPP)			

NWDPRA Watersheds Rainfall Zones



Rainfall zones	No. of locations
<700 mm	326
700 - 800 mm	121
800 - 1150 mm	453
>1150 mm	311

NWDPRA Watersheds Soil Zones

Drivers and Speed Breakers in Watersheds

- Meta-analysis of 311 case studies
- Adarsha Goa Yojana
- Sukhomajri watershed
- Adarsha watershed, Kothapally

Drivers for Improved Collective Action and Participation

- Tangible economic benefits to individuals through convergence
- Knowledge-based entry point – empowerment
- Equal partnership, trust and shared vision
- Good local leadership
- Transparency and social vigilance in financial dealings
- Equity through low-cost structures
- Pre disposition to work collectively
- Targeted activities for landless and women members

Benefits of Consortium Partnership ICRISAT-IPGRI-NRSP

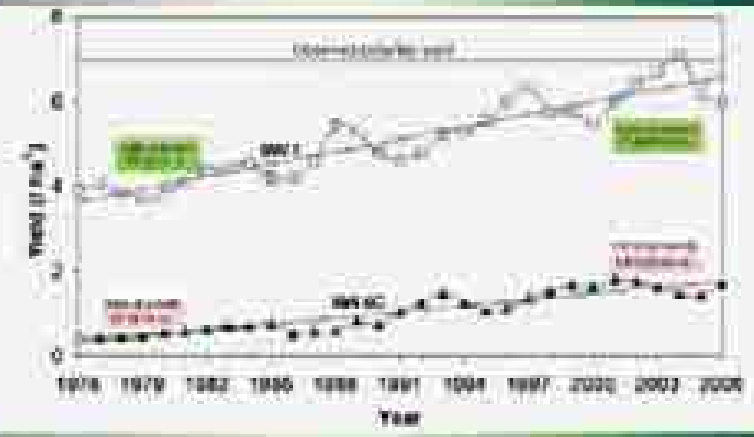
- Creativity
- Sustainability
- Cost effectiveness
- Win-win solution through empowerment of partners
- Synergy
- Faster scaling-up
- Change in organizational behavior
- Public-private partnerships are facilitated (multiplier effect)

Ambedvet: AGY Speed Breakers

Lack of

- Political support to ensure fund flow
- People's participation could not be built and facilitated
- Ambedvet village was too close to industrial belt exploitation of groundwater by industries
- Lack of local leadership
- Involvement of contractors
- No technical support

Large opportunities to increase greenwater use efficiency to reduce the consumptive water use in rainfed agriculture



Farmers' participatory evaluations for productivity enhancements in watersheds of 5 districts of Andhra Pradesh under APPLP during 2002-2004

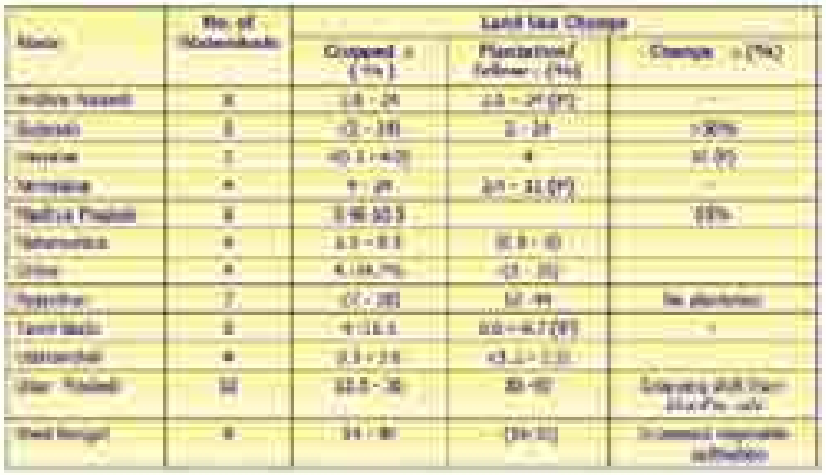
District	Watersheds/ villages	Crop	No. of Trials	Cultivars	Yield (kg ha⁻¹)		Yield gain (%)
					TP	Best bet	

Farmers' participatory evaluations for productivity enhancements in watersheds of 5 districts of Karnataka under ICRISAT-Sujala project during 2005-2006

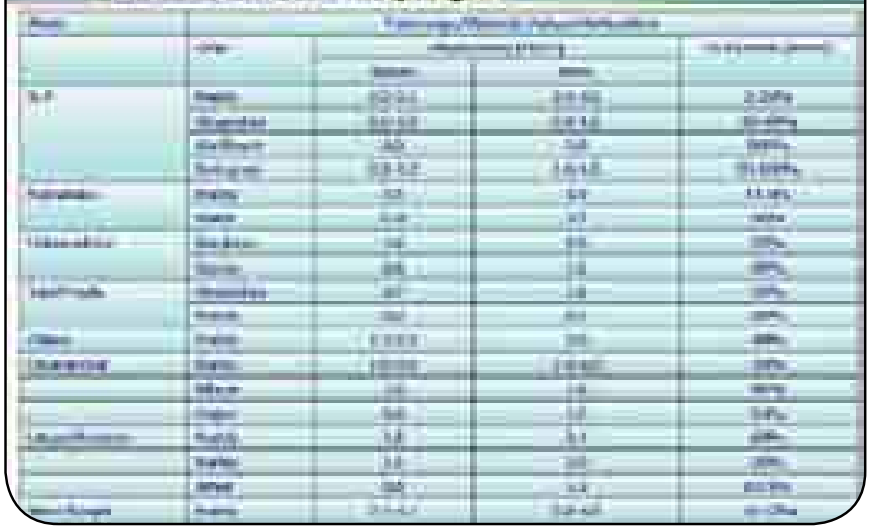
Yield advantages observed with different crop cultivars and improved management in Sujala watersheds of Karnataka during 2005-2006 seasons

Crop	Percent yield improvement with		
	Local+IMP	HYV+FP	HYV+IMP
Ragi	74	22-52	103-123
Groundnut	27	13-36	47-83
Soybean	62	0	83
Sunflower	67	54-150	152-230
maize	--	36	70
Sorghum	--	--	31

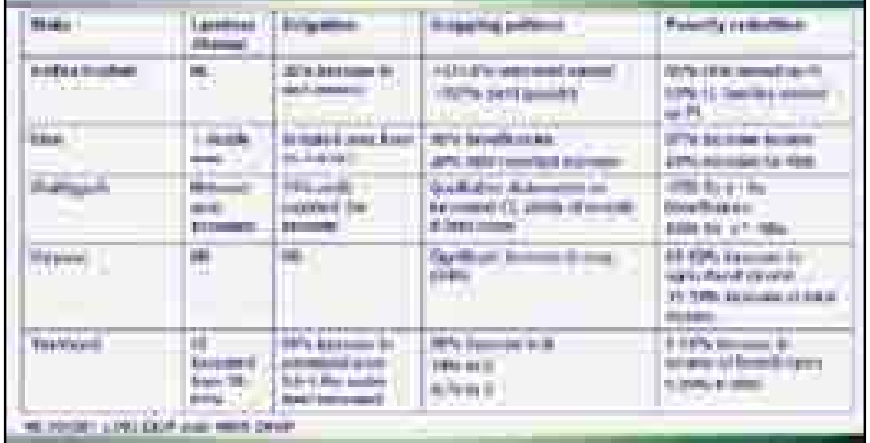
Evaluation of Land Use change in NWDPRA watersheds at the end of the project using RS and GIS



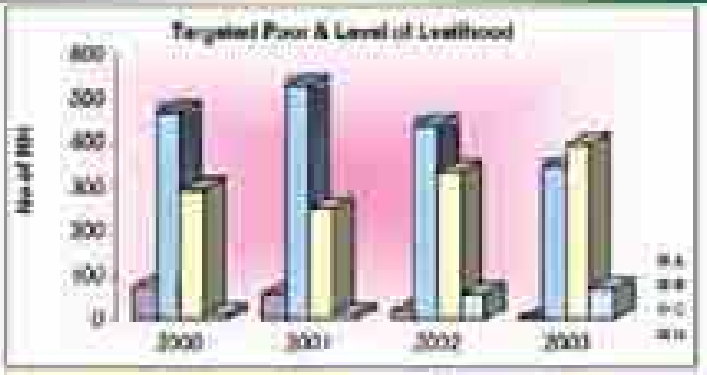
Evaluation of Productivity enhancement in NWDPRA watersheds of different states at the end of the project



Impact Assessment of Watershed Programs India, 1991-98



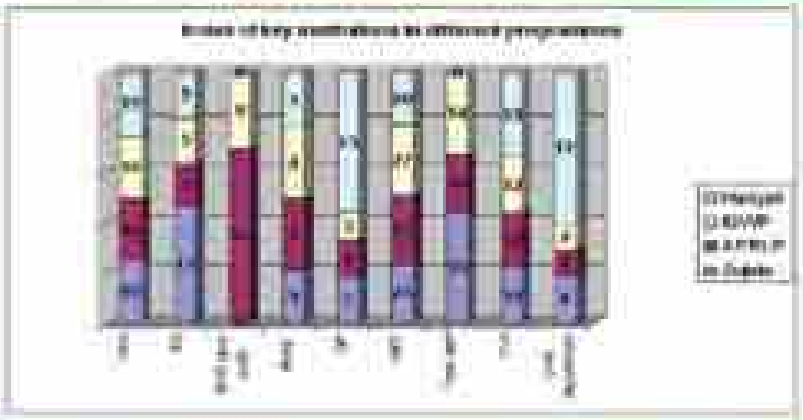
Livelihood and Poverty Reduction Observed in DANIDA Project



Case Studies to Identify Suitable Institutional Arrangements

- Andhra Pradesh Rural Livelihoods Program
- Sujala Watersheds
- DPAP Hariyali watersheds
- Indo-German watersheds

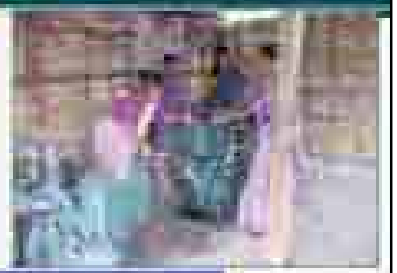
Roles of Key Institutions



Case study for understanding where we are on Gender Impact in Watershed

- 3 villages selected
  - Powerguda - Managed by SHGs
  - Kothapally - Managed by CBOs
  - Janampet - Managed by Federation of SHGs (Mahila samakhya)

Targeted activities for women produce multiple benefits in the watersheds



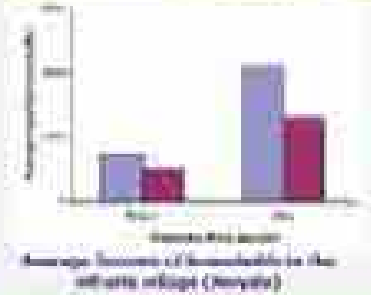
- Built institutions
- Developed social capital
- Enhanced health and nutrition awareness
- Increased incomes

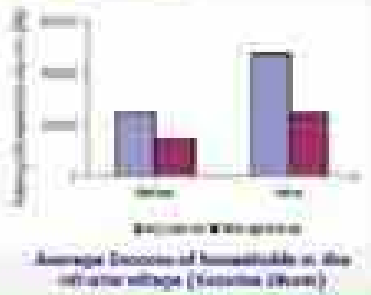
Case Studies to Identify On-site and Off-site Impacts

- Shelkeda in Maharashtra
- Rajasamadhiyala in Gujarat

Off-site Impacts

- Watershed development in Rajsamadhiyala benefited downstream villages and increased productivity, production and incomes for the farmers





Case Studies for Socioeconomic and Policy Needs

- Adarsha Gaon Yojana
- Rajiv Gandhi Watershed Mission
- MYRADA
- Sukhomajri Watershed
- ICAR Model Watershed – Fakot
- Consortium approach – Adarsha Watershed

CPRs and IGAs to Benefit Vulnerable Groups

- Collective action and convergence developed CPR in Rajasthan
- All villagers are getting grass free of cost
- Rs. 75000 per annum from auction of grass to surrounding villages
- Enhanced below- and above-ground biodiversity

CPRs and IGAs to Benefit Vulnerable Groups *(Contd..)*

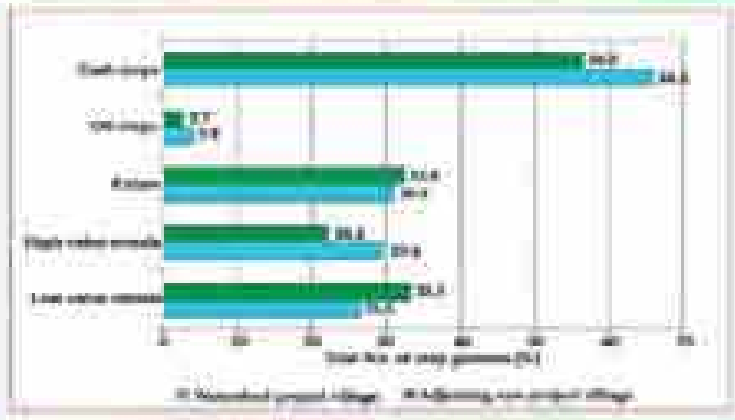
Drinking Water: A Key Intervention to Benefit Women

Catch them Young Environment Clubs

Health – Water Quality Issues

- Safe disposal of waste water
- No_3 and Po_4 pollution
- Pesticide residues

IWRM Increased Production of Commercial Crops: Kothapally, AP, India



Diversification of Systems for Sustainable Development

- Legumes in systems
- Medicinal and aromatic plants
- Vegetable and fruit trees
- Sweet sorghum for ethanol

Change in Irrigation Facility

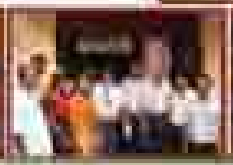
Rajasamadhiyala watershnd

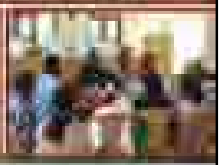
Need for New Paradigm in Watershed Management

- Collective action
- Convergence
- Consortium
- PPP– Watersheds as business model
- IWRM
- Livelihood approach
- ICT and new approaches for scaling-out
- Concurrent M&E

What and how we are evaluating in watershed programs

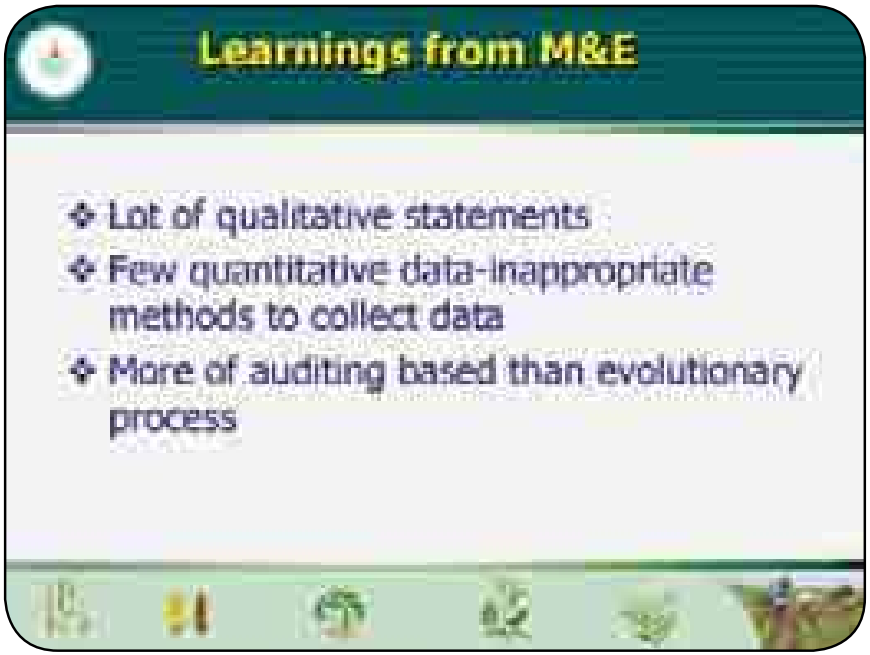
- Mid-term evaluations
- Post project evaluations





Issues

- With what we compare?
- Who undertakes M&E
- How indicators are assessed


Learnings from M&E
Lot of qualitative statements
Few quantitative data-inappropriate methods to collect data
More of auditing based than evolutionary process


What's Way Forward?
What how and when to monitor ?
How many watersheds to monitor?
Where to apply qualitative and quantitative indicators?
Participatory M&E
Need to discus and come out with a feasible and operational M&E

Watershed Development and High Value Commodities in Rainfed Areas

P K Joshi, F Shaheen* and S P Wani*

National Centre for Agricultural Economics and Policy Research

Pusa, New Delhi

*International Crops Research Institute for the Semi-Arid Tropics

Patancheru, Andhra Pradesh

Outline

- Background
- Watershed development
  - Results of meta analysis
- High-value commodities
  - Horticulture and livestock
- Connecting farmers with markets
  - Contract farming or cooperatives
- Conclusions
  - Strategies to leapfrog production/incomes in watershed areas

Background

- Rainfed agriculture is characterized by
  - Low productivity
  - High risk and uncertainty (weather & market)
  - Low level of technology change
  - Vulnerability to degradation of natural resources
- The region houses a sizable number of unemployed, poverty ridden and undernourished population.
- Policy initiatives were inappropriate, and often unintended for rainfed region.

Led to poor overall performance & distress among farmers

Key question?

- What are the technology, policy and institutional options to raise farm income, conserve soil and water resources, generate employment opportunities and minimize risk and uncertainty?

Possible options?

1. Invest to conserve and harvest rain water
2. Shift from low-income to high-value agriculture
3. Evolve institutional arrangements for linking producers with the markets

I

Conserve and harvest rain water

- Role of watershed development

- Reviewed 627 watershed studies
  - Covered wide range of agroclimatic regions and environmental conditions
- Meta analysis
  - Analysis of analysis
- Assessed impact
  - Efficiency, equity and environment

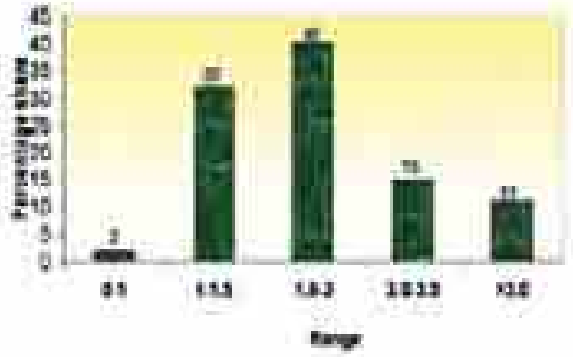
Summary benefits of watershed program

- Efficiency
  - *B/C ratio – Little changed to Now*
  - *IRR – 26.82% Ranged 6.68 to 60.7%*
- Equity
  - *Employment generation – 29 Mandays/ha/yr*
- Environment
  - *Irrigated area increased – 98%*
  - *Cropping intensity increased – 68%*
  - *Ground water recharge – 160 mm*
  - *Biomass declined by –13%*
  - *Soil loss declined by –9.92 t/ha/yr*

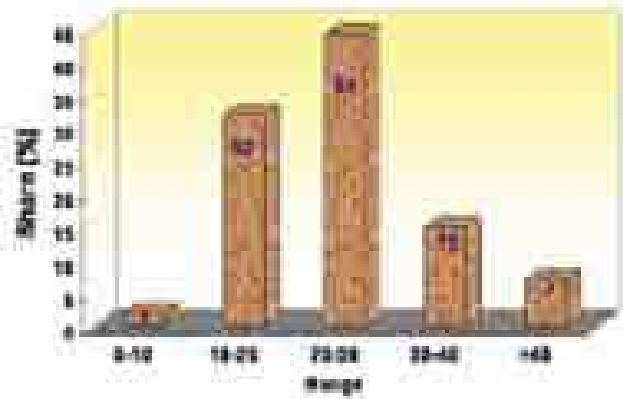
Other benefits

- Increase in agricultural productivity
  - 56.13 percent
- Increase in productivity of horticultural commodities
  - 40.40 percent
- Increase in household incomes
  - 55 percent

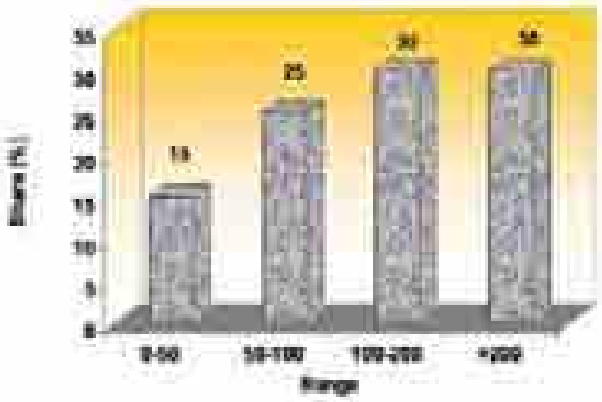
Watersheds according to BCR (%)



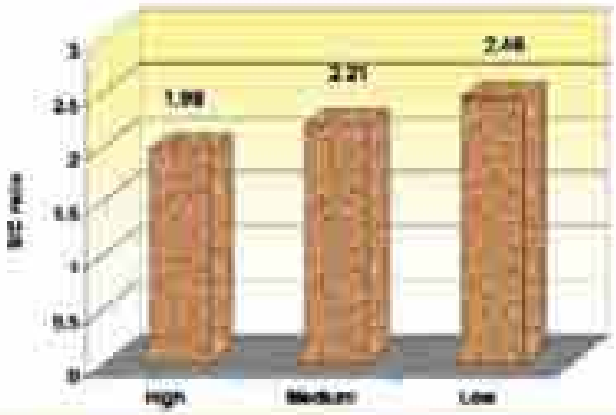
Watersheds according to IRR (%)



Watersheds and employment generation (%)



Economic status of the region and efficiency gains from watersheds



Priority target domains for watershed development and research

High impact	Low to moderate impact
Western Himalayan region, South zone	Trans-Gangetic Plain and Western Plateau zone
Maize watersheds	Maize watersheds
Rainfall ranging between 700-1000 mm	Rainfall <500 and > 1000 mm
Rainfallbearing degraded lands	Monsoon activities
Joint program by centre and state government	Inclgenhouse centrally sponsored
Poor income regions	High income regions
High people's participation	Low people's participation

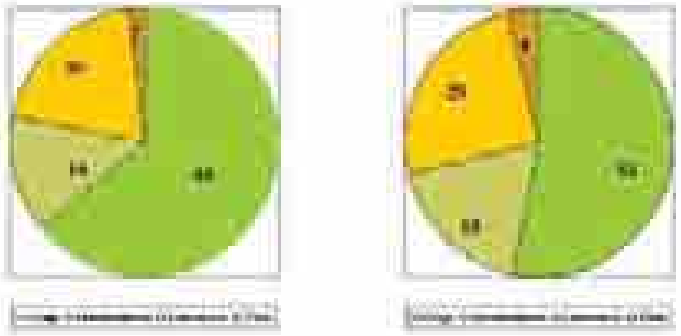
II
Shift from low value to high value production portfolio

Demand is shifting towards high value commodities

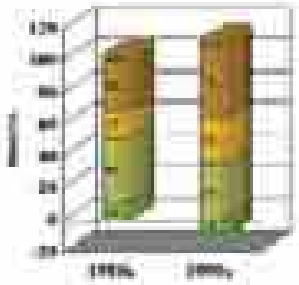
- High value commodities yield higher, quick and regular returns compared to cereals, pulses & oilseeds
- High value commodities are labor-intensive & suit smallholders more than large farmers

Changing share of different sub-sectors: all India

TE 1983-85 | TE 2002-05



Sources of agricultural growth
Rainfed areas

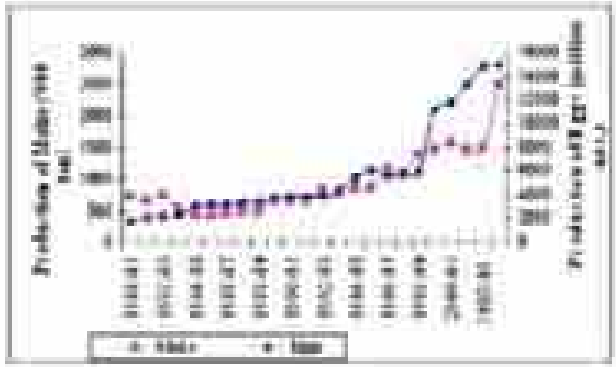


- *During 1980s*, main source of growth was *technology* followed by crop substitution
  - Oilseeds and pulses
- *During 1990s*, growth was governed by *crop substitution* followed by technology
- Higher agricultural growth during 1990s
  - Fruits and vegetables

Implications of shifting towards high-value commodities

- Higher returns
  - Cereals profitability is declining
  - Vegetables & fruits are more profitable than cereals (40-70%)
  - Livestock and poultry farming gives 3-10 times higher returns than paddy, sorghum, pulses & oilseeds
- Employment
  - Higher labor requirement for fruits, vegetables, flowers and poultry than food grain crops
- Natural resources
  - Requires less water (livestock and vegetables)
  - HVCs show higher water productivity than rice

Egg and maize production: AP



III
Link producers with markets

Marketing problems & smallholders

- Perishable nature and low volume of marketable surplus with the smallholders
  - *High transaction cost*
  - *High risk (production & marketing risk)*
- Poor post harvest infrastructure
  - *Price volatility, high price dispersion (vol.21 to 63)*
  - *High post-harvest losses*
- Chain of intermediaries
  - *Low producers' share in retail prices (30-50%)*
- Food safety issue
  - *Quality leverage due to lack of information*
  - *Pesticide residue*

Emergence of innovative institutions: *contract farming*

- **Public sector initiatives**
  - *Punjab Agro Industries Corporation (PAIC)*
- **Cooperative sector initiatives**
  - *Dairy sector*
  - *NDDB*
  - *Mahagrapes*
- **Private sector initiatives**
  - *ITC/E-choupal*
  - *Mahindra Agri Tech*
  - *Nagarjuna Agri Chemicals, Chirala*
  - *Venkateshwara Hatcheries, Namakkal*
- **Multi-national firms**
  - *Nestle*
  - *Pepsi*
- **Opportunity for agri-input services**
  - *Rasi Seeds*
  - *Mahindra & Mahindra*
- **Financial institutions**
  - *ICICI Bank*
  - *Kotak Bank*
  - *Axis Bank*
- **Rise of Retail Chains**
  - *Subhiksha*
  - *Adani, and many more ....*
- **RELIANCE; WALMART; BHARTI**
  - *[To drive out big players as usual, here!]*

What is attracting farm producers?

- **Higher profit**
  - *Access to better technology*
  - *Lower transaction costs*
- **More gains to smallholders than the large farmers**
  - *Index of productivity increased*
- **Farmers receive higher prices**
  - *5-20% higher in vegetables (RAM, case study in India)*
  - *25% higher in broilers (Venkateshwara Hatcheries case study)*
  - *82% higher returns to export of grapes (Sara Agro India)*
  - *4% higher in milk (Nestle case study in India)*
- **Risk is shared**
  - *As high as 80% risk is shifted by producers to the firm*

Conclusions: 5 point program

- **Conserve and harvest rain water**
  - *Increase in watersheds (Tilda 600 mm rainfall)*
  - *Delineate low income areas for watershed development*
- **Promote high-value agriculture in watersheds**
  - *Shift from cereals based system to horticulture, milk, meat, poultry*
- **Link watersheds with markets**
  - *Promote innovative institutions (contract farming, cooperatives, farmers' organizations)*
- **Improve business climate for private sector in rainfed areas**
  - *Tax incentives*
- **Reprioritize research & development**
  - *Concepts of value chain from production to post-harvest, processing, packaging and retailing*
  - *Role of biotechnology*

Invest in watersheds, promote high-value commodities and connect them with markets!

Thank you

Potential to Enhance Productivity and Rainfall Use Efficiency in the Watersheds of India

Piara Singh, AVR Kesava Rao and S Marimuthu

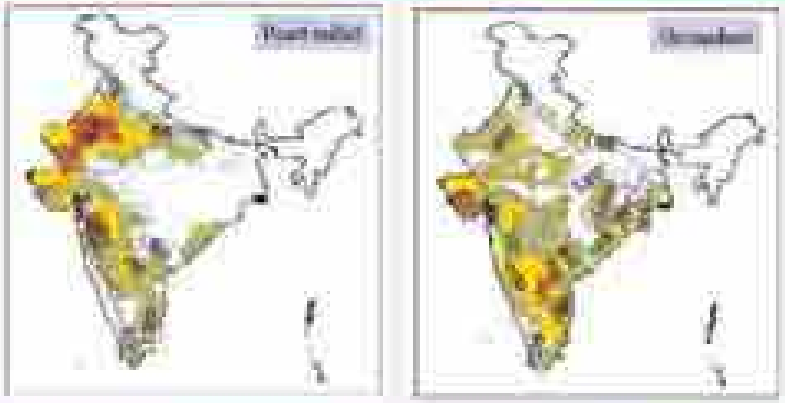
Objectives

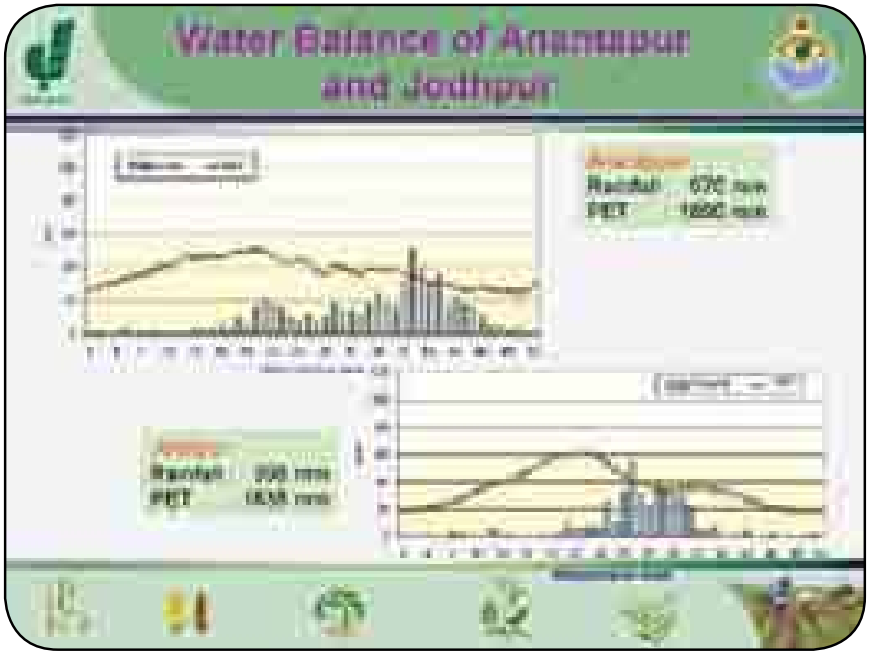
- To discuss different agro-ecologies of rainfed crop production systems in India and their production potential.
- To present integrated genetic and natural resources management (IGNRM) practices to increase crop production and rainfall use efficiency in watersheds.

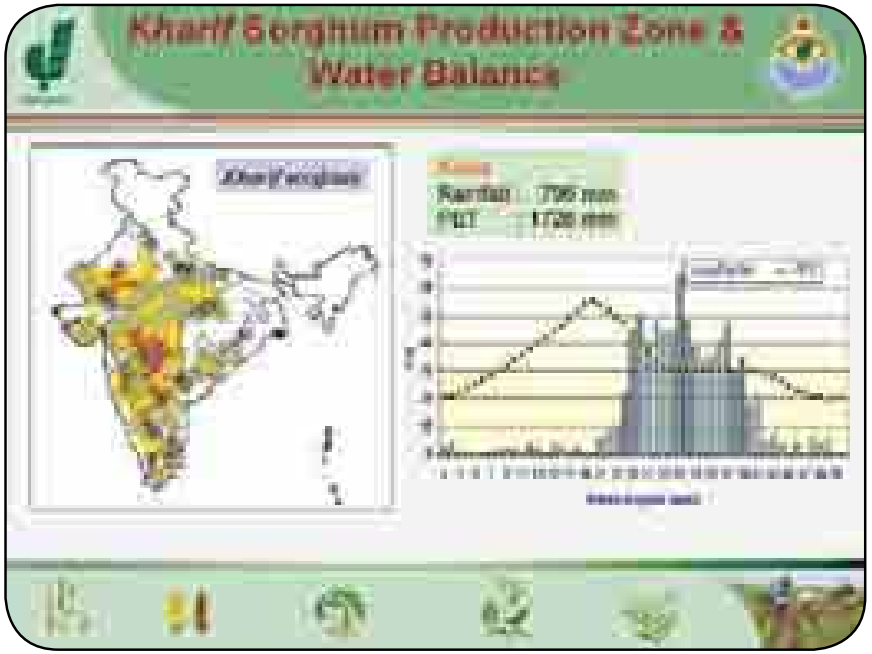
Rainfall Regions and Dominant Cropping Systems

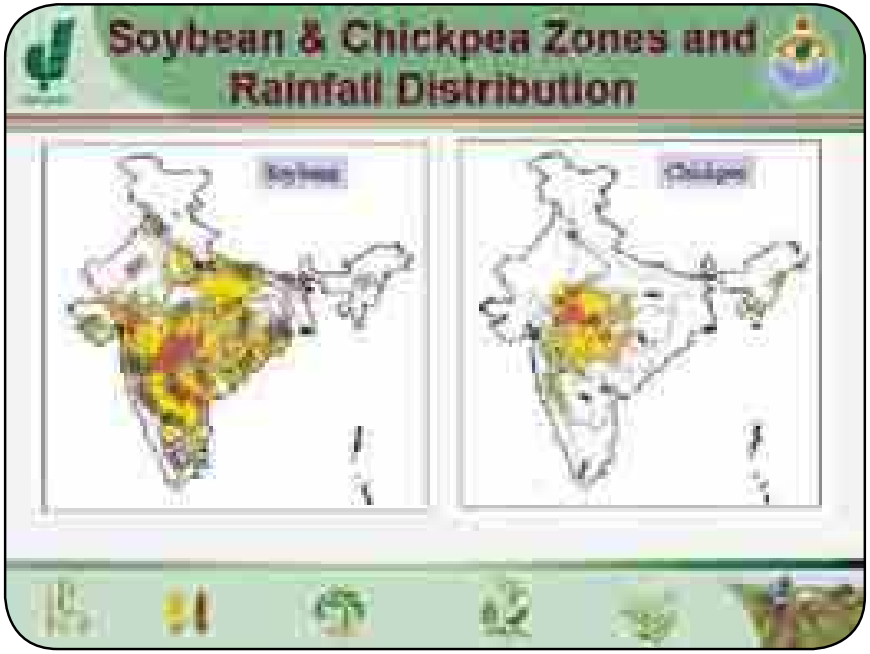
Mean annual rainfall (mm)	Bio-climate	LGP (days)	Dominant cropping systems
<500	Arid	60-90	Pearl millet, short-duration pulses, perennials
501-700	Dry semi-arid	90-120	Pearl millet, groundnut, sorghum and cotton-based, post-rainy sorghum
701-1000	Wet semi-arid	120-150	Soybean-based, maize-based, sorghum-based
1001-1600	Dry sub-humid	150-180 180-210	Upland rice-based

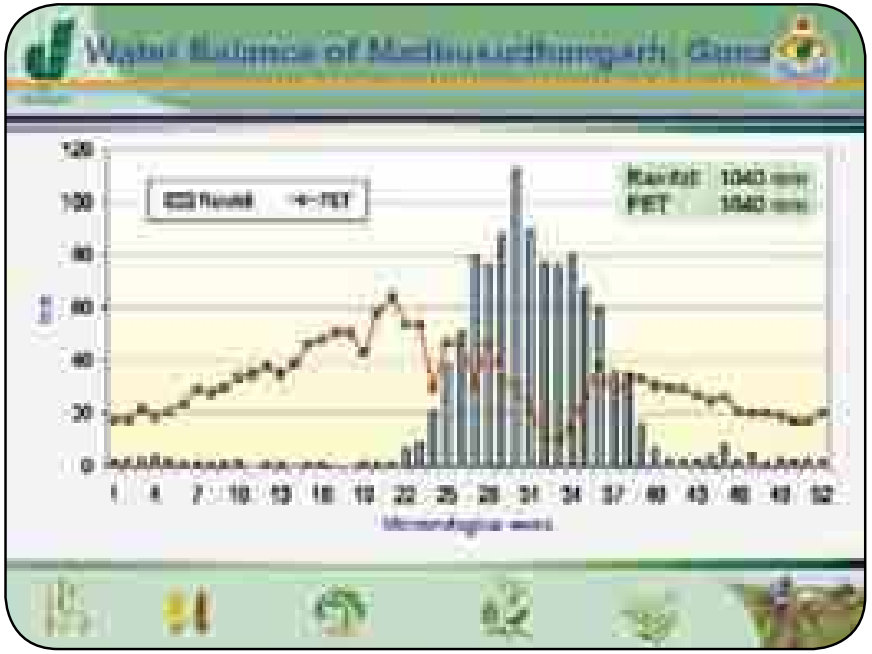
Pearl Millet and Groundnut Zones and Rainfall Distribution



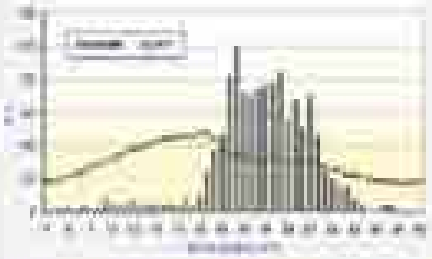

Water Balance of Anantapur and Jodhpur


Kharif Sorghum Production Zone & Water Balance

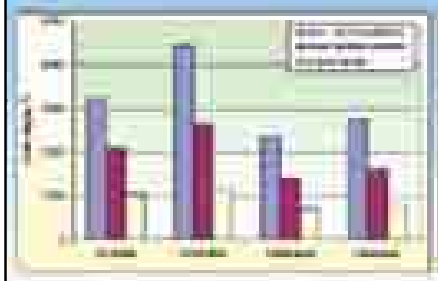

Soybean & Chickpea Zones and Rainfall Distribution
Soybean
Chickpea

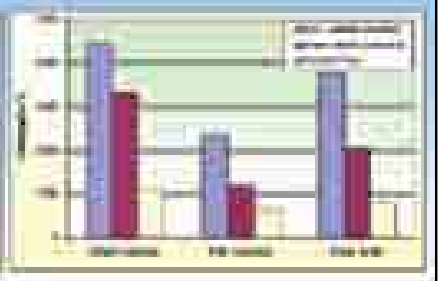

Water Balance of Madhuvanthangarh, Gujarat
Rainfall
PET

Rainfed Rice Production Zone & Water Balance



Rainfed Potential Yields and Yield Gaps of Crops in India

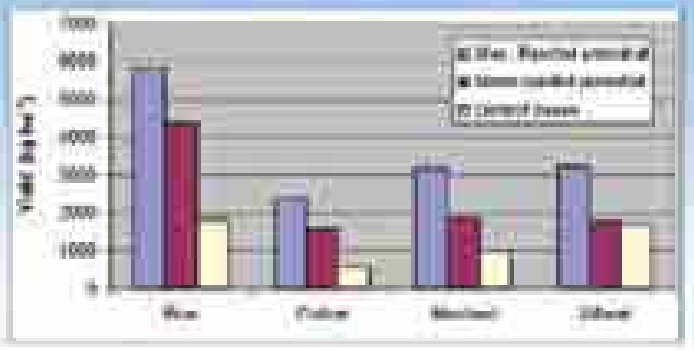




Legumes

Sorghum and pearl millet

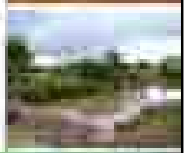
Rainfed Potential Yields and Yield Gaps of Crops in India



Interventions for Enhancing Productivity and RUE in Watersheds

IGNRM approach adopted through

- Introduction of improved crop varieties
- Integrated nutrient management (INM) including micronutrients application
- In situ soil and water conservation, water harvesting and supplemental irrigation
- Integrated pest and disease management (IPM/IDM)
- Crop intensification and diversification



Deficiency of Micronutrients in Dryland Soils of Various States, India

Locations	% of Deficient fields		
	Zn	B	S
Kurnool (AP)	81	92	88
Dewas (MP)	100	96	100
Bundi (Rajasthan)	67	72	72
Bharuch (Gujarat)	85	100	40
Gurgaon (Haryana)	89	93	60
Tirunelveli (TN)	100	100	100

Sulfur and Micronutrient Amendments Increased Crop Productivity

Crop	Control	MN treatment	% increase over control
	(Average kg ha^{-1})		
Maize	2800	4550	79
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 (15 kg ha^{-1})

Yield and Economic Returns (Rs ha^{-1}) in Response to Nutrients in AP

	Maize		Groundnut		Sorghum	
	Yield*	Economic returns	Yield*	Economic returns	Yield*	Economic returns
FP	----	13931	-	12492	-	4507
FP + S	26	17226	13	13655	32	5621
FP + Zn	33	17479	27	14780	47	5293
FP + B	33	18354	20	14851	29	5969
FP + SBZn	49	19429	48	16825	62	5733
FP + SBZn +NP	78	21766	78	18816	119	7171

*Yield increase over farmers practice (FP)

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	3.6	5.6
Mungbean	1.7	2.8
Sorghum	1.7	3.7
Madhya Pradesh (Vidisha district)		
Soybean	1.4	2.7

Effect of Integrated Nutrient Management on Crop Yields

Watershed	Crop	Year	Traditional mgmt. (kg ha⁻¹)	Improved 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

Yield Advantage Due to Best-Management Practices (BMPs) in Kurnool district

Crops	Yield (kg ha⁻¹)		Yield advantage (%)
	Farmers practice	Improved practice*	
Pearlmillet	0.88	2.14	142
Groundnut	0.89	1.52	70
Pigeonpea	1.07	1.63	52

* Improved seeds, land management, INM and IPM

Ragi Yields with Improved Management in Kolar and Tumkur districts, 2005 season

Variety	Yield (kg ha⁻¹)	
	FP/Local+IP	
Local	1.0*	
	FP/HYV + FP	FP/HYV + IMP
CPU 28	2.00	3.88
MR 1	2.40	3.91
GB 911	2.88	3.66
L 5	3.00	4.47
Hiriyur	4.00	5.00
% increase over FP	60	103

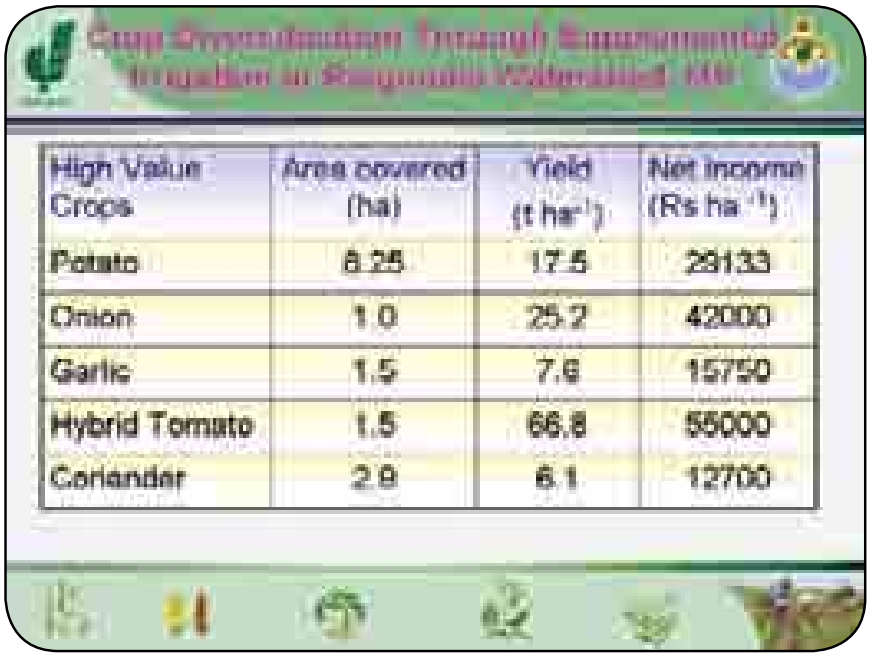
Farmers Benefited by Field-based Soil and Water Conservation Measures

- Contour cultivation
- Broadbed and furrow
- Flat-to-graded
- Conservation furrow
- Bunding strips
- Field bunds
- Vegetative bunds (Gliricidia and vetiver plants)

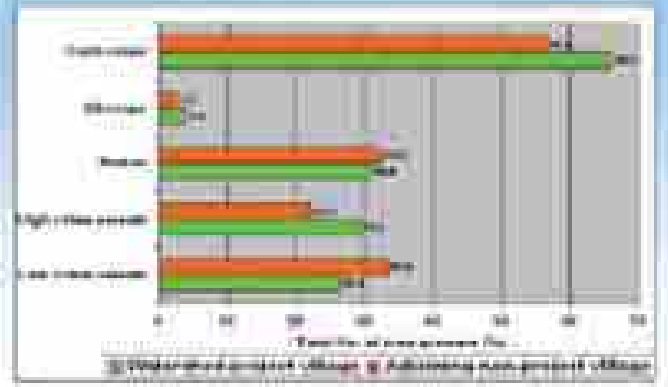

Land Management Systems increased the Crop Yields at Watersheds in Madhya Pradesh: 2001-2006
Watershed location
Crop
Grain yield (t ha⁻¹)
Broadbed and furrow system
Farmer's practice
Increase in yield (%)
Madhya Pradesh
Vidisha and Guna
Soybean+ Chickpea
1.73
1.21
1.37
0.90
26
25
Madhya Pradesh
Bhopal
Maize
Wheat
3.65
3.28
3.81
3.30
20
16


Crop Yields Improved With Land and Water Management: Sujala Watershed, 2006-07
Watershed
Crop
Farmers' practice
Conservation furrows
% increase
Haveri
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


Rainfall Use Efficiency Under Different Land Management Practices in Bhopal, M.P. India
Cropping system
Rainfall use efficiency (kg mm⁻¹ ha⁻¹)
Flat-on-grade
Broadbed and furrow
Soybean + chickpea
8.2
11.8
Maize + chickpea
8.9
11.6
Soybean / maize intercropping + chickpea
8.9
10.9


Crop Diversification through Supplemental Irrigation in Rainfed Watersheds (M)
High Value Crops
Area covered (ha)
Yield (t ha⁻¹)
Net income (Rs ha⁻¹)
Potato
8.25
17.5
28133
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

Increased Production of Commercial Crops in Kothapally Watershed, AP.



Effect of Integrated Pest Management (IPM) on Crop Yields

Watershed	Crop	Parameter	With Chemical use (kg ha^{-1})	IPM (kg ha^{-1})	% Increase
Rundi	Green peas	Yield	3530	4160	18
		Net returns (Rs ha^{-1})	10873	15069	39

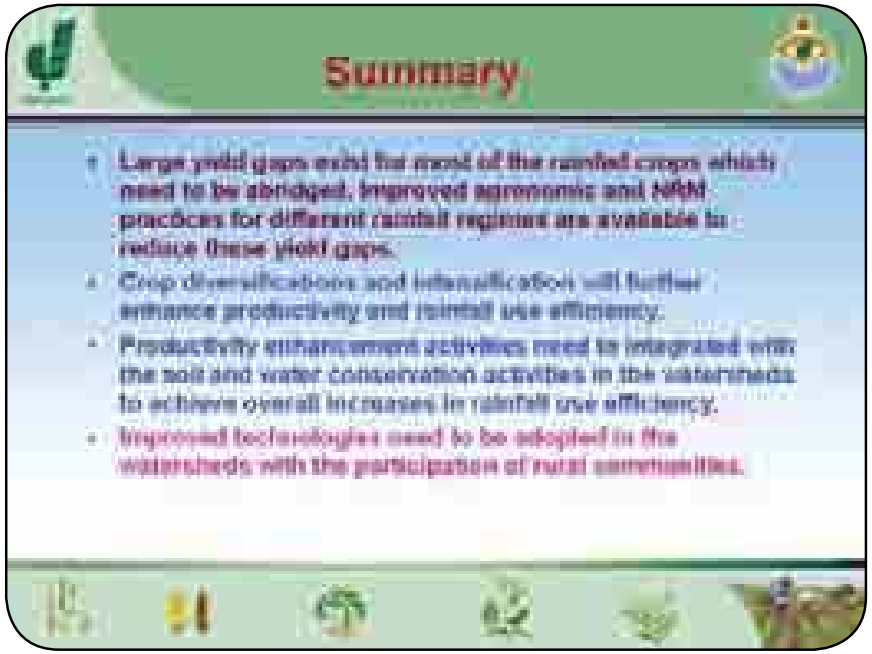
Performance of Chickpea With Residual Moisture in Rice Fallows

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

Total rice fallows area in India=11.7 million ha

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	34-79	8-38	—	—
Groundnut	32-105	9-17	—	—
Pigeonpea	34-46	10-17	—	—
Chickpea	32-79	10-37	18	17
Pearl millet	72-242	—	—	—
Kharif sorghum	30-227	—	—	—
Rabi sorghum	27	—	—	—


Summary
Large yield gaps exist for most of the rainfed crops which need to be abridged. Improved agronomic and NRM practices for different rainfall regimes are available to reduce these yield gaps.
Crop diversifications and intensification will further enhance productivity and rainfall use efficiency.
Productivity enhancement activities need to integrated with the soil and water conservation activities in the watersheds to achieve overall increases in rainfall use efficiency.
Improved technologies need to be adopted in the watersheds with the participation of rural communities.

Guidelines for Watershed Development Programmes in India: A Review

Centre for Ecological Sciences and Natural Resources
Institute for Social and Economic Change

Context

In India

- WS programs guidelines refined over the years
- Different set of guideline evolved by donors, NGOs
- Guidelines refined kept pace with
  - ✓needs of time
  - ✓art & science of NRM

Objectives

- To review the guidelines for planning and implementation of WS programs in India

Methodology

- Review guidelines and identify gaps
- Review research and evaluation studies
- Suggest way forward

Normative approach

Micro level planning theory in general & the project management theory in particular

Features of WSD Program

- Several programmes to improve degraded & wastelands implemented in fragmented & piece meal fashion
- Multi-agency participation in WSD programs
- Focus on
  - land productivity enhancing
  - quality of rural livelihood systems

Guidelines Chronology

- MoRD Guidelines - 1995
  - a national framework adopting and making synergies between state and civil society
- Revised Guidelines - 2001
- Hariyali Guidelines- 2003
- Neeranchal Guidelines - 2006

THRUST

- Flexibility
- specific role to various local institutions
- gender role to women
- SHGs and PRIs

What is required ?

Working Group on NRM for 11th FYP and,

- A national policy to identify rights on CPR in favor of local user group
- Equity for resource poor farmers and women
- Social regulation of ground water resources
- Altering the allocation of funds to various components of the programme, convergence of NREG funds with that of WSD programme
- Focus on participatory planning, implementation, monitoring and evaluation,
- Redesigning of community based organizations to meet the emergency needs, mainstreaming of women SHGs
- Further decentralisation of governance and execution of works, reforms in delivery mechanisms, enhancement of project duration
- A strategy for sustainable development of livelihood

Where do we stand ?

Guidelines -1995

- Important initiative towards institutionally and ecologically sustainable enhancement of rural livelihoods.

But.....

- WSD not planned strategically
- Insufficient funding at the Project Implementation Agency (PIA) level to attract and maintain quality staff
- At the community level, there is inadequate effort to engage weaker groups in the process of WSD.
- Weak procedures for selecting (and de-selecting) villages and PIAs

2. Revised Guidelines- 2001

- widened scope of WSD by not restricting it to rainfed areas alone. (all region approach).

But .....

- Guidelines were general principles for implementation of watershed development projects.
- State Watershed Development Committees were empowered to clarify the provisions of these Guidelines to suit local social, infrastructure, and geographical problems

3. Hariyali Guidelines-2003

- simplified procedures & provisions for PRIs involvement

- But.....
  - *Need to infuse a greater degree of flexibility into the Guidelines in view of the large variation in local conditions, needs, and the social structure.*

4. Neeranchal Guidelines-2006

– seeks to ensure

- Programme specific and focused process approach
- Greater flexibility in implementation
- Multi-disciplinary role for Gram, Block and Village level Functionaries
- Renewal of watersheds
- [illegible]
- an 'Exit protocol' for the core area
- A "Twin exam" approach to the implementation of projects
- [illegible]
- Enabling a combination of CBO/NGO as PIA
- Effective role for PRIs
- Harnessing SHGs comprising rural poor, especially those belonging to SC/ST categories
- Establishing a credit facility from financial institutions
- Effective use of common services being furnished by NRSA

Functions of Local Organizations under Participatory Watershed Programs

- State & district level organisations mandated to undertake
  - coordination, monitoring, implementation
- Organisational functions mandated at block & village levels
  - implementation, capacity building, monitoring, coordination
    - But they have been assigned to different local organisations
- But
  - only in the Government supported programs
    - local institutions (Sarpanch & Shram Sabha) have role in executing the watershed works

Review of functional assignments indicates –

- functional assignments cannot be treated as duplication
- functional assignments was made in tune with suitability of the organization to carry out the function
- Functional mandates
  - Village level organisations
    - Provisioning, implementation, conflict resolution
  - district level
    - implementation, monitoring
  - State level
    - Monitoring, coordination, staffing, financing

Guidelines consistency with objectives

- Many objectives have taken care by the guidelines
- But, changes in guidelines need to
  - Maintain continuity and link between the past and future in regard to guidelines which have a proven internal strength
  - Clearly indicate, of the previous guidelines, which are to be ignored and which are to be retained and followed
  - Further clarify to what extent the implementer can depart from the past practices and how

Way Forward

Future guidelines need to ensure

- To address the equity concerns, select villages with low rainfall and low proportion of irrigation
- Avoid villages with large proportion of sharecrop population, or alternatively to persuade the shepherds to avoid raising sheep and goats at least for a period when the vegetation cover tries to encroach itself into the developed land
- DPCs should take up the task of mobilising people and where such organisations are not present or weak (where they are present) NGOs can fill the gap
- prompt sanction and release of funds
- plan the watershed programme area to coincide with that of the panchayat concerned to strengthen PRI involvement

Key changes

Changes in	From	To
Approach		
Strategy		
Planning		
Implementation		

Changes brought in

- Shift towards participatory watershed development practices
- Multi-agency partnerships between govt agencies, non-govt organisations and CBOs
- Implementing & monitoring mechanisms in the resource management process as important institutional processes

Monitoring process

- Preced by benchmark survey and information on pre-project status of community and natural resources
- Thereafter
  1. [illegible] - ascertain through physical & financial flows
  2. [illegible] - ascertain through key processes involved
  3. [illegible]
     - i. First, identify technological components
     - ii. Second, list out impact of each components
     - iii. Third, compare with and without project areas

Design & implementation option

- Indian experiences present following implementation options
  - Through line departments of Government
  - Through non-government initiatives with community participation at different levels
  - Through panchayats, watershed development teams and user groups.

However

- Stress was more on
  - mechanisms and processes to improve implementation at micro-watershed/community level
- Less focus on
  - *inter-agency cooperation, coordination, and integration*

Therefore

- Need for
  - cross-sectoral combination
    - in implementation, enforcement, and monitoring
  - Align with on-going institutional processes
    - such as the decentralization process
  - correlate with other measures of development performance at local level
  - Build multi-level organizations to combine advantages of solidarity with scale

Objectives

To examine and compare select watershed development projects for

- Different institutional mechanisms (formal/informal) developed for the program, their roles and their interaction
- Enabling environment and support structures established for primary stakeholders and their relevance

Watershed Programs for Case Study

Selected watersheds and their institutional arrangements

- Andhra Pradesh Rural Livelihood Programme in Andhra Pradesh (APRLP) – VDC
- Sujala Watershed Program in Karnataka (Sujala) – AGs
- Indo-German Watershed Program in Maharashtra (IGWP) – PRI
- DPAP Watershed Programme following Hariyali guidelines in Rajasthan (Hariyali) – PRI

Study Methods

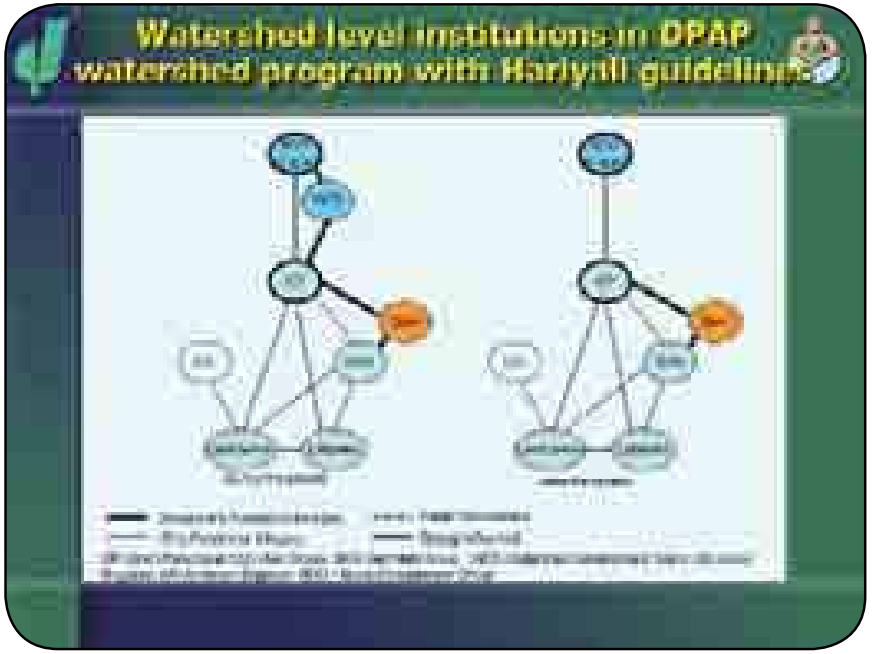
Quantitative and qualitative impact and institutional data collected through:

- Focused group discussions (FGDs) with different stakeholders
- Participatory tools – Village mapping
- Stratified random sampling of households using detailed questionnaires for yield, income, NR base, health, credit, expenses, etc.
- Stakeholder analysis tools – Institutional mechanisms
- Financial details of programs

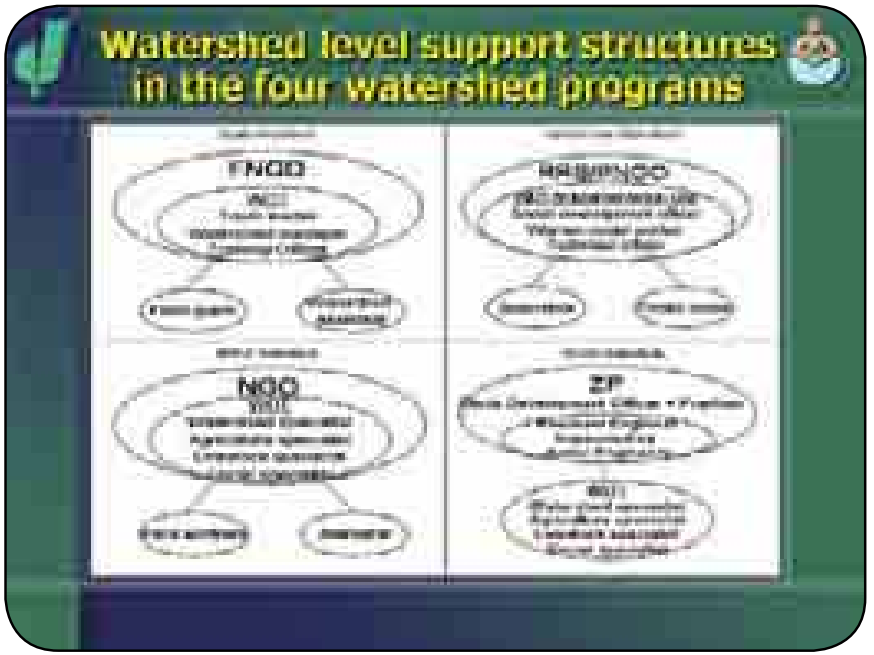

Cluster of Watershed level institutional structures and the enabling environment influencing efficiency and Sustainability

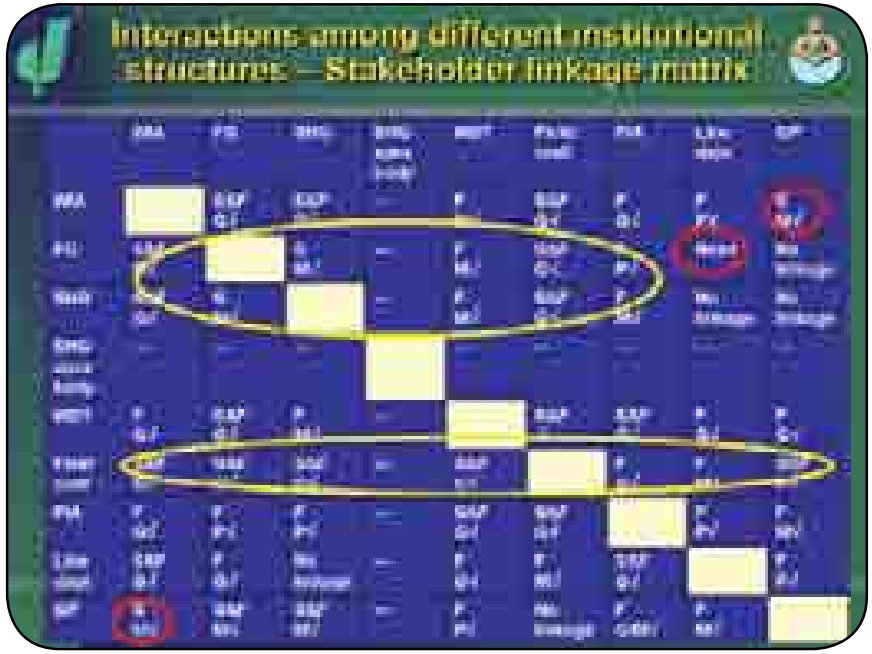

Watershed level institutions in Sujala watershed programme


Watershed level institutions in APRLP watershed program
During the project
After the project


Watershed level institutions in DPAP watershed program with Hariyali guidelines


Institutional structures of primary stakeholders
Integration of Woman in the programme
Integration of Laborers in the programme

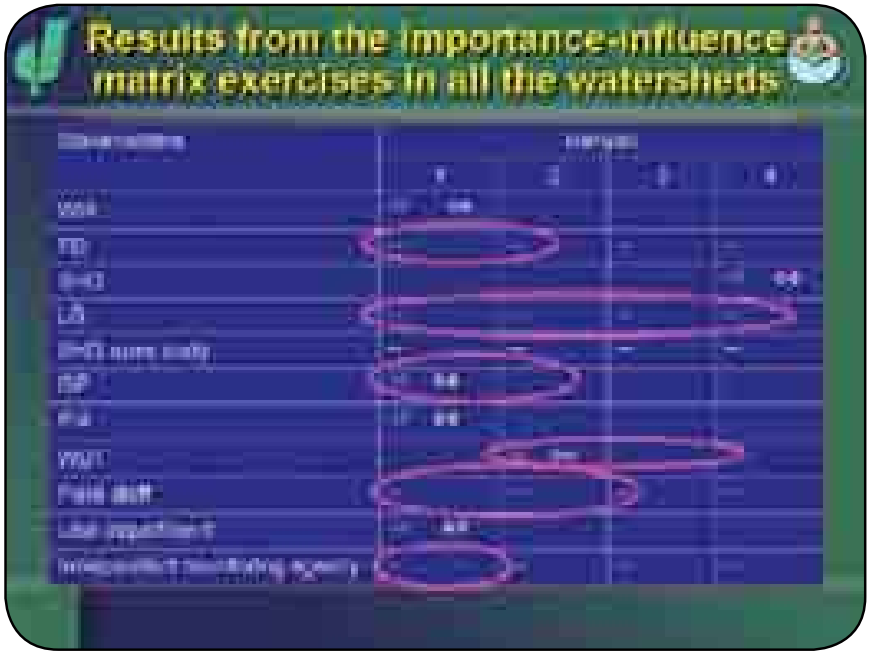

Watershed level support structures in the four watershed programs
FNGO
NGO
ZP


Interactions among different institutional structures – Stakeholder linkage matrix

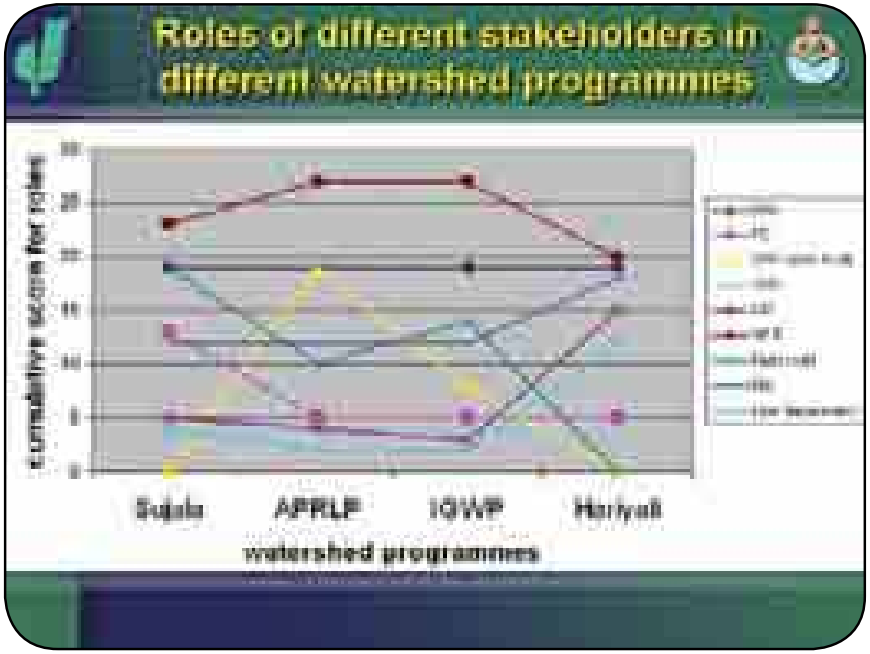

Interactions among different institutional structures – Stakeholder importance/influence matrix

Stakeholder role/performance assessment

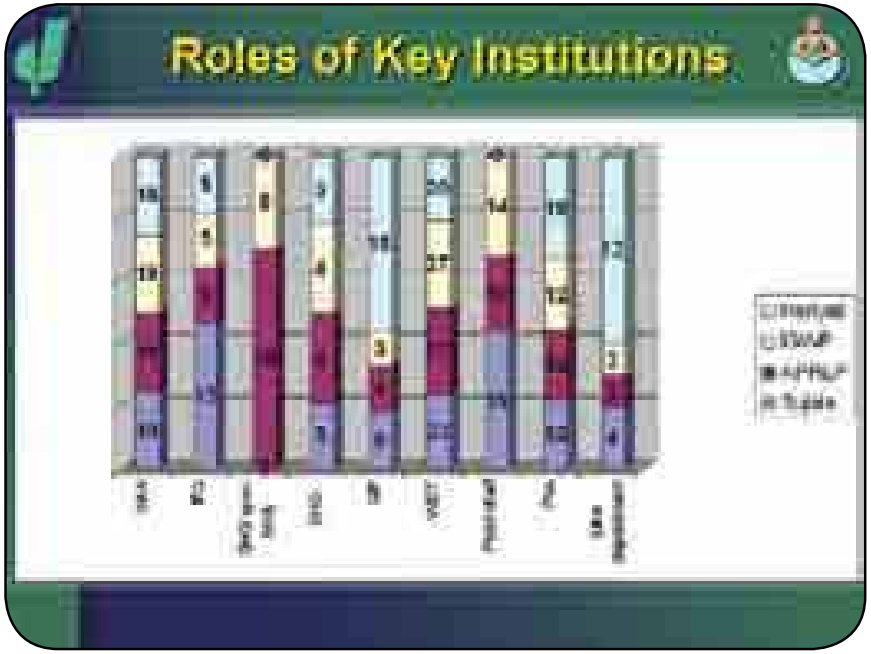
Results from the importance-influence matrix exercises in all the watersheds



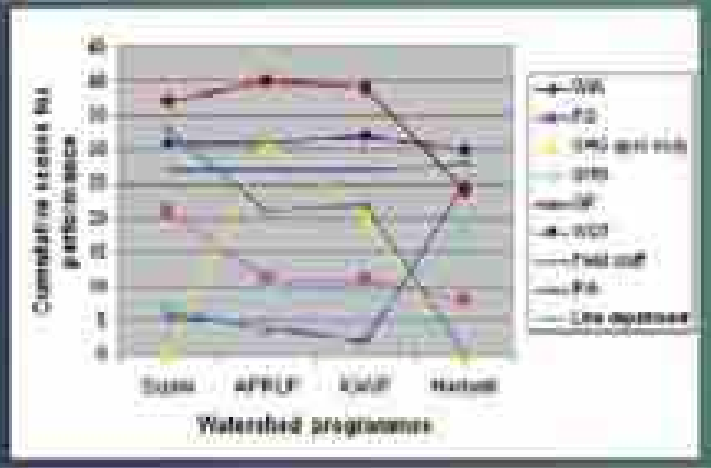
Roles of different stakeholders in different watershed programmes



Roles of Key Institutions



Performance of different stakeholders in different watershed programmes



Key Learnings

- In Haryali watersheds social organizations are moderate—Nonfunctional UG no role for SHGs
- In APRLP and IGWP SHGs/specialties play important role – Good mechanism to have impact on vulnerable groups
- Amongst the four programs only in Sujala program the AG is very influential – in other programs PGs are considered important but not influential

Key Learnings

- Independent M&E agency is playing important role and influential as per primary and secondary stakeholders
- In APRLP and Sujala programs key institutional arrangements to bring in technical support benefited farmers through increased agricultural productivity and vulnerable groups through enhanced incomes from IGA
- In Haryali program GP enjoyed little importance as compared to other programs but role of WDTs in Haryali is marginalized. In APRLP, IGWP and Sujala WDTs are quite active

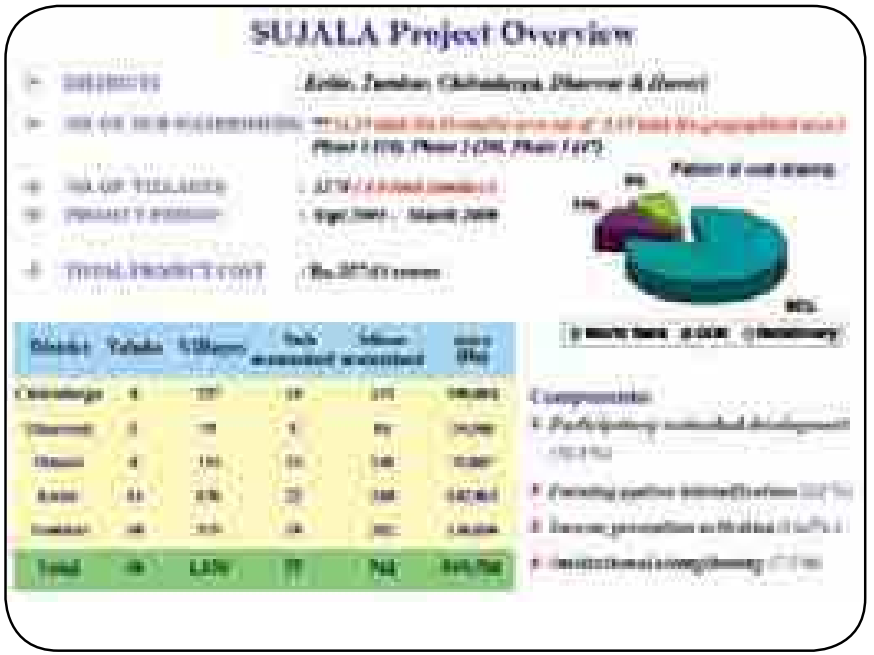
Key Learnings

- Convergence and related issues for line departments needs for improvement in all the watershed programs
- GPs have important role in watershed programs but not as PIA but in governance. The PIAE arrangements in APRLP, IGWP and Sujala are functional and GPs role in governance can enhance the impact of watersheds
- AGs arrangement in Sujala is effective and relevant and has the potential to enhance participation and ownership


Area Group (AG)
Differences with UG
Reasons for stronger AG


Watershed level implementing agency
Sujala watershed Sangha
Executive Committee – gender balance and social equity
6 AG, 5 SHG, 2 GP, 1 DWDO + invitees
50% women, 1 SF, 1 MF, 1 PF, 1 LL, 1 SC/ST, 1 RA


Livelihood
Environment
Sustainability
WATERSHED DEVELOPMENT DEPARTMENT
SUJALA WATERSHED PROJECT


SUJALA Project Overview


Experiences of Sujala Watershed Project


Private People Public Participation (PPP)

INTEGRATED APPROACH

Gender and Equity

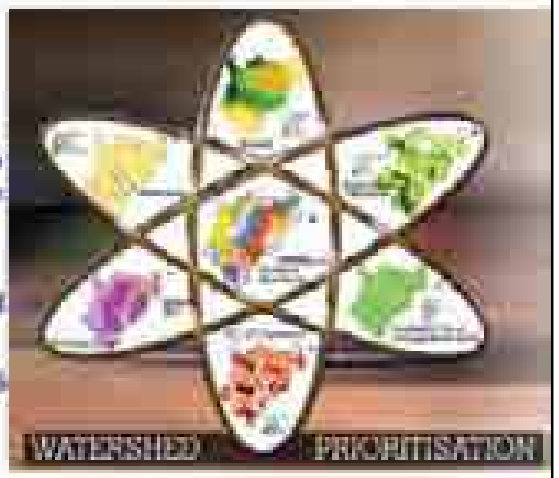
- Differential rate of contribution between vulnerable & others
- Reservation for women & other weaker sections in EC
- Mandatory coverage of all SC/ST & marginal farmer families
- By limiting total investment per individual, it is ensured that per hectare investment on SC/ST/MF is greater than or at least equal to over all per hectare cost.
- Emphasis on participation of landless in development and management of CPRs & priority in benefit sharing
- IGA – An instrument for addressing gender and equity issues
- Nearly 15% of the project cost is on IGA, which is exclusively meant for landless and women
- Considerable investment on capacity building through training & exposure visits

Income Generation Activities – A sustainable livelihood

- Covers all women especially landless, SC/ST, SAMF
- Formation of SHGs – 6648 Nos
- Total savings – Rs 12.05 crores
- Individual & group enterprises as business models
- 250 activities identified as options
- Capacity building depending upon activity opted
- Specialist NGOs to facilitate & implement the IGA
- Credit linkage with SHGs
- Revolving fund of Rs 75,000 per SHG

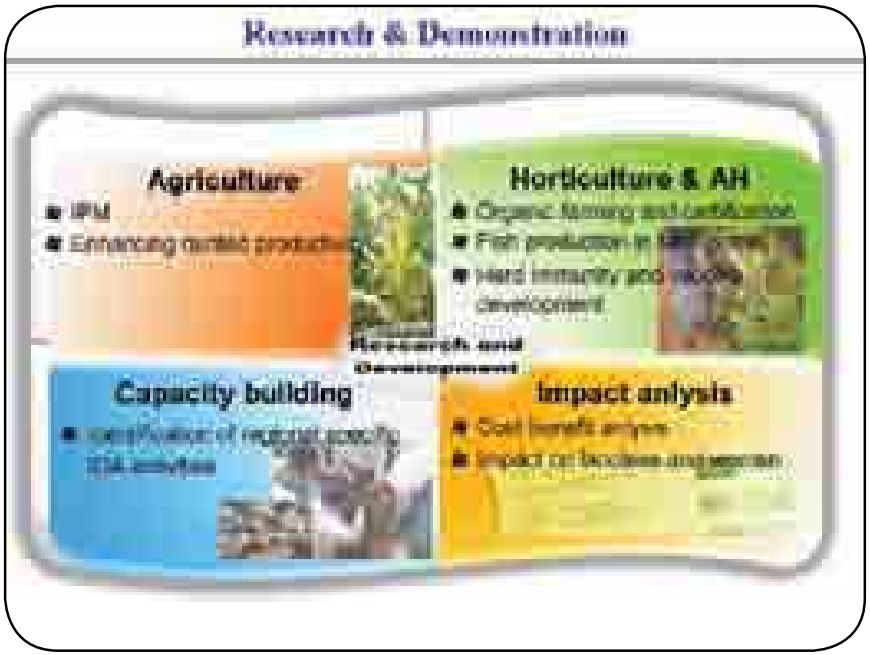
Application of GIS in Watersheds

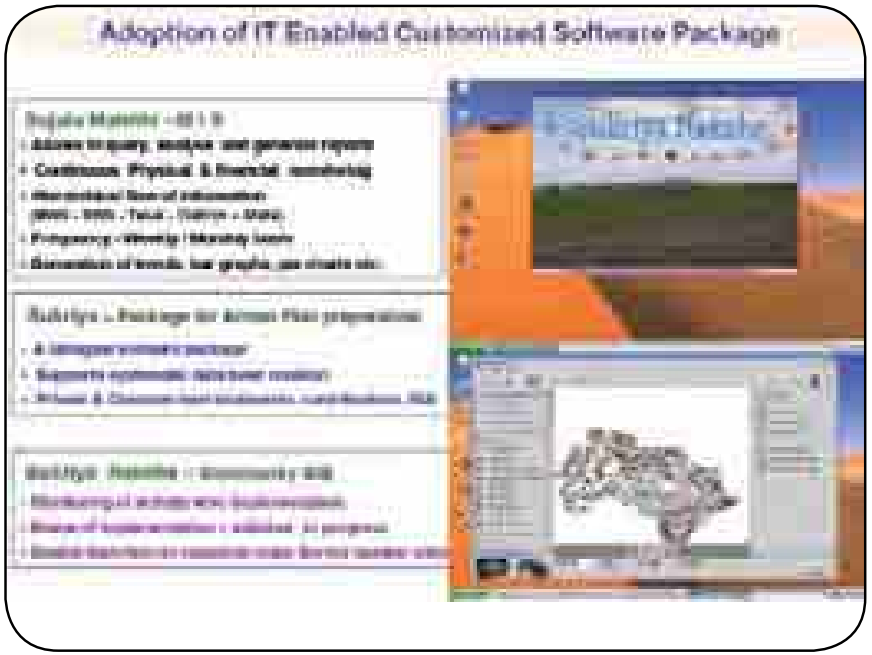
- Identification & Demarcation of Sub-watersheds and Micro watershed boundaries
- Prioritization of Sub watersheds for Implementation based selected criteria's
- Identification of MWS



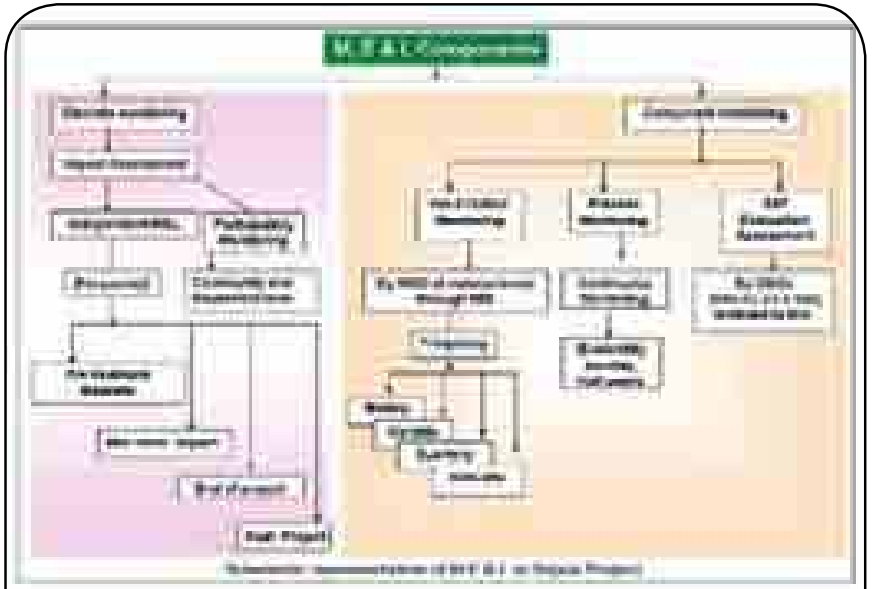

WATERSHED PLANNING
WATER RESOURCES ACTION PLAN


TREE COVER WITH
SPECIES DETAILS


Research & Demonstration
Agriculture
IPM
Horticulture & AH
Organic farming and certification
Fish production in
Herd immunity and
development
Research and
Development
Capacity building
Impact anlysis
Cost benefit anlysis
Impact on livelihood and women


Adoption of IT Enabled Customized Software Package


Transparency & Accountability
Transparency
Accountability
Open house meeting
Book keeping & Auditing
Wall paintings
Participatory
implementation
Beneficiary passbook
Payment to beneficiary
Monitoring
CBOs, WDD, MSE
Evidence from satellite
images
Audio /
Teleconference


M & E Components

Approaches Adopted for M.E &L

Blend of both conventional & satellite based monitoring system

- Remote Sensing
- Household Surveys
- MIS / GIS data
- Participatory observations
- Field Measurements
- Focus Group Discussions
- Transect Walks
- Files, Records, Documents
- Informal discussions
- Expert judgement

A team of quality control specialists for maintaining quality of structures

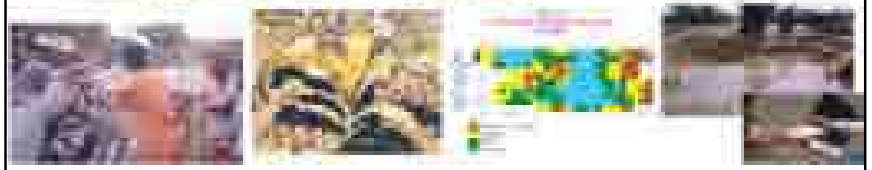
Mudiyanur MWS,
Uttanur SWS,
Mulbagal Taluk,
Kolar District

OBJECTIVES	IMPACT
Reduced soil erosion/run off	Reduced by 10 cu.m to 21 cu. m per ha.
Improved Biomass	Area under Agro horticulture / Agro Forestry increased by 14 %
Fallow land	Declined by 15 %
Increased House hold income	Increased by 20 %
WPI, Surplus	Reduced by 42 %
Increased ground water recharge	Ground water increased by 250 to 275 gallons per hrs
Increased crop productivity	Average increase in rainfed crop yield by 34 %
Cropping intensity	Increased by 99 to 134 %
Diversified cropping pattern	1. Area under food crops decreased by 9.2 % 2. Oil seed area increased by 3.59 % 3. Area under pulses increased by 1.80 % 4. Area under other cash crops increased by 3.76 %

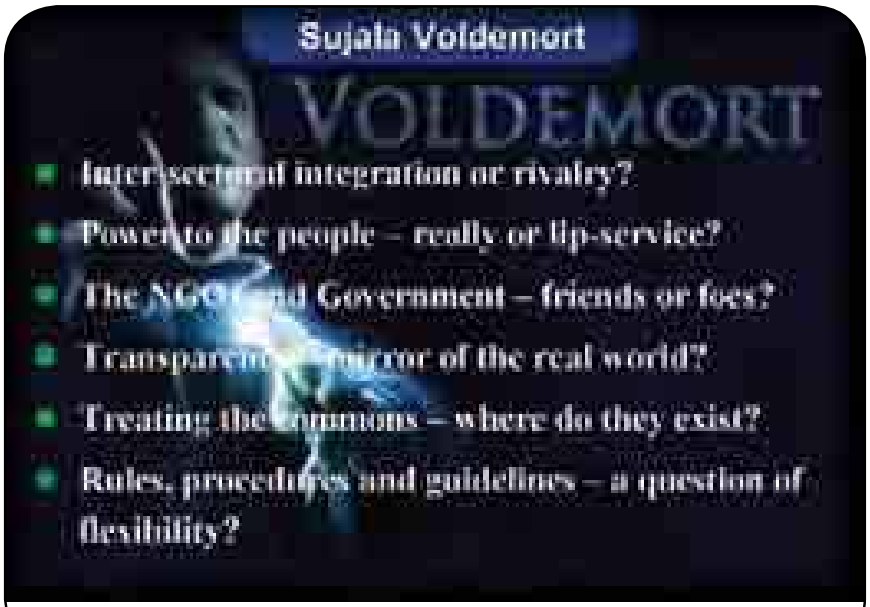
OBJECTIVES	IMPACT
Increase milk production	1.60 lts to 2.11 lts per day per animal
Cost per acre inch of ground water	Reduced from Rs. 84 to Rs 76
Cross irrigated area	Increased by 21 %
Ground water used per acre	Increased from 15.5 acre inch to 24 acre inch

New Initiatives

- Introduction of G.K Cards
- Soil health Cards
- Convergence with other schemes, eg: Total Sanitation Campaign, Adult Literacy
- Gopalaka mitras - Grass root level basic service providers to livestock sector
- Jala Mitra – A new concept introduced to develop a community man who serves as a resource person for the extension of watershed programs
- Analysis of meteorological data for proper crop choice &management
- Practices for productive utilization of water stored in different structures
- Farmers Free Schools – extension by the users



Sujala Voldemort



Watershed Development in Western Region: Some Evidence

Amita Shah
Gujarat Institute of Development Research

Four States in the Region: Gujarat, Rajasthan, M.P. and Maharashtra

Focus:

1. Spatial Coverage, Prioritisation, Convergence among WDPs Supported by MoRD and MoA (MoEF and Donor Agencies)
2. Impact on Bio-Physical, Socio-Economic, and Institutional Indicators
3. Sustainability in the Post Project Period

Status of the State Level Assessments

- M.P. and Maharashtra: Reviews prepared by GIDR and SOPPECOM under ForWaRD

Constraints: Studies on M.P. are limited

Need to Draw upon Meta Analyses (This will also help avoiding duplication)

Rapid Assessment of about 700 Completed MWDPs will be incorporated

Status: Gujarat and Rajasthan

Fresh Exercise undertaken by DSC and SPWD since May, 2007

Contacting GOs and NGOs for Published and Unpublished Studies

Adapting Rapid Assessment in 3-4 districts (Primary data)

Findings from M.P. Review (DPAP-21 districts)

*Increase in Irrigated area (0 to 24 %)
- Increase in Net Sown Area (0 to 7 %)
- Uncultivable Waste Land brought under Crops
- Limited Covergae of CPLRs
- Change in Cropping Pattern and Crop Diversification
- Substantial Employment Gain with higher wages during the project implementation phase; sustenance of employment gain is less clear

M.P. Review: Findings

- Reduction in Migration a temporary phenomenon
- Drought mitigation impact is mixed-better in Guna,Khargaon, Shajapur, Shivpuri but not so much in Jhabua, Ratlam, Dhar
- Impact Varies across Mode of Project Implimentation

Problems of Attribution

- Increase in irrigation was reported among 80 % of project vs. 60% of control villages
- Crop Diversification also has similar pattern
- District level data for Jhabua (with 40% area treated under WDPs) does not show any clear pattern of change as compared that observed in other two districts
- 66-100% survival rate of horticulture under an IWDP-project in Datia (difficult to gauge generalisability)

Impact of Other Initiatives

- Absence of Clear Pattern between Increased in NSA and NIA among DPAP-projects in 21 Districts
- Difficult to ascertain and attribute impact on drinking water
- Not much information on B:C and IRR (Need to fill this Gap)

Rapid Assessment

- 346 Completed Micro Watersheds acorss 20 districts among 8 major Agro-Climatic Zones in the state
- Focus: Initial Process (demand driven), treatments camed out, physical verification of major treatments, perceived impact, present status of institutions
- The data being analysed

Major Benefits (%MWDPs)

- Increase in Water Table- 82%
- Increased Irrigation -57%
- Reduced Soil Erosion- 77%
- Employment on Worksite-56%
- Increased Tree Cover-8%
- Water for Livestock-11%
- Drinking Water-1.4%

Extent of Benefits

- Most Beneficial Activity:

Low-28%
Medium-41%
High-30%
Overall Benefits:
Low-31%
Medium-44%
High-25

Status of Community Institutions (% Survived)

- User Groups: 54%
- SHGs: 23%
- Van Samiti:88%
- Arrangement for Pastures:31%

- No clarity on future Management (WDF or Panchayat)

Where to Go From Here?

- Identify Selected Studies in Different Zones for Ascertaining the Impact of three sets of Indicators (Studies Covered by Meta Analysis may be used fro this)
- Rapid Assessment may be used creating a larger picture, in conjunction with the above assessment
- Search for additional studies is on; Rapid Analysis is to be completed

Drawing from Existing Initiatives

- ForWaRD-GIS data base for about 20,000 micro watersheds at taluka level for three states
- MP and Maharashtra Reviews may offer Examples of Good Practices
- List/Source/ Access to the studies covered by Meta Analysis from the four states
- State level workshops in Rajasthan and Gujarat for Collating Information from NGOs (?)


IMPACT OF WATERSHED PROGRAMMES
IN SOUTH INDIA
K.PALANISAMI / Suresh Kumar
TAMIL NADU AGRICULTURAL UNIVERSITY
COIMBATORE


A QUICK SURVEY OF WATERSHED
DEVELOPMENT IN INDIA


Watershed Management in India
Low productivity
Degraded natural resources
Widespread poverty


Watershed Development Activities
Planning
Training

Funding pattern for WSD

Why watershed impact assessment?

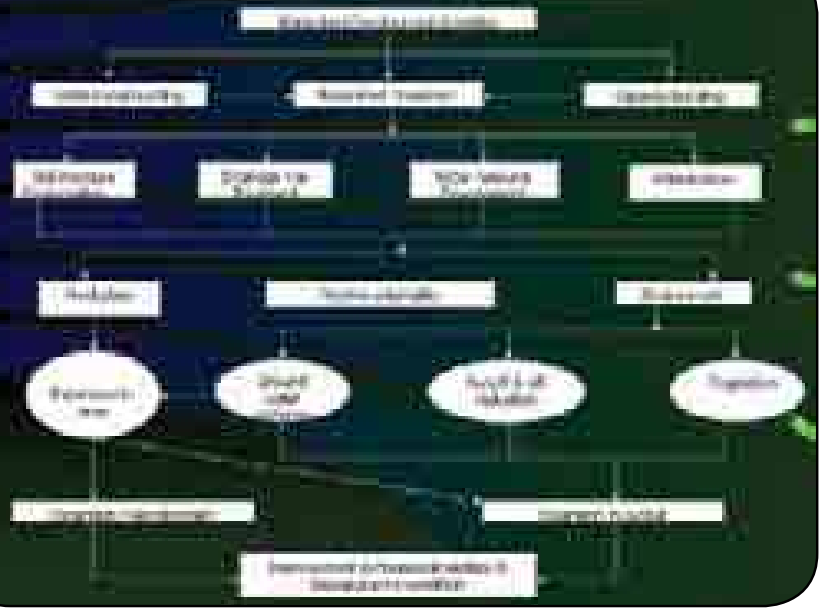
- Does the program achieve the intended goal?
- Can the changes in outcomes be accounted by the program, or are they the result of some other factors occurring simultaneously?
- Do program impacts vary across different groups of intended beneficiaries, regions, IWDP and programmes and over time?
- Are there any unintended effects of the program, either positive or negative?
- How effective is the program in comparison with the resources it used?
- Feedback for future programmes

Methodological challenges

Nature of watershed technologies and its impact on different sectors pose challenges. More specifically, major challenges include

- What impacts to assess ?
- Where to look for these impacts ?
- Choice of methodologies
- Selecting appropriate indicators to assess the impacts
- Choice of discount rate and life of the project
- Integrating indicators and assessing overall impact of the project

Framework for Watershed Impact Assessment



Indicators for IA in watershed development

- Soil conservation
- Water resource development
- Agricultural crop production
- Socio-economic condition
- Overall impact

Indicators for watershed IA

Review of Impact Assessment of Watersheds

Over view of studies reviewed

Region	: South India
States covered	: Tamil Nadu, Kerala & Karnataka
Number of studies	: 45
Number of watersheds	: 293 watersheds
Name of WSD Programme	: DPAP, IWDP, DANIDA, NWDPRA, SGRY, Sujala watershed, Myrada (NGO), SWC, PP,

REVIEW OF METHODOLOGIES OF IMPACT ASSESSMENT

Impact Analysis: Approaches and Methodologies

Approaches

- Before and after
- With and without
- Comparison of with and without
- Down stream and Up stream

Methodologies

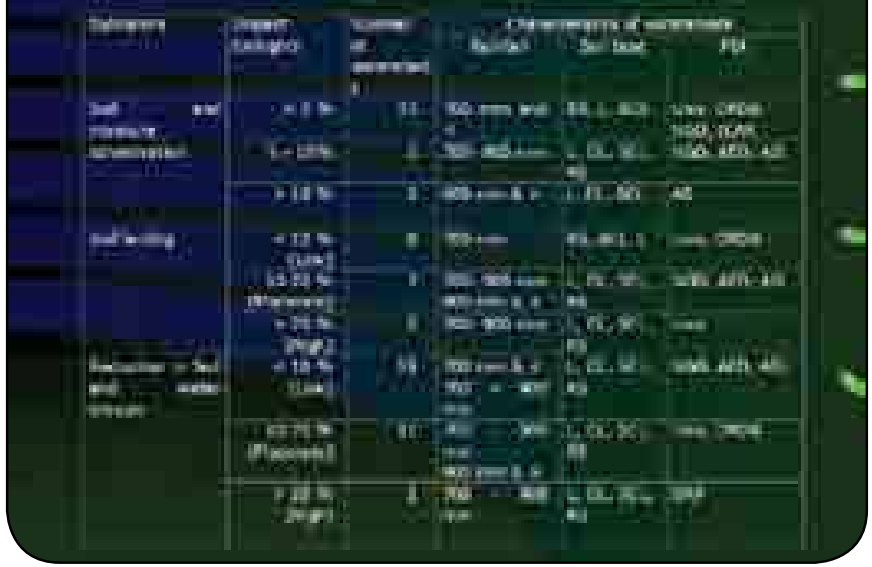
- Comparison of indicators
- Financial analysis (NPV, BCR, and IRR)
- Environmental impact
- Total Economic Valuation (TEV)
- Bio-economic modeling
- Watershed performance index

REVIEW OF EMPIRICAL STUDIES ON IMPACT ASSESSMENT

1. Soil conservation

Soil and moisture conservation	: Increase (1% - 83.3%)
Soil fertility	: Increase (0 – 28 %)
Soil and water erosion	. Reduction (upto 77.78%)

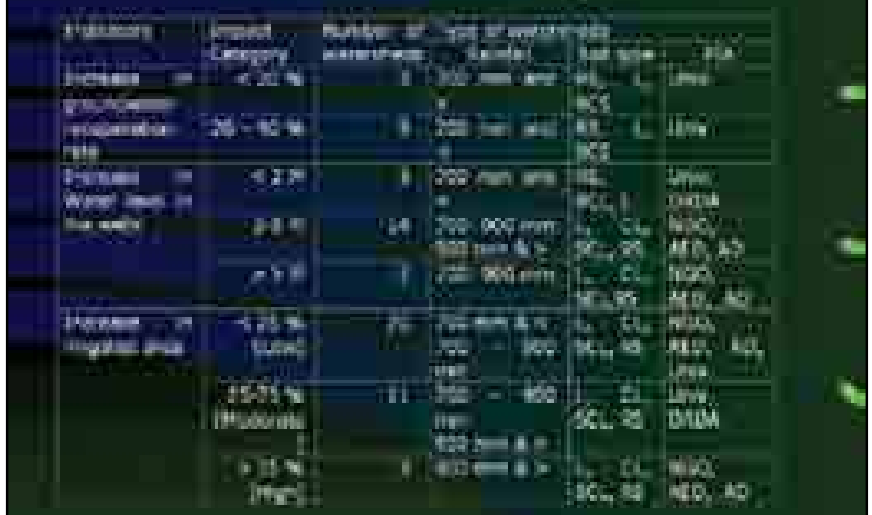
Soil conservation



2. Water resources development

Surface water storage Capacity	: Increased
Groundwater recuperation Rate	: Increase (16.7 % - 39%)
Water level in the wells	: Increased (0.1 M – 1.5M ↑)
Increase in irrigated area	: Increased (5.6% - 115.14%)

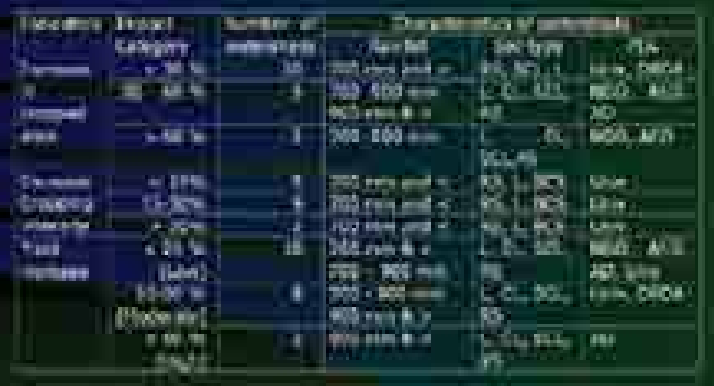
Water resources development



3. Agrl. crop production

Increase in cropped area	: Increase (6.84 – 126.4%)
Cropping intensity	: Increase (10.5 – 45 %)
Yield increase	: Increase (5 – 52.40 %)
Changes in cropping Pattern	: Changed (marginal to considerable)

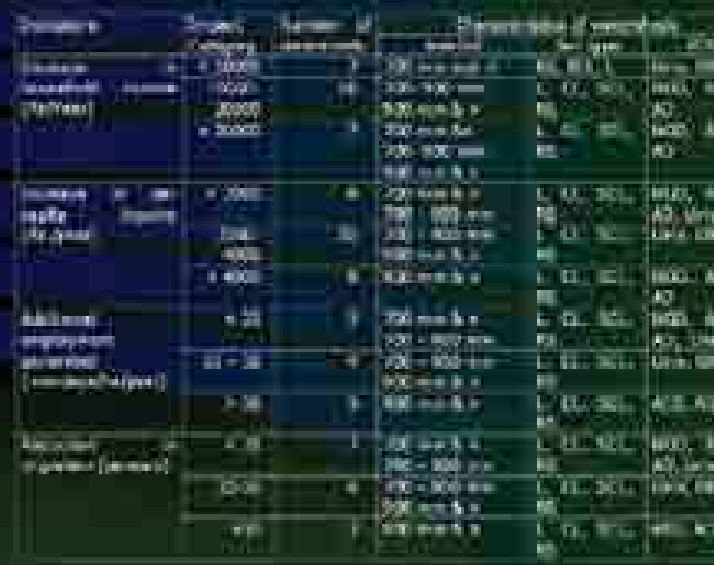
Agrl. crop production



4. Socio-economic impact

Household income	: Rs.5000 – 35000/yr
Per capita income	: Rs.950 – 4650 /yr
Additional employment	: 12 – 84 days/ha/yr
Migration	: 14- 58 persons

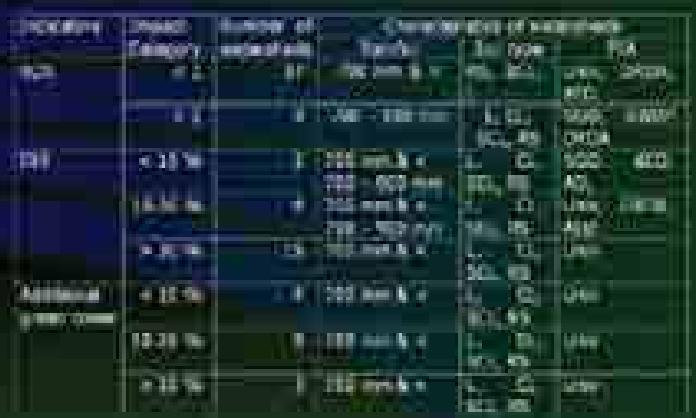
Socio-economic impact



5. Over all impact

Benefit-cost ratio (BCR)	: 1.3 – 6.13
Internal Rate of Return (IRR)	: 13.2 – 38 %
Additional green cover	: 1.5 % - 35 %

Over all impact



Bio-economic simulation

Total income of the watershed due to soil and water conservation measures during initial year would be about 9.12 % higher income than the watershed without soil and water conservation.

The average income per household under WC would increase by 6.40%, 5.22% and 12.47% during 10th year in small, medium and large households respectively

A shift in the crop cultivation from maize to paddy was found due to conservation measures under small and medium farmers groups.

Compared to without soil conservation measures, 9.91%, 11.36 % and 10.51% higher labour was used on farm for soil conservation activities under small, medium and large farmers' field respectively during first year.

Watershed Performance Index

a. fitting the regression model

b. developing weights for each parameter

c. working out the watershed performance index

d. ranking/classification of the watersheds

e. developing a DSS

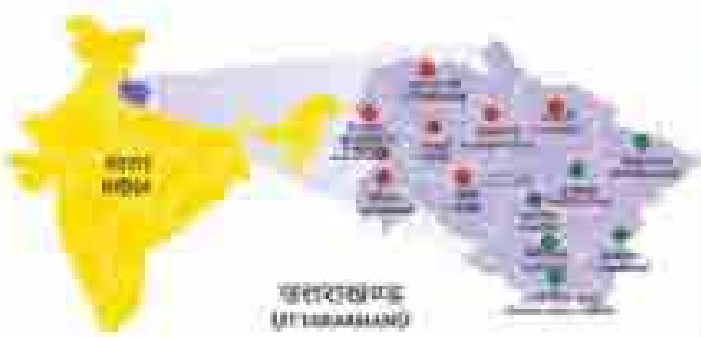
IMPACT ASSESSMENT OF WATERSHED PROGRMS A CASE STUDY: UTTARAKHAND

Kiran P. Raverkar

&

Team

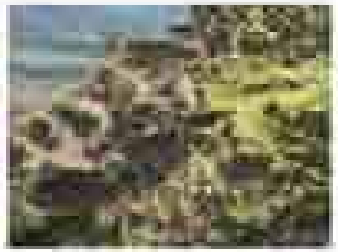
G.B. Pant University of Agriculture and Technology, Pantnagar



Part of NW Himalayas	
Geographical area	[illegible] sq.km
Revenue divisions	2
Districts	13
Tehsil	49
Development blocks	95
Revenue villages	16570

Uttarakhand

- Himalayan mountain range
  - Young
  - Geo-morphologically unstable
  - Major contributor to run-off and sediment to principal rivers of South Asia
- Himalaya exhibit high biodiversity both for flora and fauna
- There is excessive erosion due to
  - Young rock formation
  - Thin fragile surface
  - Steep slopes
  - Wide seasonal and diurnal temperature



Details of catchments, WS, SWS, and MWS in Uttarakhand

Alaknanda	Alaknanda	1	60	6,05,645
	Lower Alaknanda	1	42	85,615
	Mandakini	4	31	1,69,000
	Pindar	3	50	1,87,000
Bhagirathi	Bhagirathi	44	228	5,11,223
	Bhilangna	4	31	1,49,000
Ganga I	Ganga I	1	14	1,76,391
Ganga II	Ganga II	2	20	2,34,000
	Yamuna	3	20	2,59,613
Kali	Kali	1	40	3,69,000
	Lower Kali	1	31	3,27,100
	Sarju	3	123	5,15,351
Kosi	Dhaura	2	9	1,04,100
	Garla	2	20	1,81,000
	Kosi	4	11	3,96,19
	Kaushiya Lwr.	3	27	2,33,010
Ramganga	Dhela Nadi	1	2	45,000
	Khoh	2	6	85,700
	Ramganga	4	70	3,33,024
Yamuna	ADCP	2	7	71,000
	Asan	2	22	82,000
	Lower Tons	3	21	45,000
	Tons	4	36	1,47,700
	Yamuna	7	41	2,04,100
Grand Total		114	1134 + Headwater	86,85,618 + 3,15,000
			Total	90,00,611

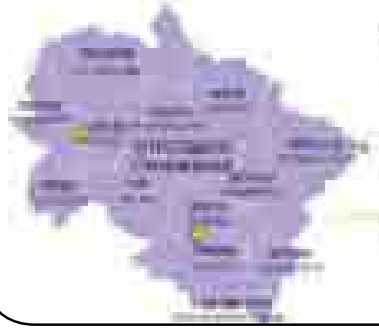
District wise total # of MWS and area

Sl. No.	District	# MWS	Area (ha)
1	Dehradun	99	4,05,648
2	Tehri	124	4,13,000
3	Pauri Garhwal	329	5,38,773
4	Uttarkashi	264	7,86,921
5	Chamoli	339	8,23,229
6	Rudraprayag	40	1,82,324
7	Haridwar	-	2,55,936
8	Nainital	71	4,00,646
9	Almora	306	3,19,934
10	Pithoragarh	158	7,51,958
11	Champawat	48	1,45,718
12	Bageshwar	89	2,14,990
13	Udham Singh Nagar	9	1,77,780
	Total	1818	50,36,825

Selection of MWS

Details of the area and coal power schemes proposed in Uttaranchal

Sl. No.	Name of Project/s	# projects	Total area (ha)	Total cost (Rs. in lakh)
1	PWDP (1999-2004)	17	11,5346	6756.66
2	WWDPAA (1999-2004)		45750	3837
3	DFAP (1997-2004)	264	25435	9778



- Two MWS selected for case study after discussion with the officials of WWD and Dept. of Agriculture
- Bangar MWS, Dist. New Tehri (Garhwal) : InGP
- Kunyalgad MWS, Dist. Nainital (Kumaon) : SWDPPA

Nainital

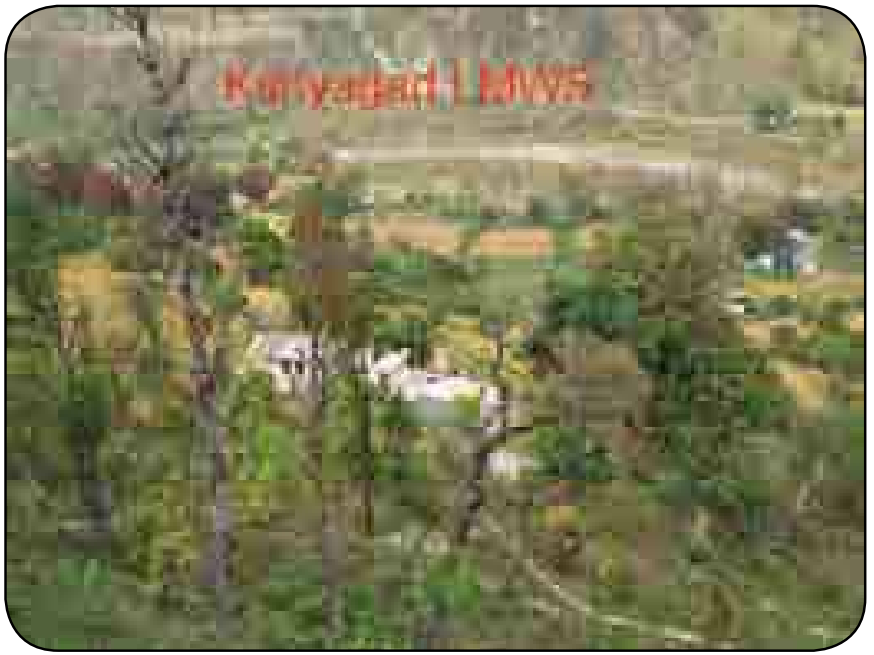
- Tourist place
- 4 blocks: 06
- 8 tehsils: 06
- Area : 3422 Sq Km
- Population: 762909
- Population density: 198/km
- Sex ratio: 909
- Altitude: 1938m
- Latitude:29°06' & 29°05'
- Longitude:80°14' & 79°60'
- Rainfall: 2525mm
- Min. Temp. : 3.2°C
- Max. Temp. : 29.4°C

Methodology for IA

- Qualitative and quantitative information in respect to pre and post project status of various ecological and socio-economic indicators
  - Official project reviews at each FY.
  - Revenue records
  - Informal group discussions with beneficiaries
  - Formal meetings and interactions with the WA committees
  - Structured household and field survey (Around 30%)
  - On the spot collection of various observations and activities undertaken
- Common criteria
  - Suitability and acceptability
  - Protection and conservation efforts perceived by beneficiaries
  - Physical status and replicability of the intervention by beneficiaries and type of subsidy
- Project implementation approach for
  - Participatory development
  - Co-ordination between WA committee and line management staff
  - Synergy between different project components
- Discussions with the WA implementation team
- Shortcomings and strengths of the project

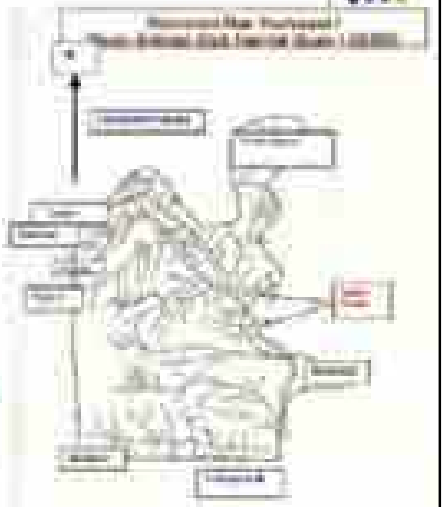
Socioeconomic status

- Physical impact
  - Land use
  - Cropping pattern
  - Crop production
- Economic impact
  - Income
  - Employment
- Hydrological impact
  - Ground water
  - Subsurface water storage
  - WHC
- Social impact
- Institutional developments

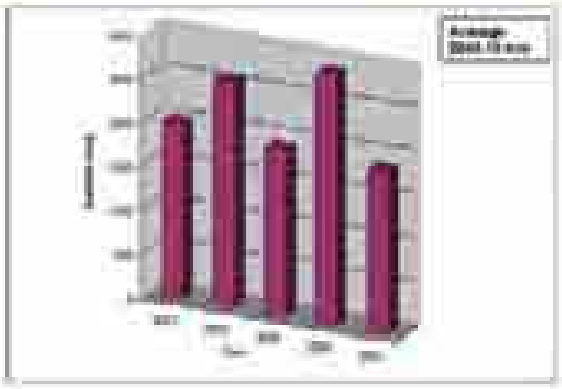


Kuriyagad I MWS

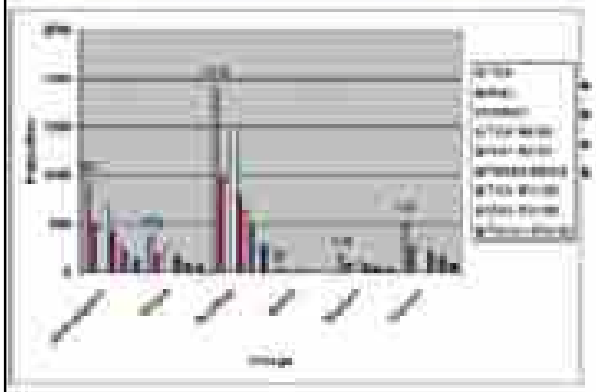
- Area: 600 ha. (Total 637 ha)
  - Distance from Panchayat: 10 km
  - Distance from Dist. HQ: 20 km
  - Distance from Block (DRDA): 10 Km
- No. of villages: 6
  - Jaithapalyam
  - Dollwal
  - Dagra
  - Bahyal
  - Bodhuni
  - Rambag
- No. of Watershed Committee: 1
- Watershed Team
  - Member s
  - WM Manager : M. Pan Singh Rawat (Agri. Diploma)
  - AWS Manager : Mr. Sanjay Singh (B.Sc. Agri.)
  - AWS Manager : Mr. A. R. Selvakarve (B.Sc. Agri.)
  - Asstt. Engg. : Mr. Gyanda (B. Tech Agri.)



Rainfall pattern in Kuriyagad I MWS



Population of Kuriyagad I MWS



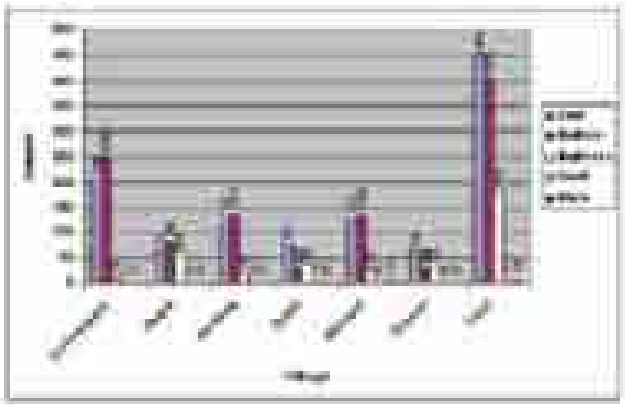
- # of families: 372
- Total population: 1995
- Sex ratio: 927
- Literacy (%): 77.16
  - Male (%): 80.88
  - Female (%): 64.76

Family size and literacy of sample household

Parameters	Categories of households				
	Landless (0)	Marginal (1-2ha)	Small (2-5)	Others (Shop, Pension)	Overall
# of sample HHs	7	20	10	03	40
Average family size	5.14	5.53	5.81	4.75	5.80
Sex ratio	893	954	869	827	892
Literacy rate(%)					
Post Graduate	0.00	1.01	3.23	3.70	1.75
Graduate	3.70	5.03	13.88	8.11	7.87
Intermediate	13.80	4.01	16.13	13.84	11.33
High school	19.61	35.68	34.73	25.89	31.56
Primary	38.83	47.28	34.81	33.53	36.25
Literate	95.83	91.93	87.10	81.76	78.31
Illiterate	38.83	18.07	12.88	18.24	22.84
Average size of holdings(ha)	0	0.81	3.47	1.21	0.98

Note: *Land holding is Rain fed lands + Irrigated lands

Livestock population in Kuriyagad I MWS



Activities undertaken in Kyriyagad I

Diversification and crop production	Non agricultural soil and water conservation	Income generating activities
• Horticulture plantation Mango Jackfruit Citrus -Banana -Strawberry • Forestry Plantation Jatropha Mulberry -Tegasi • Crop demos • Vegetable seed kits	• Irrigation channel ('ganil') • Water tanks • Check dam • Contour trenches • Gabion structures • Check walls • Recharge pits • Bunding walls	• Poultry • Dairy • Ginger cultivation • Veg. production • Compost pits

Diversification: Fruit and Tejpast plantation
Banana plantation
Tejpata plantation
Cane & mango plantation

Compost preparation
Vermi compost
BIOGAS

Improved crop production, agro-hort & agri-silviculture
Agri-silvi
Agri-silviculture
Improved seed demo

Soil & water conservation
Check wall
Grass plantation on slope
Gabion structure
Vetiver cutting grass

Nursery and hitech vegetable production

Tripper & Green species nursery

Low cost polyhouse

Land Use Pattern

Land use pattern in Kuriyagad I MWS

Livestock composition in Sample households (Kuriyagad I)

Sl. No.	Livestock	Before	After	Net change
1	Cow	117	74	-47.86
3	Bullock	83	78	-19.81
3	Bullock	133	87	-46.11
4	Goat	53	38	-40.94
5	Hen	13	3883	29858.33
6	Male Hen	7	4	-42.86

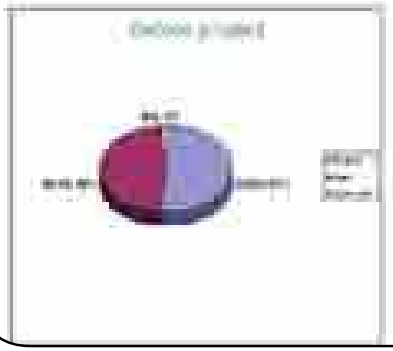
Number of plants planted and their survival in Kuriyagad I

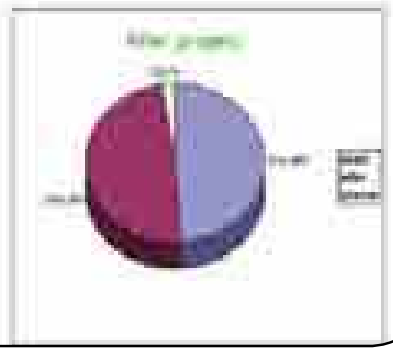
Impact of project on yield of major crops of MWS (q/ha)

Sl. No.	Crop	Before project	After project	% increase
1	Paddy	15.18	21.45	40.85
2	Maize	14.09	19.82	17.99
3	Ashwa	27.27	33.29	[illegible]
4	Mentinia	4.85	10.59	34.68
7	Urid	3.86	3.97	3.81
6	Cowpea	5.12	4.84	[illegible]
7	Wheat	13.78	16.14	17.39
8	Barley	13.62	16.53	8.08
9	Lentil	3.11	3.61	16.08
10	Potato	41.99	78.84	68.31
11	Mixed	7.52	11.36	51.06

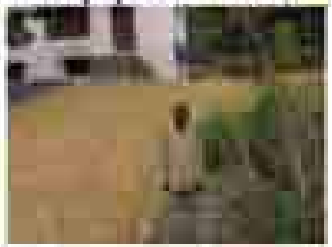
Area of crop production in sample households and cropping intensity: Kuriyagad I

Sl. No.	Name	Before Project	After Project	% increase
1	Gopi	0.40	1.06	0.11
2	Kali	0.40	0.80	0.11
3	Chinni	0.61	1.21	0.11
4	Lali	0.81	0.81	0.00
5	Nagaraj	0.81	0.81	0.00
	Average	0.61	0.94	0.07





Impact Process: Irrigation gool, water storage tank and crop production

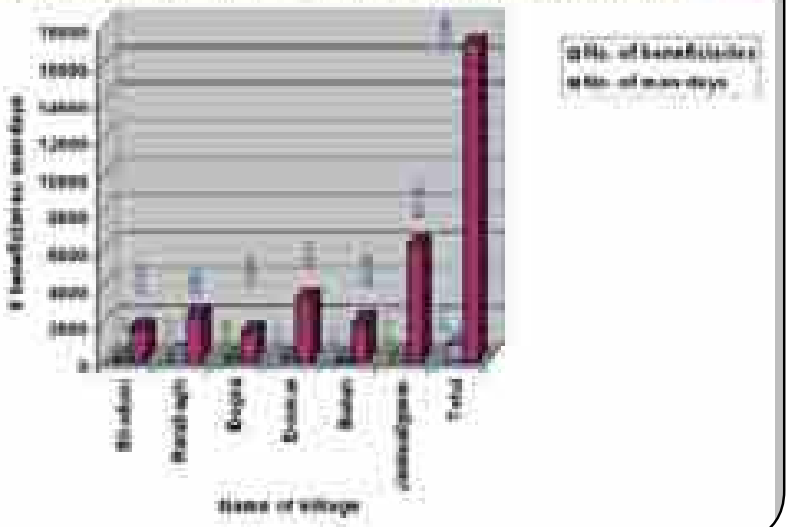


Impact Process: Strawberry cultivation & marketing

Impact Process: Oladkolus, vegetable cultivation & Poultry

Income and employment: Occupation in sampled households

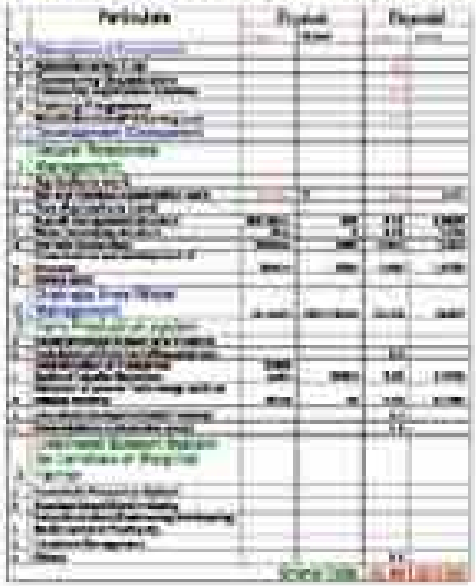
Employment: No. of beneficiaries & mandays during project period



Impact of WS activities on the income of beneficiaries

Category	Earlier Income (Rs)	Present Income (Rs.)	Percent Increase
Landless	1,38,000	3,80,100	91.97
Marginal (1-2.5 acre)	5,55,000	11,55,000	96.10
Small (2.5-5 acre)	1,36,750	3,53,900	158.54
Others (5 acre &)	4,85,550	9,46,500	93.75
Total	14,19,700	28,27,810	99.999

Physical and Financial achievements

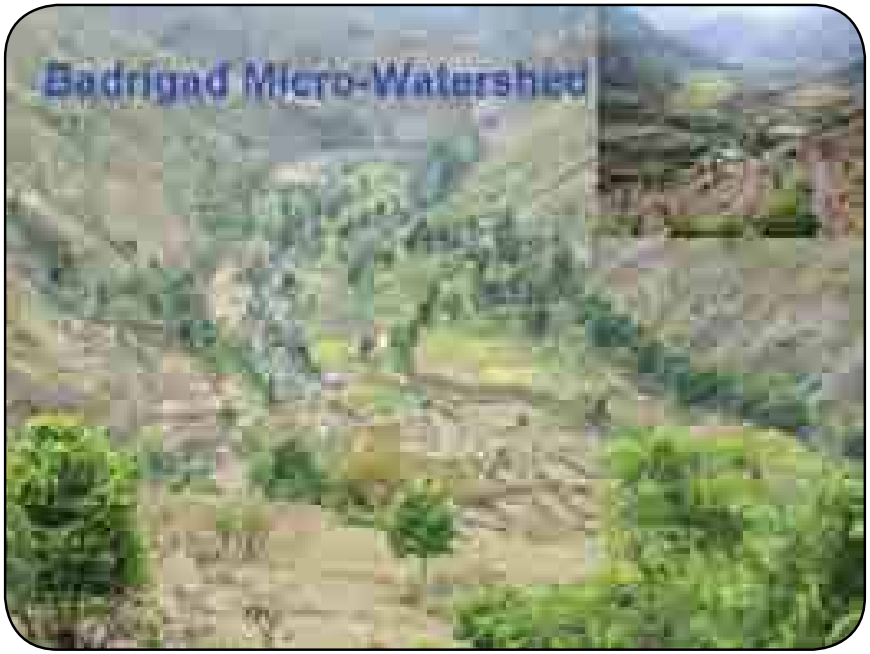


Weaknesses

- Difficult terrain
- Common Pasture i.e. Gia, SCST, insufficient
- Lack of integrated approach
- Technical backstopping
- Services WRA for impact Assessment
- Coordination between WS team, WS committee & beneficiaries
- Community Awareness regarding activities
- Exposure of WS team
- Trainings of beneficiaries, WS committee, WS team
- Deviation from targets
- Demonstrations for enhanced crop production
- Staff Help Shortage

Strengths

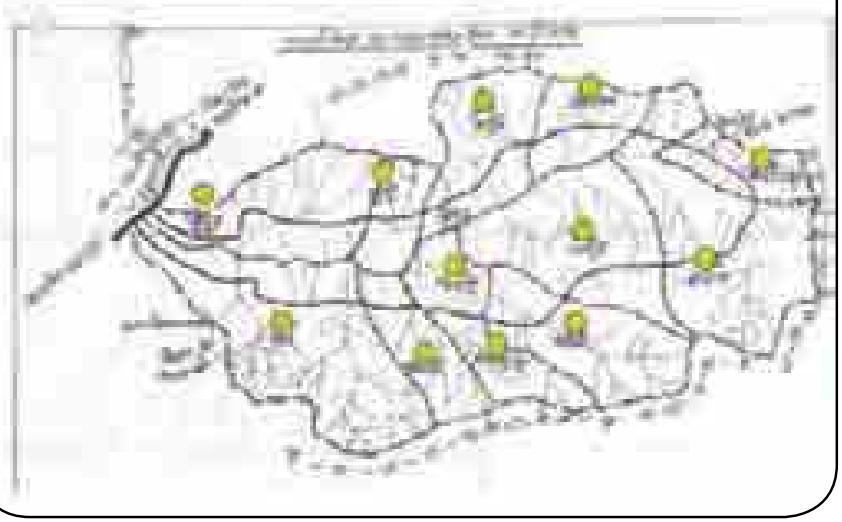
- Water resources
- Willingness of the inhabitants
- Villages of MWS near to national highway to Nainital
- Congenial climate
- Young, energetic and educated WS committee secretary, chairman & members



Tehri

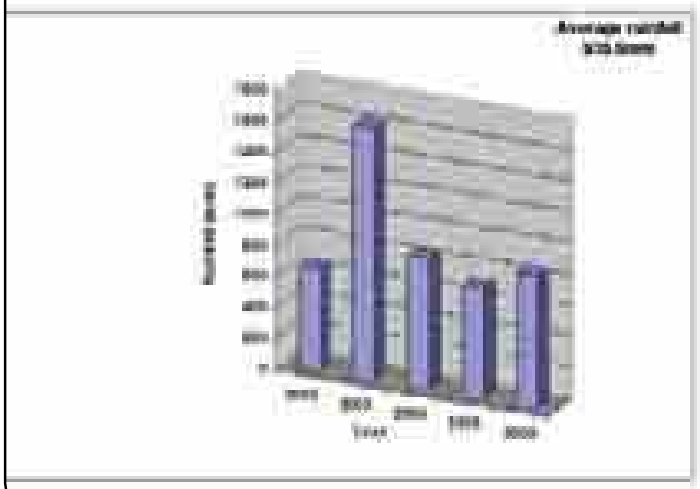
- 8 blocks: 08
- 8 forests: 05
- Area: 3796 Sq.Km
- Population: 604009
- Population density:159/km
- Sex ratio: 1051
- Altitude: 1550-1950
- Latitude: 30°3'10" &30°5'45"N
- Longitude:78°8'45" & 78°2'45"E
- Rainfall: 1238.7 mm
- Min. Temp.: 2.9°C
- Max. Temp.: 35.9°C

Badrigad



Badrigad MWS

Rainfall pattern in Badrigad



Status of work

- Badrigad MWS:
- Socioeconomic survey of households : 90%
- Interaction with WS committees : 75%
- Formal meetings and discussions with the WS committees
- Information regarding SHGs : 90%
- On the spot evaluation of various interventions and activities undertaken :75%
- Informal group discussions with beneficiaries :90%
- Data punching and analysis : In progress
- Report preparation for both MWS : To be prepared

MID TERM REVIEW WORKSHOP FOR COMPREHENSIVE ASSESSMENT OF WATERSHED PROGRAM

IMPACT OF WATERSHED PROGRAMS IN HIGH RAINFALL AND HIGH SLOPE REGIONS IN INDIA

23-24 July, 2007
ICRISAT, Patancheru

By

G.P. JUYAL

CENTRAL SOIL AND WATER CONSERVATION RESEARCH AND TRAINING INSTITUTE
DEHRADUN (UTTARAKHAND)

Hill & Mountain (H&M) Regions

- Western Himalayas (UK, HP, J&K, Shiwaliks of Punjab, Haryana)
- Eastern Himalaya (Arunachal, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura, Sikkim)
- Central mountainous (Vindhyan & Satpura)
- Southern mountainous (Western & Eastern Ghats)

Himalayas occupy largest area (53.71 M ha) accounting for 16% of TGA of country

Strengths

- Rich biodiversity, forest wealth and origin of major river systems.
- Ecosystem services (water, energy, food, timber, medicines, eco-tourism etc.) are source of livelihood to million of people in hills as well as plains.
- Regulating climate of region.

Weaknesses

- Geological and ecological fragility
- High soil loss – average 20 t/ha/yr
  NWH – 43% area in very severe category with erosion rate > 40 t/ha/yr
  64% area with erosion rate > permissible 10 t/ha/yr
- Inaccessibility, marginality and high-risk-low-pay-off agriculture resulting in poor economic condition of farmers.

Opportunities

- Varied agroclimatic conditions and niche for rich biodiversity.
- Home for rare medicinal plants.
- Congenial climate for growing off-season vegetables and horticultural crops.

Constraints

- Limited water availability for irrigation-assured irrigation hardly 10% of total cultivated area through harvesting small streams/springs (Most of the river water flows down the slope and groundwater not available).
- Steep slopes and undulating topography
- Small and fragmented holdings and absentee land ownership.
- Inadequate marketing arrangements for produce and post-harvest facilities.

WATERSHED PROGRAMS IN HILLY REGIONS

Watershed development programs in the Hilly Regions and their achievements (upto 2008)

Sl. No.	Programme*	Details of watershed programmes			
		No. of Watersheds	Physical achievement (Area in ha)	Financial achievement (Rs. in lakhs)	Funding agency
1	IWDP	75	28581	5778.00	Planning Commission
2	WSDP	1115	539406	22550.00	do-
3	WDPRRA	..	318168	27041.00	Min. of Agriculture
4	uDWSP	77	236846	43200.00	World Bank
5	SVP	64	249970	11105.00	NEC
6	Himalayan IWMP	75	28570	9949.00	World Bank
7	IWSDPRA	..	911937	47308.00	Min. of Agriculture
8	DPAP	1560	1390604	59153.00	Min. of Rural Dev.
9	IWDP	177	75394.2	44731.00	do-
10	RVPAPPR	1	880000	13775.00	Min. of Agriculture
11	DDP	3737	1390604	59153.00	Min. of Rural Dev.
	Total		6101951	294422.00	

* EEC=European Economic Community, MWS=Microwatersheds

** States covered : Uttaranchal, Himachal Pradesh, Haryana, Punjab, J &K, Tamil Nadu and NEH Regions (Assam, Arunachal Pradesh, Manipur, Nagaland, Meghalaya, Tripura and Mizoram)

Impact Assessment of Watershed Programme

Typical objectives of watershed programmes may include

- Raising productivity of rainfed agriculture and non-arable lands.
- Optimum use of rainwater, surface, sub-surface and groundwater resources.
- Reducing soil erosion
- Conserving forest and other natural vegetation
- Creating employment
- Fostering cooperative spirit and strengthening social institutions.

Impact Evaluation Indices

- Biophysical Indices
- Social Indices

Biophysical Indices

A. Hydrological Indices

Changes reflected after treatment

- Change in runoff depth or water yield.
- Ratio of peak runoff rate before and after
- Changes in duration of flow in the stream (i.e. enhanced perenniality of flow);

B. Water Availability Indices

- Changes in surface water storage e.g. pond, tanks capacities etc.
- Changes in groundwater table (as observed from open wells)
- Increase in water yield/recoupment.
- Change in perenniality (duration of water availability over the year)

C. Soil Erosion and Sedimentation Indices

- Changes in soil loss.
- Changes in sediment yield of ponds/tanks
- Silt deposition in channel bed behind structures in ponds/tanks

D. Land Levelling Index (LLI)

$$LLI = \frac{\text{Recommended slope (\%)}}{\text{Existing or treated slope (\%)}}$$

LLI can attain a maximum value of 1.0

E. Landuse and Productivity Indices

a. Crop Yield Index (CYI)

$$= \frac{\text{Average yield in the watershed (q/ha)}}{\text{Average yield in the area (q/ha)}}$$

b. Crop Productivity Index (CPI)

$$= \frac{1}{n} \sum_{i=1}^{n} (y_i/T_i)$$

Where,
n = total number of crops in watershed
y_i = average yield of ith crop in watershed
T_i = average yield of ith crop with standard package of practices

c. Crop Diversification Index (CDI)

$$= \sum_{i=1}^{n} Pi \text{ Log } (1/Pi)$$

Where,
Pi = Proportion of area sown under ith crop in comparison to total cropped area
n = Total number of crops in the watershed.
Higher value of CDI is a measure of better diversification

d. Cropping Intensity Index (CII)

$$= \frac{\text{Gross cropped area of watershed}}{\text{Total watershed area}} \times 100$$

e. Crop Fertilization Index

Indicates extent of fertilizers (NPK) applied to the crop in comparison to recommended level of nutrients in that crop.

f. Cultivated Land Utilization Index (CLUI)

$$= \frac{\sum_{i=1}^{n} a_i d_i}{A \times 365}$$

Where,
i = 1, 2,3.....n
n = Total number of crops
ai = Area occupied by the ith crop
di = Days that that ith crop occupied
A = Total cultivated land area available during the 365 days period

g. Biometric Measure of Trees

Important growth parameters of trees - Plant height, Girth, Biomass, Survival Percentage.

h. Induced Watershed Eco Index (IWEI)

$$= \frac{\text{Additional area brought under perennials during project period}}{\text{Total watershed area}}$$

Social Indices/Measures

Peoples' Participation Index (PPI) can be used to assess their participation at different levels such as Planning, Implementation and Maintenance

Mean Participation Rate (P)

$$= \frac{\sum_{i=1}^{n} P_i/N_i}{n}$$

Where,
P_i= score of ith respondent
N = Total number of respondents

$$P_i = \sum_{j=1}^{n} (PP_i + PI_i + PM_i + PE_i)$$

Where,
PPi , PIi, PMi & PEi are total scores of peoples' participation in programme planning, implementation, maintenance and monitoring evaluation, respectively

$$\text{Overall, PPI} = \frac{\text{Mean participation score (P)}}{\text{Maximum participation score}} \times 100$$

Employment Generation
- Mandays created during implementation and after the project is over
- Gains in social amenities, sustainable income etc.

Economic Indices
- Net present worth (NPW)
- Internal rate of return (IRR)
- Benefit cost ratio (BCR)

Impact Assessment – Case Studies

DETAILS OF INTERFLOW WATER HARVESTING STRUCTURE AT VILLAGE KALIMATI, BLOCK RAIPUR UNDER IWDP

Parameters	Specifications
Intervention	Participatory water resource generation through community action
Structure metal	Gabion type, surface and sub-surface water harvesting
Size of the pond	21x9x2m
Storage capacity	236 cu.m.
Total cost of construction:	Rs.1,28,243-68,715=59,528.00
A. Farmers' contribution	25%
B. Service providers' contribution	65%
C. Year of completion	1999

Interflow water harvesting = a potential water source

SUSTAINABLE WATERSHED DEVELOPMENT AT FAKOT, UTTARANCHAND

Parameter	Pre-project	During intervention	After withdrawal of project
	(1974)	(1975-86)	(1987-94)
Food crops (q)	882	4015	7562
Fodder	Negligible	83	2562
Milk yield (lit.)	56.6	186.8	342.9
Cash crops (000 Rs.)	6.5	34.8	827.6
Animal rearing method	Heavy grazing	Partial grazing	Stall feeding
Dependency on forest fodder (%)	90	40	20
Runoff (%)	42	14	14
Soil loss (t/ha/annum)	11.1	2.7	< 2

Drought Negotiation

Drought moderating effects of watershed measures during severe drought year of 1987 revealed that:

- The treated Fakot watershed helped farmers in sowing almost entire area (96%) while there was about 18% reduction in net sown area outside.
- The reduction in average productivity was only 5% in Fakot watershed as compared to 40% outside watershed.
- Good quantity of fodder was available from the treated watershed due to better moisture conditions.

Common Property Resource (CPR) Management

- Earthen dam (13.5 m high) constructed at Nainajra watershed during 1992; catchment area – 59 ha, command area – 25 ha.
- Water Use Society (WUS) formed to manage the CPRs (dam, water and its utilization, catchment resources and its management).
- WUS mobilized stakeholders in CPRs - sale of fish, Napier and Bhabar grass and other CPRs. Income distributed among stakeholders.

Multiple Use of Water

- An integrated farming system (IFS) based on multiple uses of water comprising of Water – mill, Fisheries, Poultry, Piggery and Agriculture developed at Sainji watershed in mid Himalayas of Uttarakhand state to provide additional monetary benefits to small and marginal farmers.
- The system costs Rs. 12,000.00 in addition to existing set of water mill and terraces. The system yields a net benefit of about Rs.23,500.00 annually against Rs.15,000.00 earned from the watermill alone. Initial cost recovered with 6-7 years.
- The synergic benefits – remnants from water mill serve as feed for fish, pigs and poultry birds and droppings of poultry act as fish-feed, can be mutually harvested in this system. Pig and poultry dung used as manure for agriculture.

Ground Water/Sub-surface water Recharge

- Lean period sub-surface flow increased due to bioengineering treatment in the Sahastradhara Mine Watershed. The dry weather flow prolonged by 150-180 days in the main channels, quantity improved and new springs appeared.
- In the mid Himalayan watershed (Sainji, Uttarakhand), sub-surface flow was observed as chief contributor to the total runoff amounting to about 46% of rainfall whole surface runoff account for only 4-6% during heavy storms.
  - Sub-surface flow in the oak forest watershed was about 8% higher than scrub forest.
  - Bio-engineering measures in degraded lands resulted in increase in base flow by about 15%, minimized landslides and improved seedling growth.

Increase in lean period flow due to treatment at Sahastradhara watershed

Special Problem Areas

Sahastradhara mined watershed in outer Himalayas at Doon Valley was rehabilitated through a package of soil and water conservation measures. The highly degraded watershed was put to green cover, eco-stabilized with drastic reduction in debris flow, runoff and improved water regime.

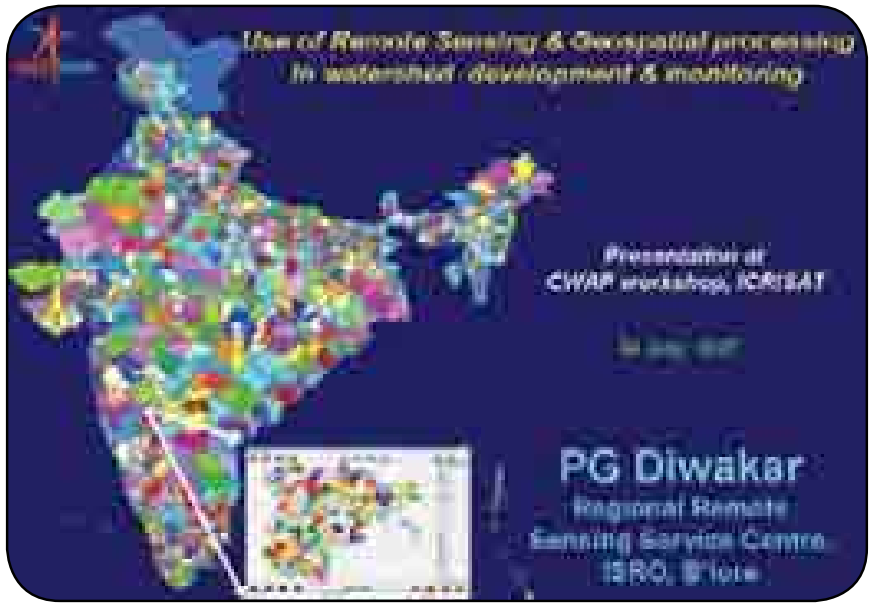
Eco-restoration of mined watershed at Sahastradhara (Dehradun)

Particulars	Before treatment (1994)	After treatment (1996)
Vegetation cover	30	80
Debris flow (Cu.m/a)	550	06
Monsoon runoff (%)	57	37
Lean period flow	60	240
Channel slope (%)	38	20

Water quality parameters (ppm) for treated and untreated mine spoils

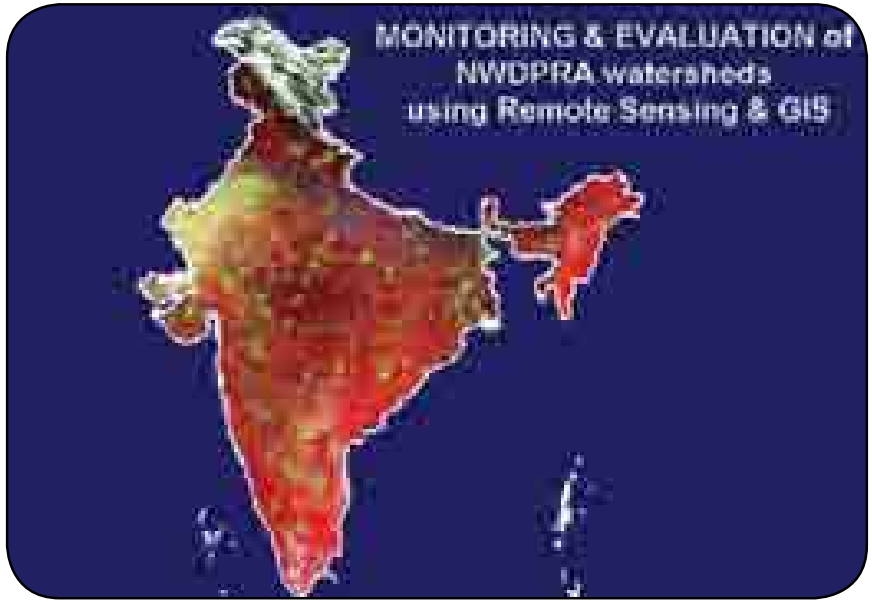
Site	Ca	Mg	SO_4
Treated mine	74	34	138
Untreated mine	100	39	240
Water quality standards	75	50	200


Future Needs
Impact of soil and water conservation measures on watershed basis on flow regimes at micro and macro scales.
Upstream-downstream linkages in conservation and management of rainwater and groundwater recharge. Upstream plays an important role in conservation aspects mostly inhabited by marginal farmers whereas downstream dwellers are beneficiaries. Complementarities and conflicts therein need to be studied.
Impact of land use changes on water resources (spatial and temporal), soil health, runoff, soil loss, equity etc.
Quantification of micro irrigation potential created through watershed programs in the country. Such information is missing at present.
Improving water use efficiency at farm level through efficient application systems (drip/sprinkler) and multiple use of water.
Hilly regions have wealthy animal based farming system, hence livestock aspects need due attention.
Employment generation, livelihood issues, institutional mechanism, CPR management, equity and gender issues need greater attention.
Quantification and valuation of intangible benefits and off-site effects of watershed programme on groundwater recharge, drought mitigation, flood moderation, environmental externalities and hydro-ecological aspects require due attention.
Convergence and synergy among various watershed related programs



Specific Areas of Work undertaken under CWAP

- *Impact Assessment of NWDPRA watersheds*
  - Use of Remote Sensing and GIS for assessments
  - Processing methodologies using multi-temporal data
  - Assessment on various natural resources parameters
  - Organisation of above content in a Web-based presentation
- *Impact Assessment for specific identified watersheds*
- *Best bet approaches of Monitoring & Evaluation in Sujala Project*
  - Use of Remote Sensing, GIS and Information technology
  - Community level Action plan preparation package in local language
  - Field level Process follow-up and MIS for concurrent monitoring
  - Special case studies, thematic studies and assessment reports



MONITORING AND EVALUATION OF NWDPRA WATERSHEDS USING RS & GIS

Project sponsored by Remote Sensing Systems Division (RFSD), Ministry of Agriculture, Govt. of India

Objectives

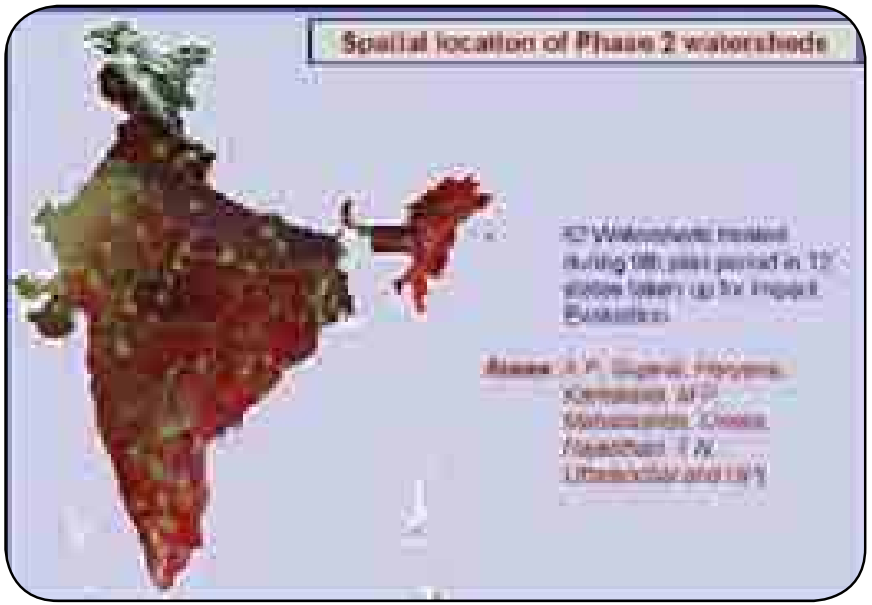
- Impact Evaluation: Implementation of Developmental Activities
- Performance analysis based on Agro-climatic zone

Impact Parameters from Remote Sensing

- Change in green cover, surface water, cropped area (Kharif, Rabi)
- Change in cropping intensity / cropping pattern
- Change in Biomass levels, using Normalised Difference Vegetation Index

The task carried out in 12 States across the country by Regional Remote Sensing Service Centres (RRSSCs) of ISRO


Spatial location of Phase 1 watersheds


Spatial location of Phase 2 watersheds


Spatial location of watersheds across the country


Spatial distribution of the coverage

Parameters for impact assessment

Remote Sensing based assessment on :

- Cropped Area: Changes in areal extent, cropping pattern, extent of irrigated area (to infer ground water status), yield & productivity.
- Plantations: Changes in horticultural and forest plantations.
- Sustainability: Switchover from marginal croplands to agro- horticulture, agroforestry, changes in green cover.
- Productivity: Overall changes in green biomass inferred from vegetation index studies.
- Area under fodder cultivation.
- Drainage Line treatment: Changes in number and areal spread of surface water body.
- Non-Arable lands : Changes in areal extent of wastelands.

Ground based Assessments :

- Ground water depth, well density and yield.
- Socio-economic indicators:Migration of labour & cattle, employment opportunities, land value, agro based and allied industries.

Impact Evaluation approach using remote sensing

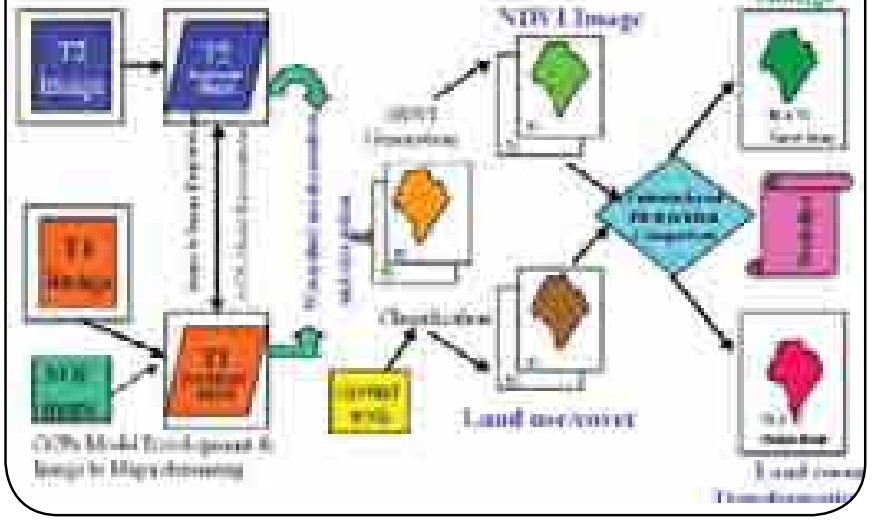


IMAGE TO MAP / IMAGE TO IMAGE CORRECTION

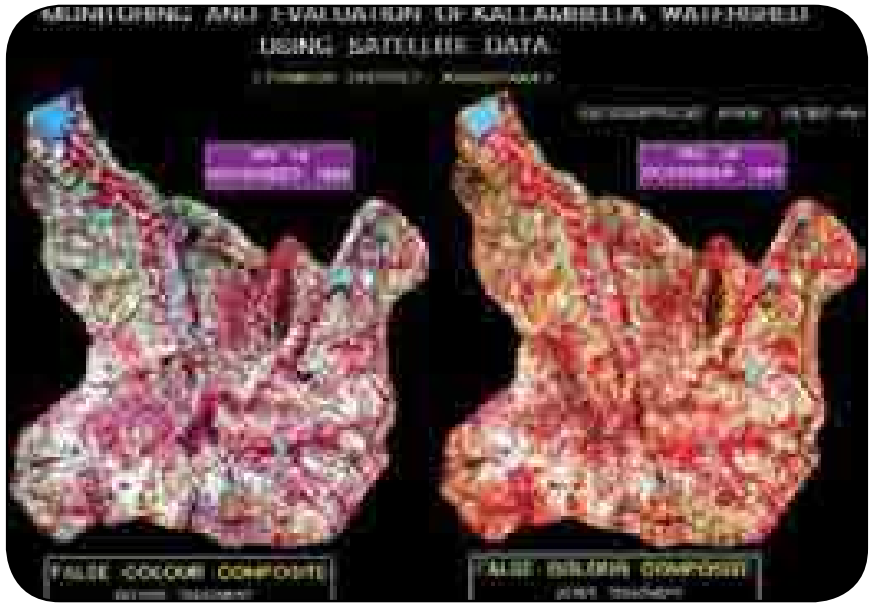
Image Classification

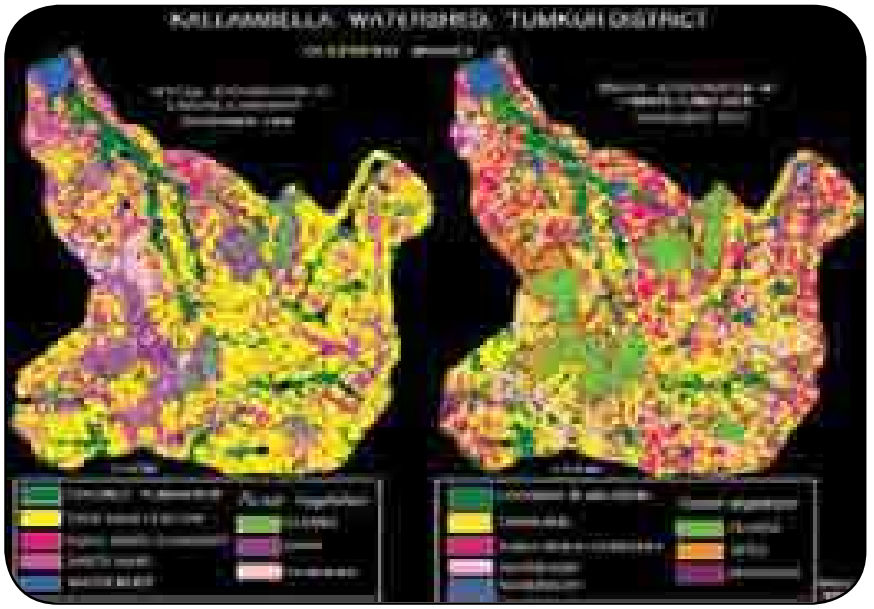
Supervised Classification

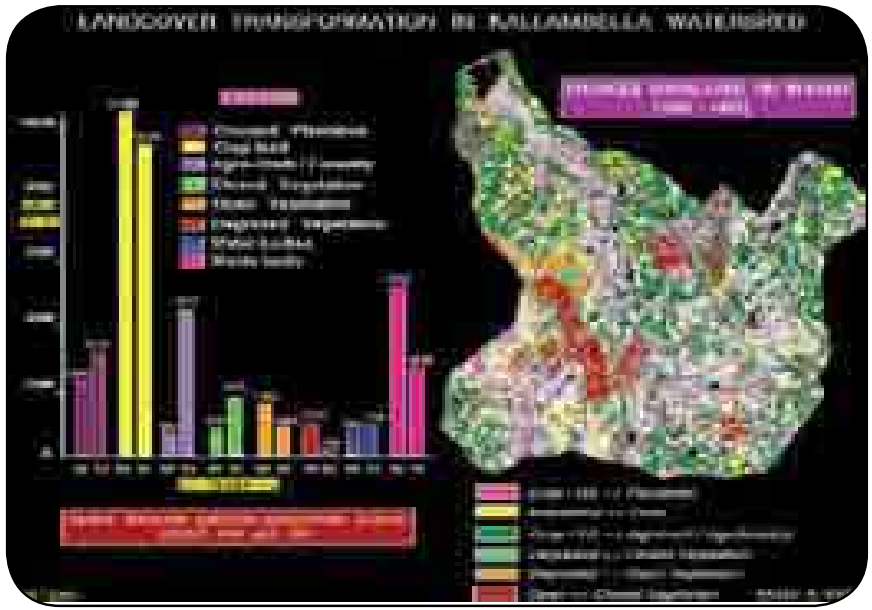
A probabilistic model performing pixel level classification using spectral signatures

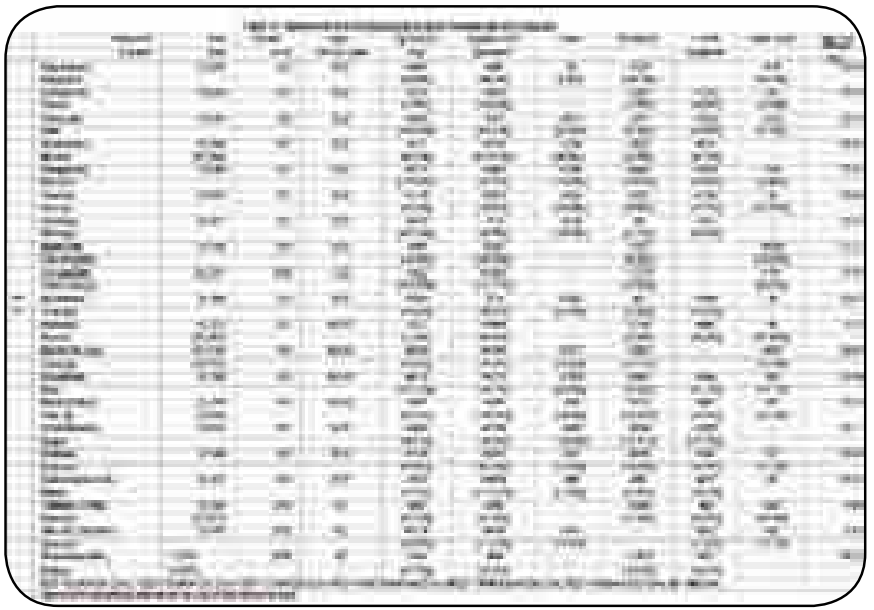
A class of evolution based algorithms which incorporate training principles but without using some parameters

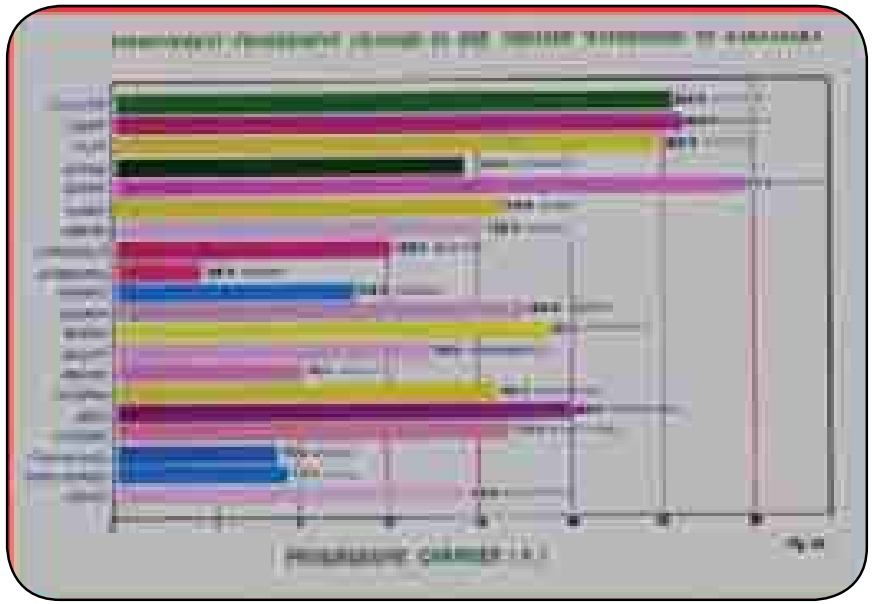
Unsupervised Classification

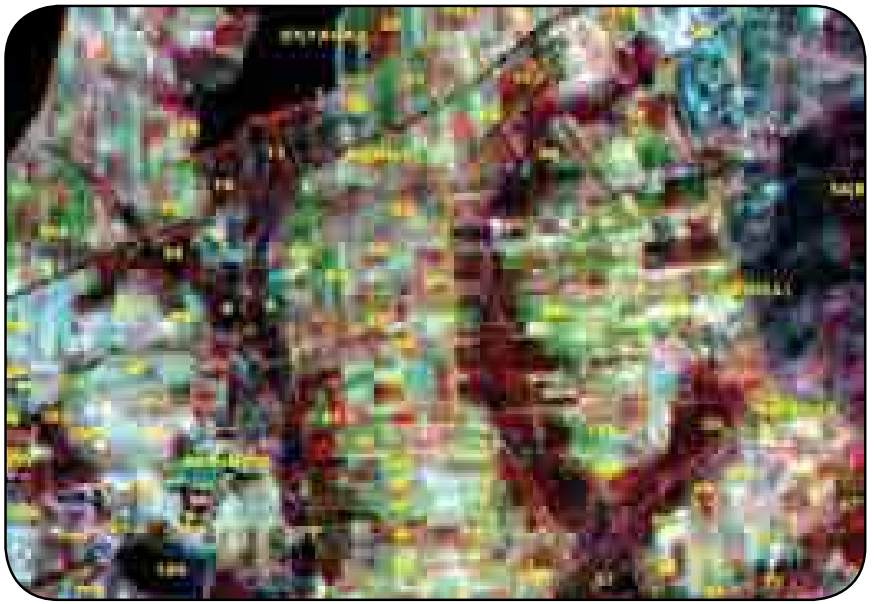

MONITORING AND EVALUATION OF KALLAMBELLA WATERSHED
USING SATELLITE DATA
FALSE COLOUR COMPOSITE
TRUE COLOUR COMPOSIT


KALLAMBELLA WATERSHED TUMKUR DISTRICT


LANDCOVER TRANSFORMATION IN KALLAMBELLA WATERSHED







The reports compiled agro-climatic zone wise with the following outline

- Executive summary
- Agro-climatic set up of the region
- Activities of NWDPRA in the watershed
- Data used for monitoring
- Methodology adopted
- Output products
- Impact analysis
- Agro-climatic zone-wise performance evaluation
- Conclusions and recommendations

Work done by CAZRI on Watershed Development

1. Jhanwar Model Watershed Project (1987-92).
2. On-Farm Research for Arrest of desertification DDP TOT Programme (1995-97).
3. Watershed Management Technology in Hot Arid Region- Bavali-Bambore Watershed (2000-2004).
4. Land use planning for management of agricultural resources in Salori Watershed in Jodhpur district (2001-2004).

IWM Components adopted in Jhanwar Model Watershed Project (1987-92)

Technology	Type rough cost	Physical achievements upto 1992 final	Expenditure (Rs. in lakhs)
Farm forestry	550	150	0.630
Reclamation of gullied land	200	125	1.000
Pasture development	150	125	0.900
Improved dry land crop production (demonstrations)	25	7	0.010
Masonry dams	3	3	1.200
Brush wood check dams	500	155	0.150
Brush wood check dams	80	25	0.110
Stabilizing nallahs (unit cm)	1000	6000	0.384
Farm pond	12	10	2.000
Animal health camps	-	-	0.171
Agrohorticulture	50	25	1.500
Solar energy (No.)	-	45	0.157
Miscellaneous expenditure	-	-	1.130
Total	-	-	10.528

Impact of Watershed Programs

1. Creation of Extra water reservoir for agriculture and drinking e.g. JMWP 30000 cum.
2. Biodiversity Conservation 400 to 800% increased vegetation density.
3. Ground Water Recharge (0.84 m/yr.).
4. Stabilization of hummocks & gullies in dormer area (30 ha); gradual soil erosion reduction (20 t/ha/yr to 2.1 t/ha/yr in 10 years).
5. Increased productivity of dryland crops and legumes (170 to 250%) & grass/fodder (20 to 300%).

6. Enhanced feed (120%) & fodder (400%) availability thereby increased milk yield . 2 kg/day/animal over the base yield of 1.5kg/day/animal.
7. Enhanced fuel-wood production in the watershed area 500 t over 10 years period (1989-1999).
8. A total of 25500 trees of MPTS planted under various ALUS helped to enhance livelihood security, distress management and SLM of watershed community.
9. The project generated extra employment of 32880 mandays with a total injected income of rupees 7.23 lakhs to the landless and poor farmers.
10. The income of the farmers in project area sharply increased by 12,76 and 80% for marginal, medium and large farmers respectively in 7 years period (1987-94).

11. Appreciation certificate to Jhanwar Watershed Project for "Saving the Drylands and Combating Desertification" from United Nations Environment Programme in 1996.
12. Three Khadins (19 ha) constructed in Bavarli-Bambore watershed gave good yield of chickpea (25-30 q/ha) on conserved moisture during normal rainfall year (2003) and alleviated fodder scarcity (90-95 q/ha) in drought year (2002).
13. In DDP-TOT Project Khari Nursery (1,12,000 seedlings), Ber stru ber budding (10,000 plants), Gum production from A. senegal (5000 plants), BIOMIX feeding to livestock and popularization of improved varieties of dryland crops made perceptible impact in the project area.

Project Replication

1. As a follow up action of JMWP a Mega Project under DDP-TOT in twelve villages of six district of And Rajasthan with total budget of Rs. 10 million was under taken by CAZRI in 1995.
2. The World Bank funded IWDP of GOR with a funding of Rs. 600 million was a flagship of JMWP.
3. On the request of MORD, CAZRI produced a "Manual for Development of Model Watershed Projects in DPAP&DDP Areas of India" as reference book for field staff engaged in watershed development works in arid and semi-arid areas of the country.

Problems Encountered in Program Implementation

- Initial community resistance on CPR development.
- Perceptional difference on applicability and adoption of technological interventions.
- Top-down approach hampered community participation.
- Poor acceptability of farmers to ALUS. Their problems were small land holding, seasonal dwelling, water scarcity, uncontrolled animal movement, longer gestation period and poor baseline socio-economic framework.

Lessons learnt

1. In Rajasthan despite difficulties since planning to post-project management the concept of Watershed based Development is important for NRM, livelihood security & poverty alleviation.
2. Watershed + activities like livelihood security, poverty alleviation addressing of gender issues, disparity reduction etc are very important aspects & should figure prominently in the programme.
3. Field bund strengthening and safe disposal of runoff water from agriculture lands to water harvesting sites and its effective utilization is very important in western Rajasthan need to be focused in the arid Watersheds/Index catchments.
4. Post project management systems needs to be evolved for sustainability and scientific disaster management.

5. Adoption of convergence and consortium approaches among all stakeholders is a must to get active community participation and success of integrated area development programmes in the state.
6. Development Khadins, Nadies, Tanks, and Diggiees are crucial TIs for non watershed areas of W. Rajasthan.
7. In area receiving rainfall < 300 mm livestock husbandry is the main stay of arid zone farmers and more emphasis should be given on management of AGD's, diversified agriculture, in situ and inter plot WHs & wind erosion. To get proper results the project period in such difficult area should be 8-10 years.
8. In arid Rajasthan where watershed boundaries are not well defined, block administration development approaches should be adopted.

Present Status of Watershed Programmes in Rajasthan

- Total Geographical Area = 34.4 m ha
- Total area to be treated = 20.3 m ha
- Area treated till 2000 = 4.8 m ha
- Revised on-going programmes : CSP, DDP, IWDP, DPAP, NWDPRA

Progress of NWDPRA works in Jodhpur Division of Rajasthan (Dec. 2006)

S.No.	Name of District	Target for the year (Rs Lac.)	Financial Progress (Rs.lac.) Dec.06	Physical Progress (ha)		Total No. of work
				Targets	Progress	
1.	Jodhpur	544.40	115.74	4640	1380	40
2.	Jaisalmer	48.75	9.56	1120	150	8
3.	Barmer	251.52	49.10	6000	1160	33
4.	Jalore	168.64	33.64	1010	282	20
5.	Sirohi	188.82	74.16	4120	1600	24
6.	Pali	445.41	168.78	10000	3667	49
7.	Nagaur	184.08	87.58	3420	1267	17
8.	Hanumangarh	148.58	48.10	3172	1166	18
	Total	1744.78	182.50	33162	10721	209

Financial Progress (Rs. in Lac.) of CDP and WS works taken up in DDP in Jodhpur Division (up to Dec. 2006)

S. No.	Name of Districts	Targets WSI/CDP wrorks 06-07	Total Expenditure up to Dec.06	% of Achievement upto Dec 06
1.	Jodhpur	3020.00	1874.23	66.58
2.	Jaisalmer	4107.80	1791.09	43.36
3.	Barmer	8543.06	3053.18	53.18
4.	Jalore	4000.00	1267.08	31.00
5.	Sirohi	457.97	181.18	53.17
6.	Pali	3670.00	1600.04	68.15
7.	Bikaner	8210.00	3062.07	55.44
8.	Hanumangarh	7209.59	462.68	36.24
	Total	34908.37	17843.14	48.06

Recent Policy Shifts of GOR

1. Poverty Alleviation Programmes – IFAD Project to be launched in 6 desert districts of Rajasthan for poverty alleviation with a total budget of Rs.300 crores in five years 2006-12. (Project formulation is in progress).
2. Livestock Husbandry - Breed improvement, Nutrition & Health enhanced forage production from grazing lands and cultivated fields
3. Livelihood security & Employment generation - Rajasthan Mission on Livelihood (RMOL) established in 2004
4. Skilled Manpower - Manpower in Surplus Vocations in 30th Five Year Plan & increase 74% of Skilled Manpower

Livelihood Issues in the State

- Out of 28 m labour force 26 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 lakhs people/yr.
- 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 AGCs 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	

Livestock population (2003) in Rajasthan vis-vis arid Rajasthan

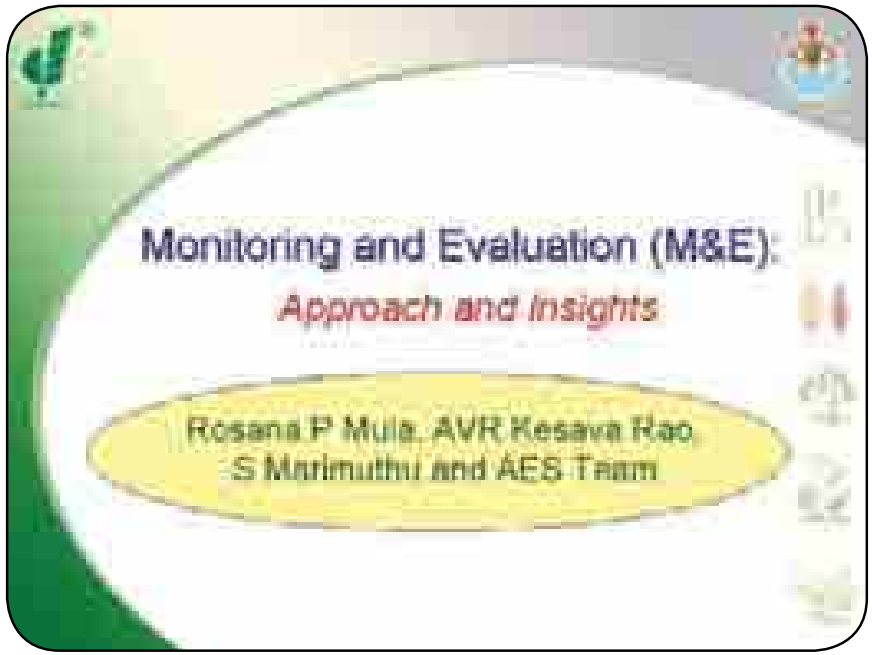
Livestock	Rajasthan	Arid Rajasthan	% of Popn. in arid Raj
Cattle	19.0[illegible]	4.11	[illegible]
Buffalo	10.41	3.20	30.74
Sheep	19.0[illegible]	[illegible]	[illegible]
Goat	[illegible]	[illegible]	[illegible]
Camel	0.5[illegible]	0.40	80.0[illegible]
Total	45.61	[illegible]	[illegible]

Requirement vs. availability of feed & fodder in Rajasthan

S.No.	Commodity	Requirement mt/yr	Availability mt/yr	Gap (%)	
				Rajasthan	Arid Rajasthan
1.	Dry fodder	41.5	20.8	49.8	76.9
2.	Green fodder	77.8	32.1	58.8	93.5
3.	Concentrate	24.7	3.3	86.6	84.5

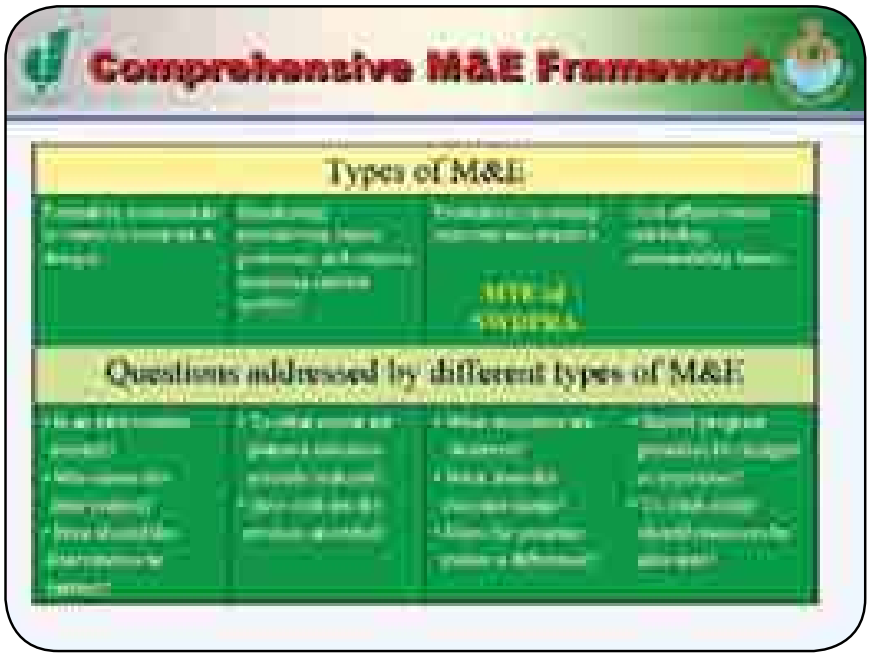
Conclusion

In arid region water being the most delicate as well the most precious. Therefore attainment of maximum water productivity should be the core motto of development process in the desert. To achieve this goal holistic water based watershed programmes like Watershed/Index Catchment/Khadin/Agrihorti area development approaches assume high priority. However, for success, societal issues existing, Convergence among various stakeholders, active community participation, assisted growth and empowerment of neglected segments of the society, effective Post project management strategies are crucial. Besides rural, investment in components of livelihood security, namely, Nutrition & health, market, infrastructure development are devised for poverty alleviation and balanced socio-economic progress of the desert dwellers and due to equal importance to overall economic development.

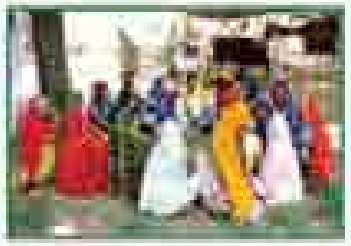

Monitoring and Evaluation (M&E):
Approach and Insights
Rosana P Mula, AVR Kesava Rao,
S Marimuthu and AES Team


M&E Defined
M&E


Why M&E?
An effective M&E provides the ability to:
Assess to what extent the objectives of the project are fulfilled
Evaluate how effectively change is promoted
Foster cooperation and support (public-private-people partnerships)
Equip managers with a tool for timely information on the progress of activities


Comprehensive M&E Framework
Types of M&E
Questions addressed by different types of M&E

Evaluation Process



- To improve the design & performance of an ongoing project
- To make an overall judgment about the effectiveness of a completed project (summative evaluation)
- To generate knowledge about good practices (suggestions / methodologies / future directions)

Current Practices, Tools and Methods

Quantitative	Qualitative
Focuses on "how many"	Seeks depth
Provides generalizable results	Looks at processes and meanings
Open to statistical analysis	Looks at "why and how"
Systematic (pre-determined protocol)	Adaptable (can shift according to what you find)
Seeks objectivity	Seeks richness of response
Provides snapshot or longitudinal information	Looks for emotional depth

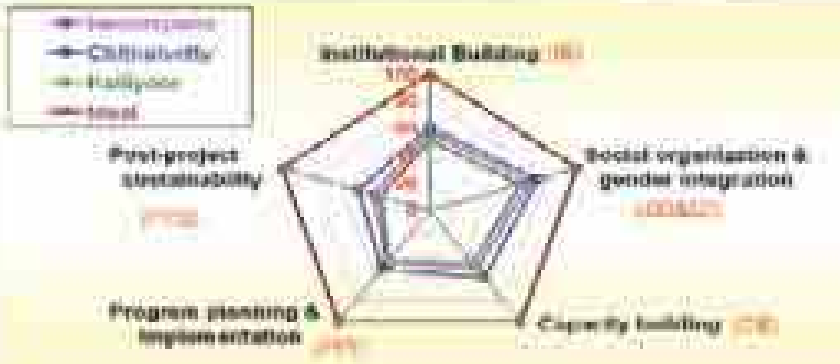
Current Practices, Tools and Methods

Methods for collecting M & E data

NWDPRA MTE EXPERIENCE

- Household interviews
  - *Open and close ended questions*
- Discussions and focus group discussions
- Review of documents and existing data
- Logs or diaries
- Dialogues between & among different levels
- Observation
- Participatory evaluation involving officials from apex watershed body at state level
- Multi-disciplinary and interdisciplinary
- Cumulative rating & web diagram

Performance Indicators: Web diagram



Strengths are SO&GI (community organization), CB (training), PPI (Decentralized approach)

Improvements needed in M/R (monitoring and evaluation), BI (convergence), PPS (developing withdrawal strategy) and PFI (fund flow and utilization)

Types of M&E in NWDPRA Watersheds

- Monitoring of progress at PIA, district level and state level
- Concurrent evaluation or Mid term evaluation by external agencies
- Impact evaluation
- Annual auditing the records (focus: financial auditing)

MTE in NWDPRA Watersheds: Experiences

- Need to develop common guidelines for baseline data
- Need to have a framework for monitoring the impact of watershed activities not just the demand for physical and financial targets
- MTE format demands much of impact assessment (equity, sustainability, stability). Given the limited activities observed in the field, are these possible indicators for a mid-term type of evaluation?

  i.e., Presenting evaluation results in terms of stability, sustainability and economic indicators like IRR

Insights from other Evaluation Reports

- Need to develop indicators with the threshold level for measuring the sustainability of natural capital (ecological factors like water, feed, fodder etc)
  - This data can become the driving force for improved physical, financial, and social capitals
- Developing web diagram for factors contributing the improvement in the natural capital
- Using advanced tools like remote sensing and GIS (NDVI and LULC) with sustainability indicators will enable an assessment of impact at wider scale

Community Watershed Indicators


Community Watershed Indicators


Community Watershed Indicators


Community Watershed Indicators


Community Watershed Indicators

Challenges in M&E

- Under- or over-doing it; looking only at the inputs and outputs and not the outcomes or impacts (to further accountability)
- Waiting until the last minute to set up a data system, enter, or analyze data
- Knowing when people are telling you what they really think vs. telling you what they think you want them to say (FEAR FACTOR)
- Difficulties with memory or perceptions
- Challenging the notion of rigorous data collection, analysis, validity, and reliability by using participatory M&E
- Difficulty in scaling up M&E process
- The ties that [illegible] research and M&E

Impact of watershed interventions on runoff, soil loss and environmental quality

Prabhakar Pathak, S P Wani, K L Sahrawat, Ch Srinivasarao and R Sudi

Collection of hydrological and environmental data from the watershed

Objectives:

- To assess the impact of watershed interventions (runoff, soil loss and environmental quality)
- To provide the basic data for the design of hydraulic structures (viz. check dams, ponds, and gully control structures)
- To assess the potential of runoff water harvesting and groundwater recharge in the watershed
- To assess the sustainability of soil and water resources and environment
- To provide data for testing and developing simulation models

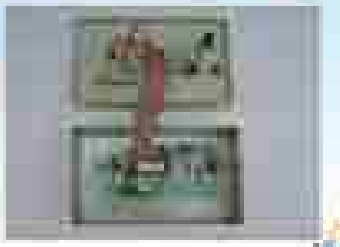
Hydrological data collection at the benchmark watersheds

- Rainfall
- Runoff
- Soil loss
- Groundwater level
- Soil properties
- Other related data such as topography

Benchmark watersheds monitored for hydrological data in India

Benchmark watersheds monitored for hydrological data in China, Thailand and Vietnam

Hydrological monitoring station with runoff recorder and sediment sampler, and control unit



Effect of improved and traditional watershed technologies

Parameters	Improved	Traditional
Mean annual rainfall (mm)	780	780
Mean annual runoff (mm)	107 (13%)	178 (23%)
Peak runoff rate (lit^{-1} s $^{-1}$ ha $^{-1}$)	0.38	0.52
Mean annual soil loss (t ha $^{-1}$)	5.0	17.8
Production per unit rainfall (kg mm $^{-1}$)	5.0	2.5
Rainfall used by crops (%)	71	58

Impact of watershed interventions on runoff and soil loss at benchmark watersheds in India, 1999-2006

Rainfall range (mm)	Treatment	Rainfall (mm)	Runoff (mm)	Runoff as % of rainfall	Peak runoff rate (m^3 s $^{-1}$ ha $^{-1}$)	Soil loss (t ha $^{-1}$)
High (>1000)	Treated	1046	96	9.2	0.0019	1.69
	Untreated	1046	319	30.6	0.0061	9.89
Medium (700-1000)	Treated	799	84	8.8	0.0026	3.16
	Untreated	559	95	18.8	0.0036	8.21

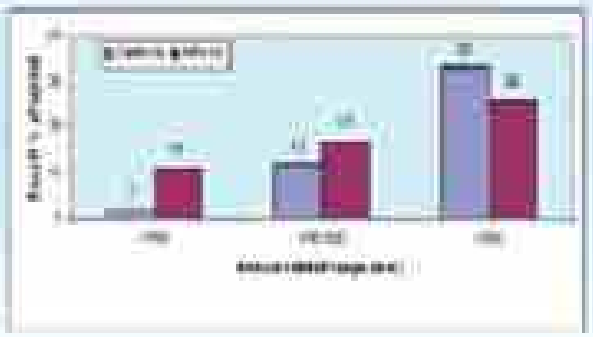
Mean rainfall, runoff, peak runoff rate and soil loss from 20 benchmark watersheds

Rainfall range (mm)	Rainfall (mm)	Runoff (mm)	Runoff as % of rainfall	Peak runoff rate ($m^3 s^{-1} ha^{-1}$)	Soil loss ($t ha^{-1}$)
<400	342	23	8	0.027	2.4
600-1000	796	111	14	0.032	3.8
>1000	1266	305	24	0.052	5.2

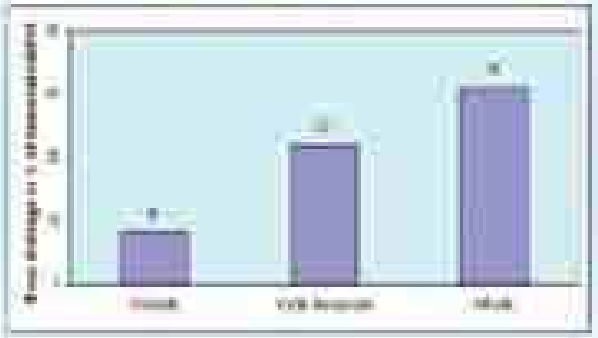
Some of the characteristics of runoff and soil loss in different Asian countries

Country	Range of seasonal runoff (%)	Contribution of major storms to seasonal runoff and soil loss (%)
India	8-16	70-90
Thailand	13-35	85-95
Vietnam	18-32	85-90

Runoff characteristics of Alfisols and Vertisols

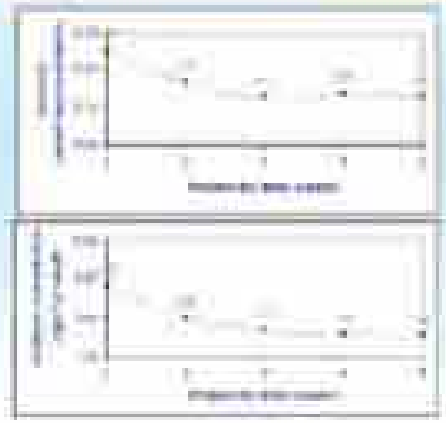


Deep drainage in different SAT soils

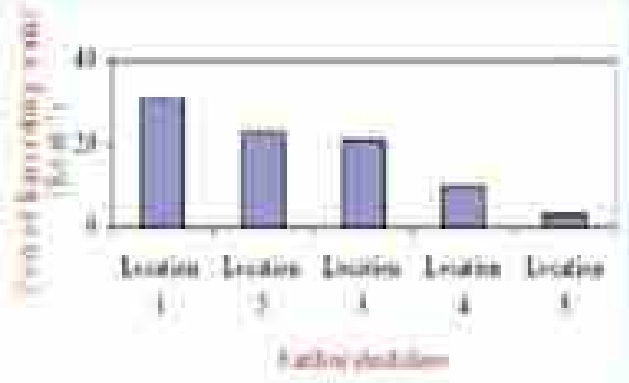


Effect of watershed interventions during the project period on runoff and sediment

(mean of benchmark sites in India)

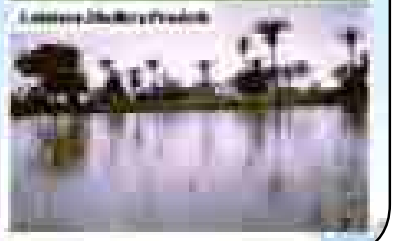


Effect of location on cost of water harvesting at benchmark watersheds in Madhya Pradesh



Community-based rainwater harvesting/ groundwater recharging structures

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



Adarsha watershed map with location of wells

Participatory groundwater monitoring in benchmark watersheds

Groundwater level measuring device
Equipment costs only Rs 800/-

Farmer measuring groundwater level

The impact of watershed interventions on groundwater levels

Effect of supplemental irrigation on crop yields at benchmark sites, Madhya Pradesh

Crops	Control	Two supplemental irrigations at 40 days	% of increase
	Crop yield (t ha^{-1})		
Chickpea	0.89	1.29	127
Groundnut	0.82	1.30	59

Supplemental irrigation from a small storage reservoir at Lalpura watershed, Vidisha dist., M.P.

Impact on land use pattern, Bundi watershed

Land Use	Before watershed intervention Area (ha)	After watershed intervention Area (ha)
Irrigated	297 (22)	341 (25)
Rainfed	535 (40)	344 (26)
Pasture	148 (11)	148 (11)
Horticulture	6	53 (4)
Forest	186 (14)	186 (14)
Dwelling and road	246 (22)	246 (22)
Total	1340	1340

Water Quality studies

Water quality are monitored in ponds, tube wells and open wells

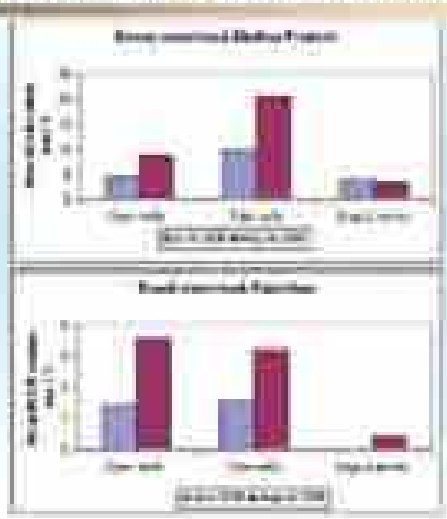
Sampling frequency for water quality:

May, June, Aug, Oct, Jan, March

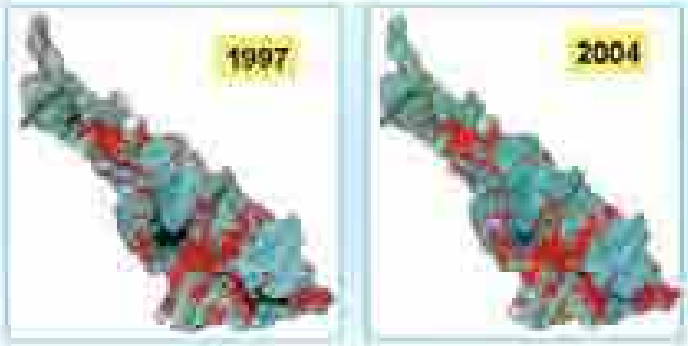
Analysis for

- Pesticide residues (Organochlorine Endosulfan, Organo phosphorous Monocrotophos, Cypermethrin, Pyrethroids)
- Heavy metal concentration viz. Cd, Cu, Ni, Pb, Cr, Li
- Nutrient status (NH4, NO3, Water soluble Na, K, Ca, Mg, S, Fe, Cu, Zn, Mn and B)

Concentration of NO_3-N in different sources of water in Dewas and Bundi watersheds



Increased vegetative cover, Bundi watershed



Bundi watershed, Rajasthan

Off-site impact

Watershed development in Rajasamdhiyala (Gujarat) benefited downstream villages and increased productivity, production and incomes for the farmers

- Groundwater recharge increased by 25%
- Increased duration of water availability
- Crop production increased by 25-30%
- Crop diversification increased
- Reduced sedimentation and silting of water bodies

Status of hydrological and environmental quality data collection in various watershed programs in India

Based on 110 reports of various watershed programs such as: National Watershed Development Project for Rainfed Area (NWDPRA); Indo-German Watershed Development Project (IGWDP); Drought Prone Area Programme (DPAP); Integrated Wasteland Development Project (IWDP)....

- There is hardly any monitoring of hydrological and environmental parameters
- Currently not much hydrological data are used in the design and development of watersheds

Conclusions

- High runoff, soil loss and low rainfall use efficiency under current land use
- Increased surface and groundwater availability both for agriculture and other uses
- Reduced runoff, peak runoff rate and soil loss
- Increased area under irrigation in the post-rainy and summer seasons
- Efficient use of natural resources (higher rainwater use efficiency)
- Reduced flooding and siltation in the downstream
- Reduced environmental pollution

Conclusions

- Excellent scope to improve the design and construction of structures based on hydrological data
- Excellent scope of improving the overall effectiveness and reducing the cost of watershed development
- Current monitoring of hydrological and environmental parameters in the watershed is poor
- Needs to strengthen the monitoring of hydrological and environmental parameters at selected benchmark watersheds

Manual on Best Bet Practices for Watersheds

under the initiative of
"Comprehensive assessment of watershed programmes in India"

Dr YS Ramakrishna and Team
CRIDA,Hyderabad

It would aim to cover following aspects

- Better technological interventions and their impact (Biophysical)
- Qualitative and quantitative impact monitoring indicators (Economic and Impact)
- Facilitating policies and institutional mechanisms (Policies and Guidelines)
- Drivers for bright spot watersheds including drivers for enhancing community participation, gender and equity perspectives (Management, Institutions & Capacity building)

Bio physical Interventions:

- Soil and water conservation (In-situ & Ex-situ)
- Agronomic practices (crops, cropping & farming systems, tillage)
- Nutrient Management practices (INM/IPM)
- Alternate land use systems including horticulture, sericulture, pisciculture, etc
- Livestock based interventions

Management:

- Water (Surface / Ground water)
- Resources(CPRs, Wasteland)
- Asset Management- Income generating activities
- Mechanisation, Post harvest, Value addition

Social Issues

- Planning (contribution)
- Creation and sustenance of institutions(pre, current and post watershed scenario)
- Post-project (sustainability, Land Use Planning , Physical infrastructure like Structures)
- Equity, Gender concern

Approach could be based on

Theme versus Area approach

-A core team preparing an above topics for each of major states. (Ideal one if time and resources are not limited)

-A team would be preparing on each topic synthesizing the information available through published reports

Second approach was chosen and individual topics were listed out and lead authors were identified for those topics. A list of co authors was also provided to get the holistic information on the relevant topic.

Lead authors were given responsibility to contact co-authors for preparation of respective ppt.

No.of chapters in manual: 24

Institutions involved:

- ICRISAT
- CRIDA,CAZRI,CSWCRTI, NCAP,ITSS, UAS(Bangalore), Ag. University (Tamagadi)
- ISRO
- IISR,
- WASSAN,GIDR,RIRDS
- BAIF,WOTR
- DV etc.

(contd..)

1. Watershed management concepts and practices

Kanthee Chopra, SP Wani and YS Ramakrishna

2. Models of watershed management

SP Wani, David Rodcliffe, Richard Shaw & and TK Sreedevi

3. Process of watershed selection

YS Ramakrishna and KV Rao

4. Characterization of natural resource base (agroecological potential, water balance etc.)

YS Ramakrishna, AVR Kesava Rao, Piara Singh and Ma.Osman

5. Knowledge-based entry point and other novel options for rapport building

SP Wani and Srinivasa Rao (contd..)

6. Watershed planning (wet planning)
Crispino Lobo & Team

7. Soil and water conservation measures
P Pathak, PK Mishra, MV Padmanabhan

8. Sustainable cropping systems in watersheds
KPR Vittal, Masood Ali, CSWCRTI, and S. Marimuthu

9. Farming systems in watersheds
N.G. Hegde, G Subba Reddy and GR Kumar

10. Integrated nutrient management options
SP Wani, Ch Srinivasa Rao, Shanker, Dilli Rao

11. Integrated pest management options including disease management for crop production
GV Ranga Rao, Suresh Pande, DP Bapale, Krishnappa and S.Desai

12. Diversification of land use and farming systems
YV Shelke and B Venkateswarlu

(contd..)

12. Watersheds and livestock based activities
Peter, ILRI , B&IP and AK Mishra

14. Livelihood opportunities for vulnerable groups (landless, women and youth)
Deep Joshi, SP Tucker, S Parthasarathy, (CSDR) TK Sreedevi

13. Drinking water and sanitation in watersheds
Marcella D'Souza

16. Rehabilitation of degraded lands
TK Sreedevi, SP Wani and Mohd Osman

17. Participatory monitoring and evaluation
K Palanisami, Suresh Kumar and Anita Shah

18. Impact assessment methods and practices
PK Joshi, SP Wani Rosana P Hule and RL Shiyani

19. Policies and guidelines
GV Raju, PK Joshi, Anita Shah, Ramdas Chavre and SP Wani
(contd..)

20. Use of remote sensing and GIS for monitoring and impact assessment
PG Chavkar, KS Dwivedi + (IIRS, (Dehradun)

21. Sustainable use of groundwater in watersheds
Tushar Shah, K N Reddy (IGROW)

22. Watershed Planning for watersheds
RS Deshpande, K. Tirupathaiah, Anupam Das (ORLP), PV Vasra Raju (Sujala)

23. Capacity building in watersheds
Ravindra, Crispino Lobo, TS Vamsidhar Reddy and K Tirupathaiah

24. Institutions and community-based organizations in watersheds
Anita Shah, SP Wani, TK Sreedevi and NK Sangli

Future work

•Workshop scheduled on 26-27th July at ICRISAT with all lead authors.

•Need to organize small group meetings at different locations to synthesize drafts as technical interventions as the available information is not representing the situation in major states(Mostly from one or two institutions perspective only).

•Need to identify lead authors for few topics as authors expressed their inability to contribute. Lead authors and co-authors would be finalsied in the coming workshop

Completion of report by November,2007.

Watershed management concepts and practices
Ramdas Chavre, SP Wani and YS Ramakrishna

• Aspects on the growth of watershed program in India (post independence era),

•area coverage (national and state level in different plan periods),

•Changes in priorities and implementation methods in government sponsored schemes, externally funded projects, NABARD supported projects etc.

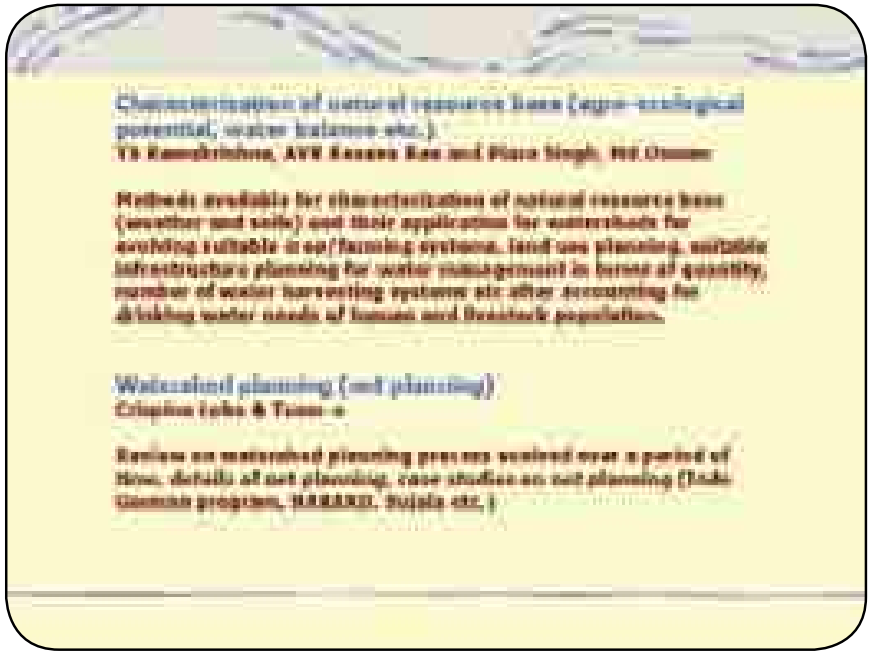
•Proposed improvements in the program implementation from past experiences.

Process of watershed selection
YS Ramakrishna and GV Rao

•Prioritization methods followed (AIBLUS etc) / recommended by guidelines (IWDPRA,Haryali etc)

•Prioritization of watersheds based on Bio-physical methods and social constraints

•New evolving approaches for watershed prioritization (Bio physical & social parameters)/ scientific methods , Experiences of APRLP etc.


Characterization of natural resource base (agro-ecological potential, water balance etc.)
Methods available for characterization of natural resource base (weather and soils) and their application for watersheds for evolving suitable in-situ farming systems, land use planning, suitable infrastructure planning for water management in terms of quantity, number of water harvesting systems etc after accounting for drinking water needs of human and livestock population.
Watershed planning (soil planning)
Review on watershed planning process evolved over a period of time, details of soil planning, case studies on soil planning (India Germin program, NARMADA, Rajula etc.)

Going Beyond The IGWDP - Maharashtra Towards An Equity Based, People Led Development

Marcella D'Souza

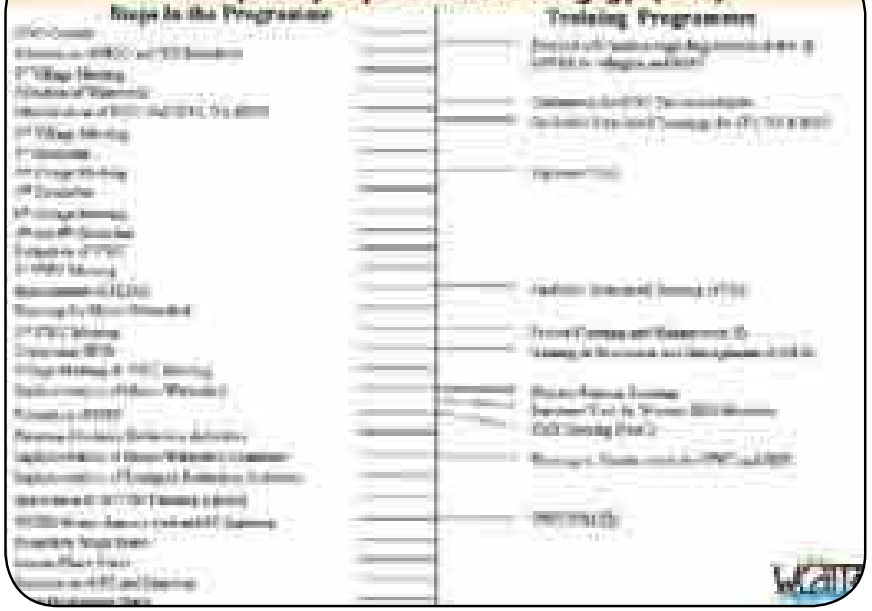
IGWDP - Maharashtra
(as on 31st March 2007)

- Total projects: 163
- FIP 72
- CBP 17

Challenges in Search of Answers (early '90s):

- *Agency Assessment and Accreditation*
- *Assessment of the Demand*
- *Needs Assessment and Capacity Building of Agencies*
- *Establishing Frame Actors Support and Convergence of Developmental Projects*
- *Empowering Women and Gender Mainstreaming (94)*

Participatory Operational Pedagogy (POP)



Participatory Operational Pedagogy (POP)

Selection of Partners and Areas:

Self selecting Conditionalities

- Initial Qualifying Criteria (Technical) :
  - Topography, Demography, Irrigation, etc.
- Gauging the demand (3-6 months):
  - The Epiphany Principle ("Tell us Who You Are and How Really Serious You Are"):
    - Accepting Pre-Conditions (voluntary labour, self organisation, ban on free grazing and clear felling, ban on borewell sparkling and water consumptive crops)
    - Undertaking a common voluntary effort over 4 days on a soil conservation work.
  - The Reciprocity Principle : Trust Clinching ("We'll Walk the Talk") Signing an Agreement

Participatory Operational Pedagogy (POP)

Capacity Building-Core Principles

1. Watershed to Watershed and Village-to-Village Extension
2. "Learning-by-Doing"
3. "Nothing succeeds like Success"
4. Need-based Curriculum and Training Pedagogy
5. Hand Holding and on -site Accompaniment

Participatory Operational Pedagogy (POP)

Instruments for Process Facilitation & Sustainability

1. Gender Oriented – POP (GO-POP)
2. Participatory Net Planning (PNP)
3. Qualitative Assessment Matrix (QAM)
4. Participatory Impact Monitoring (PIM)
5. Peer Group Review
6. Cross Learnings: Peer Sharing and Review
7. Maintenance Fund

Village Institutions:

- Gramsabha / Grampanchayat (PRIs)
- Village Development Committee (VDC)
- Forest Protection Committee (FPC)
- Self-Help Groups (SHG)
- Joint Women' Committee (JWMS)

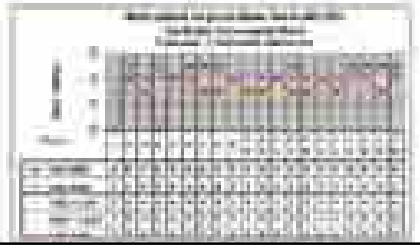
Institutional Arrangements

- Political / Administrative Buy-In
- Government Resolutions
- Institutional Linkages

Qualitative Assessment Matrix (QAM)

Objectives:

- To steer the quality of project
- To assess the extent of participation
- To assess the capacities of local institutions
- To assess whether rules and regulations are followed
- To impart self assessment capacity to watershed dwellers
- To assess the skills and competencies of project staff



Participatory Impact Monitoring (PIM)

Objective:

- Realization of impacts from watershed measures
- Community learning to assess impacts on their own

- To capacitate people to gather impact information & present it
- To learn from the community their understanding of impacts

Peer Group Assessment

Process:

- Selection of Monitoring Committee at regional level
- Orientation and training on monitoring
- Identification of issues to be considered for monitoring
- Creation of checklist with grades
- Field visit, record checking, discussion with watershed dwellers
- Providing grades for each components
- Selection of best watershed at regional and at state level
- Public recognition of the best projects

Actors:

- One member from each VWCs of ongoing watersheds with proper representation of women members
- Facilitators (initially)

Participatory Operational Pedagogy (POP)

Transparency and Public Accountability

1. Villagers organized into representative Village Watershed Committee(VWC) nominated by the entire village with at least 30% women
2. Women organized into SHGs and federated into a SMS at the village level
3. Project Plan approved by each landholder and village as a whole
4. Information of sanctioned works and funds publicly displayed
5. Funds released to an Account jointly operated by VWC and Facilitating Agency
6. Work organized, supervised and documented by VWC in a public event
7. Copy of work done receipt given to each laborer/service provider
8. Disputes resolved by VWC failing which by a Village Meeting

Participatory Operational Pedagogy (POP)

Transparency and Public Accountability

9. Information on Work done and Amount spent displayed publicly every fortnight
10. VWC meets every month to review work done, scrutinize accounts and validate calls for funds as required
11. VWC presents Report of Work Done and amount spent quarterly to the villagers
12. Regular Concurrent Monitoring, Hand holding and onsite accompaniment by facilitating Agency and WOTR
13. PIM undertaken on yearly basis
14. Peer Group Review undertaken once in 2 years
15. Cross Learnings through regional village fairs on a yearly basis

Operational Efficiency

- Technical Soundness- Ridge-to-Valley, Maintaining Standards and Quality
- Adding Resources to Responsibilities
- Simple but robust systems of Record Keeping and Reporting and Funds Claims
- Efficient,Timely and Adequate Release of Funds
- Regular Monitoring
- Thinking Ahead : Maintenance Fund
- Convergence: Dovetailing Complementary Schemes
- Additionalities : Micro Finance and Technical Support for Micro Enterprise Development
- Use of IT and Best Management Practices.

Area of Operation

Facts that surfaced on Re-visiting project villages post-project (2003-2004)

- **Structures and treatments:** Maintained. Good benefits observed, each year more land comes under cultivation.
- **Agriculture and Allied activities:** Increase production, diversification, livestock & milk production increase.
- **Water table:** Increased, more dug wells, some bore wells, longer duration of water in wells. Assumed that drinking water needs met.
- **CBOs:** VWC in some villages still function. Some changed but most not willing to be changed. SMS some active and continue development process, many not so active. SHGs some active some not. Some linked to banks. Linkage with GP: some work together.
- **MF:** Since this was released by NABARD at the end of the project, most did not want to touch it. Some used it for loans, a few for some development work.
- **Contact with Team:** Felt abandoned unless some contact was maintained.

Facts that surfaced on Re-visiting project villages post-project & On-Going (2003-2004)

Assumptions	Facts on the Ground
• VWC / VDC: Active, All communities & women engaged	• Not willing to change and not generally active.
• Shramdaan: differential landless poor exempt	• Village cells all equal. Time factor doesnt permit negotiation
• Village united (all castes & classes continue to come together)	• Differences surface & come with a revenge.
• Maintenance Fund: managed, well used & accountability to GS	• MF: not touched, somewhat used. Little accountability unless asked (internal/external)
• Poor also benefit in post project period	• Somewhat improved, but gap exists (not livelihood project)
• Development process continues	• Not to expectation

Paradigm shift: Moving from Assisting to Accompanying

Key Challenges:

- How do you ensure that the target group becomes the subject and not the object of the developmental intervention
- The marginalized have a voice and are effectively represented
- The village takes responsibility for the development of their village as a whole and of their poor , vulnerable and marginalized groups
- The development process continues.

WOTR's Wasundhara Approach

- WOTR's Wasundhara approach is built on 3 premises
  - Each vocational, interest, economic and social group must be given space to articulate its needs, priorities, hopes and aspirations in terms of concrete outcomes in the near, middle and long term perspective.
  - These groups must be effectively represented in a pan-village body (VDC) tasked by the Gramsabha with undertaking developmental activities in collaboration with the Gram Panchayat (where the two are not synonymous)
  - An Action Plan with budget with responsibility allocation must be developed and implemented by the VDC supported by the Accompanhayat and monitored by BS.
- WOTR has developed two tested and effective tools to bring this about
  - Constituencies Building, Bottom Upward
  - Village Envisioning- Goal Oriented Project Planning

Tool 1: Building Constituencies Bottom Upward

- The constituencies are formed based on economic conditions (poor, average, better-off), occupation, category (SMS, youth, UGs, etc.) and gender (women). The data collected in PRAs, wealth ranking and government records are used to define the constituencies. The people themselves decide the constituencies based on data analysed jointly with WOTR team. Gramsabha/Gram Panchayat monitors the selection process.
- Needs identification is done with the people in hamlets / wards on a constituency basis. People prioritize the five most important needs.
- Final selection of priorities is done at the Gramsabha level based on aggregation of priority grades and highest common priority is taken as Key Problem Issue.

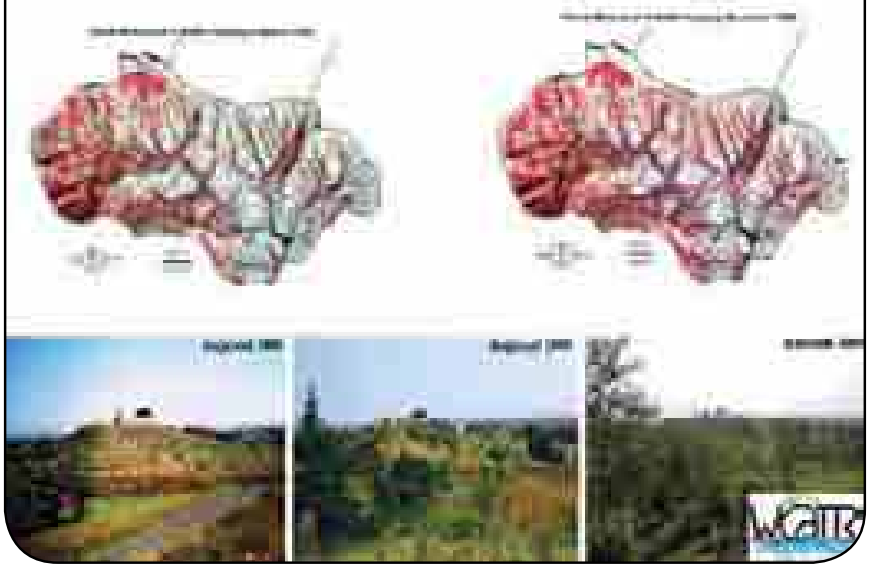
Tool 1: Building Constituencies Bottom Upward

- The VDC members are selected from different constituencies and the number is dependent on number of households.
- Gram Panchayat nominates their member/s in VDC.
- The Gramsabha ratifies the selection. GP sanctions the formation of VDC and sends the Resolution to WOTR. The VDC becomes a sub-committee of Gram Panchayat.
- Members and chief functionaries are rotated after every two years under the supervision of Gramsabha.
- VDC is accountable to GP and Gram Sabha for its performance and finances. The members of VDC are also accountable to their respective constituencies for their performance and transparency.

Tool 2: Village Envisioning-Goal Oriented Project Planning

- Key Problem Issue is analyzed using Problem Tree Approach (cause-effect).
- Problem Tree is converted into Objective Tree (Means-Ends)
- This is converted into a Project Planning Matrix (Activities-Outputs-Objectives-Goal with budget, and source agency)
- Those prioritized needs which are not covered are analyzed using the same process
- At implementation time the needs of the poorest 30% are prioritized and differential contributions determined.
- Annual Action Plans are prepared by VDC and ratified by Gramsabha.
- Access funding from different sources (taught to prepare proposals).

The Impacts of Watershed Development



Water Shortages : Fading Memories

Increase in Fodder, Biomass & Livelihood

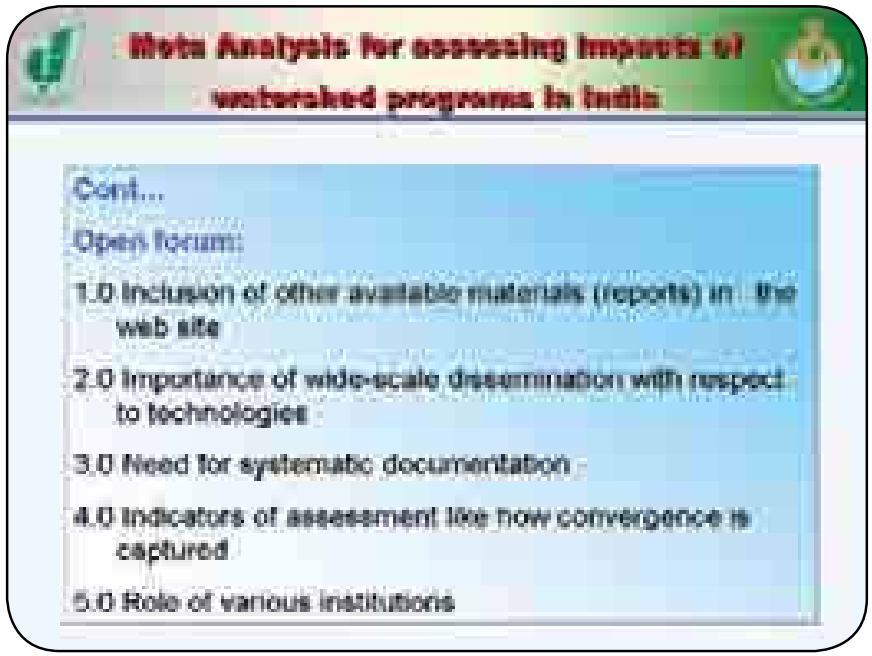
IMPACT DATA -DAREWADI

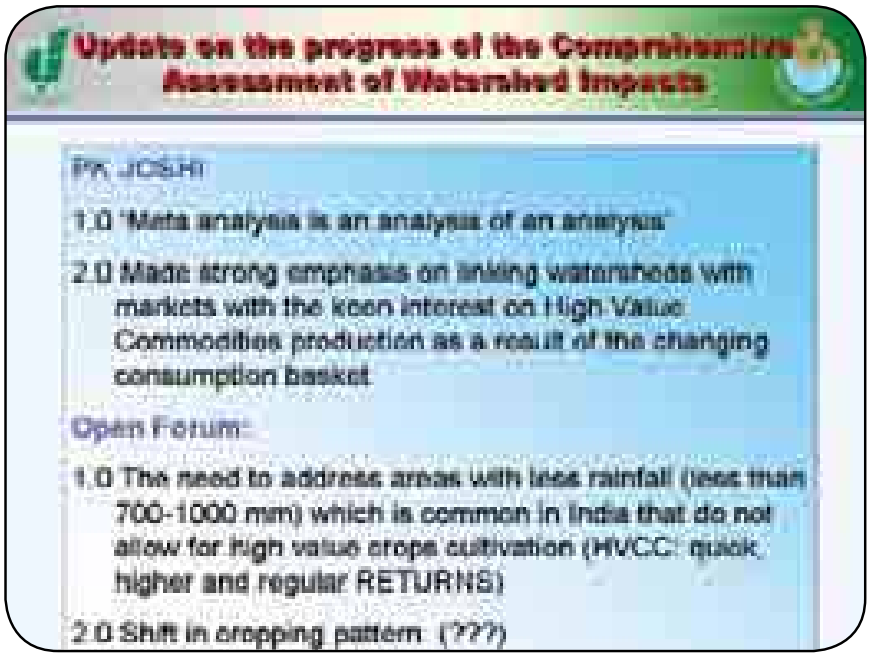
Darewadi Watershed

Darewadi Watershed
Increase in Agriculture Income (1998-2005)


SYNTHESIS:
Technical Session I

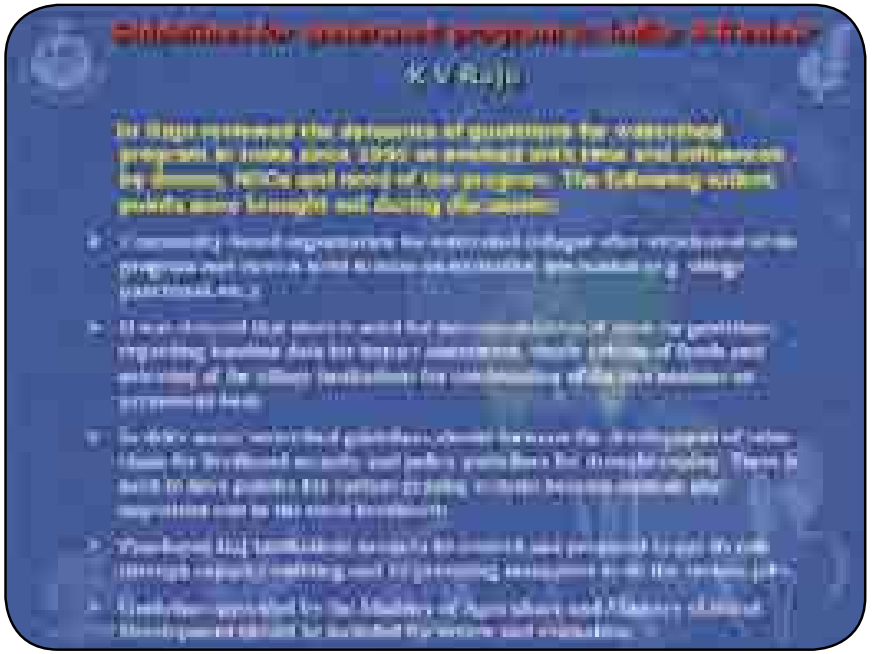

Update on the progress of the Comprehensive Assessment of Watershed Impacts
SP WANI
1.0 Underscored a very important point on having a common platform for delivering expected outputs of the project: presentation of activities from the inception of the Comprehensive Assessment project
2.0 Presented experiences and areas by which watershed initiatives can be harnessed to give maximum benefit to communities
3.0 Culled out from the experiences drivers of success like consortium partnership and even impediments like lack of political support and local leadership to watershed projects

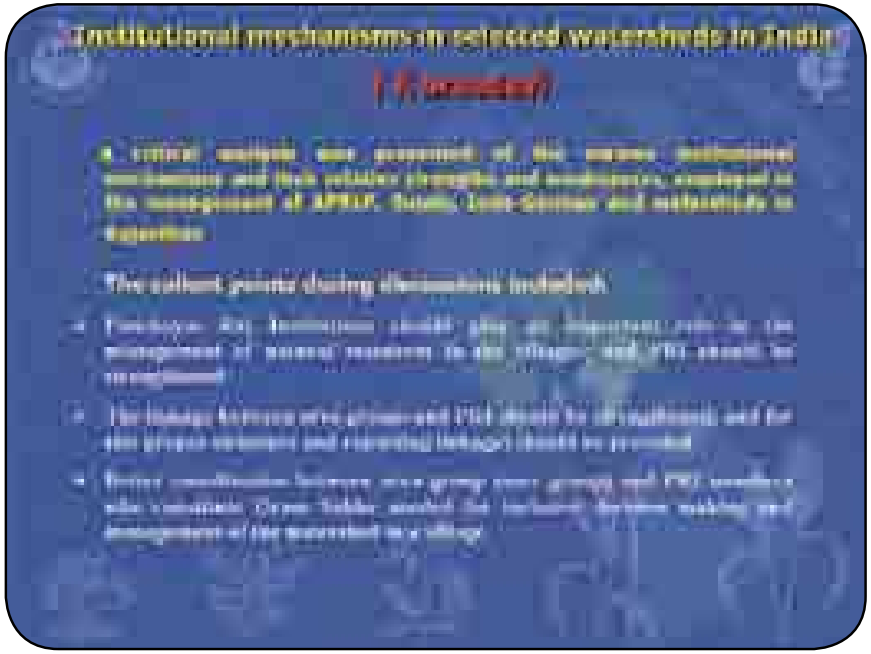

Meta Analysis for assessing impacts of watershed programs in India
Cont...
Open forum:
1.0 Inclusion of other available materials (reports) in the web site
2.0 Importance of wide-scale dissemination with respect to technologies
3.0 Need for systematic documentation
4.0 Indicators of assessment like how convergence is captured
5.0 Role of various institutions


Update on the progress of the Comprehensive Assessment of Watershed Impacts
PK JOSHI
1.0 'Meta analysis is an analysis of an analysis'
2.0 Made strong emphasis on linking watersheds with markets with the keen interest on High Value Commodities production as a result of the changing consumption basket
Open Forum:
1.0 The need to address areas with less rainfall (less than 700-1000 mm) which is common in India that do not allow for high value crops cultivation (HVCC: quick, higher and regular RETURNS)
2.0 Shift in cropping pattern (???)

Potential to enhance productivity and reinstate
use efficiency is the watersheds of India
PIARA SINGH
1.0 Pointed out that there are potentials of increasing productivity of rainfed areas (i.e. addressing micronutrient deficiency)
Open Forum:
1.0 To reckon with, that economic productivity is just one of the parameters (C.Bantilan's query on reconciling the point made by PK Joshi on the HVCC)
2.0 Rainfall is just one of the parameters
3.0 Research is still a significant niche in watershed to include other indicators


Technical Session II
Chair : Sandeep Dave
Rapporteur : K.L. Sahrawat
Total two presentations were made in this session !!


K V Raju


Institutional mechanisms in selected watersheds in India
(Presented)

Rapporteur's Report -- Technical Session III

Chair	:	P.K. Joshi
Rapporteur	:	Piara Singh
Total presentations	:	5

1. Experiences in Sujala watershed programs for enhancing impact – By Sandeep Dave

- Gave Sujala project overview
- Experiences of Sujala watershed project
  - Private people Public Participation (PPP)
  - Transparency at all levels
  - Monitoring and evaluation
  - Application of GIS and IT in the watersheds
- Described new initiatives
  - Introduction of Q-K cards and health camps
  - Convergence of schemes
  - Gopala Mitra, Jala Mitra, Analysis of soil data
  - Pre-sowing farmer field school

Comments: How to deal with the holistic approach when needed rather than the piece meal approach?

2. Impact of watershed programs in South India – By Suresh Kumar

- Described watershed management/development in India
- Need for watershed impact assessment
- Methodological challenges/framework/indicators of impact assessment
- Review of methodologies and empirical studies on impact assessment

Questions/Comments

- We need to consider whether watershed development and implementation was done properly before assessing the performance of a watershed
- How soil fertility index was calculated?
- Watershed performance assessment should consider agroclimatic conditions/initial conditions before development
- How to get the watershed to its best performance?

3. Impact of watershed programs in Uttarakhand – By K P Raverkar

- Described watershed characteristics and management activities in Uttarakhand
- Highlighted the gains made in terms of changes in land use pattern and economic benefits to the people
- Described weaknesses and strengths of working in the mountainous region

Questions/Comments

- Need to advise policy makers about Jatropha cultivation in the region
- Are the fruits and vegetable processors available in the nearby watershed villages?
- Involvement of local institutions need to be strengthened for sustainability

4. Impact of watershed programs in high rainfall years – By G P Juyal

- Described strengths, weaknesses, opportunities and constraints of the hill and mountain region for watershed development and management
- Discussed impact evaluation indicators – bio-physical and social indices
- Discussed impact assessment of watershed at Fakot, Uttarakhand
- Future needs and lessons

4. Impact of watershed programs in high rainfall years – By G P Juyal – contd.

Questions/Comments

- Sustainability and replicability of work in the region
- Influence of infrastructure development on watersheds and environment (roads?)
- Documentation of reverse migration, education, land encroachments etc.
- Ecological sustainability

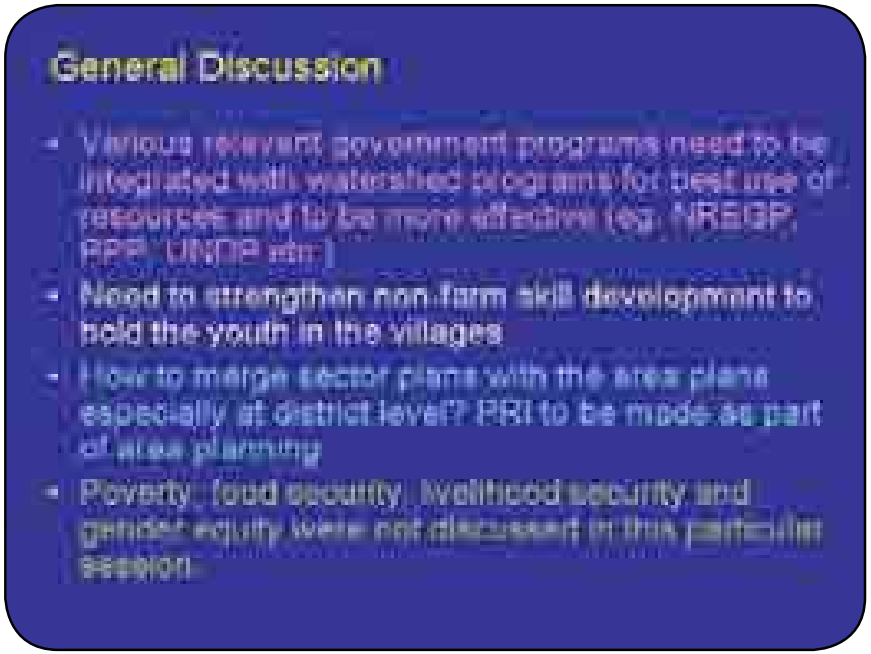
5. Impact of watershed programs in arid regions – By T K Bhati

- Described the work done by CAZRI on watershed development
- Impact of watershed programs, project replication, problems and lessons learnt
- Recent policy shifts of GOR
  - Poverty alleviation programs
  - Livestock husbandry
  - Livelihood security and employment generation
  - Bio-fuel plantation

5. Impact of watershed programs in arid regions – By T K Bhati – contd.

Questions/Comments

- Drinking water, biodiversity management, fuel wood and stabilization of sand dunes important for the arid regions
- What is the economics of bio-fuels in arid areas?
- Seed money needed for functioning of SHGs
- How the watershed strategies be different for arid regions in terms of resource allocation and use?


General Discussion
Various relevant government programs need to be integrated with watershed programs for best use of resources and to be more effective (eg. NREGP, RPP, UNDP etc.)
Need to strengthen non-farm skill development to hold the youth in the villages
How to merge sector plans with the area plans especially at district level? PRI to be made as part of area planning
Poverty, food security, livelihood security and gender equity were not discussed in this particular session

Technical Session IV

Impact of NWDPRA program using RS and GIS - PG Diwakar

- Shared the learnings on impact assessment of NWDPRA watersheds implemented in VIII plan period and demonstrated webpage developed for posting in CA website
- Elaborated on webpage content (summary of achievements including watershed features) for 112 watershed evaluated through RS across 12 states
- Discussion on level of accuracy while mixing ground cover points with digital images and replied there is enough accuracy with imageries with resolution of 25 m and 2 pixels over a scale of 1:50000

Impact of NWDPRA program using RS and GIS - PG Diwakar ... Contd.

- Discussion on the scope of using available simulation models using RS data with ground validation for assessing the impact in watersheds
- Spectral reflectance varies with crops based on LA, PA and leaf characteristics which helps to distinguish crops in the ground. However, there is a concern when the crop are in same growth stage (rice and finger millet)
- Correlating NIR with soil moisture content and concurrent ground truth, it is possible to differentiate water in surface water bodies whether it is from immediate RF or recharged one

Impact of NWDPRA program using RS and GIS - PG Diwakar ... Contd..

- Availability of satellite imageries at 5G m resolution at public domain, can be used only for regional planning and soil map (1:50000) prepared by NBSSLUP can not used for superimposing satellite imagery because of scale (spatial)
- Images of 23 m resolution (1: 50000) can be used for preparing action plans whereas need 2.5m for monitoring
- Repetitive mapping with WiFS? IRS LISS III? helps to avoid the influence of cloud cover during kharif season
- Suggestion to compare treated and non treated watersheds for monitoring changes in land cover

Impact of NWDPRA program using RS and GIS - PG Diwakar ... Contd.

- Concern to what extent NDVI has calibrated with actual yield data? Agreed there is 20 -30 % changes while comparing data from crop cutting experiments and NDVI, needs to be calibrated
- Agreed to debate on the implications of using RS for monitoring watersheds, in terms of accuracy, time, human cost so that things can be set in guidelines

Monitoring and evaluation – Approach and insights – Roksana Mitla

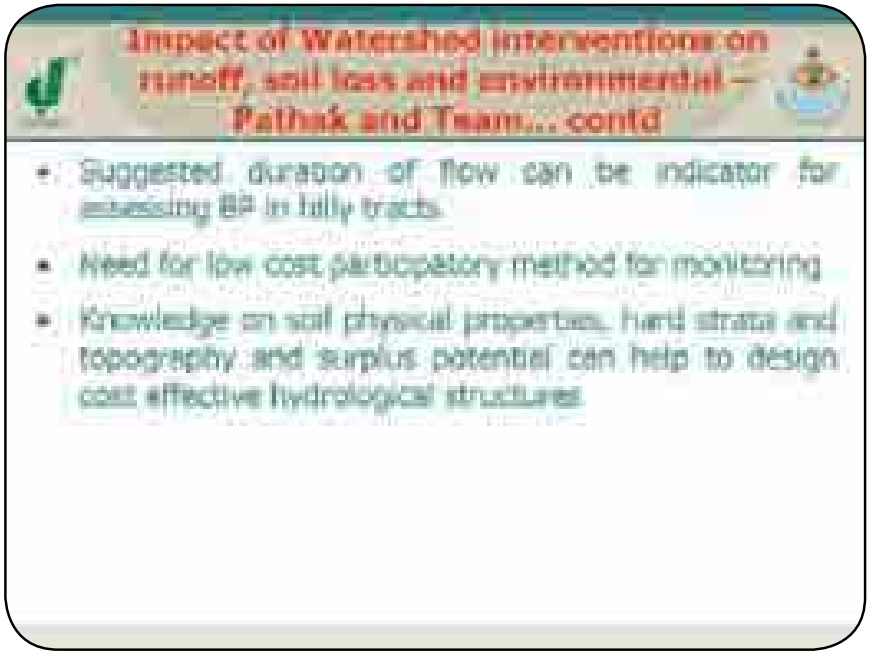
- Discussed the experience while carrying out MTE of NWDPRA watersheds and methodologies followed in the study
- Need to have guidelines for baseline characterization
- Defined indicators for various process at various level of evaluation and proper format for the evaluation studies
- Feedback saying that methodologies are available for monitoring and evaluation, it is made clear that purpose of monitoring in state level is for administrative purpose, while IA is to appraise the situation (BP, Economical, social factors) due to interventions made in the project

Impact of Watershed interventions on runoff, soil loss and environmental – Pathak and Team

- Knowledge on Hydrological data not only useful for assessing the impact, it is highly relevant for designing hydraulic structures and stability of structures
- Useful in establishing cost effective structures
- Equipments and methodologies are available for monitoring runoff and soil loss e.g. for GW monitoring
- Studies on behavior of soil type for rainfall events is highly useful for framing strategies to utilize supplemental irrigation
- Need to document problems and failures of structures at different toposequence levels

Impact of Watershed interventions on runoff, soil loss and environmental – Pathak and Team ... contd

- Importance of supplemental irrigation on crop yields
- Shared the impacts in terms of BP documented in the evaluation reports
- Need for collecting data on Hydrology across AER and has to be compiled in a format used by NGOs
- Empherical equations assessing soil loss has to be calibrated before using into wider scale
- Suggestions for separate guidelines for assessing soil loss in hilly tracts and cost norms for reclaiming also has to considered accordingly


Impact of Watershed interventions on runoff, soil loss and environmental – Pathak and Team... contd
• Suggested duration of flow can be indicator for assessing BP in hilly tracts.
• Need for low cost participatory method for monitoring
• Knowledge on soil physical properties, hard strata and topography and surplus potential can help to design cost effective hydrological structures

Technical Session V

Chair: S Meenakshi Sundaram

Rapporteur: Prabhakar Pathak

Total three presentations in the session

Manual on Best Bet Practices for Watersheds

• K V Rao on behalf of Y S Ramakrishna

Key points

- He gave the background about this manual and it is aimed to cover bio-physical interventions, management, social issues.
- Manual will have total 24 chapters
- Institutions involved are: ICRISAT, CRIDA, CAZRI, CSWCRTI, NCAP, IISS, UAS (Bangalore), Agril. Univ. Junagadh, ISRO, IWMI, WASSAN, CIDR, BIRDS, BAIF, WOTR, DU Etc.
- He also gave the list of chapters along with authors names.

Manual on Best Bet Practices for Watersheds

• K V Rao on behalf of Y S Ramakrishna

- Workshop scheduled on 26-27th July at ICRISAT with all lead authors.
- Need to organize small group meetings at different locations to synthesise drafts.
- Need to identify lead authors for few topics as authors expressed their inability to contribute.
- Completion of report by November,2007

Major discussion points: Manual on Best Bet Practices for watersheds

- Role of lead and other authors in writing the chapters
- Fodder and fuel aspects are not covered
- Fuel issue is important
- Integrated water management is the key area (demand and supply....)
- Chapter on drinking water
- Issues of sanitation
- Chapter on convergence and partnership
- Need to have executive summary

Going Beyond The IGWDP – Maharashtra Towards An Equity Based, People Led Development

– Marcella D'souza

Key points

- She presented the Challenges in Search of Answers (namely 'Why) viz. Assessment of the Demand; Needs Assessment and Capacity Building of Agencies; Empowering Women and Gender Mainstreaming
- She gave details about participatory operational pedagogy (POP) viz. Selection of partners and area; Initial qualifying technical criteria; Gauging the demand (3-6 months)
- She highlighted the role of Participatory Impact monitoring also the need of Peer group assessment
- Results from the re-visiting the project villages and project were presented
- She briefed the recent approach: WOTR's Watersheds Approach
- She concluded presentation by giving the reasons of Watershed Development

Major discussion points: Going Beyond The IGWDP – Maharashtra Towards An Equity Based, People Led Development

- What is the exit policies of watershed projects
- What is the role of Indo-German project after the project phase
- What is the role or linkages with Gram Panchayat

Watershed Development in Central and Western Region: Some Evidence

Amisha Shah

Key points

- Study area of four states (Gujarat, Rajasthan, M.P., Maharastra).
- She presented the focus of the study viz. Impact on Bio-Physical, Socio-Economic, and Institutional Indicators; and Sustainability in the Post Project Period.
- She briefed the status of the state level assessments.
- Highlighted the findings from the review (21 districts in Madhya Pradesh), which includes Irrigated area increase, Increase in net sown area; Waste land brought under cultivation; Change in cropping pattern and crops
- Also gave the impact of various initiatives.

Watershed Development in Central and Western Region: Some Evidence

Amisha Shah

Key points

- She gave the details of Rapid Assessment that included: 348 micro watersheds across 29 districts covering 8 agro-climatic zones in the state with focus on initial process and the data analyzed.
- She highlighted the major benefits (IWDPs).
- Briefed the status of community institutions.
- Mentioned "where to go from here" - Rapid Assessment may be used creating a larger picture, in conjunction with the above assessment?

Major discussion points:
Watershed Development in Central and Western Region: Some Evidence
Irrigated area covered by small tanks or check dams not covered
In rapid assessment what kind of questions were (are)
What were drought mitigation indicators
Need to conduct workshop to complete activities

Impact of WDPs among Women and Vulnerable Groups

Amita Shah
Gujarat Institute of Development Research

Perspectives

- Eco-feminism
- Participation and Decentralisation
- Gender Mainstreaming
- Rights Based Approach

WDP-guidelines:

A Somewhat late Realisation drawing mainly on Participation and Decentralisation

NGOs took Major initiatives

Goals: Equity and Women's Emancipation

Indicators:

- Membership and Participation in Decision Making
- Enhanced Resource Access and Reduced Drudgery
- Expanding Choices and Rightful Role in Shaping Developmental Options

Information on Impact on Women

- GO-Schemes: Membership, Participation in Project Work, Women-SHGs, Income Generating Activities
- Other Projects (NGOs): Case Studies of Selected Initiatives where Gender dimension Assumed Special Place Right Since the Initial Phase

These case studies will form a major part of the thematic Chapter (15 have been specially identified)

Case Studies: Important Dimensions

- CPLRs and Food Security (DDS)
- Women's Committees (AKRSP)
- Processes and Monitoring (WOTR, WASSAN)
- Drinking Water (Uthan)
- CPLRs, Livestock and Fodder (Arthra; Sewa Mandir)
- Gender Differentiated Preferences for Crops/Plantation (DVP)

Continued----

- Institutional Innovations though SHGs, Women's Groups (WOTR)
- Income Generating Activities-Horticulture (TISS, ANANDI)
- Employment Generation and Link with NREGA (RGWM,TISS)
- Reduced Male Migration (GVT. ?)
- Exposure and Information Dissemination

From Membership to Resource Management and Empowerment

Constraints:

- Limited Resource regeneration besides irrigation
- Control and Access over Land and Credit
- Perpetuation of Low Productive Work
- Absence of Basic Securities and Skills
- Links with Expanding Markets

What is Expected?

- Actual Impact
- Constraints
- Good Practices/ Policies

Additional Material with Specific Details on Project, Location, other Key Information

Equity Issues

- Agro-climatic and Geo-hydrological (determining the size of benefits)
- Property Rights Regime (Land, Water, Forest)
- Technology and Institutional Mechanism (influencing source, size and distribution of Benefits)

11th Plan Addresses this as an important issue

Evidence

- Neglect of CPLRs and Livestock (Charabandi having inequitable impact)
- Gains to Landless confined to On-site Employment During Project Work
- Impact of WHS limited to 40-50 HHS within Village Community
- Absence of Maintenance Reduces the Coverage of Future Benefits

- Upstream-Downstream Conflicts
- Increased Extraction of Ground Water Impinges on Intergenerational Equity
- Inadequate Attention to Area/Locational Priorities

Overall MixedEvidence

Need for a Multi-Pronged Approach

A Comprehensive List Presented to the PC-Working Group

Highlighting

Equitable Distribution of Regenerated Resources

Bio-Mass Based Approach

Effective Prioritisation, Differential Norms for Investment, and Policy Approaches for Special Problem Areas/ Harsh Agro-Climatic Conditions

Women and watershed

Case of vadgaon Lakh

Taluka: Tuljapur

District: Osmanabad

Chhaya Datar

Women Stakeholders: Five Counts

- Opportunity to earn wages through earth treatment
- Increase availability of drinking water
- Food security through increase in cropping intensity
- Increase in fuel wood availability on common land
- Provision of water for women in productive use

Deflective Processes in Watershed

Locating Women in Watershed

Impact on Women

- Labour: Out of 200 labourers, 40 percent women
- Drinking Water: No tanker during drought period
- Food Security: Increased cropping intensity, 115 to 125.65
  Increased irrigated area: 92.91 percent
  Wells increased from 74 to 84
- Fuel and Fodder availability: No record on fuel but income from livestock increased to 698.15 percent
- Water for productive activity: two Nallah streams
  Collective horticulture activity
  Suggestion for taking Devsthan land on lease.

Collective Seri-culture
Initial activity

- 50 Devsthan private land to lease-Rs 9000 per year
- Water charges separate-Rs 3000 per year
- Nine cycles completed
- Except first few cycles others fail and did not possess assuring inputs of rent, labour and women and travel
- Causes: Drought and no availability of water in the third year
- Women found it delicate activity requiring 12 hours attention
- Only three to four women got wages
- In case of profit no dividend could be distributed
- Women members lost interest.

Water for Productive Use
Leasing of Devsthan Land

- 40 acres of land belonging to Devsthan
- Women wanted to take it on lease for horticulture
- Horticulture dept. reimburses labour cost for three years under IWDP
- Asset development for 15 years and arrange commodity opportunities
- Lack of water for seasonal irrigation
- NABARD refused use of funds to sink borewell and lay pipelines for storage
- Women found land too far away (3-4km)
- Men did not show interest
- Failure due to lack of conducive atmosphere

Samyukta Mahila Samiti
Federation of SHGs in Vidarbha Cadre

- Five Self Help Groups with 60 members including Dalit women
- Rs. 20 saving per month per member
- Rs 8 interest rate per month for internal lending activity, mostly consumption loan
- NABARD loan installment I in 2001 and installment II in 2002
- Rs. 8 per lakhs for women's activity
- Rs. 1.50 lakhs for women's hall and equipment for Nallah
- Rs. 20,000 to buy cooking equipment for festival food to be used by the members, and to earn income to pay for the secretary
- Rs. 85,000 to buy equipment for seri-culture activity
- Rs. 50,000 fixed deposit
- Rs. 2,00,000 as revolving fund

1. Distribution of Loans: No positive discrimination

It was accepted that the amount distributed should go to all the five SHGs in an equal manner. This rule was essential because of the diverse composition of the SHGs. Amongst SHG was formed by all Dalit women. It was likely that members of other SHGs were able to afford loans easily and would generate more demand for loans. Principle of allocating preferential treatment to socially deprived or economically needy could not have been accepted by members, and affordability or capacity of repaying loan was the only criterion they would find justifiable.

2. Need for formal Agreement

Another important rule laid down was that the woman should come with a proposal of any particular income generating activity and should stick to it once the loan is disbursed. For that two women from the group should remain guarantor. The principle of mutual guarantee in the case of SHG activity. No hypothecation is required for loans. The agreement should be signed on the stamp paper of Rs.20, whereby the woman had to commit for accepting all the repaying rules. We were struck by the need for formality felt by women where they would waste Rs.20 on stamp paper. But it was told by women that it was a necessary rule, which brings sense of commitment and fear for violation.

3. Productive Loan Vs. Consumption Loan: Differing Interest Rate

The third rule was that the woman should not have had pending loan, mostly consumption, from the mother SHG, before she demands the loan for income generation. It was clarified that she would take the inexpensive loan to repay the expensive loan from the mother SHG. In fact, the logic used for keeping the interest rate for SHG loan higher than the SMF loan was that the members would use the loan for doing private money lending activity, which prevailed in all the villages.

The interest earned from the loan disbursement of SMF would get accumulated as enhancement of capital available for loan. Some amount out of that earning would be spent for the administrative expenses such as honorarium to the secretary maintaining accounts and traveling to the city for banking work etc.

This rule really helped for revamping of the SHGs since all the earlier loans were returned promptly.

4. Loan for Women's Activities and not for Men's

The rule for disbursing loan was strict to ensure that it would be only for the income generating activity preferred by women. This was to avoid tendency of men taking loan for their activity of farming and other businesses under the inexpensive loan scheme. However, it was noticed that two women took loan for pooling of dal (cattle) machine and it was directed for digging of well for the family farm. They were pulled for this act of violation several times, but this could not help because the agreement subsidy promised did not come through. But otherwise out of 32 loans disbursed in the first round, 31 were used for genuine women's activities, and the dairy was accounting for 19 women.

5 Higher Rate for Men's Activities

However after one and half year now, when it was realized that still lot more money has remained in bank unutilized, it was decided to give it out to the male in the family of the women member, but at a higher interest rate of Rs. 2 per month, for Rs.100. This measure was meant to move from men, because they could now access cheaper loan compare to the informal market. Only two loans have been disbursed so far.

6. Small loan at a time

The minimum amount of loan was fixed at Rs.5000 per person regardless of amount of her saving in the SHG. Usually the consumption loan is always tied up with the amount of saving. The idea of fixing amount at this level was that more women should get opportunity to take loan. This idea was easily accepted, because not many were planning to buy crossbreed variety.

7. Preference for Indigenous Buffalo

Women preferred indigenous variety because she is less expensive to maintain. This was a wise decision, we thought. Unless one was thinking of devoting full time to this activity and make a real business out of it there was no point taking crossbreed buffalo which costs around Rs 12,000-14000. The crossbreed buffalo requires more fodder and richer nutrients such as cotton seed cake (gundi). Also, she could not be taken out for grazing because she is too delicate and vulnerable to diseases. Thus she needs to be stall-fed. It means more work for the person tending her. Her dung does not have same nutritional value as indigenous variety and thus cannot get sold for the purpose of manuring. It cannot be used for dung cakes.

8. Appropriate Information Dissemination

The repayment rate chart for each bracket of loan was prepared. Break up between the loan amount and the interest amount in the total repayment is given to each loanee with clear columns indicating how much would be the repayment of loan amount and how much was interest amount every month. The interest amount was getting reduced every month because the interest was charged only on the balance loan.

9. Re Condoning of Loan/Women know business

One request was received for condoning half the amount of loan, because the buffalo bought by the woman member apparently died soon after she was purchased and there was no income generated from the loan. The request was rejected twice by the members. The reason given was that the purchaser might not have been done with genuine interest of conducting business, it was possible that to do favour to the relative the animal was bought and unfortunately it died. The argument was that, "It becomes difficult to prove how much money was spent while purchasing the animal, because all these transactions are done informally. In the animal bazaar also, the transaction is in the form of cash and thus one does not know whether it was a careful purchase or not." However, it prompted the members to look for insurance agent and insured the buffaloes at some cost but at least get cover for risk of death of an animal. At that point the price of animal is determined by the average rate prevailing in the animal market. In case of this request of condoning, after much discussion it was decided to condone her interest amount but the loan amount had to be paid regularly. The woman was happy.

10. Mutual Guarantee gives way to Cheating

One moment proved that women could be smarter than we thought. It was felt that the two guarantors need to be punished in these kind of cases, whose responsibility it was to check that the transaction was genuine.

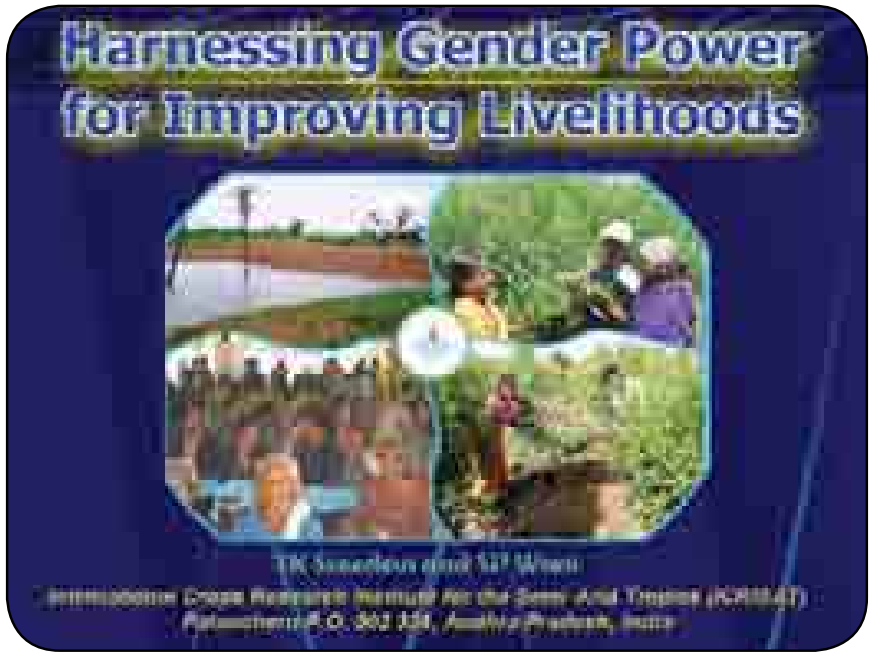
A woman member pretended that she bought a buffalo of her neighbour, but allowed to keep it in the same stable as before because she did not have a space to keep the buffalo. When questioned why the buffalo was stolen by the neighbour, she replied that because she was offering Rs. 100 per month to the neighbour as her salary, she was doing that job for her. Guarantors looked the other way. Everybody knew that it was a fake transaction and the lady might have used the loan for something else.

11. Rule to Punish Guarantor

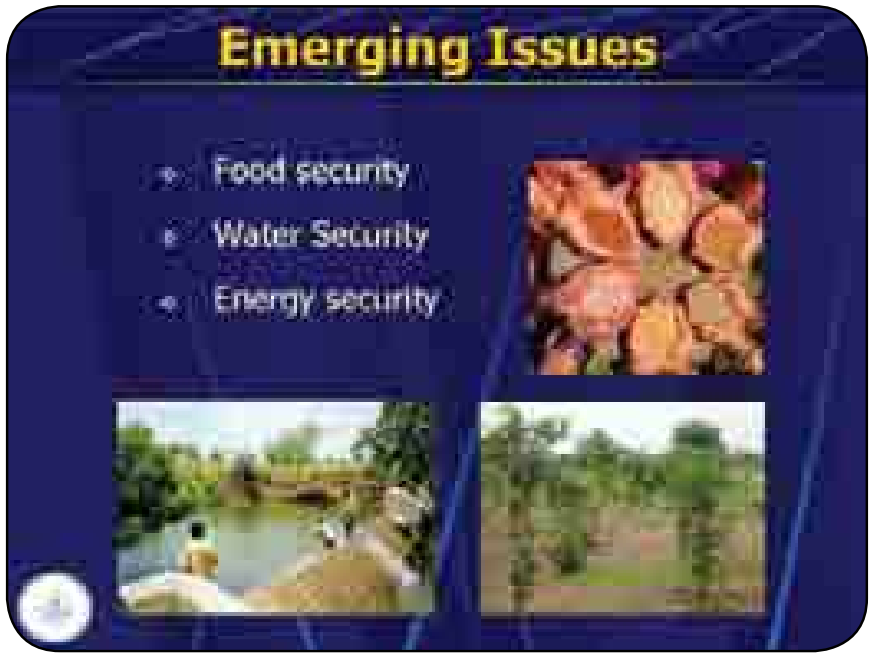
The rule was made that the saving of the guarantor would be frozen/contained if the loanee did not observe commitment of repayment for successively three months. This rule had not been enforced so far, however, not many instances of default had taken place.

12. Loan without Interest

One novel idea was suggested by the NABARD for type of loan to be sanctioned. Activities such as buying a gas cylinder or constructing a toilet should be awarded some premium and interest rate should be zero for the same. Somehow no member has come forward to take loan for any of these activities. This incidence gives insight about the rural women's perceptions on their priorities.


Harnessing Gender Power
for Improving Livelihoods


Asia: Global Hot Spot
Population Pressure
Poverty
Low Productivity
Climatic Change & Variability
Degraded Lands


Emerging Issues
Food security
Water Security
Energy security


Land Degradation
Soil degradation
- Quantity
Water
- Quality
Environment

Soil Health

- Is the key to sustainable rural livelihood
- Direct link between soil and human/animal health
- Poor soil health results in low productivity, poor environment, and poverty
- Imbalanced nutrition – Lack of knowledge for the stakeholders
- Integrated nutrient management

Women and Watersheds

- Watersheds are recognized as growth engines for agricultural development and combating food insecurity
- Participatory Watershed management is a multidisciplinary, multi-institutional approach for HRD and poverty / food security through diversification of livelihood options and increased productivity
- Women are key to address household food security
- Women play a major role in agriculture and livestock development
- Health and Education of women has an immediate and lasting effect on the well being of the family
- Since 70% of the poor are women, they along with other resource poor are central targets for watershed development

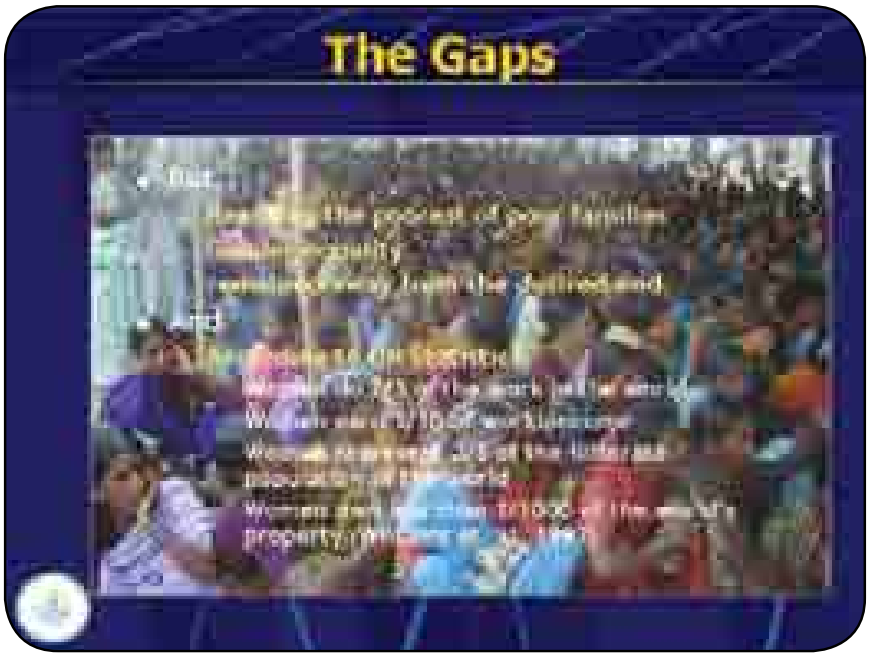
Lessons Learnt

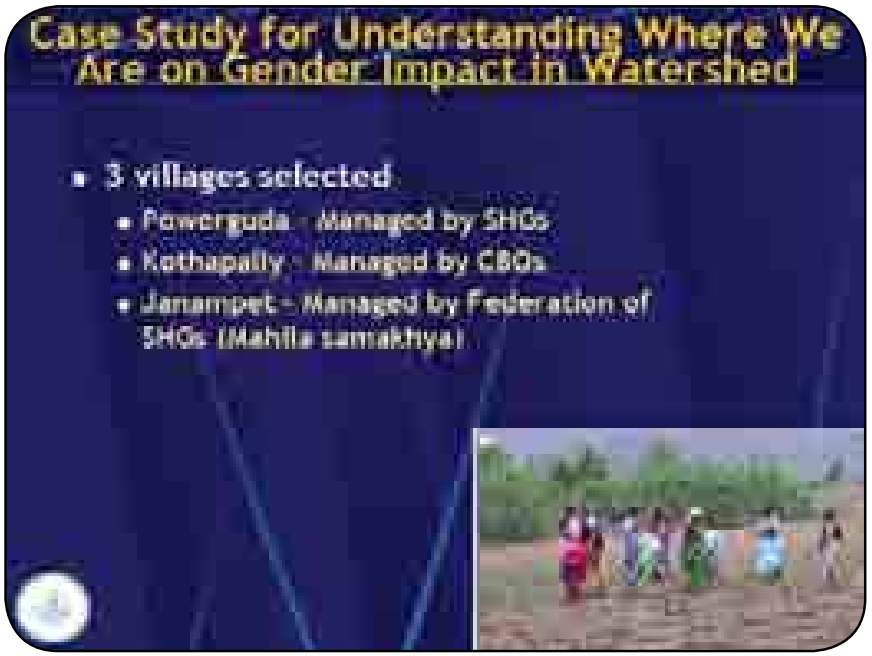
- Evaluation of a no.of watershed programs have indicated the importance of:
  - People's participation in development process
  - Role of institutions for enhanced participation
  - Extent of people's participation which determined the success
  - A combination of participation and sound technical input
  - Need for supporting policy
  - Watersheds as vehicles that reversed environmental degradation and permitted quantum shift in sustainable agricultural productivity
- In the process women paid the price of development in most cases: (Nutrition, Security, Basic amenities, workload)

Eight Arms of Holistic Development


Adarsha Watershed, Kothapally, India:
A Brightspot


Benefits from Watershed Development
Watershed development yielded good results in:
Productivity increase
Growth of Agriculture allied sectors, Micro-enterprises
Conserving groundwater
Reduced migration
Reduced no of people below poverty line


The Gaps


Case Study for Understanding Where We Are on Gender Impact in Watershed
3 villages selected
Pawerguda - Managed by SHGs
Kothapally - Managed by CBOs
Janampet - Managed by Federation of SHGs (Mahila samakhya)

Profile of the Case Study Villages

	Adarsha watershed, Kothapally	Powerguda	Janampeth

Profile of the Case Study Villages

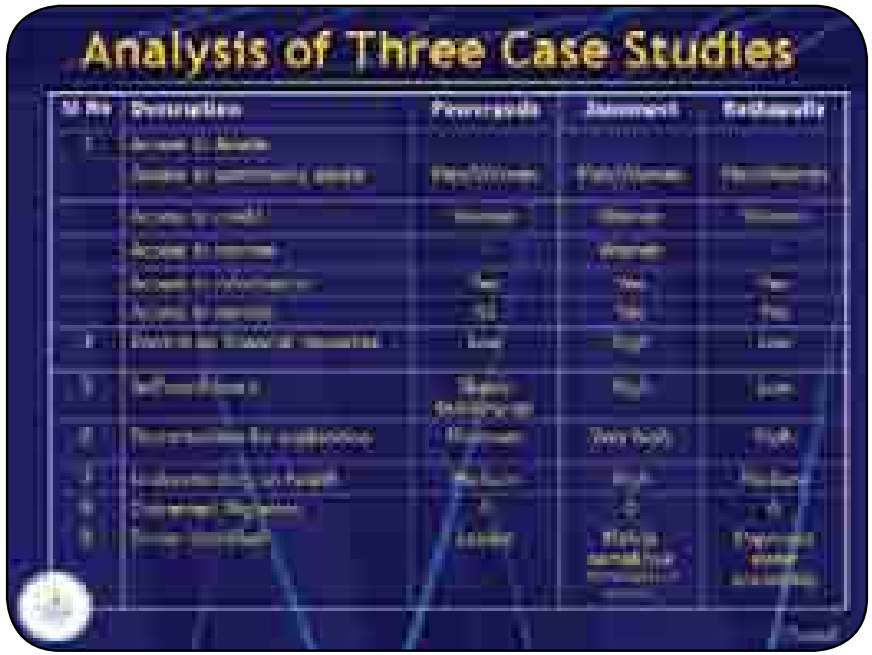
	Adarsha watershed, Kothapally	Powerguda	Janampeth

Analysis of Three Case Studies

Sl.No	Description	Powerguda	Janampet	Kothapally

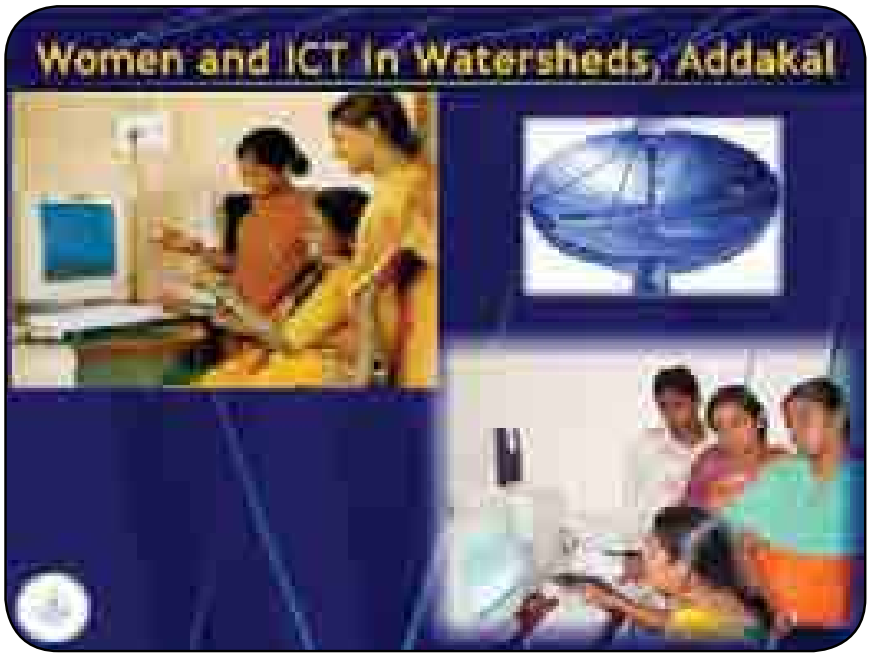
Analysis of Three Case Studies

Sl. No	Description	Powerguda	Janampet	Kothapally


Analysis of Three Case Studies


Matrix of Community Participation


On the Ladder of Participation
Degree of control
Information
Consultation
Deciding together
Acting together
Supporting
Co-opted
Co-operating
Consulted
Collaborating
Co-learning
Collective action
Substantial Participation


Women and ICT in Watersheds, Addakal

Drinking Water: A Key Intervention to Benefit Women

Adarsha Watershed, Kothapally, India

Women Washing Clothes in Tank

Findings

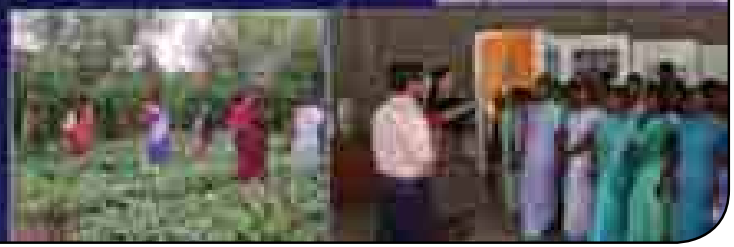
- It is evident that the higher on the ladder of participation the stronger are the institutions
- Supportive policy for institution building is a driver
- The benefits of development that usher through integrated watershed development could maximize if the energies of all the contributing stakeholder are harnessed esp. women.
- Capacity building of women in income generation activities, financial management, social dynamics of groups yielded substantial results.
- For the inclusion of gender perspective in IWMP it is necessary to use the existing institutions, small groups (Women), and federation of these groups as levers of holistic development

Need for Micro-enterprises

- 78% households are small and marginal
- Off-farm income is important source of livelihood
- Middle-men make good money
- Micro-enterprises create livelihood opportunities in villages
- Natural resource-based activities can be sustainable
- Value-addition retains money in villages

Micro-enterprises for Improved Livelihoods

- Vermicomposting
- Value addition: *Daal* mills installed
- Village-based seed bank
- Nursery raising by SHGs
- Biopesticide preparation
- Rural information hubs
- Fish sauce making



Value Addition to Agri-Produce

- Pigeonpea *daal* mill installed on pilot basis
- Additional income source
- By-products – nutritious animal feed retained in villages
- Finished product available for villagers at lower price

Fish Rearing

Fish Sauce Making in Wang Chai, Thailand

Income Generating Activity (IGA) for landless and women members enhanced participation and their Incomes

Model to Benefit Landless People

- Collective action for minimizing land degradation
- CPRs are rehabilitated thru biodiesil plantations with SWM
- SHGs are formed and would benefit not only from the wages but will have usufruct rights
- Within six months usufruct rights awarded to SHGs

Decentralized Biodiesel Making

Suitable for	: Entrepreneurs, Transport companies and Farmer cooperatives	
Suitable location	: Town and district places	
Feasible capacity	: 1 kl per shift/3 kl per day	
Plant capacity	: Raw material	Cultivation area
1 kl/shift	4 tons of seeds	480 ha
For 3 kl/day	12 tons of seeds	1440 ha

Diversification with High value Crops Increased Family Incomes

Diversification of Farming Systems

Recognizing Women

Recognizing Women

Gender and Vulnerable Groups

- Mere token representation of women and vulnerable groups is not sufficient
- Targeted income-generating activities for women and vulnerable groups be included in the workplans of watershed to ensure their participation
- Existing SHG mechanism to be followed for women as well as vulnerable groups to link the watersheds

Conclusion
Tangible economic benefits to individuals thru productivity enhancement and income generating activities enhanced community participation

GENDER INCLUSIVENESS IN WATERSHED DEVELOPMENT

JYOTSNA SITLING
State Project Director,
Aajeevika Project

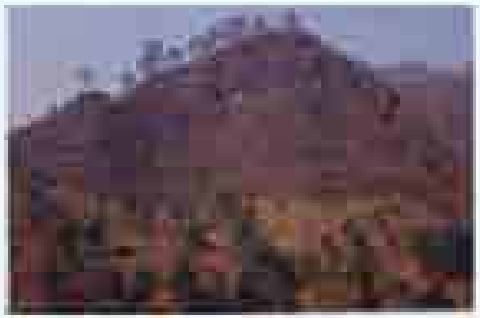
Why gender in Watershed Management?

What are the interventions we need to focus on?

Practical and strategic needs

Food Security
Water Security
Energy Security

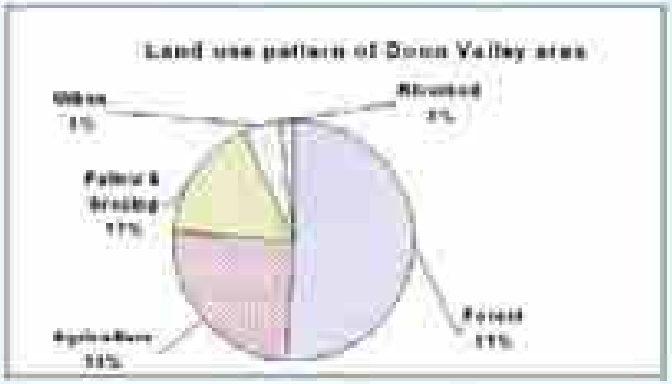
Doon Valley Area



The Bio-physical profile of the Project Area

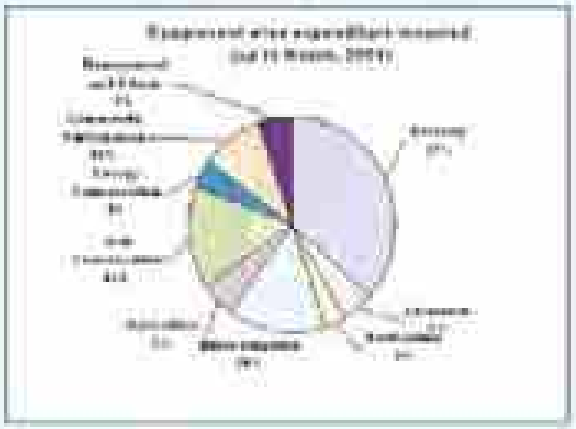
Project area	:	2408.00 Sq. Km.
No. of micro-watersheds	:	65.
Elevation	:	500m to 2500m above msl.
Rainfall & temperature	:	Average 2000mm, subtropical to temperate.
No. of villages	:	303.
Farmsize	:	Small and fragmented (70% below 1 ha)
Population density	:	19.8 persons per sq. Km. (growth rate- 33.2%per decade)

Cattle Population	:	7.2 cattle units cattle units per Sq Km.(growth rate-2.47 cattle units per annum)
Economy	:	Subsistence agriculture and wage employment
Resource Base	:	Diverse and fragile



The Project Profile

Project period	:	9 years (1993-94 to Dec. 2001).
Funding agency	:	European Union (Grant of 23.7 Million EURCS)



PROJECT COMPONENTS

Community participation – establishment of village resource management associations (GARIEMAs), Self Help Groups and COREMAs.

Social forestry – establishment of fuelwood and fodder plantations;

Minor irrigation – construction of storage tanks and irrigation channels;

Agriculture – minikits/kits, training-demonstrations and tomase repair;

Horticulture – orchards, vegetable models and training/demonstrations;

Livestock – NBCs, pasture development, animal health and troughs/equipment;

Soil conservation – check dams, gully plugs and river bank protection;

Energy conservation – bio-gas plants and energy saving devices.

KEY FACTORS INFLUENCING THE GENDER INCLUSIVENESS

-Project Design
-Project Process

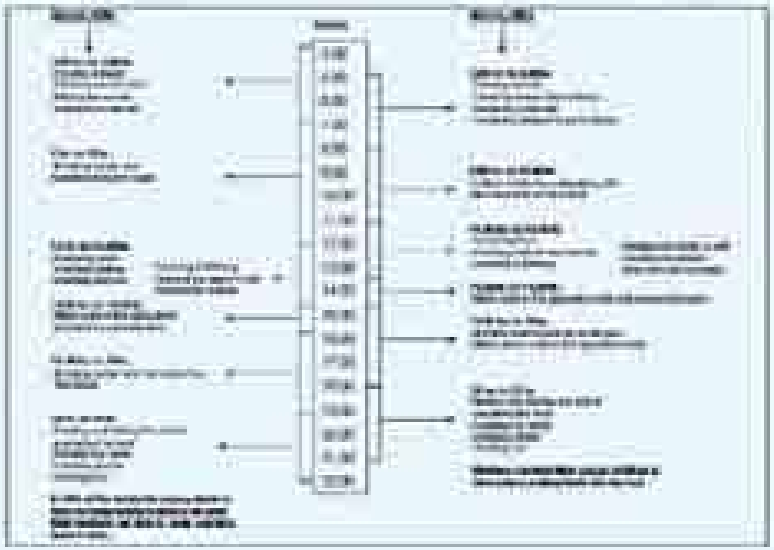
- NRM and CPR practice
- Women's Empowerment process
- Village institutions supporting empowerment process
- Local Employment economy of \$ and Social Equity
- Withdrawal strategy—gender and poor inclusive

Major institutional outputs

- Village institutions: No. of *Ganemas* : 350, Revolving fund- 26 million (Rs. 4 million in circulation for loaning.) No. of SHGs : 297 Saving fund- Rs. 2.1 million. (Rs. 0.65 million is in circulation for loaning.)
- PRIs became more accountable on account of overall awareness that came in the community.
- Social awareness for conservation of environment remarkably increased.
- This model ushered many watershed projects in Uttarakhand

Major impact in drudgery reduction of women

Daily calendar of women in Basoli – 1996 and 2001 comparison



Impact of Project Intervention on drudgery reduction of women

A comparative study - daily diaries of women in March 1996 and in March 2001.

- Women had more time (2.0hr) to sleep at night and also to take rests (0.5 to 1.0hr) during daytime. They reported that their health had significantly improved.
- The time taken to go to the forest had been reduced by 3¼ hr in the morning and by 1.0 hr in the evenings.
- Women had time for themselves and for their children between 12.30pm to 14.30pm.
- The drudgery involved in distance travelled, seasonality, time consumed and weight carried REDUCED.

(Source : Intervention survey conducted in 2001 in village Bavani)

School attendance (Bavani)

Children in 'XI' and 'XII'	1996 93-94	1996 94-95	1996 95-96	1996 96-97	1996 97-98	1996 98-99	1996 99-2000	1996 00-01	1996 01-02
Boys	31	34	32	35	28	28	31	35	35
Girls	8	8	8	14	18	21	24	23	32
% Girls	48.3	57.2	53.5	52.3	62.8	58.7	57.9	56.8	65.7

Data Sources: *School records of Middle School, Village Bavani, Taluk Narasimarajapuram, District Tiruchirappalli*

Impact on food security of children below 5 yrs old

- Village apparently food secure.
- Food insecure specially for vulnerable 0-5 yrs
- Evening cooking time brought from 7.30 to 6.30

This saved 0-5 old children from hidden starvation. Head masters' comment reported in 2001 - children developed better grasping power and retention capacity of lessons over a period of time from 1996 to 2001.

Work in commons

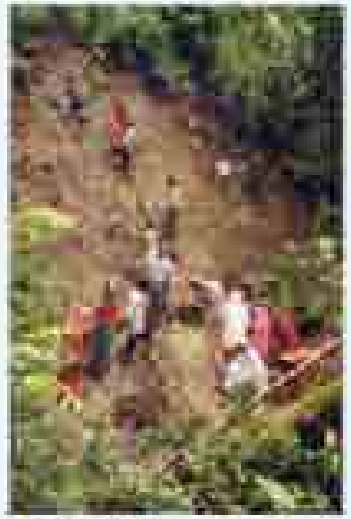
village – Ayur

village – Ovur

village – Bagi

village – Kaka

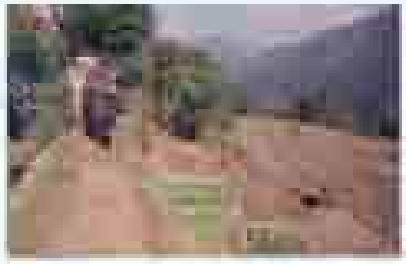
Work in commons



Details of Shramdan from 1997 to 2000

	1997	1998	1999	2000
The number of villages and the villagers involved and the quantum of work done through 'Shramdan'	Villagers -430 villages - 44 Sapling nursing - 89,500 Seed 7.26 Kg treatment - 5 erosion prone sites	villagers - 2010 Villages - 58 Cuttings and saplings- 1,85,000 Seeds 18.5 Kg treatment - 91 erosion prone sites	Villagers - 3500 Villages - cuttings and saplings - 66,663 Seeds - 20.5 Kg Treatment - 80 erosion prone sites	Villagers - 2372 Villages - 79 cuttings and saplings - 93,100 Seeds - 59 Kg Treatment - 79 erosion prone sites

- 3.5 lakh cuttings & saplings planted
- Treated 356 erosion prone sites
- Involved 10,800 villagers over the period of 5 years from 1997 to 2001
- Female participation increased



Mobilisation of financial resource
direct and indirect
asset

withdrawal plan

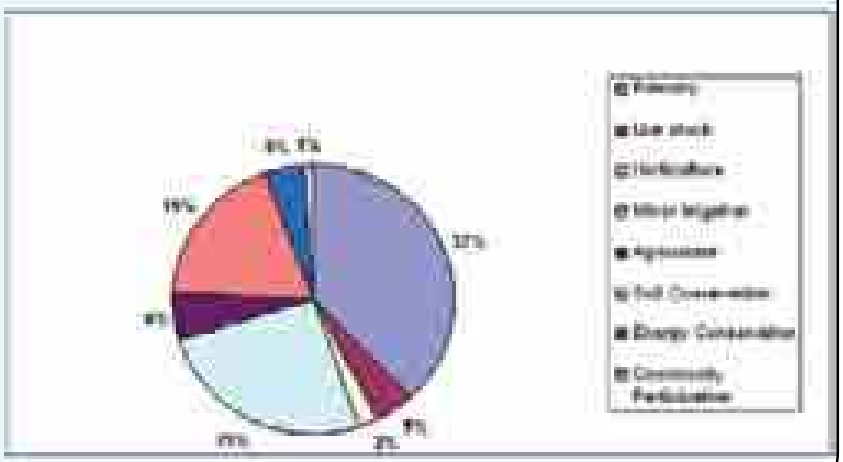
Yearwise scaling-up of contribution from stakeholders in minor irrigation component from 1995 to 1998 (in Rs.)

Items (in numbers)	Unit Cost in Rs.	95-96	96-97	97-98	98-99
Large Tanks	75,000	None	1,000	2,000	1,000
Wells	3,00,000	None	10,000	20,000	40,000 to 50,000
Percolating Tanks	1,500	500	600	1000	1500

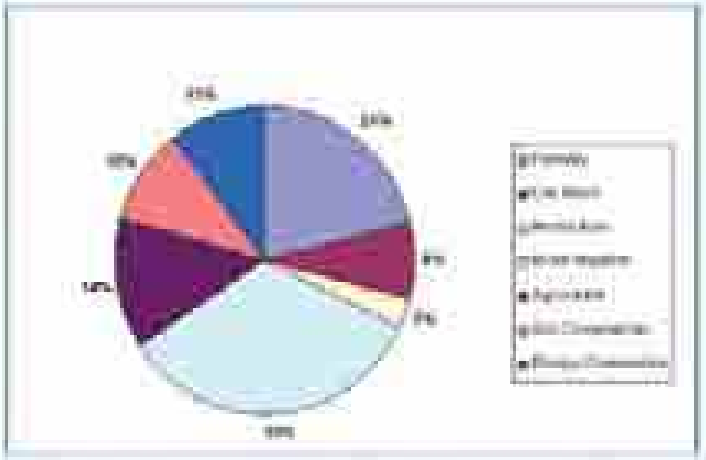
From 1997 contribution was raised even on creation of common property resources . Example from soil conservation component is cited below (in Rs):

Soil conservation component (in numbers)	Unit Cost in Rs.	95-96	96-97	97-98	98-99
Stone Checkdam	1,000	None	None	1,00	1,00
Contourbund	4,000	None	None	500	500
Silvi Structures	1,500	None	None	100/35	100/35
Soil Retaining Wall	25,000	None	None	10/0	10/0

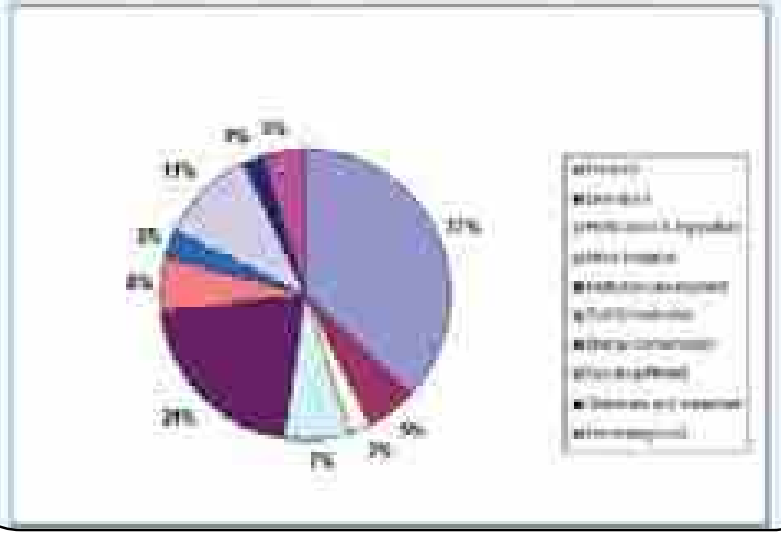
Expenditure made by the Project on different components in a sample of 10 Villages (2.1 crores)



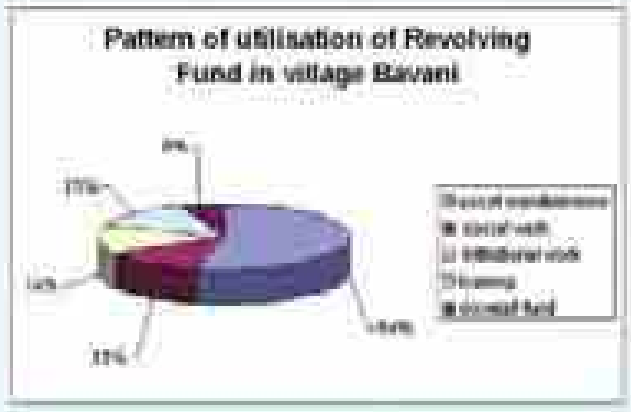
Contribution raised in different components in a sample of 10 Villages (%of revolving fund)=23 lakhs



Utilisation of Revolving Fund by CAREMAs in a sample of 10 Villages (excluding loaning)



Pattern of utilisation of Revolving Fund in village Bavani



Impact of drudgery reduction on well being of women

Impact of improve fodder grass

The production of fodder grasses-1,016 qtl per year in nearby plantations - reduction of distance have reduced the drudgery

Impact of biogas plant

Biogas saved 212 tonnes of fuel-wood per year - reduced the seasonality, time and distance involved in collection of fuel-wood.

Community empowered to draw drinking water scheme

GAREMA brought Water Supply Department (Jal Sansthan), to implement the drinking water scheme, in Bavani in 2002. This reduced problems of fetching water

Health, Hygiene, Vitality & Food Security of Women

Incidence of seasonal diseases has not only decreased between 1996 and 2001 but the number of days lost due to these diseases has also declined. Earlier they used to use home remedies and never sought medical aid.

Decreased Drop-out Rates by Girl Children from School

Factors Contributing to Women's Involvement in the project

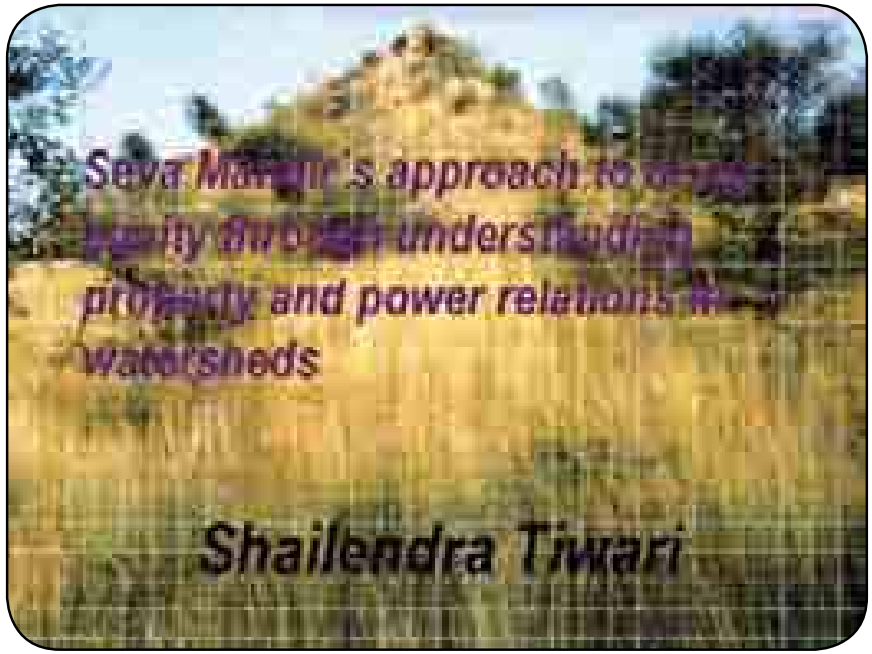
- Developed 104 ha under improved Grasses community land, spread among the hamlets in 27 pltns.
- Five protected under 'social fencing' and one plot succeeded without any watch and ward system.
- Project had developed a nursery for Guinea and Napier grass within the village, as source of planting material.

Implementing crucial intervention for women

1. The women earned 43% of the person-days of employment created by project work
2. women to dispose off unproductive cattle and facilitated them in purchasing cattle of improved breeds
3. Reduction in drudgery of women by average 3 hrs a day.
4. Most loans from the revolving funds have gone to purchase improved buffaloes.
5. On average, milk production increased from 2.5 to 3.0kg per day per buffalo.
6. Trained women skilled workers in construction field emerged

Trends in animal population, village Bisvani

Animal	1990		1998		2003	
	Local	Improved	Local	Improved	Local	Improved
Cow	75	-	90	-	87	69
Ox/Bull	110	-	110	-	111	-
Calf (Cow)	30	-	21	-	9	2
Female buffalo	100	1	100	70	133	78
Male buffalo	1	-	-	1	-	1
Calf (Buffalo)	11	2	40	11	13	11
Sheep/Goat	170	-	130	-	183	-
Oxen	-	-	9	-	11	-
Local	160	4	400	90	483	133
Total livestock	512		899		579	
Poultry data could not be obtained.						



Theory

Watershed development recognized a tool for improvement of livelihood of poor

The Practice

Land development in a watershed is done bye passing the property and power relations

Outcome

This leads to uneven distribution of benefits between the rich and poor.

Understanding watershed development in a different framework through Seva Mandir's experiences

Attempt

To develop the community lands as it is in the interest of the poor.

Rationale

11-39% contribution of CPRs to rural livelihoods.

The poor has meager private land and lacks resources to improve his land.

Thus the gains from developed commons are enormous for the poor.

Work on commons apart from physical gains to poor, also builds up social cohesion and group solidarity among them.

....different framework(contd)

Through

Understanding the power relations and balancing them in favor of poor through community institutions

Requirement

Changing these relations means a process imparting social change, which may go beyond project mode.

SM's experience:

-70% of land is state owned

-Development of commons, in spite of higher incentives and positive policy signals, is still a major bottle neck.

Issues

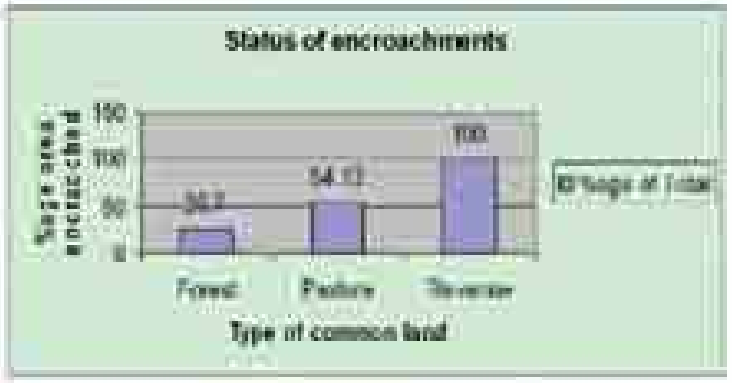
-Large scale privatization of commons

-Dominance of patron-client relation in land governance

-Political value of land complicates the matter further

Assessing the malaise

Status of Encroachments in 10 villages of Udaipur District.



Encroached areas in select forest blocks of Udaipur district

Range	Forest blocks	Areas of Forest Blocks	No. of encroacher families	Total area encroached
Jhadol	Kankoda	488 Ha	383	488 Ha (100%)
Jhadol	Bum II	5500 Ha.	839	1996 Ha (36%)
Kherwada	Kalanwa	2101 Ha	788	1483 Ha (68%)

Level of Encroachment in Community Pasturelands Around Rajasthan

Habitation	No. Encroachment	Permits Encroached	Velocity Encroached	Trend
Overall				

How the problem of unclear titles affects the watershed development

-Due to unclear title over the common lands, these are not included in the watershed action plan.

-On the part of community also there is low demand for the development of the commons.

-As the encroachments are scattered over a vast area, the watershed treatment in such conditions leads to a fractured land improvement.

Managing the problem

Recognizing that

-The watershed is made up of heterogeneous fragmented community

-The vested interests have taken over the community interests

-It will require long term strategy and a lot of energy to facilitate the group action where people can join together for their common interests.

Seva Mandir's Approach

-Investment in building community institutions and leadership development

-Assistance for the development of both private and community land

-higher incentives for the development of community lands

-Negotiations and providing support to encroachments vacating households

*Compensations

*Incentives

-Awareness and advocacy

Conclusion

The commons are contested and the existing power relations favor the treatment of watershed as private property regime under this arrangement the poor loses.

To enable the poor to gain, long term investment in the community institutions is necessary for undertaking watershed development by altering property arrangements in favor of commons.

Promoting Inclusiveness in Watershed Development Projects

Marcella D'Souza
Watershed Organisation Trust
Comprehensive Assessment of Watershed Development Programmes
ICRISAT
23-27th July 2007

Generalized Facts that surfaced on Re-visiting project villages post-project (2003-2004)

- **CBOs:** VWC in some villages still function. Some changed but most not willing to be changed. Women not so active. The marginalized groups became inactive. All groups supposed to be represented.
- Back to square 1 almost. The **caste and class differences re-surfaced**, though to a less extent and varying from village to village.

SMS some active and continue development process, many not so active. SHGs some active some not. Some linked to banks. Linkage with GP: some work together. Banks link to individual SHGs.

Generalized Facts that surfaced on Re-visiting project villages post-project (2003-2004) .....

- **Women's Promotion** Activities to be implemented by women were hurriedly completed. Mainly selected by NGO or by the men. Sufficient time not given.
- Drinking water needs not sufficiently met.
- Addressing Drudgery: energy for cooking, other needs of women
- Tough dialogue with NABARD more move to IG activities rather than drudgery reduction.

Facts that surfaced on Re-visiting project villages post-project & On-Going (2003-2004)

Assumptions	Ground Truth
• **VWC / VDC: Active, All communities & women engaged**	• Not willing to change and not generally active.
• Showdown: differential landless poor exempt	• **Village calls all equal. Time factor doesn't permit addressing cultural factors.**
• **Village united (all castes & classes continue to come together)**	• Differences surface & sometimes come with a revenge.
- Poor also benefit in post project period.	- Somewhat improved, but gap **exists (not livelihood project & special attention not given.**
• **Expected women's emancipation**	- More than before, but not to the expected extent.

Paradigm shift: Moving from Assisting to Facilitating

Key Challenges:

- How do you ensure that the target group becomes the subject and not the object of the developmental intervention
- The marginalized have a voice and are effectively represented & participate in DM processes
- The village takes responsibility for the development of their village as a whole and of their poor , vulnerable and marginalized groups & women are given their space.
- The development process continues.

WOTR's Wasundhara Approach

WOTR's Wasundhara approach is built on 3 premises :

- Each vocational, interest, economic and social group must be given space to articulate its needs, priorities, hopes and aspirations in terms of concrete outcomes in the near, middle and long term perspective.
- These groups must be effectively represented in a pan- village body (VDC) tasked by the Gramsabha with undertaking developmental activities in collaboration with the Gram Panchayat (where the two are not synonymous)
- An Action Plan & budget with responsibility allocation must be developed and implemented by the VDC / SMS supported by the Gram panchayat and monitored by GS

Tools for Inclusion

Tested and effective tools & processes to bring this about:

- The Wealth Ranking is important and to be done in the early stage.
- Constituencies Building, Bottom Upward
- Village Envisioning- Goal Oriented Project Planning

This can be done up to a cluster level and a plan for a cluster can be thus prepared.

Tool 1: Wealth Ranking

- The constituencies are formed based on economic conditions (poor, average, better-off), occupation, category (SMS, youth, UGs, etc.) and gender (women). The data collected in PRAs, wealth ranking and government records are used to define the constituencies. The people themselves decide the constituencies based on data analysed jointly with WOTR team. Gramsabha/Gram Panchayat monitors the selection process..

Information on the community board

Used as the basis for all selection and contribution. Needs a lot of community motivation and mobilization.

Facilitating team needs to be well prepared.

Tool 2: Building Constituencies Bottom Upward

- The VDC members are selected from and by the different constituencies
- Gram Panchayat nominates their member/s in VDC
- The Gramsabha ratifies the selection. GP sanctions the formation of VDC and sends the Resolution to WOTR. The VDC becomes a sub-committee of Gram Panchayat.
- Members and chief functionaries are rotated after every two years under the supervision of Gramsabha.
- VDC is accountable to GP and Gram Sabha for its performance and finances.
- The members of VDC are also accountable to their respective constituencies for their performance and transparency.

Tool 3: Village Envisioning- Goal Oriented Project Planning

- Needs identification is done with the people in hamlets / wards on a constituency basis. People prioritize the five most important needs.
- Final selection of priorities is done at the Gramsabha level based on aggregation of priority grades and highest common priority is taken as Key Problem Issue.

Tool 3: Village Envisioning-Goal Oriented Project Planning

- Key Problem Issue is analyzed using Problem Tree Approach (cause-effect).
- Problem Tree is converted into Objective Tree (Means-Ends)
- This is converted into a Project Planning Matrix (Activities-Outputs-Objectives-Goal with budget, and source agency)
- Those prioritized needs which are not covered are analyzed using the same process
- At implementation time the needs of the poorest 30% are prioritized and differential contributions determined.
- Annual Action Plans are prepared by VDC and ratified by Gramsabha.
- Access funding from different sources (taught to prepare proposals).

Prioritization of Needs

- People have limited awareness and information, therefore development agencies need to make the people aware of other possibilities
- Watershed development the most felt need (mainly for agriculture)
- Drinking water
- Fuel for cooking, directly related to sustainability of the watershed development
- Roads and communication
- Growth monitoring of Children should be included in all villages & linkage with govt projects (ICDS)
- Address needs of all groups: fodder for livestock, IG activities for the poor and the marginalized...

Formation of the VDC

Information of 7 villages having 499 households

	Very Poor	Poor	Average	Better-Off
VDC	14.5%	35.5%	39%	11%
No. of HHs	21%	29.2%	38.6%	11%

Of which 50% are women and 50% men

Results of the last 2 years Experience

Through the intervention of the VDC & GP:

- 2 villages obtained funds from Tribal development program for 5 SHGs.
- Shared the LFA with the Forest dept and convinced them to do the plantation on 20ha.
- 4 nala bunds and a check dam implemented under EGS. A road was also constructed.
- Differential local contribution (according to WR), for crop & other demonstrations.

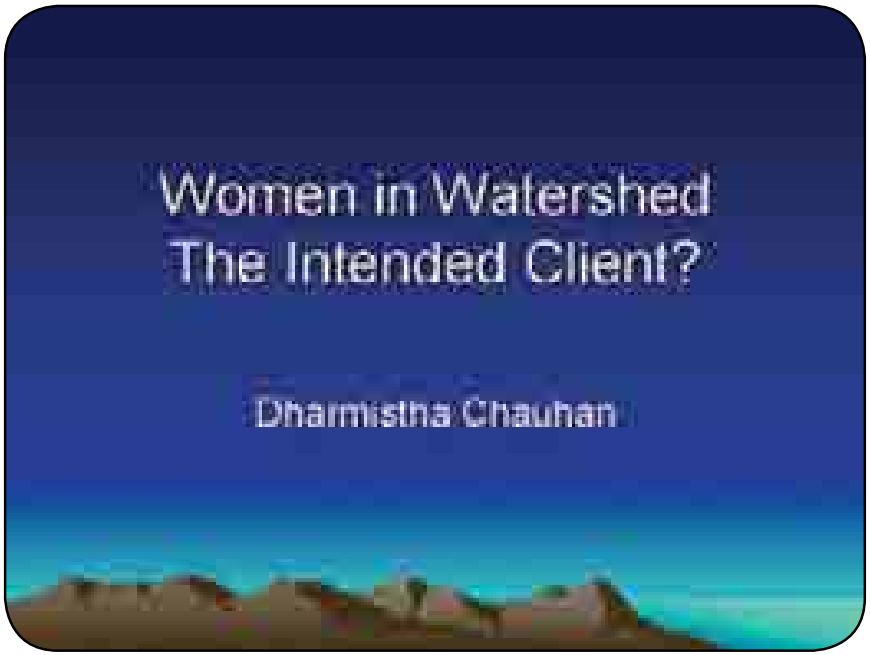
People feel more confident and informed.
At first threatened, but later are comfortable with this approach.

Water Shortages : Fading Memories

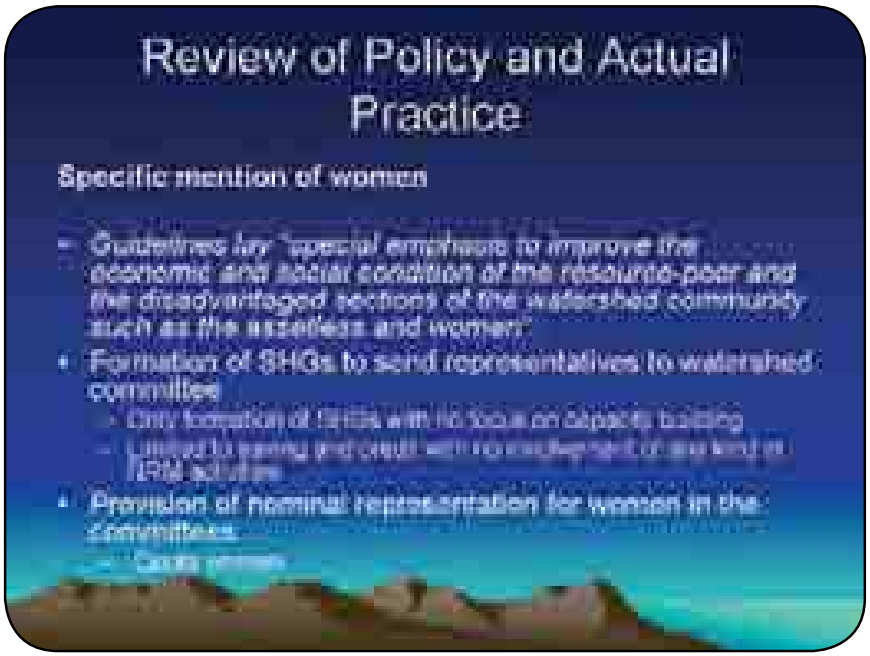
Increase in Fodder, Biomass & Livelihood

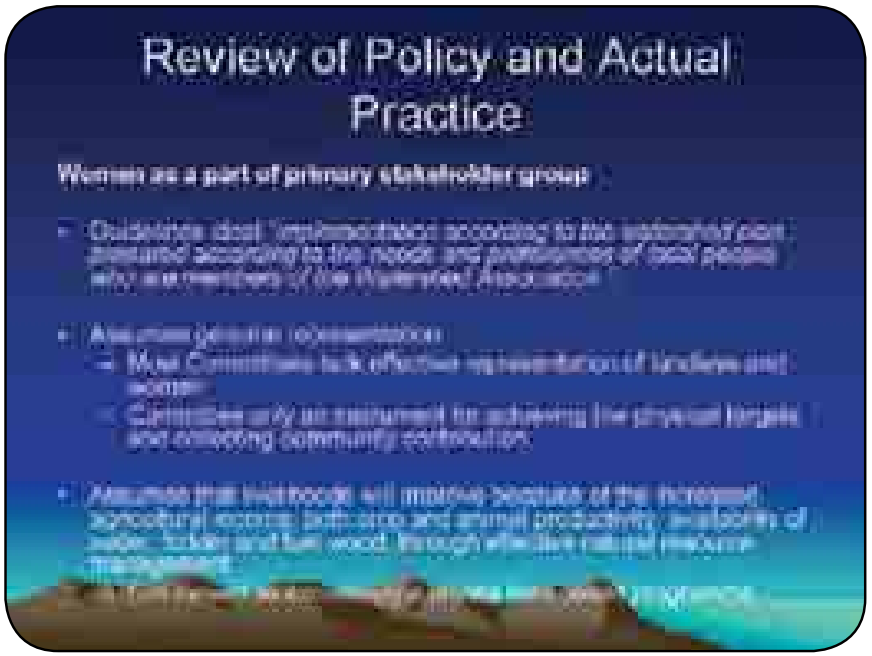
The Learnings:

- Do not take the impacts observed at face value. Have the courage to study it at depth & to risk the necessary interventions & changes. On-going studies important.
- Attitudinal change required in the Project Owner and Implementing Agency. A willingness to adapt.
- Transparency pays.
- Knowledge empowers & brings about confidence.
- Strategies for inclusiveness to be built in.
- Village must be made responsible for their poor and their development. Outsiders can only assist.


Women in Watershed
The Intended Client?
Dharmistha Chauhan


Rationale for targeting women in watershed
• Holistic farming system approach for rainfed areas- key to rural development
• Women are the primary workers in dryland agriculture
• Greater role on care economy in household sustenance
• Care economy depending on natural resources
• Hence primary stakeholders in watershed project


Review of Policy and Actual Practice
Specific mention of women
• Guidelines lay "special emphasis to improve the economic and social condition of the resource-poor and the disadvantaged sections of the watershed community such as the landless and women"
• Formation of SHGs to send representatives to watershed committee
• Provision of nominal representation for women in the committees


Review of Policy and Actual Practice
Women as a part of primary stakeholder group

The Impacts

- Fairly successful:
  - in bringing in an integrated land treatment approach rather than the earlier scattered approach.
  - in terms of increasing agriculture productivity and to some extent drought coping
- Fails to achieve:
  - effective involvement of primary stakeholders
  - development of common pool resources for restoring the ecological balance

Women have been at the receiving end thus as they are the effective primary stakeholders

Cases from the field

- Cases where women have not been specifically involved
  - Hiware Bazaar (Maharastra)
  - Mokesar (Gujarat)
- Cases where there has been an inbuilt gender component
  - Piprali (Gujarat)
  - Sorapada (Gujarat)

Analysis of the Cases

Criteria	1	2	3	4
Drinking Water Security	P	Y	Y	Y
Food Security	Y	Y	Y	Y
Fuel Security	P	-	-	P
Financial Security	Y	Y	Y	Y
Education of Children	Y	Y	Y	Y
Increased Participation	N	N	Y	Y

Analysis of the Cases


Recommendations
• Demonstrated strategies to feed into mainstream programme
• Shift to watershed plus (livelihood) approach
• Integration of economic and physical infrastructure

Facilitating equity through integrated NRM

Saroj Mahapatra

PRADAN

Outline

- Outreach
- Developmental Challenges
- Building equity
- Structure and processes
- Impact
- Way forward

Outreach

- ~113,000 families,
- ST 54 % , SC and OBC 43 %
- 7600 women Self Help Groups
- 3,044 villages,
- 89 blocks,
- 30 districts,
- 7 states.

PRADAN: Impacting Livelihoods to Enable Rural Communities

Developmental Challenges in operational area

- Vulnerable farming systems, monsoon dependent, low yielding [1/3rd of country average] and many crop pest
- High dependence on fast depleting forest resources
- Low investments either public or private in resource regeneration
- Very poor resource humanity
- High concentration of extremely poor communities
- Exclusion of women, scheduled castes, other marginalized families
- Isolation of tribal communities in the forest fringe villages
- High prevalence of food and nutrition insecurity, ill health especially among women and girl children
- High incidences of distress migration and indebtedness

Building equity

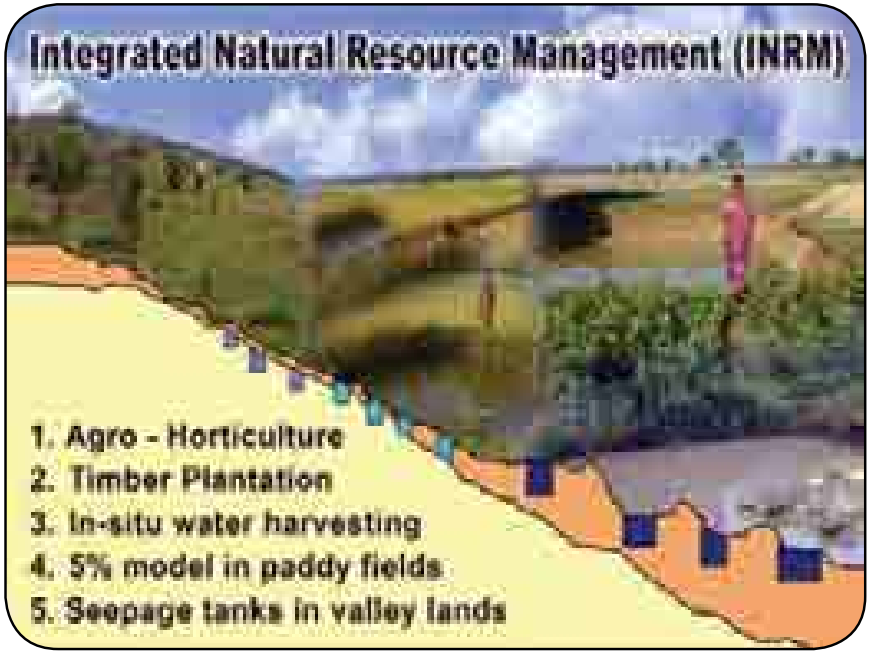
- Equity considerations integral to all PRADAN interventions
- Interventions begin with identification of the poor and very poor families in selected poverty pockets
- Integrated NRM activities planned around these families with a livelihood focus
- Special attention to building capacity of women to take charge of INRM institutions

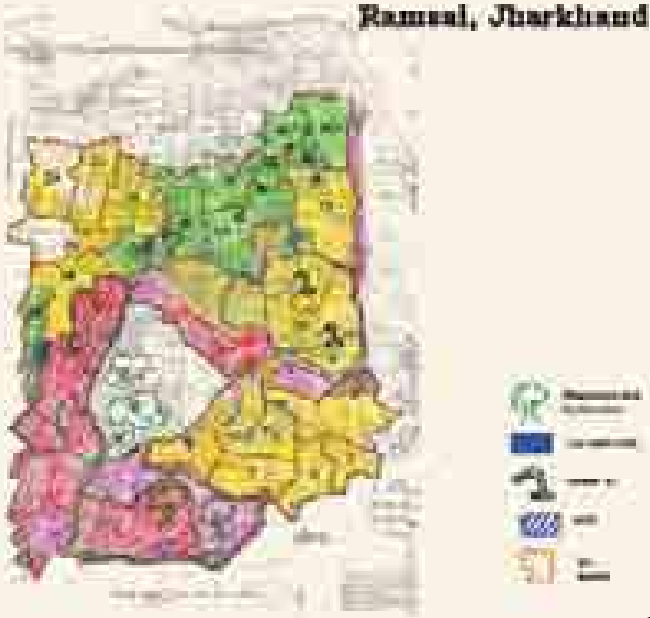
Structures and Processes

- Women from the identified target families formed into SHGs
- PRADAN staff work intensely with SHGs, strengthen groups and build finance, management and life and livelihood skills of women
- SHGs form the foundation of women led natural resource management processes

Process followed

- **Social and Resource Mapping**
- **Ownership mapping**
- **Problem Identification**
- **Option generation**
- **Scrutinizing generated Options and Prioritization**
- **Activity plan**

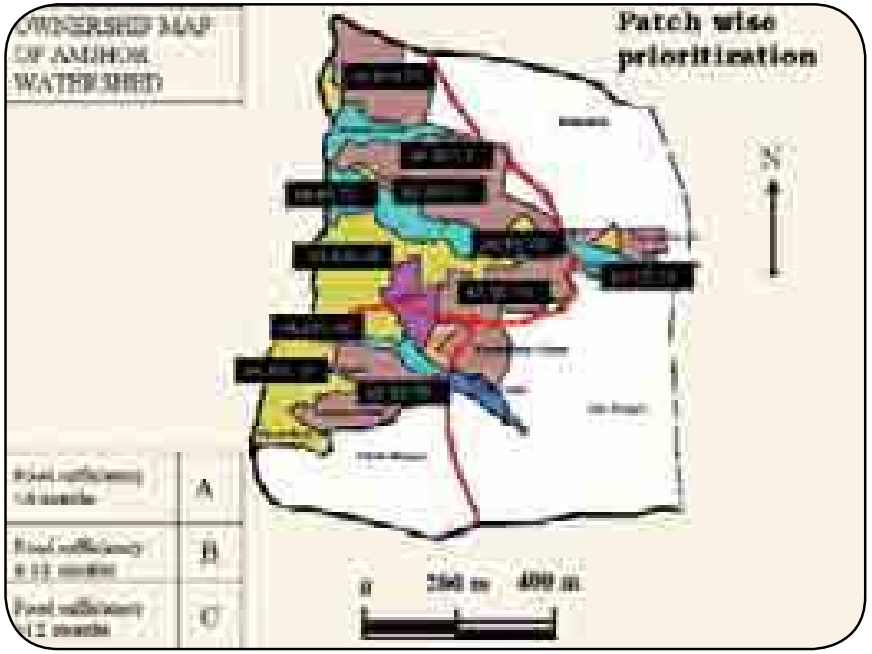




Ensuring equity in process

- Watershed planning done placing equity upfront
- Priority given to plan of landless and women
- Treatment from upland (predominantly held by poor) to low land to ensure maximum coverage of poor people
- Small decentralized structures like 3Mx4M, 5% model ensure equitable distribution
- Almost all interventions labor intensive and not capital intensive

For example



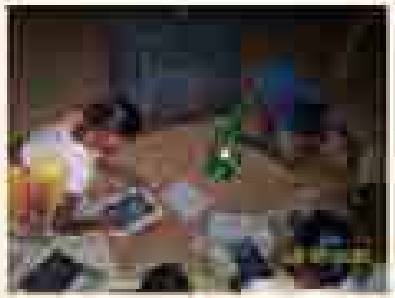
Family wise prioritization

- Equipments for rural artisans
- Pump set for landless

- Poultry, goat rearing, Piggery, Dairy, vermi-compost
- Fishery

Family wise prioritization

- Sonk pit, cleaning of well, cover with pulley on drinking well
- Thresher machine, paren threshing ground
- Bathroom at roadside bathing ghat
- Night school

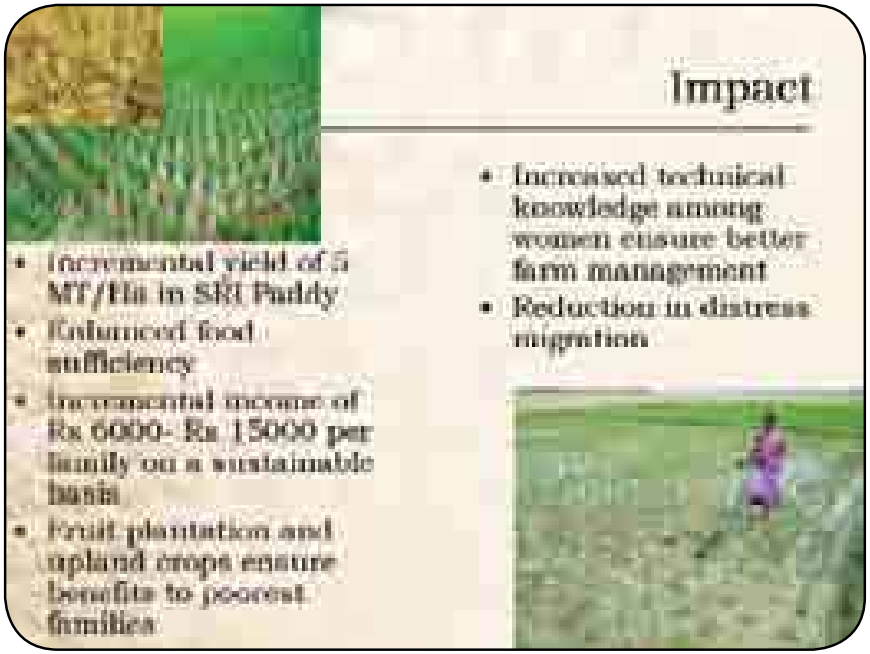


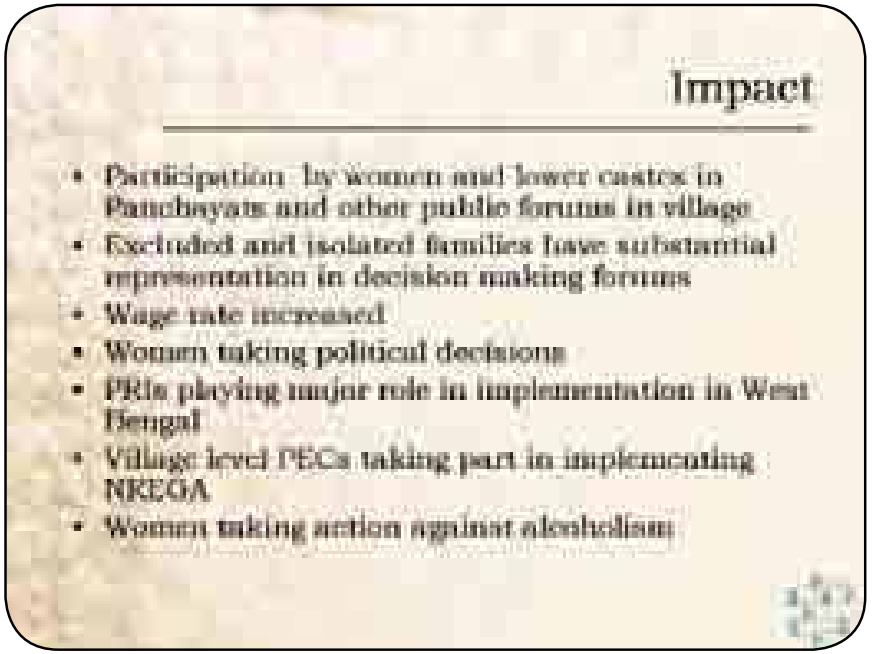
Representation of disadvantageous groups in decision making

- Substantial representation of women and other marginalized groups
  - In West Singhbhum district of Jharkhand in 22 watershed villages 22 FEC
    - Strength 320 , 100% SC-ST (52% ST, 8% SC)
    - 176 women (55%)
    - 25% of total belong to families with less than 6 months food sufficiency

We are doing similar work in

- West Singhbhum and Khunti district of Jharkhand with the funding from IFAD-JTDS, Peterbar with NABARD support
- Bankura and Purulia in West Bengal from NABARD and in collaboration with Panchyats
- Dindori, Sidhi and Betul in MP under NREGA
- Banka of Bihar with NABARD support


Impact
• Incremental yield of 5 MT/Ha in SRI Paddy
• Enhanced food sufficiency
• Incremental income of Rs 6000- Rs 15000 per family on a sustainable basis
• Fruit plantation and upland crops ensure benefits to poorest families
• Increased technical knowledge among women ensure better farm management
• Reduction in distress migration


Impact
• Participation by women and lower castes in Panchayats and other public forums in village
• Excluded and isolated families have substantial representation in decision making forums
• Wage rate increased
• Women taking political decisions
• PRIs playing major role in implementation in West Bengal
• Village level PECs taking part in implementing NREGA
• Women taking action against alcoholism


Way Forward..
• Conceptualization of 3 pillars has to be pitted upfront
• Technology choices has to flow from equity consideration
• To address exclusion and exclusion integration of livelihood approach is needed
• For integration of Livelihood more investment per family is needed


Thank you

Watershed development projects – Are they a panacea for development of dry land agrarian communities?- Evidence from Karnataka

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Bangalore

Introduction

- Watershed projects as a strategy for rural development has received policy thrust- Rs.76,000 crores over a 25 year period leading to a treatment of 63 million ha.
- Recommendation of the Parthasarathy Committee for restructuring the programe 'radical' in nature (Vaidyanathan, 2006)
- Further process of stock-taking should lead to a more informed dialogue with Bureaucrats on how we could move forward.

Purpose and focus of the paper

- Contribute to the stock taking exercise with evidence from Karnataka
- Examine the differential processes and outcomes across the two 'modes' – DPAP vis-à-vis KAWAD
- Discussion on equity aspect largely focuses on class(land holding as a proxy for class) and to a certain extent on gender dimension
- Evidence from certain better processes and outcomes achieved from NGO projects
- Policy implications emerging from the evidence from DPAP and KAWAD modes.

Study Area and methodology

- Molkalmur taluk of Chitradurga district (Central dry agroclimatic zone); Krishna basin; Mean annual rainfall 565 mm
- DPAP – II phase projects ; KAWAD- 2 villages each from two NGOs and one village for the LA-MYRADA
- Strata-Upper and Lower reach – small, medium and large
- Evidence – 325 Households wherein DPAP and KAWAD projects implemented (10 villages); literature on NGOs with 'better' processes

Processes across the modes – initial social capital 'enhancement' planning of the SWC intervention

- **DPAP activities relating to SHG formation made only after action plans were prepared and submitted ; preparation of the "Master plan and action plan" (Kelva Yojane) done in a superficiatory manner**
- **KAWAD- "donor" SHG formation. Planning undertaken through Transect; 40% aware, choose not to participate, More participation of farmers in the upper reach('pper Large-40%) as there was an active interest to get boulders removed from the plot**
- **Low participation in Marlahalli (Lver), high in Devarahatti and Bommadevarahalli due to better staff effort**

WDC

- DPAP – 67% of the farmers not aware as to who the WDC chairman was, this proportion higher among small farmers, High proportion aware in Devasamudra(77%) as compared to passive villages (Bommadevarahalli:23%, Muthugarahalli:16%).
- KAWAD- 97% of the farmers attended the meeting for MWSDC representative selection. Lesser contestation when rep. Selection took place for the first time, later active lobbying and contestation took place

Contribution

- DPAP-92% of the farmers not asked to pay the contribution amount (norm:10%), crop failures/poor productivity• farmers not willing to contribute – "adjustments"
- KAWAD-"demand-driven" approach, high contribution norms, 'wealth seeking' by farmers, MWSDC member, NGO staff
- Average 'adjusted' amount-Rs.3598, highest Lower Large-Rs.5851, least Lower small-Rs.1967

Decision making on the SWC treatment in the plot- DPAP

- **Never consulted- 30%; 24%-consulted and consent was taken; Farmer request-36%; Active lobbying – 10%**
- **Proportion of households not consulted higher among small farmers in both the upper and lower reaches; Proportion of no consent treatments higher in the passive villages while Devasamudra had least proportion.**

Decision making on the SWC treatment in the plot- KAWAD

- **Farmer request:41%, no consent:22% (Marlahalli-highest proportion Devaruhatti-least proportion); Consent taken:13%, 'Joint' decision making:25% (High in Bommalingnahalli and Devaruhatti)**

Differentiating processes

- DPAP- 'passive'; 'chose' not to participate: no conditionalities; win-win strategy for both farmer and Agricultural Assistant
- KAWAD- 'entrepreneurial'; wealth seeking cooption behaviour

Evidence on Gender

- Women played an active role in starting SHGs, resisting the effort of the elites to stifle their efforts, participated actively in the planning exercise (Rayapura)
- 'myth' – women are *less* corrupt- lady fixer in Marlahalli; lady ZP member in Devasamudra

Differentiating Outcomes-DPAP vis-à-vis KAWAD

- Comparison of 2003-04 with 1999-2000
- Rainfall in 1999 was 33% more than the normal rainfall (565 mm), while 2003 was a 'bad' year with a rainfall of 243.99 mm.
- *Apriori* expectation outcomes would be poorer in 2003 as compared to 1999, specifically crop productivity.

Endowment-DPAP vis-à-vis KAWAD villages

- **Average rainfall in both DPAP and KAWAD villages low in 2003 (244 and 255 mm respectively), but KAWAD had higher rainfall in 1999 (740 mm in KAWAD as compared to 402 mm in DPAP villages)**
- **KAWAD – 30% of area irrigated; DPAP – 11 %**
- **Soil Profile- similar in both DPAP and KAWAD**
- **KAWAD – endowment better**

Quantum area treated

- DPAP-58% of the area; KAWAD-63%.
- DPAP – proportion treated higher among small farmers; KAWAD- highest treatment-Lower medium(86%), Upper medium(85%)
- Higher proportion of treatments in LM and UM strata due to higher "adjustment's" (Rs.5030 and Rs.3124)

Crop productivity of groundnut-farm bund plots-DPAP

- **1.75 Qtls/ha in 2003 as compared to 6.90 qtls/ha in 1999**
- **Highest productivity in 2003-UL strata with productivity of 2.38 qtls/ha; causative factor-due to better endowment-high proportion of good quality soil(black and red) in the plots ;**

Crop productivity of groundnut-farm bund plots-KAWAD

- **KAWAD-2.34 qtls/ha in 1999 as compared to 6.95 qtls/ha in 2003**
- **Higher productivity in KAWAD plots in 2003 vis-à-vis DPAP plots due to better irrigation endowment, while difference gets reduced for 1999 as this was a 'good' rainfall year for both DPAP and KAWAD villages and therefore irrigation did not make a difference**

Crop failure-DPAP

- Higher concentration of crop failures in the lower small reach (44%) - poorer quality soil (67% of the soil either alkali soil or gravally soil);
- However, plots with highly fertile red sandy loam also have lead to crop failures, therefore, rainfall was a more crucial determinant.

Livestock

- Hypothesis of Paskar, Bouma and scott(2004) tested: (a) for large ruminants(cow, buffalo and ox) the effects of drought are not adverse as they depend largely on crop residues and stall-feeding (b) 'marginal' land owners who depend on small ruminants(goat and sheep) the effects of drought are not adverse.

  DPAP-Cows-49% mortality/sale – because of non availability of fodder from common land-too costly to buy; lesser-Buffaloes(20%), Ox(15%); Goats-26%, sheeps-81%

- KAWAD-Buffaloes and cows-23%, ox-6%, goats-34%,sheep-18%

- Lesser sale/mortality in KAWAD due to better irrigation endowment

Migration

- 2003-Lower in KAWAD(5%) as compared to DPAP(17%)-predominant cause-poor productivity/crop failures

- Lower migration in KAWAD-better irrigation endowment, consumption loans from SHGs

Another study-consecutive drought years (Bouma and Scott, 2006)

- Kanakanala watershed –Koppal district
- Main beneficiaries were those close to the drainage lines and check dams, particularly farmers with better quality black soils benefited from increased soil moisture
- In contrast farmers located in the uphill with red soil and no access to irrigation reported that benefits were lower, these farmers preferred to work for wages rather than maintain investment in their land

NGOs with better processes-MYRADA-PIDOW, Gulbarga (Fernandez, 1994)

- **Synergy between women SHGs and watershed intervention-: 3 women SHGs took responsibility for managing a watershed –motivation – group common fund would benefit rather than work being given to contractors/outsiders**
- **Effort in reaching out to landless not very successful efforts to persuade absentee landlords to lease out land to landless families not successful ; although demand for wage labour increased due to increased area under cash crops, wage rates were still below the official rates**

NGO with better processes-ISPWD-K

- Equal wages and equal training opportunities have contributed to self-worth and confidence among women
- Watershed works have brought some women who have never worked before into wage labour
- Women taking leadership role in Village Development Societies; men who support women in such roles are respected
- In Mammuri watershed, Gulbarga-few wage labourers were able to get an increase of Rs.10 to Rs.15 in wage labour due to the efforts of a women's SHG (MYRADA)

NGO with better processes-BAIF-Manjunathapura village, Tumkur

- GOK –alloted C and D class revenue waste lands belonging to weaker sections, initial appraisal-not proper useage due to poor soil, lack of resources
- Tree Based Farming systems: (a) Increased production of fodder, strengthening of livestock as a source of income (b)increased production of fuelwood- earlier women used to walk 5 to 10 km to collect to get firewood, now they get it from their own land © credit worthiness increased due to assets created on their land

Conclusion

- DPAP farmer 'choose' to exit – no conditionalities; win-win strategy for both farmer and the Agricultural Assistant; KAWAD farmer-entrepreneurial- wealth seeking behavior through cooption of MWSDC and NGO staff
- Poor outcomes in both modes, but slighily better in KAWAD

Policy implications

- Need for greater synergy between dry land development and irrigation schemes; minimum quantum of 'external' water per household should be the norm to reverse the skewed modes of irrigation development occurring in the country

Policy implications

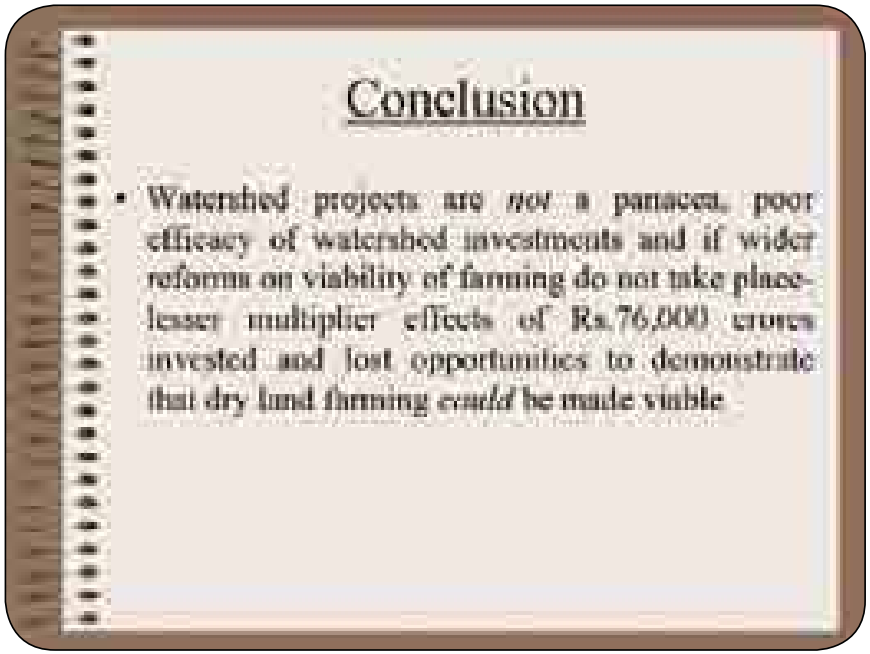
- GOI(2006)- Phase implementation of the programme- Need for disaggregated and easily monitorable set of conditionalites for farmers participation in various phases of the project
- Evidence from our KAWAD field sites contributes to other critiques of DFID intervention(Kumar and Corbridge, 2002) and Mosse(2005)

Policy implications-donor implemented projects

- Need to reduce information assymetry of tax payers in developed countries,who need to know the 'successes' and 'failures' of projects that they fund
- Plateau(2004)- Multilateral reputation mechanism, funding in a phased-manner needs to factor in 'more' actors in the Indian context

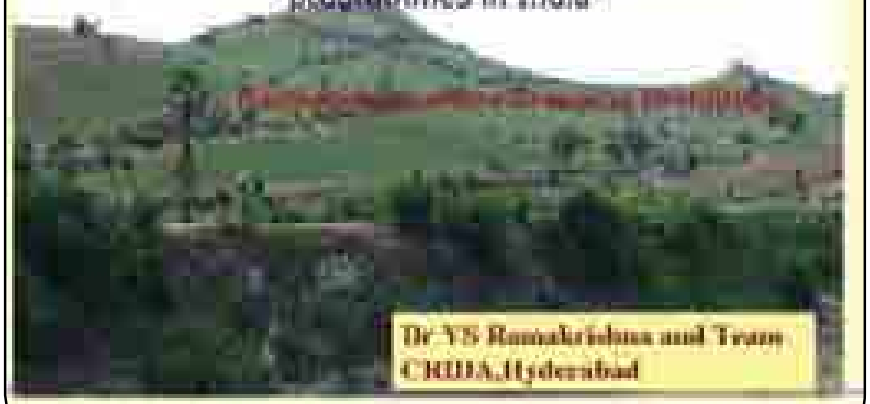
Conclusion

- Agrarian crisis- More than 1,00,000 farmers have committed suicide since 1991 , GOI(2006)- skeptical of this being solved by irrigation based strategy of development
- Structural issues- Declining profitability of farming needs to be addressed; 40% of farmers would give up farming, if they had a choice(NSSO, 2005)


Conclusion
• Watershed projects are *not* a panacea, poor efficacy of watershed investments and if wider reforms on viability of farming do not take place-lesser multiplier effects of Rs.76,000 crores invested and lost opportunities to demonstrate that dry land farming *could* be made viable

Manual on Best Bet Practices for Watersheds

under the initiative of
"Comprehensive assessment of watershed programmes in India"



Dr YS Ramakrishna and Team
CRIDA,Hyderabad

INDIA'S SHARE IN GLOBAL RESOURCES

Human Resource	16.0%
Land Resource	2.45%
Water Resource	4.00%
Livestock Resource	15.0%

Water scarcity

- Below 1700 m^3 per capita/year : Water scarce
- Less than 1000 m^3 per capita/year : Severely water scarce

1990: 18 countries (12 less than 500 m^3)
2025: 30 countries (19)

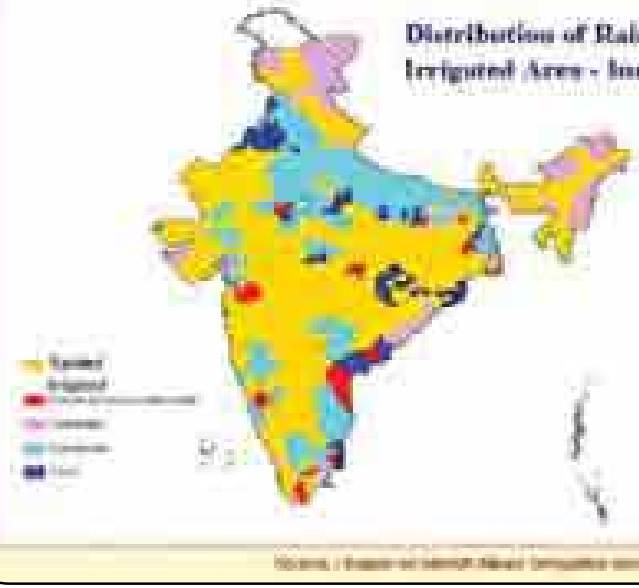
Population and per capita water availability

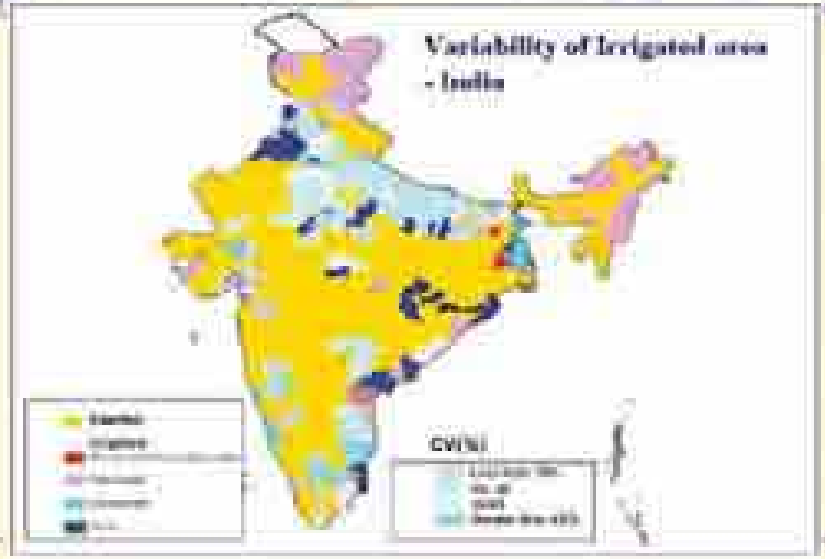
Country							

Estimates of Water Needs for India (M ha m)

Activity	1990	2000	2025
Irrigation	46.0	63.0	77.0
Domestic	2.5	3.3	5.2
Industrial	1.5	2.7	12.0
Energy	1.9	2.7	7.1
Others	3.3	3.5	3.7
Total	55.2	75.2	105.0

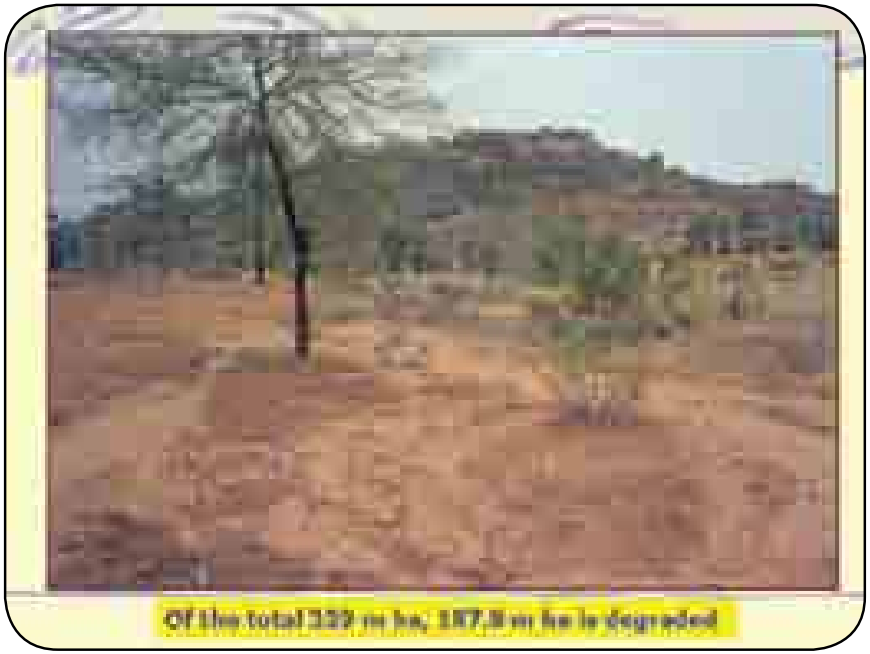
The entire water potential of 1122 BCM need to be developed by all means by 2025 through surface and ground water development





Resource Degradation

- India's 57 per cent of the total geographical area (329 m ha) is suffering from various forms of degradation like water erosion, wind erosion, chemical and physical degradation.
- Out of 400m ha-m precipitation in the country, 113 m ha-m is lost as runoff resulting in drought in the catchments and floods downstream.
- Over 5.3 billion tons of top-soil alone is lost annually resulting a loss of around 8 m tons of plant nutrient and 3 m tons of food grains.
- The per capita availability of water will touch stress level of 1700 m^3
- The water resource is dwindling in quantity, quality and equitable availability



Of the total 329 m ha, 187.8 m ha is degraded

Consequence of soil erosion:

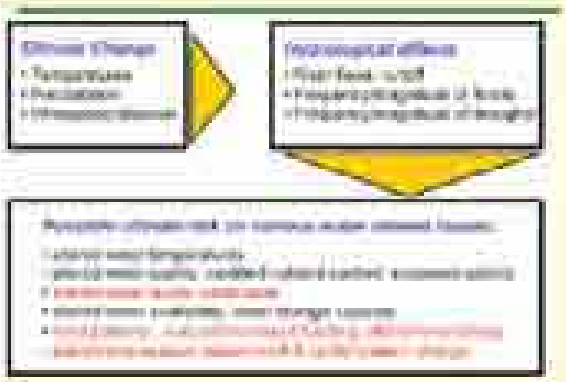
- Loss of cultivated area and productivity
- Siltation of reservoirs and water pollution

Rill Erosion in the Farmers Fields of Resource Poor Farmers

Future scenario

- Much of Western and Peninsular India will suffer from acute water scarcity by 2025
- Conflicts around water will intensify at the local, meso and regional level
- 25 % of India's harvest will be at risk from groundwater depletion and contamination
- Water scarcity will soon emerge as a binding constraint on India's progress

Impact of climate change on water resources



Challenge

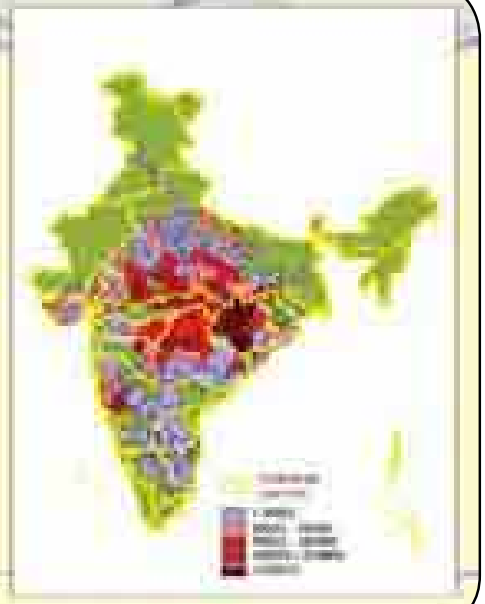
- With productivity gains from irrigated areas slowing down;
  - rainfed areas need to contribute significantly towards second Green Revolution to alleviate poverty and ensure food and economic security
- By 2020 average productivity in rainfed areas must upscale to 2 t ha^{-1} from current level of 1 t ha^{-1}

Challenges ahead -----

- Drought and water scarcity is a constant threat
- Poverty & food insecurity
- Low rainwater use efficiency, low crop productivity & high instability
- Land degradation & declining soil health
- Acute fodder shortage and poor livestock productivity

Opportunity

Spatial distribution of surplus runoff (ha-m) across districts and river basins



NWDPRA: The Flagship Program

Major ethos of NWDPRA

- Development of land, water and biomass
- Integrated farming systems approach
- Environmental sustainability and economic viability
- Development of local institutions

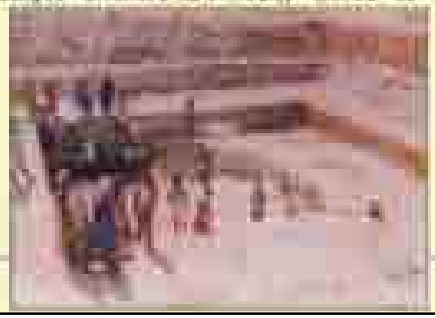
DEGRADED LANDS DEVELOPED UNDER VARIOUS WATERSHED DEVELOPMENT PROGRAMMES, SINCE INCEPTION UPTO MARCH, 2006

S.No.	Ministry/ Scheme/ Programme	Area treated (in Million Ha.)	
		Actual	Expenditure (Rs. Crore)
(Ministry of Agriculture)			
1.			
2.			
Sub Total			
(Ministry of Rural Development)			
1.			
2.			
3.			
Sub Total			
(Ministry of Environment)			
1.			
TOTAL			

People's Participation: The Key Mantra

Tribal emphasis on SWC Structures; Lack of "people" element

- Democratic & participatory methods: A socio-political compulsion
- Satisfies agenda for sustainable NRM & multi-stakeholder needs
- Compelling lessons from top-down, target oriented approaches
- Shift from target oriented-commodity based to knowledge-based approach



The Livelihoods Era: Role of NRs

- Most poor depends on NRs for foods, medicines, building materials, cultural artifacts.
- NRs provide opportunities for supporting & enhancing livelihoods - especially of poorer groups.
- Communities on the margins often depend on NRs for subsistence
- NRs are safety nets for droughts, floods and collapse of market prices.

Resource Management through IWS Management

Holds Promise because...

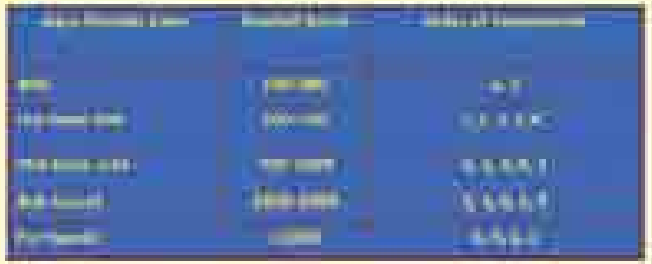
- Integration of crop production with NRM
- Land use according to land capability possible through diversification
- Provides opportunity for participative on-farm research:higher degree commitment from stakeholders
- Effective means of CPR management and sharing of productivity gains

Management : Key Elements

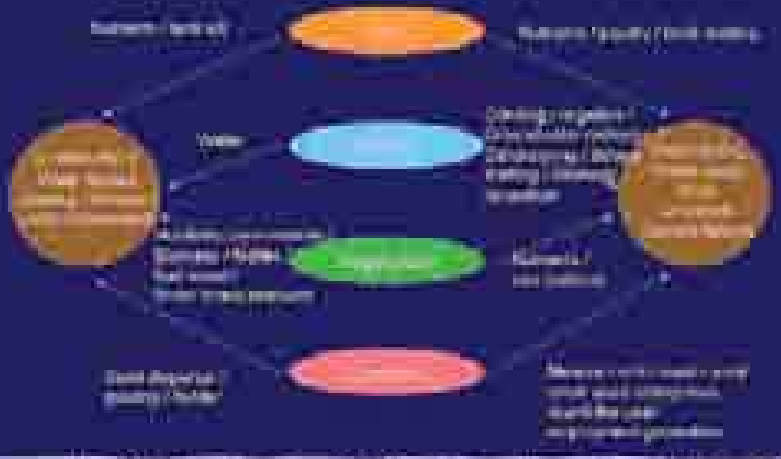
- Control of runoff and soil loss
- Rainwater conservation in situ and storing / recycling of harvested water
- Recharging groundwater, wherever possible
- Matching the crop / cropping system with the natural resources
- Soil quality and fertility management through INM and appropriate tillage
- Use of marginal lands for fodder, fuel wood, fibre and timber, etc., through agroforestry approaches
- Introduction of additive mechanization

Components of Rainwater Management in watershed Mode

1. In-situ conservation
2. Graded line Bund
3. Drainage line treatment
4. Water harvesting & utilization
5. Groundwater recharge



NRM interventions: Improved Livelihoods



Livelihood without round-the-year employment is not possible

Observations on Watershed programs:

- Implementation by various agencies governed by different guidelines with different objectives
- Wide range of benefits results across watersheds
- Non replicability
- Insufficient human resources and capacity building
- Lack of sufficient off-farm activities
- Lack of proper attention to CPRs
- Un realization of full potential in terms of agriculture production

CONCERNS

1. Improving water use efficiency
   - Reducing area under water loving crops like rice & sugarcane
   - Improved irrigation methods - drip
2. Conjunctive use of surface and ground water - rain water harvesting
3. Participatory management of ground water – empowering the people
4. Drainage in irrigation systems as too much or too little is dangerous
   - Water logging & water stress in tail end areas
5. Surface and ground water pollution
6. Diversified use of water from irrigation systems drinking, agriculture, industrial, aquaculture, recreation
7. Water pricing as demand is outpacing the supply
8. Water Conflicts Village to Village, District to District, State to State and Country to Country

Need for the Manual on Best bet Practices:

- Location specific improved management practices available but need compilation

- Identifying gaps in: knowledge , technologies, governance, policies, funding , implementation, withdrawl strategy

- Need for development of state of the art knowledge report

The manual aim to cover following aspects

- Better technological interventions and their impact (Biophysical)

- Qualitative and quantitative impact monitoring indicators (Economic and Impact)

- Facilitating policies and institutional mechanisms (Policies and Guidelines)

- Drivers for bright spot watersheds including drivers for enhancing community participation, gender and equity perspectives (Management, Institutions & Capacity building)

Bio physical interventions:

- Soil and water conservation (In-situ & Ex-situ)

- Agronomic practices (crops, cropping & farming systems, tillage)

- Nutrient Management practices (INM/IPN)

- Alternate land use systems including horticulture, sericulture, pisciculture, etc

- Livestock based interventions

Management:

- Water (Surface / Ground water)
- Resources(CPRs, Wasteland)
- Asset Management- income generating activities
- Mechanisation, Post harvest, Value addition

Social Issues

- Planning (participation)
- Creation and sustenance of enthusiasm(pre, current and post watershed scenario)
- Post-project (sustainability, Land Use Planning , Physical infrastructure like Structures)
- Equity, Gender concern

Approach could be based on

Theme versus Area approach

- A core team preparing on above topics for each of major states. (Ideal one if time and resources are not limited)
- A team would be preparing on each topic synthesing the information available through published reports

Second approach was chosen and individual topics were listed out and lead authors were identified for these topics. A list of co authors was also provided to get the holistic information on the relevant topic.

Lead authors were given responsibility to contact co-authors for preparation of manuscript.

No:of chapters in manual: 24

Institutions involved:

- ICRISAT
- CRIDA,CAZRI,CSWCRTI, NCAP,IISS, UAS(Bangalore), Ag. University (Junagadh)
- ISRO
- IISC,
- WASSAN,GIDR,BIRDS
- BAIF,WOTR
- DV etc.

(contd..)

Titles of chapters

1. Watershed management concepts and practices

Kanchan Chopra, SP Wani and YS Ramakrishna

2. Models of watershed management

SP Wani, David Radcliffe, Michael Glueck and TK Sreedevi

3. Process of watershed selection

YS Ramakrishna and KV Rao

4. Characterization of natural resource base (agroecological potential, water balance etc.)

YS Ramakrishna, AVR Kesava Rao, Piara Singh and Md.OSman

5. Knowledge-based entry point and other novel options for rapport building

SP Wani and Sreenath Dixit

(contd..)

6. Watershed planning (net planning)
Crispino Lobo & Team

7. Soil and water conservation measures
P Pathak, PK Mishra, NV Padmanabhan

8. Sustainable cropping systems in watersheds
KPR Vittal, Masood Ali, CSWCRTI, and S. Narimuthu

9. Farming systems in watersheds
N.G. Hegde, G Subba Reddy and GR Korwar

10. Integrated nutrient management options
SP Wani, Ch Srinivasa Rao, Shankar, BLN Rao

(contd..)

11. Integrated pest management options including disease management for crop production
GV Ranga Rao, Suresh Pande, OP Rupela, Krishnappa and S Desai

12. Diversification of land use and farming systems
VN Sharda and B Venkateswarlu

13. Watersheds and livestock based activities
Peter, ILRI , BAIF and AK Mishra

14. Livelihood opportunities for vulnerable groups (landless, women and youth)
Deep Joshi, SP Tucker, R Parthasarathy,(GIDR) TK Sreedevi

15. Drinking water and sanitation in watersheds
Marcella D'Souza

(contd..)

16. Rehabilitation of degraded lands
TK Sreedevi, SP Wani and Mohd Osman

17. Participatory monitoring and evaluation
K Palanisami, Suresh Kumar and Amita Shah

18. Impact assessment methods and practices
PK Joshi, SP Wani Rosana P Mula and RL Shiyani

19. Policies and guidelines
KV Raju, PK Joshi, Amita Shah, Kanchan Chopra and SP Wani

20. Use of remote sensing and GIS for monitoring and impact assessment
PG Diwakar, RS Dwivedi + IIRS, (Dehradun)

21. Sustainable use of groundwater in watersheds
Tushar Shah, K N Reddy (IHRDS)

22. Watershed Planning for externalities
RS Deshpande, K. Tirupathaiah, Anupam Das (ORLP), PV Veera Raju (Sujala)

23. Capacity building in watersheds
Ravindra, Crispino Lobo, TS Vasudhar Reddy and K Tirupathaiah

24. Institutions and community based organisations in watersheds
Amita Shah, SP Wani, TK Sreedevi and NK Sanghi

New chapters suggested

- Sanitation
- Integrated Water Resource Management
- Market Linkages (Dr PK Joshi & Team)

- Chapter to be about 5 pages
- Executive summary (8-10 pages)

Future work

- Need to organise small group meetings at different locations to synthesize drafts on technical interventions as the available information is not representing the situation in major states(Mostly from one or two institutions perspective only).

- Review of papers

Completion of report by November,2007.

MAPPING LAND, WATER AND BIO-PHYSICAL RESOURCES

PARTICIPATORY NETPLANNING (PNP)

- PNP is a method adopted by WOTR to provide the concerned farmer, his wife an *active role* in the **Planning and Implementation** of water and soil conservation practices to be implemented in his field
- It ensures *greater participation* and ownership of the landholder.
- PNP helps in *adopting sustainable traditional* practices of land and water management.

PARTICIPATORY NETPLANNING (PNP)

•It is site specific and farmer friendly

PARTICIPATORY NETPLANNING (PNP)

PARTICIPATORY NETPLANNING (PNP)

SURVEY NUMBERWISE LAND RESOURCE SUMMARY

Sr. No.	Gat No.	Area (ha)	Slope	Depth	Texture	Erodibility	Class	Present Land Use	Proposed Land Use
1.	88/1	1.00	S	45	N	nE	III	CTH	CTH
2.	84/2	0.80	D	30	gN	eS	IV	WL	PP

SURVEY NUMBERWISE LAND NET PLANNING SUMMARY

Sr. No.	Existing Condition				Proposed Condition				Estimated cost (Rs.)	Total Days required for Work	Estimated Net Profit	Remarks	Farmer's Sign
	Type	Length / Area	No.	Volume	Type	Length / Area	No.	Volume					
84/1					BB	200	2	100 CM		2	200		
85/1	Tr	200	2	40 CM	CCT	180	1	50 CM		1	150		
86/1					FP	1	1	1 CM		1	100		
87/1					CCT	150	1	40 CM		1	120		
88/1					BB	200	2	100 CM		2	200		
89/1					CCT	150	1	40 CM		1	120		
90/1					FP	1	1	1 CM		1	100		

A "NET PLANNING" Format of Each Farmer addresses the following:

Survey Number, Area, Irrigation Availability, Output/Production and Present Land Use of Arable, Wasteland and private Forest Land.

Land Capability Classification (LCC) of all the lands owned.

Proposed Land Use and Treatments (soil and water conservation together with plantations) with actual measurements, items and costs for all the lands owned.

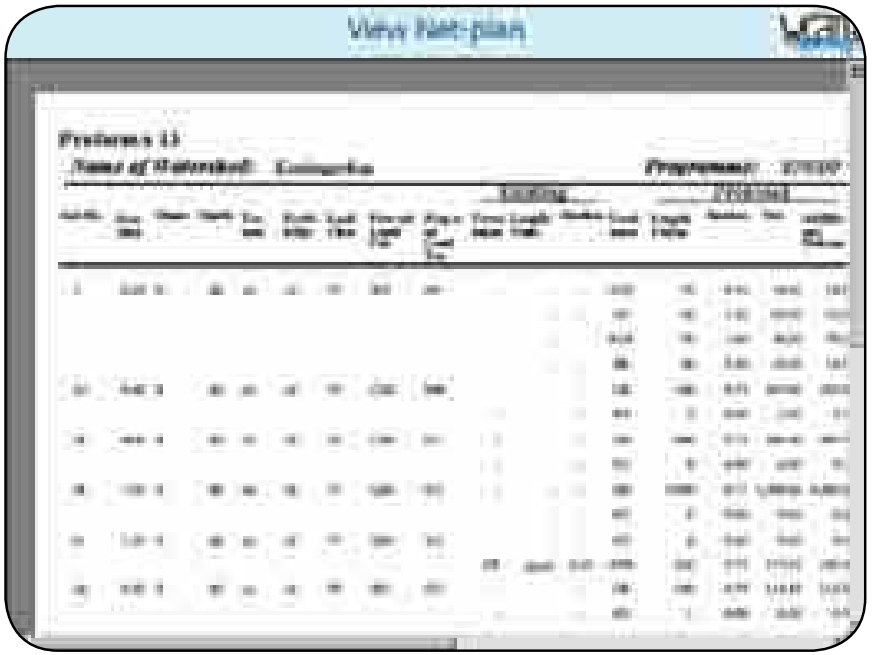
Diagram of what is going to be done on the lands owned.

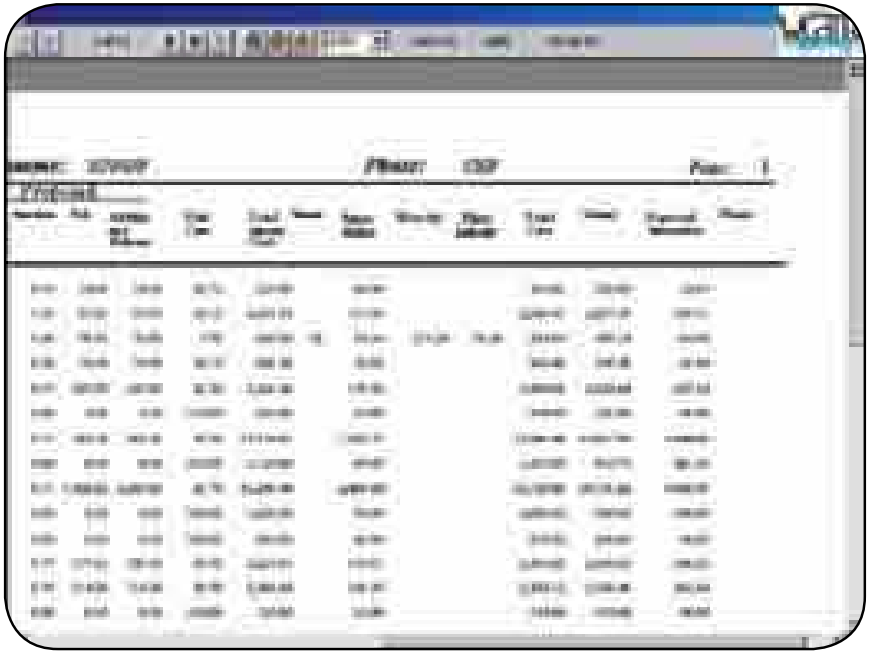
Written Consent and Agreement of the farmer to the proposed interventions

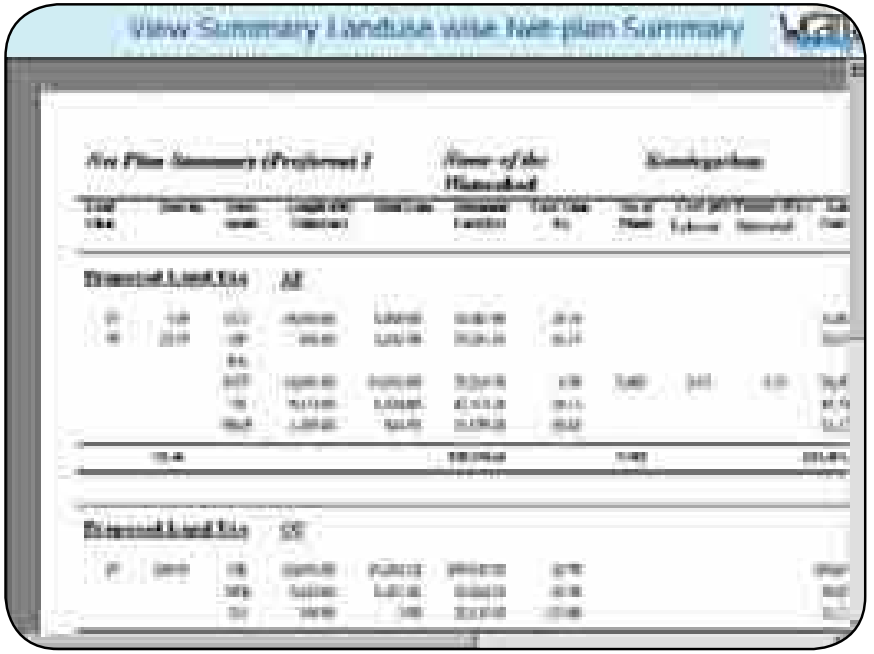
ORGANISING DATA,

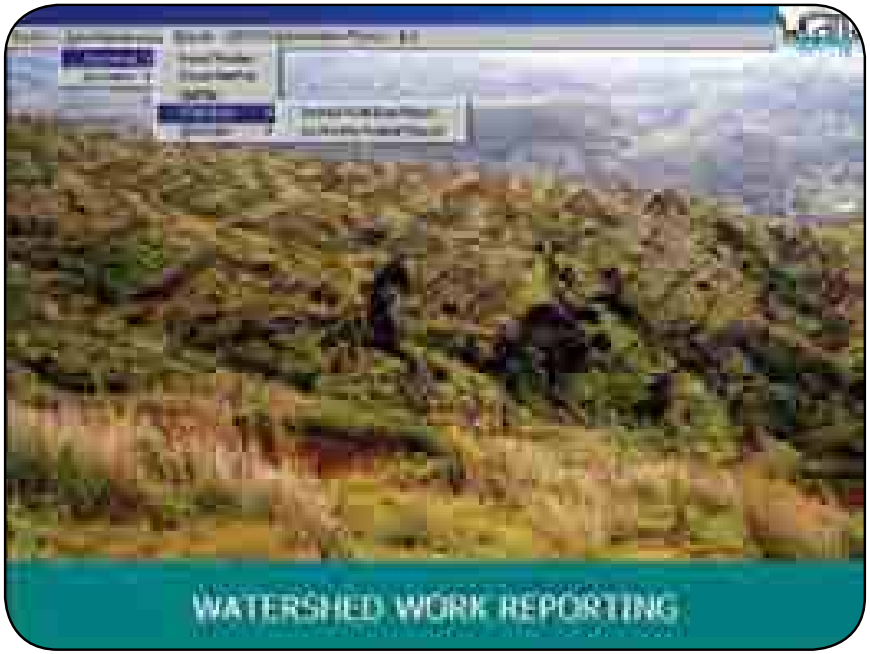
ANALYSIS AND

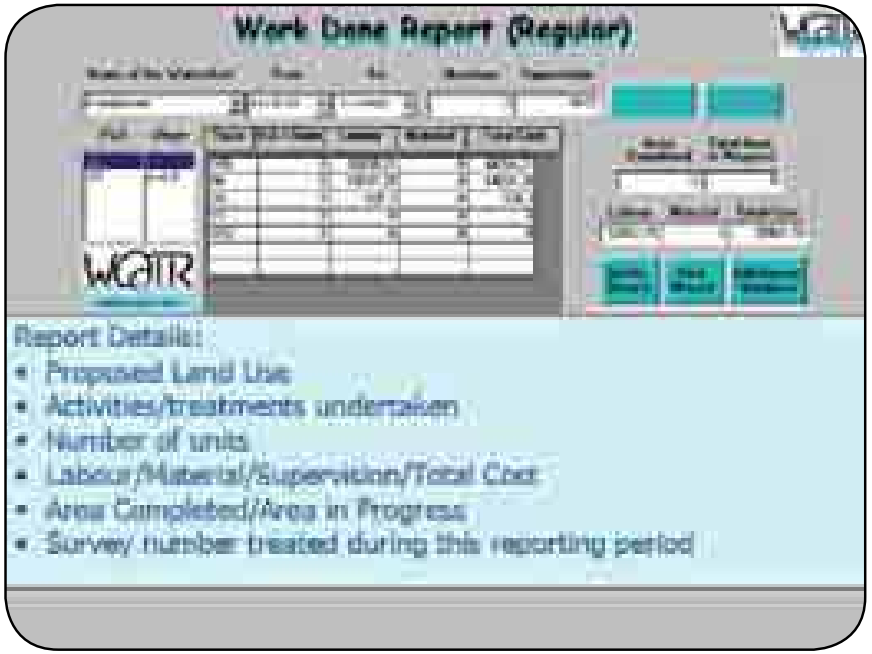
PROJECT FORMULATION

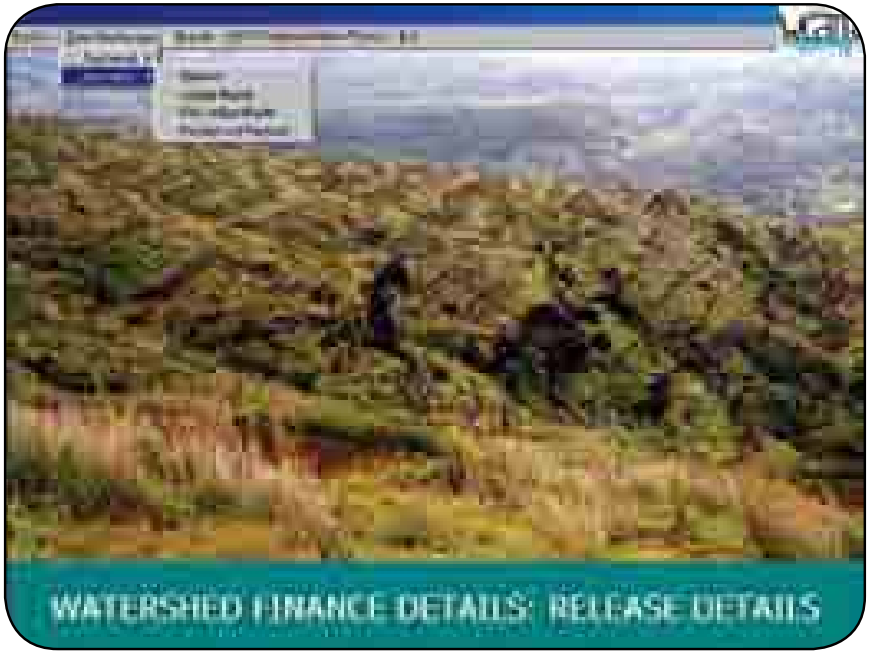


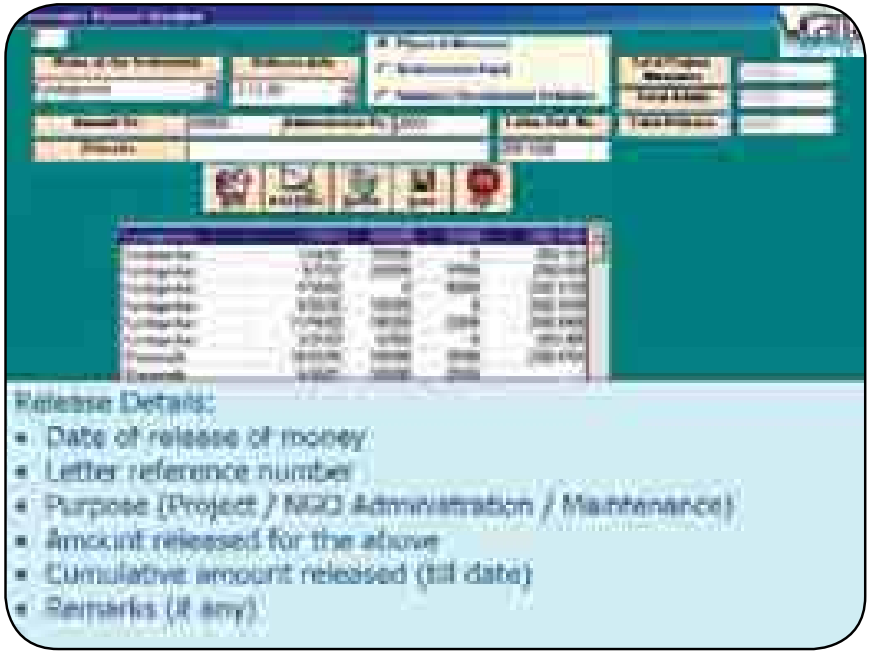


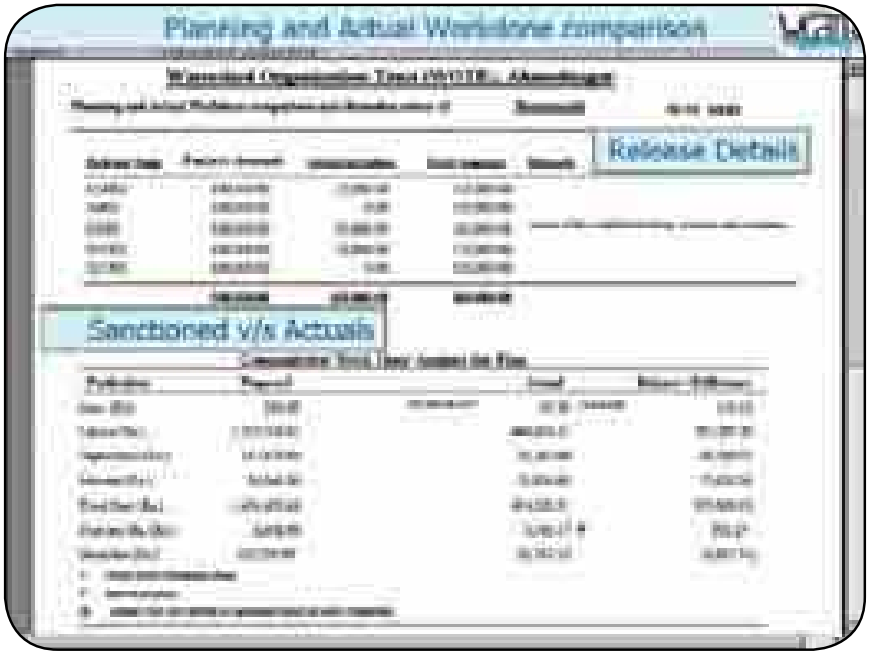



WATERSHED WORK REPORTING

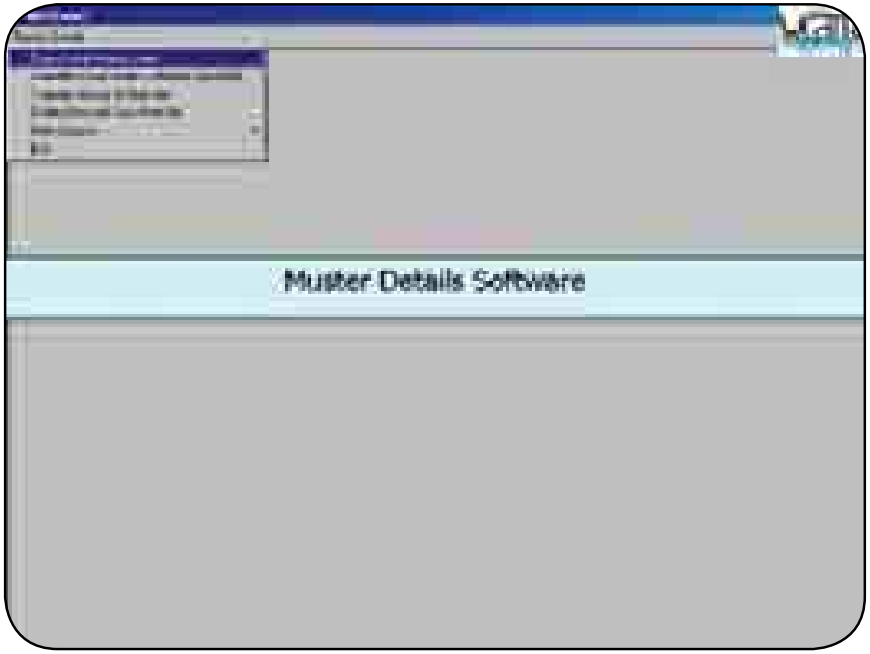

Work Done Report (Regular)
Report Details:
• Proposed Land Use
• Activities/treatments undertaken
• Number of units
• Labour/Material/Supervision/Total Cost
• Area Completed/Area in Progress
• Survey number treated during this reporting period

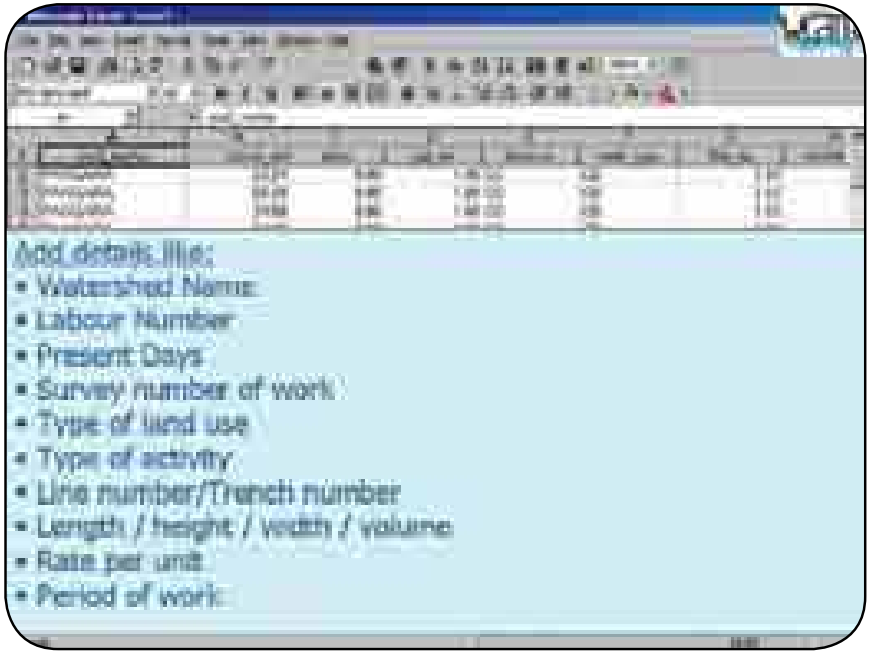

WATERSHED FINANCE DETAILS: RELEASE DETAILS


Release Details:
• Date of release of money
• Letter reference number
• Purpose (Project / NGO Administration / Maintenance)
• Amount released for the above
• Cumulative amount released (till date)
• Remarks (if any)

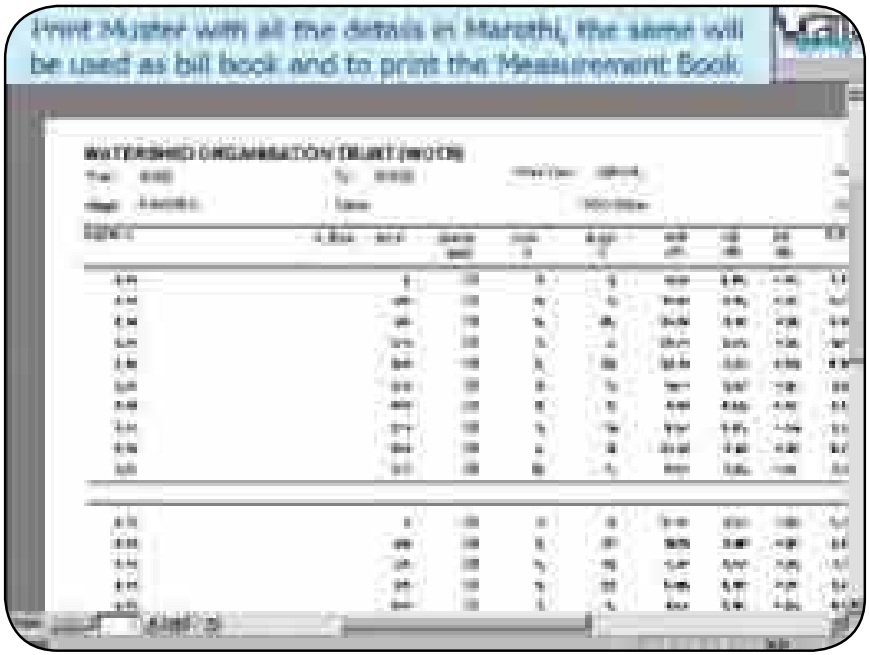

Planning and Actual Workdone comparison
Release Details
Sanctioned v/s Actuals


List of Survey Numbers
As per the Plan
Not as per Plan


Muster Details Software


Add details like:
• Watershed Name
• Labour Number
• Present Days
• Survey number of work
• Type of land use
• Type of activity
• Line number/Trench number
• Length / height / width / volume
• Rate per unit
• Period of work

Print Muster with all the details in Marathi, the same will be used as bill book and to print the Measurement Book.



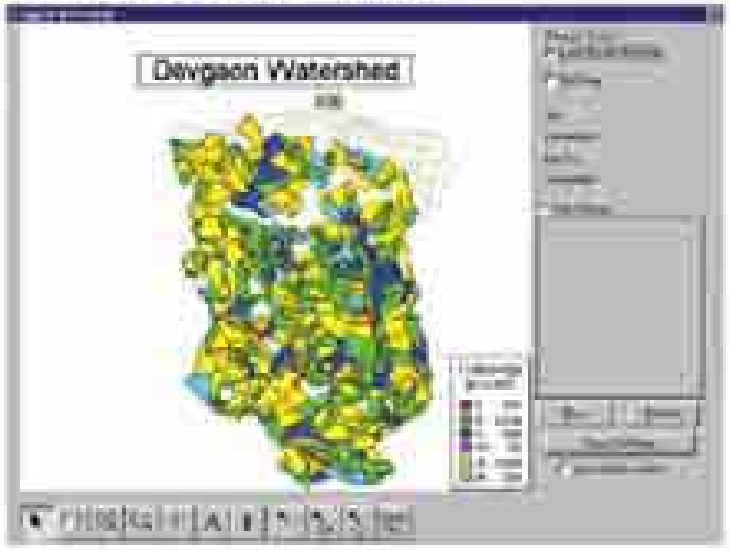
WATERSHED STATUS

USING

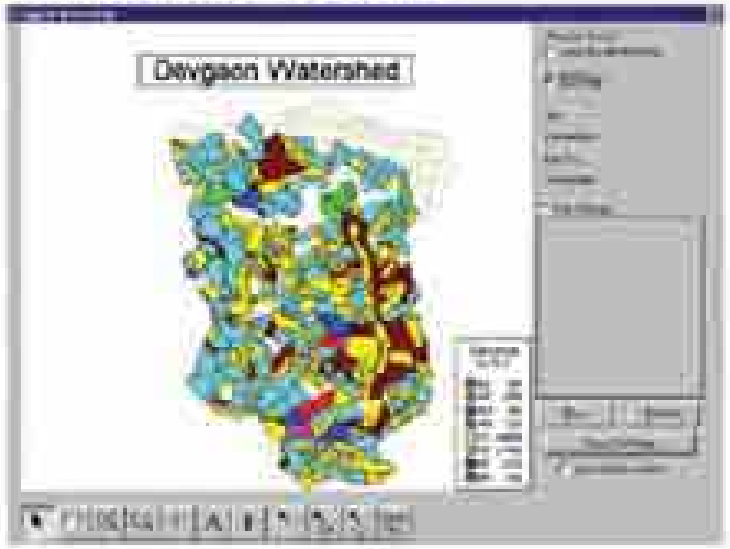
GIS + MIS

Select Watershed and open a village map:

Select Land Classification map:

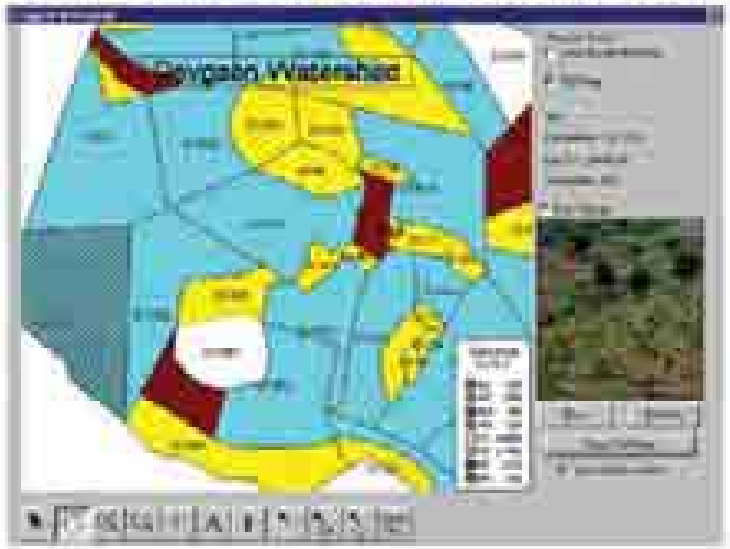


Select Proposed Land Use map

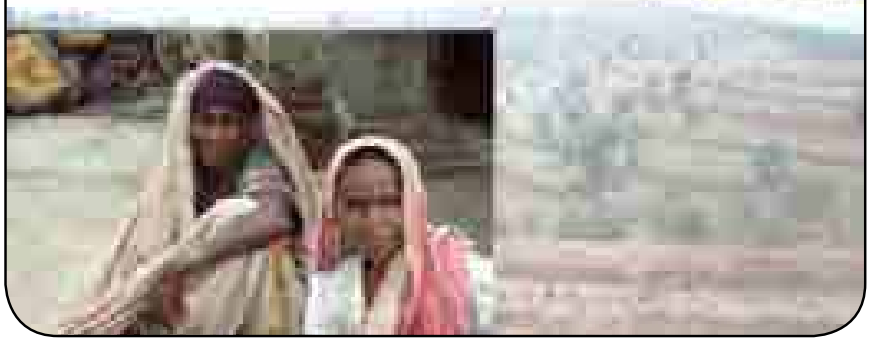


Select Gat number: map + attribute details + photograph

Select Gat number: zoom in to map for more details



Watershed Organisation Trust (WOTR)
'Paryavaran', Behind Market Yard
Ahmednagar - 414 001
Maharashtra, India



Addressing Drinking Water Needs in Watershed Development Projects

Marcella D'Souza

Addressing Drinking Water Requirements.... A Project Component

National & States policy on meeting Drinking water requirements....

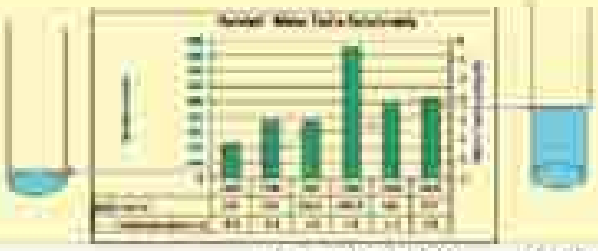
- NAWDPRA ?
- DPAP +
- IGWDP -
- DDP ?

A Study of Drinking Water Availability in Watershed Projects in Maharashtra

- 48 watershed projects
- In 8 districts in 4 regions (North Maharashtra; Vidarbha; Marathwada & Western Maharashtra)
- IGWDP & DPAP projects
- Completed watersheds

DAREWADI WATERSHED

A village of 7 hamlets scattered over a 5Km radius. A mixed village with predominantly ST population. Community well constructed in 1996 after the WSD project was initiated.
4 Water tanks constructed in 2000. Today 2 hamlets have yet to meet their drinking water needs.



Water for Drinking	Pre-project ('96) Tankers Feb-June	2005 Tanker free
No. of Wells	23	67
Well water column (from surface)	6.5m	3.5m
Land under irrigation/ Perennial	0	15.2ha
Uncovered	19/.2ha	30/2ha

Meeting the Drinking Water Requirements in WSD- What should be looked into.... :

1. Addressing the drinking water needs of a village is complex: (a) broken up into main village and hamlets (b) Main settlement generally a mixed community, hamlets usually of marginalized groups may be homogenous groups (c) distances for fetching water from the various sources vary (d) multiple sources - open tanks, streams, open wells, taps, bore wells, etc of various types (e) private and public sources (f) portability (g) seasonality of water availability

   The situation of each village varies, therefore response should be custom- made.

2. Watershed development increases the water table in the watershed villages. Study findings show that priority is given to water for agriculture.

   The end use of water uses in a WSD program should prioritize the drinking water needs, putting it as an indicator of success. While it concerns women, it should be made a village issue.

Meeting the Drinking Water Requirements in WSD- What should be looked into.... :

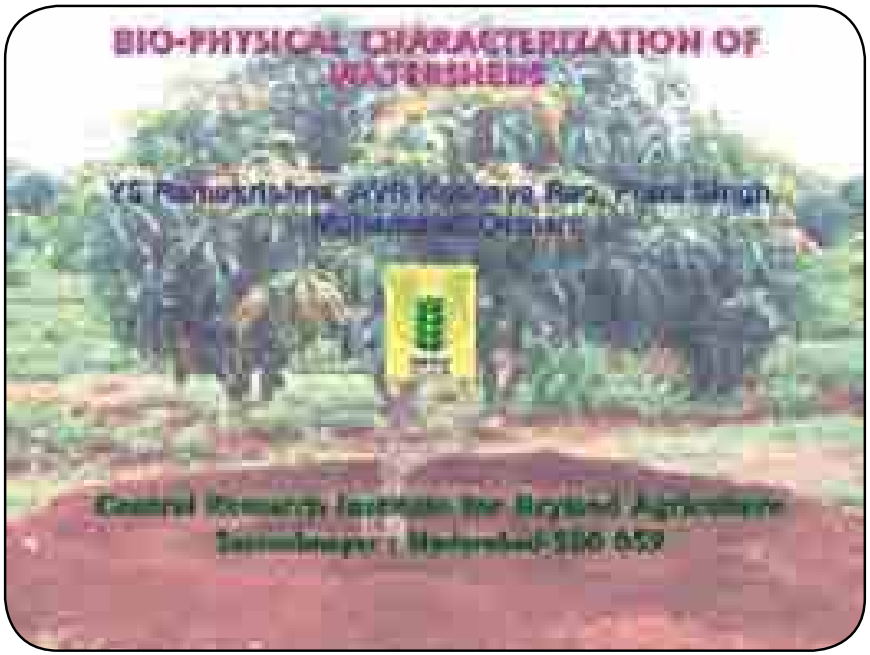
3. Drinking water sources scattered.

   Identify & construct water harvesting structures that can service all drinking water sources

4. Water resource development & processing handled by different departments having different thematic areas, priorities and approaches working different local CBOs

   Therefore when designing a WSD project the respective watershed villages/s prepare a comprehensive plan that will include meeting drinking water needs. When empowered they will approach different departments to address these

5. Often when a drinking water scheme is implemented, the powerful have the water source placed near their homes or even within, even if it doesn't benefit the others.



Definition and overall objective

- Biophysical characterization means assessment of biological and physical characteristics and resources of a watershed.
- It involves assessment, quantification, mapping, and understanding of biophysical resources of a watershed.
- Biophysical characterization is needed for watershed development and for harnessing the benefits of improved watershed management for better livelihoods of the rural people.

Specific needs for biophysical characterization of watersheds

- To assess the distribution of natural resources and their variability in a watershed.
- To assess potentials, constraints, and risks to natural resource management and production of crops, animal husbandry, and forests or other natural vegetation.
- To evaluate opportunities for natural resource development, control soil erosion and land degradation, assess vulnerability of watershed resources to management and other changes in watersheds.
- To understand farmers reasons for the existing soil, water, crop and nutrient management practices and constraints to adoption of new practices.

Contd.....

- To carry out more suitable watershed development plans and interventions to improve living standards and conditions of people.
- To serve as a baseline information to assess the progress and impacts made due to various interventions.
- To develop homogeneous management zones for precision farming.
- To serve as input to biophysical models aimed at improved management of natural resources.
- Establishment of ecological balance between man and the environment, and many more needs for human welfare.

Information needed for biophysical characterization of watersheds

- Thematic maps
- Soils data
- Long-term weather records
- Assessment of surface and groundwater availability
- Land and water management practices
- Crops and cropping systems
- Pest management

All information should be available both in the form of actual data (documents and reports) for the site as well as geo-referenced maps.

Thematic maps

- *The need:* Watershed maps including base map with watershed demarcation, distribution of fields as per survey number, topography, drainage pattern, geology, vegetation type, and land use systems. Needed for the watershed and the adjoining area/district.
- *Use:* To know the representatives of the watershed and to extrapolate the results to the larger area. Useful for understanding the hydrology of the watershed as well as the problems associated with surface runoff, soil loss, and sedimentation.
- *Source:* topo-maps, survey reports, and remote-sensing images.

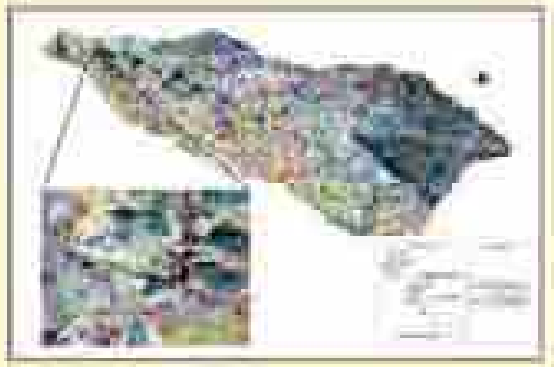
Soils data

- ***The need:*** Soils map of the watershed, their soil physical and fertility characteristics, including soil texture, soil water retention characteristics, soil depth, permeability, status of macro and micronutrients, current nutrient management practices and alternate sources of nutrients.
- ***Use:*** Needed for the management of soils of a watershed for crop and animal production and to control land degradation.
- ***Source:*** Soil survey reports, field sampling, or through remote sensing.

Assessment of surface and groundwater availability

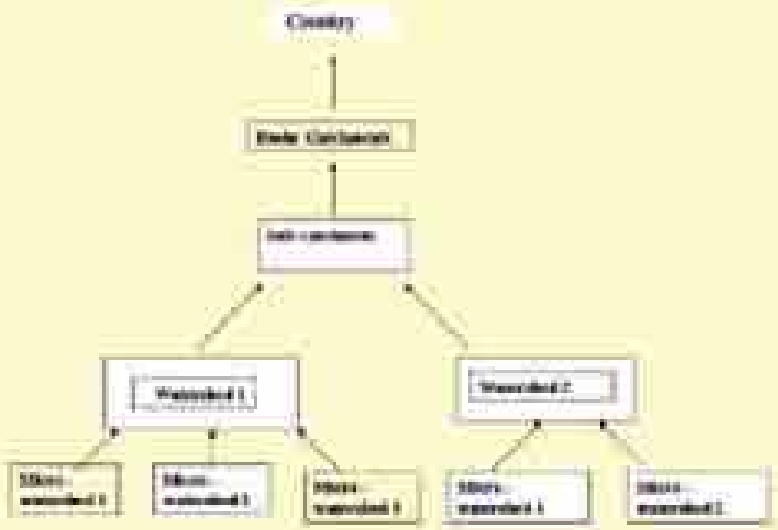
- *The need:* Number and distribution of ponds, open wells, bore wells, and other surface water bodies in the watersheds and the periods of water availability in these waterbodies. Groundwater availability in terms of depth of groundwater and its fluctuations will also be useful in planning conjunctive use of water in the watersheds.
- *Use:* Helpful for assessing irrigation potential of watersheds and for planning water harvesting and groundwater recharging.
- *Source:* Field survey reports of surface and groundwater.

Use of Remote Sensing for Prioritization & Delineation of micro watershed: Halia sub-basin of Krishna river S.S. Patly micro-watershed – Nalgonda District



Use of RS for monitoring and evaluation, NDVI

Creation of database for natural resource management on watershed basis



Long-term weather records

- **The need**: Long-term weather records (preferably for the past 30 years) for the watershed site or the nearby meteorological station. Preferably daily values of rainfall, maximum and minimum temperatures, solar radiation or bright sunshine hours will be required.
- **Use**: To assess the length of growing season and its suitability, potential for crop and animal production, occurrence of droughts and wet spells etc. and the water harvesting and management opportunities in the watershed. Climate data in conjunction with soils data will help in assessing the potential for new technologies in the watersheds.
- **Source**: Historical records of climatic data, field monitoring, remote sensing maps, etc.

Agro-climatic characterization - Concepts

Classification of rainfed agro-ecosystem based on moisture availability indices

Climate zone	Mean annual rainfall (mm)	Moisture index (%)
Arid	< 500	-66.7 to 80.0
Semiarid (dry)	501 - 700	-50.6 to -66.6
Semiarid (moist)	701 - 1000	-33.3 to -50.5
Sub-humid (dry)	1001 - 1300	0.0 to -33.3

Length of Growing Period - Criteria

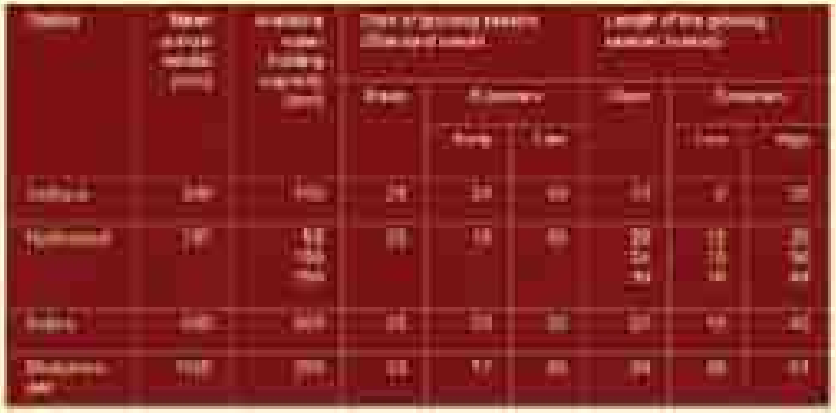
Index of Moisture Adequacy (IMA)	Type of water availability
0.00-0.24	Dry
0.25-0.49	Semi-dry
0.50-0.74	Sub-moist
0.75-0.99	Moist
1.00	Humid

Length of Growing Period

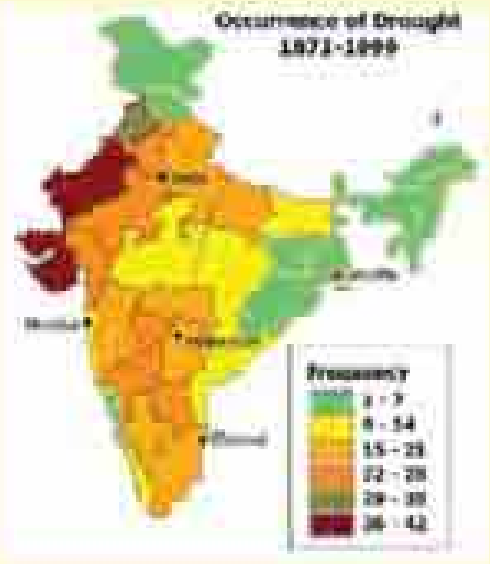
Length of Growing Period – choice of cropping system

Length of Growing Period	Cropping system
< 75 days	Grasses, shrubs, silviculture Monocropping of short duration pulses
75 – 140 days	Monocropping
140 - 180 days	Intercropping
180 - 240 days	Double cropping
> 240 days	Multiple cropping

Length of growing season - Characteristics



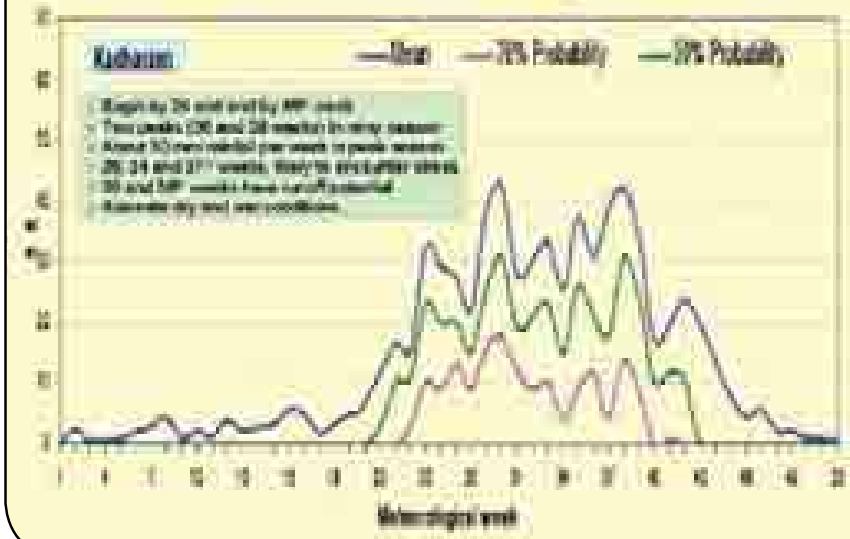
Frequency of droughts in India



Percentage occurrence of Droughts in different Watershed areas

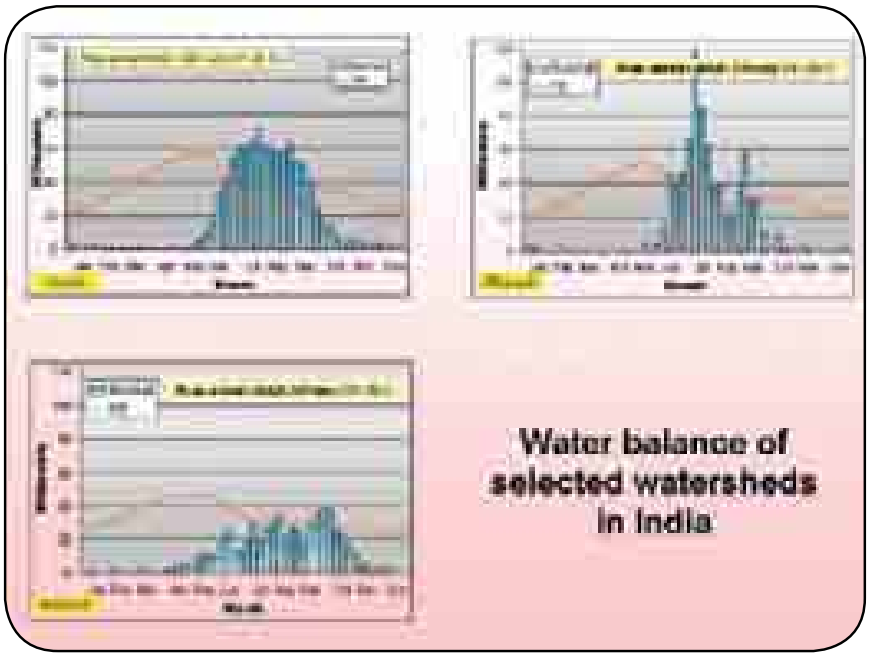
District	Watershed	Mild	Moderate	Severe
Nalgonda	Kacharam	50	8	0
	Thirumalapuram	68	16	0
	Nemmikal	31	0	0
Kurnool	Karivemula	63	23	0
	Devarakonda	63	23	0
	Ramadevaram	84	15	1
Mahabubnagar	Mallebompally	29	0	0
	Appayapally	29	0	0
	Sripuram	57	0	0
	Mentapally	37	14	0

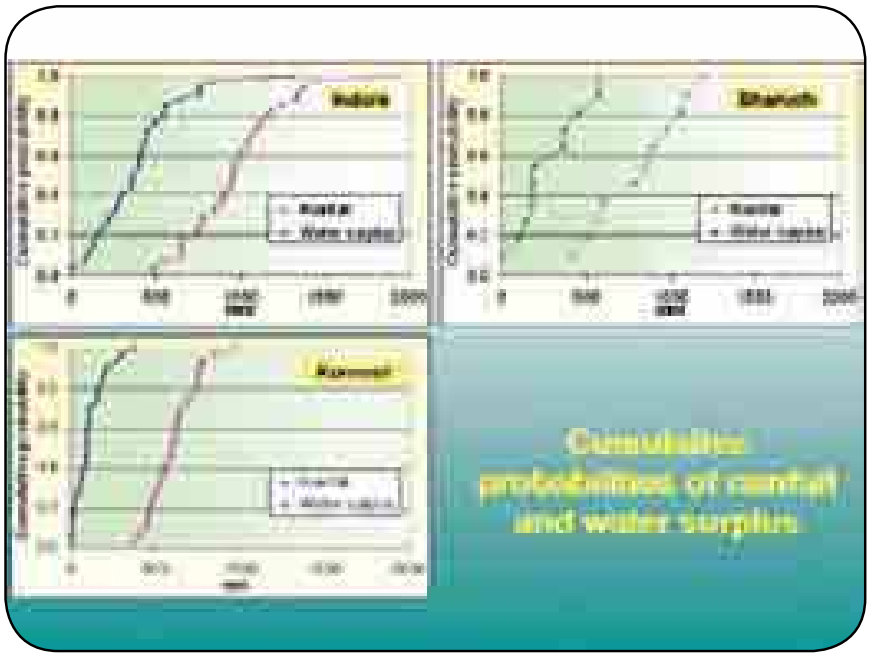
Rainfall characteristics – Nalgonda district




Variability in Length of Growing Season at Kacharam


Variation of LGP across nucleus watersheds
Dharwad
Huballi
19 Jun
05 Dec
180
Haveri
Haveri
10 Jun
05 Dec
180
Ranebennur
25 Jun
30 Nov
160
Chitradurga
Chitradurga
05 Jul
30 Nov
145
Hiriyur
20 Jul
30 Nov
130
Kolar
Kolar
10 Jul
15 Dec
155
Gudibanda
01 Jul
20 Dec
170
Siddaghatta
10 Jul
20 Dec
155
Tumkur
Tumkur
01 Jul
15 Dec
165
Pavagada
20 Aug
25 Nov


Water balance of selected watersheds in India


Cumulative probabilities of rainfall and water surplus

Better prediction of rainfall at smaller spatial scale would be useful

- To identify potential drought areas
- To intensify the production programme in the areas with positive rainfall deviations through better resource management so as to compensate crop loss from potential drought areas
- To provide improved agro-advisories with lead time to farmers for better decision making

Performance Indicators

- Soil: Soil loss, organic carbon,etc.
- Water: Utilization of runoff, rise in water table
- Crop: Production, productivity, cropping intensity, land use changes
- Vegetation: Biomass production, survival of tree species, fodder and feed availability.

Conclusion

- Analysis of long-term agro-climatic data at micro-regional level and integrating with crop water needs
- Detailed analysis using water balance techniques
- Critical analysis of drought frequency and intensity using various drought indices including remote sensing techniques

Integration of agro-climatic information with the components of farming system including :

soil management

cropping systems

alternate land use systems

livestock management along with management of rainwater will lead to mitigation of droughts on a watershed basis

Knowledge-based Entry Point and Other Novel Options for Rapport Building

Entry Point Activity

- To build a rapport between PIA and the villagers
- The entry point intervention/activity is identified through PRA
- Common money driven activities
- Prone for Skewed decision due to existing power structure

Entry Point Activities

- Providing drinking water and sanitation to the community
- Conducting health awareness camps
- Construction of community halls
- Chemical control of ipomea
- Repairing of roads
- Promotion of kitchen gardens etc.
- Construction of bundh (embankment)
- Construction of small culverts
- Supply of school furniture

Adoption of Top Down Target Driven Approach

- Subsidy approach to enlist stakeholder involvement
- Turned out to be contractual and stakeholders never took active interest
- Sacrificed the sustainability

Identification of Entry Point Activity (EPA)

- Knowledge-based and not to involve direct cash resource
- Maximum possibility of success (>80-90%)
- Tangible benefits individuals
- Participatory research and development (PR&D)
- Result in measurable tangible economic benefits
- It should be simple for farmers to undertake
- Should be applicable for majority of the farmers
- Should have a reliable and cost-effective approach

Constraint Identification through Participatory Rural Appraisal (PRA)

Improved Crop Varieties as an EPA

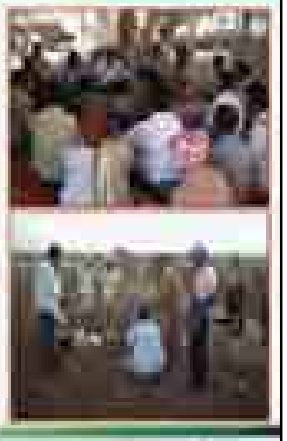
Empowering the Community

Representative soil sampling of a microwatershed

- Representative, simple and cost effective method
- Farmer meeting to identify different fertility/soil quality groups
- Farmers were trained in collecting representative soil samples

Soil Sample Analysis and Discussions of Results with Farmers

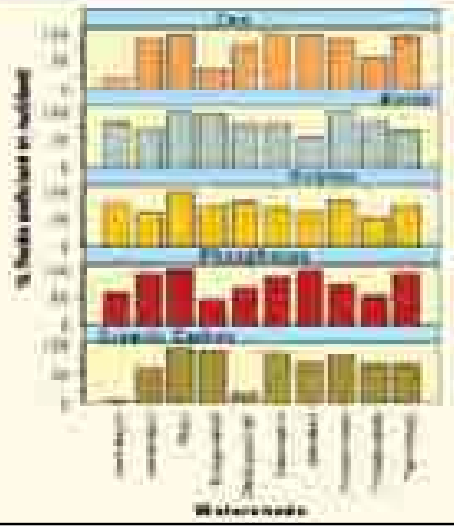
- Nutrient budget approach
- The critical limits for each nutrient
- Emphasize samples collected were representative randomly selected and no significant for a particular farm
- Gram Sabha for discussing soil analysis EPA results
- Lead farmers get hands on experience of explaining the details
- Voluntary farmers to evaluate the responses in their fields



Knowledge based entry point enhanced participation

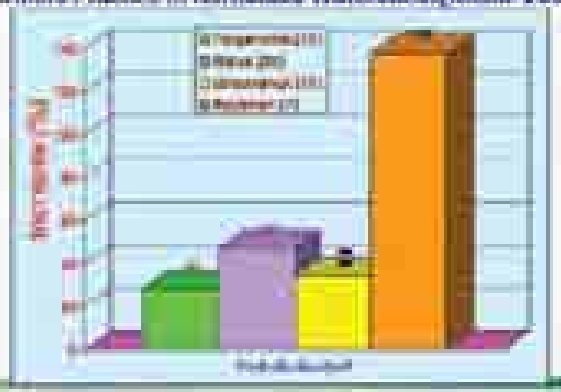
- Soil analysis a valuable tool to enhance farmers knowledge

Deficiencies



Field PR&D Trials

Percent Increase in yields Different Crops due to Balanced Fertilization over Farmers Practice in Karnataka Watersheds(Kharif-2008)



Economic Benefits

Crop	Additional benefit due to increased yield due to balanced fertilization (Rs ha^{-1})
Fingermillet	6300
Sunflower	21000
Maize	16000
Groundnut	15200
Soybean	14410

Up-scaling Strategy from Nucleus to Satellite Watershed

- Four satellite watersheds selected during the second year
- Farmers from the satellite watersheds were sensitized by using the knowledge-based EPA
- Gram Sabhas were conducted in one of the selected satellite watershed villages
- For Gram Sabha villagers from all the four satellite watersheds were invited
- Project staff did hand holding for the lead farmers to serve as trainers
- Lead farmers from nucleus watersheds served as trainers

Best bet options of land and water management for rainfed regions

Prabhakar Pathak[1], P K Mishra[2], M V Padmanabhan[3] and T K Bhatt[4]

Major NRM issues of rainfed agriculture

Introduction:

- Water Scarcity
- Land Degradation
- Low productivity and unsustainability

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

- Need for improved land and water management for increasing the productivity and reducing risk of crop failures

Approach adopted

- Both field-based and community based land and water management practices are covered
- Promising land and water management practices identified for each region based on following parameters:
  - Rainfall (<500 mm, 500-750 mm, 750-1000 mm, >1000 mm)
  - Soil type (Alfisols, Vertisols, Vertic inceptisols,...)
  - Topography (plain area, mountainous regions)
  - Main issues in each agro eco regions

Broadbed and furrow system

Background

Dr Hasli with the problem of waterlogging and water scarcity occurring during the same cropping season are quite common. There is a need for an in situ soil and water conservation and proper drainage technology in deep black soils that can protect the soil from erosion through out the season and provide control at the place where the rain falls. A raised bed configuration "Broadbed and furrow" (BBF) system has been found to satisfactorily resolve these goals (Fig. 1)

Recommended agro-eco region:

Soil : Medium to deep black soils (Vertisols)
Rainfall : 700 - 1300 mm
Slope : Maximum up to 9%

Fig 1. Broadbed and furrow system at [illegible]

Broadbed and furrow system

Description:

(contd...)

Broadbed and furrow system

(...Contd)

Description:

Table 1. Mean crop yields in improved and traditional system in Vertisols watersheds, ICRISAT Patancheru (1976-2006)

Crop	Mean crop yield (t ha^{-1})
BBF system with improved practice (Double cropping)	
Maize or sorghum	2.9
Chickpea or pigeonpea	1.3
Total yield	4.2
Traditional flat system (Single cropping in post-rainy season)	
Sorghum or Chickpea	1.1
Total yield	1.1

Broadbed and furrow system

Benefits:

Rainfall based prioritized in-situ soil and water conservation measures

Rainfall based prioritized in-situ soil and water conservation measures

Contour cultivation with conservation furrow system

Background:

Recommended agro-eco region:

Contour cultivation with conservation furrow system

Description:

Table 2.Mean crop yields in improved land and water management system at Sujala watersheds, Karnataka, 2005-2006

Crop	Mean crop yield (t ha^{-1})		Increase in yield over farmers practice (%)
	Farmers practice	Contour cultivation with conservation furrows	
Groundnut	1.18	1.49	26
Finger millet	2.22	2.56	15
Maize	3.45	4.22	22
Sunflower	1.25	1.81	44

Contour cultivation with conservation furrow system

Benefits

- Increased in-situ moisture conservation
- Reduces runoff and soil loss
- Simple and very low cost
- Crop in ridge can be harvested using traditional implements
- Increased crop yields
- Further runoff from small inter-spacing down the slope is intercepted by furrows, the velocity is slowed down and runoff water is collected in these furrows. Thus it improves the moisture regime in the soil profile.

Field bunds with N-rich *Gliricidia* plants

Background

Most commonly field bunds are constructed along the field boundaries or property boundary without any consideration of erosion, particularly in small land holding farms. These are known as peripheral bunds. They serve as fences and in addition, provide protection from water and wind erosion in low rainfall areas. Growing *Gliricidia* plants on field bunds serves dual purpose of producing organic matter under field conditions and also helps in conserving soil through reduced soil erosion (Fig.1).

Fig.1. *Gliricidia* plants on bunds and area of a watershed with *Gliricidia* on bunds (inset)

Recommended agro-eco regions

Soil : Alfisols, Vertisols and associated soils
Rainfall : 500 - 1,000 mm
Slope : 1 - 3%

Field bunds with N-rich *Gliricidia* plants

Description

When planting N-rich *Gliricidia* strengthens farm bunds. In the very intense storage can be planted under humid conditions as large as 10-15 cm deep holes or 3-4 month old seedlings can be planted on bunds at a spacing of 0.5 m apart. One year after planting these plants are pruned to 0.75 m height. *Gliricidia* plants can be well managed through pruning at appropriate times before sowing of rainy and post-rainy season crops. The pruned green biomass (leaves and tender stems) are cut into small pieces and applied to the soil surface as mulch or incorporated into soil as green manure to improve the soil quality. *Gliricidia* fast growth, N-rich leaves, tolerance to pruning, ability to coppice vigorously, and good fodder value. It can be grown as rainfed plants even at places which receives only 500 mm rainfall annually.

Field bunds with N-rich *Gliricidia* plants

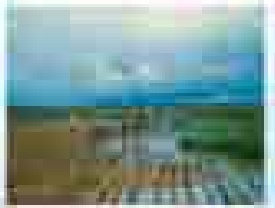
Benefits

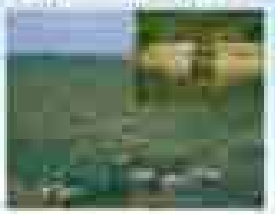
- The *Gliricidia* plants grown on bunds not only strengthen the bunds while preventing erosion, also provide N-rich green biomass, fodder and fuel.
- Plants can survive various soil and climatic conditions.
- Simple to propagate/establish.
- The cross section of earthen bund can also be reduced.
- A study at ICRISAT reveals that by adding the green biomass from the *Gliricidia* plants planted on bunds on a spacing of 0.5 m apart for a length of 700-800 m will provide about 17-20 kg N per ha, and also improves physical properties of soil over a period of time.

Modified contour bund system

Background

Well-designed and maintained conventional contour bunds on Alfisols satisfactorily conserve soil and for this purpose contour bunds are perhaps efficient. However it appears that the perceived disadvantages – mainly water stagnation and the slowness of crop drainage (particularly during the rainy season) (Fig. 4) causing reductions in crop yield – outweigh any advantage from the viewpoint of soil conservation. Water stagnation in conventional contour bunds increases as the years in more than normal rainfall are registered around the world. The contour bunds with gentle slopes have further potential because of the factors control on parallel runoff losses (Fig.5).





Modified contour bund system

Recommended agro-eco region:

Soil : Alfisols

Rainfall : 600-900 mm

Slopes : 2-8%

Description:

Modified contour bunding involves of non-eroding embankments on contours with guard cutlets at the lower end of the field. The guard cutlet allows the runoff to be stored in the field for a limited period, and then released at a predetermined rate through the cutlet(s), thus reducing the time of water stagnation behind the bund, which will have an adverse effect on crop growth and yield and also facilitates the inter tillage/weeding operations will be optimum capacity. The patch-cutlet contour bunds are suitable in semi-arid Alfisols having an average annual rainfall of 600-800 mm and general slopes of 2-8%. The advantage in terms yield increase is shown in Table 3.

Table 3. Grain yield from conventional contour bund and modified contour bund system at ICRISAT Centre (1981 – 1985)

Bunding system	Crop	Grain yield (t ha^{-1})
Conventional contour bund	Sorghum/ Pigeonpea	2.52 0.73
Modified contour bund	Sorghum/ Pigeonpea	3.02 0.97

Modified contour bund system

Benefits:

- The problem of prolonged water stagnation around the contour bund is reduced in the gated outlet control bund system. This results in better crop growth and higher yields particularly in the arid and humid.
- The chances of bund breaching are lower in this system, while in conventional control bunds the occasional breaching of bunds is common during periods of prolonged water ponding (or more or 48-72 hrs of continuous water ponding).
- The pest &disease rates are generally lower in the gated outlet control bunds when compared with conventional contour bunds.
- Relatively more timely tillage and other cultural operations are possible in the gated-outlet control bund system because of better control on ponded runoff water, where as in conventional control bund system timely operations are not possible because of the prolonged water ponding situation.
- Gated-outlet control bund system involves low cost and simple to adopt.

Best bet options for other agro eco regions and mountainous regions

FARMING SYSTEMS IN WATERSHED

BK Kakade

1. Background

- Agriculture contributes about 1/4th to the gross domestic product and provides livelihood support to about 2/3rd of India's population
- Loss of vegetal cover, followed by soil degradation through erosion, has resulted in lands lacking in water as well as nutrients. In India out of a total geographical area of 329 million hectares, 57% of the area is suffering from soil degradation as a result of over-population, harsh climate condition, over exploitation, improper use of soil resources, deforestation etc.

2. Farming System Concept and Scope

The overall objective is to evolve technically feasible and economically viable farming system models by integrating cropping with allied enterprises for irrigated, rainfed, hilly and coastal areas with a view to generate income and employment from the farm.

The specific objectives -

- To identify existing farming systems in specific areas and assess their relative viability
- To formulate the farming system model involving main and allied enterprises for different farming situations
- To ensure optimal utilization and conservation of available resources and effective recycling of farm residues within the system and
- To maintain sustainable production system without damaging resources / environment.

3. Farming Systems in Watershed Development

3.1 Watershed Development Strategy

- Livelihood Support System
- Addressing Equity Issues
- Sustainability

3. Farming Systems in Watershed Development

3.2 Approach

3.2.1 Micro planning

3.2.2 Implementation

- Tree Based Farming
- Livestock Development
- Fisheries
- Other Skilled Activities
- Processing and Marketing

Tree Based Farming

Fundamental Concept

- Addressing the "under-employment"
- Checking the migration
- Use of available local resources
- Creating visible asset "owned" by family
- Best use of traditional skills of family

planning

managing

Key Interventions

LIVESTOCK DEVELOPMENT

Approach

Programme Outcomes

BENEFITS OF CROSSBRED COWS

- Milk yield : 2200 - 2700 kg / lactation
- Herd Building / Conservation of Ecosystem
- Increased Dung Collection, Efficient Recycling of Nutrients
- Use of Bullocks : early maturity,
  low calorific fuel, fodder
- Preference of Women for Dairy Husbandry
- Scope for participation of landless
- Families with 2 crossbreds earn

Rs 15000-18000 / yr.

COMMUNITY PASTURE MANAGEMENT

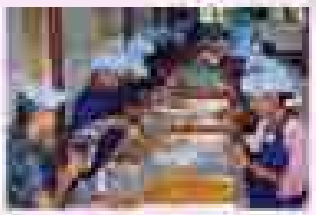
Problems

- Dealings with the Community
  - No one is responsible
- Administrative Control by Govt. Functions
  - No resources to develop and protect
  - Lack of appropriate technologies
  - Inadequate powers
- Lack of People's Participation
  - No mechanism to coordinate the work
  - No system for equitable sharing of benefits
  - No responsibility with ownership

Opportunities

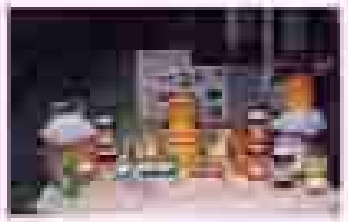
- Investment on dry land / low yielding grass lands. Rs 5,000 / ac
- Fodder / forestry
- Soil and water conservation
- Improved Environment
- Community ownership

POST PRODUCTION SERVICES



Packaging of mango pickles

Local youth trained in cashew processing



Products of a Tribal Cooperative

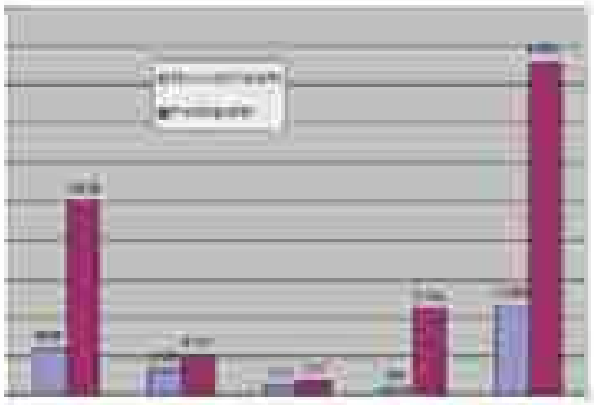
Cashew shell and nut

4. Overall Impact

- Social
- Economic
- Ecological

Household Income in Rs

(Gokulpura watershed, Rajasthan)



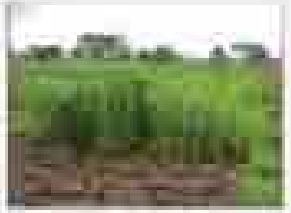
Annual Income (INR) Generated Through Wadi (Agri-horti-forestry) Programme at Various Stages

	Source of Income	Age of Orchard	
		5-7 Years	10-15 Years
I	Income from Gira Wadi activities		
	a Fruit Trees (Custard apple and Mango)	2,700	13,500
	b Intercrops in Orchards	5,000	8,000
	c Forestry	-	4,400
	d Livestock	-	7,200
	Sub-Total I	7,700	33,100
II	a Other Enterprises (Fruit nursery, Forest nursery, Vermicompost, etc.)	1,400	12,000
	Sub-Total II	1,400	12,000

Integrated Nutrient Management Options

Introduction

- Food security
- Fodder security
- Energy security
- Power security

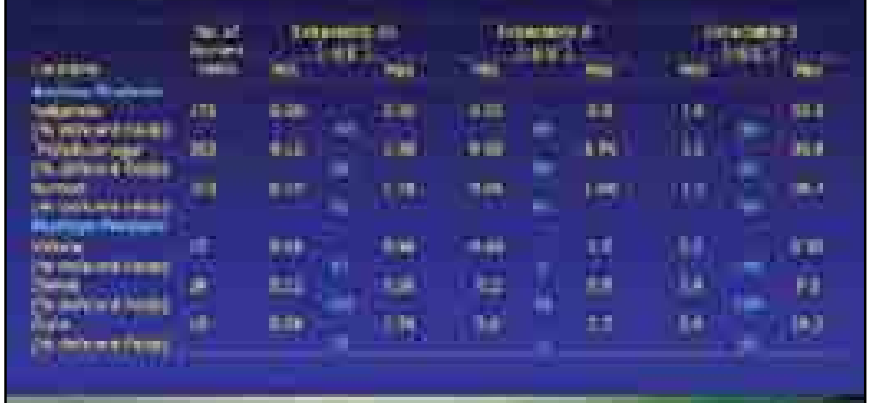


Constraint Identification

- PRA and RRA
- FGDs to prioritize constraints
- Verification using suitable diagnostic tools

Fertility-Related Constraints

Diagnosis of soil fertility problems for enhancing crop production



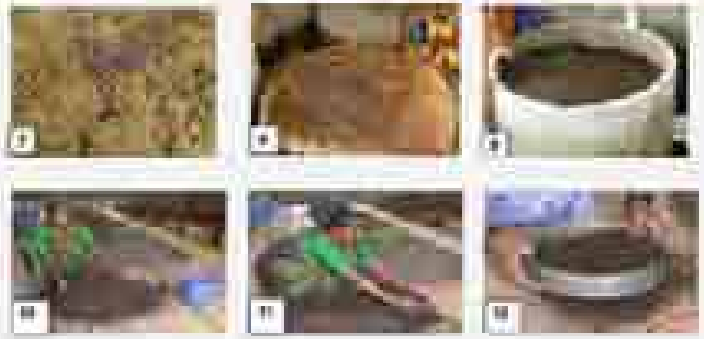
Strategy for Productivity Enhancement and Fertility Maintenance

INM Strategy

- Strategies to manage soil organic matter
  - Vermicompost
  - Composting
  - In-situ generation of green matter
- Organic inputs for nutrient management
  - Agricultural residues
  - Sericultural residues
  - Animal manures
  - Dairy and poultry wastes
  - Food industry wastes
  - Municipal solid wastes
  - Biogas-sludges from sugarcane factories

Vermicompost Preparation

Vermicompost Preparation



Precautions

- Use only plant materials such as vegetable peelings, leaves, or grass.
- Remove glass, metal, and plastic materials from the organic material
- Protect against birds by covering mesh on the rings
- Sprinkle the water intermittently and maintain adequate moisture
- Prepare compost under shade to protect from sun and rain.

In-Situ generation of Organic Matter

Gliricidia maculata grown on border of multiple field under rainfed situation in India

Biological Inputs for Nutrient Management: BNF

- Beneficial microorganisms
- Nitorgen fixing microorganisms
- PO_4 – solubilizing microorganisms
- *Mycorrhizae*
- Plant growth promoting *rhizobacteria* (PGPR)

Biological Inputs for Nutrient Management: BNF

Management Practices to improve plant growth and BNF in soil

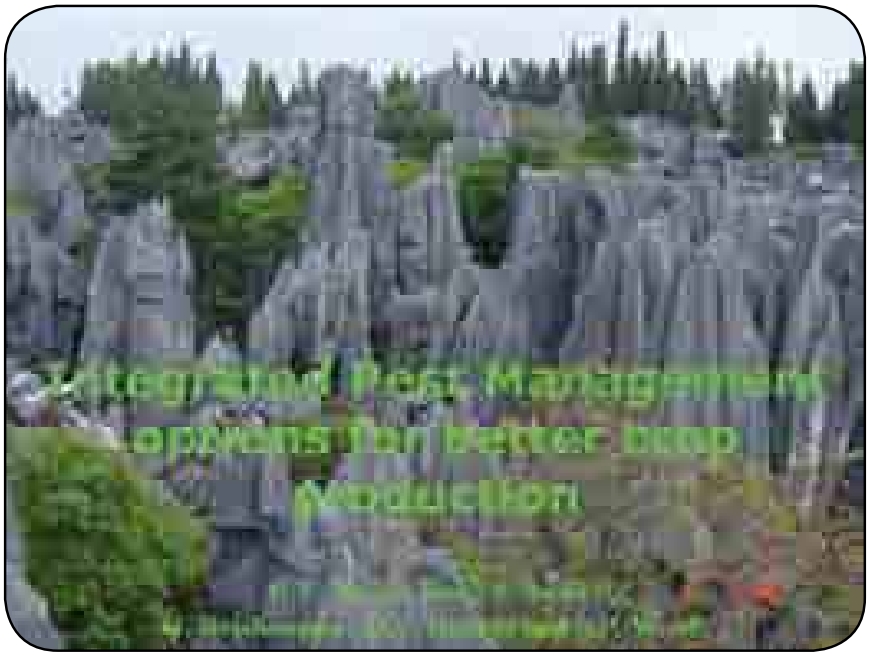
- Use high nitrogen-fixing crops/varieties
- Practice mixed and intercropping (row and strip) with legumes
- Use appropriate tillage practices, landform treatments and nutrient amendments
- Inoculation with efficient inoculants

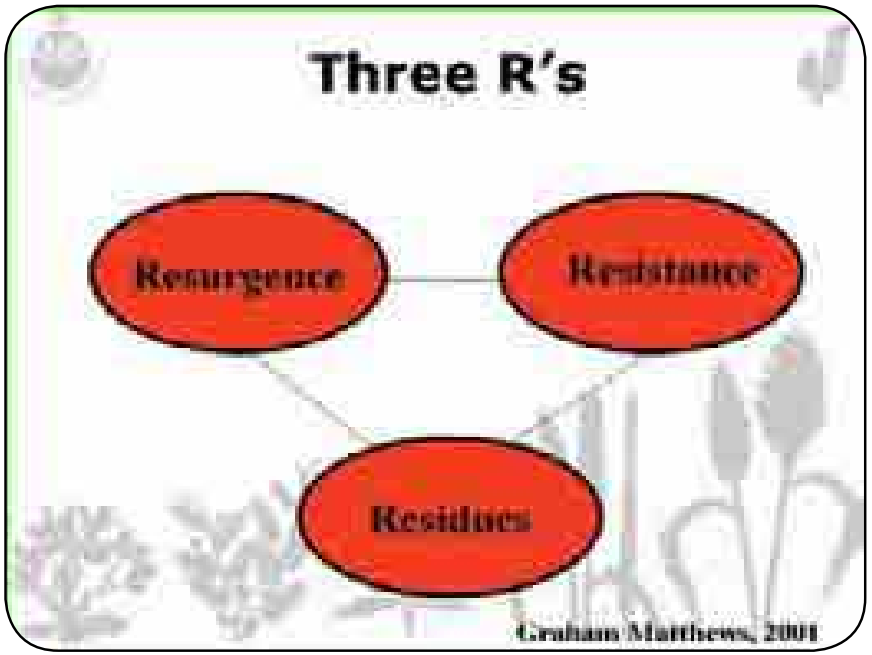
Mineral Fertilizers

- Use appropriate mineral fertilizers based on soil analysis as INM component
- Form or type – as recommended for the crop
- Method – furrow placement and covering with soil instead of broadcasting
- Time – split N doses instead of one application
- Quantity – just sufficient to meet plant demand without adversely affecting biological nitrogen fixation

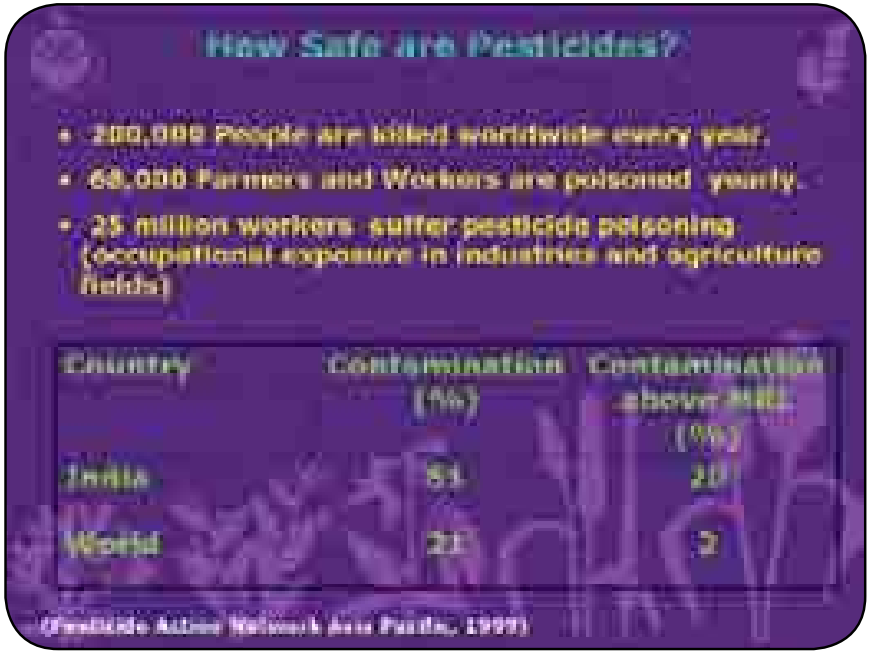

Recommendations for Practitioners
Undertake detailed soil analysis to identify soil fertility constraints limiting crop production
Develop suitable nutrient management recommendations from soil analysis results and share knowledge with the farmers and stress the need for adopting INM strategy to maintain fertility and productivity
Use participatory research and development (PR&D) approach
Optimize and harness full potential of available biological and organic sources and use chemical fertilizers only to supplement the gap in the nutrient requirements of the production system
Adopt holistic rather than compartmental approach for sustainable development


Policy and Financial Incentives
Enabling policies and incentive mechanisms for greater adoption of INM practices.
Timely availability of quality products and knowledge on quality products and sustainable INM practices to the farmers, by establishing appropriate institutions.
Enabling policies and mechanisms to produce, distribute and use various sources of different plant nutrients.



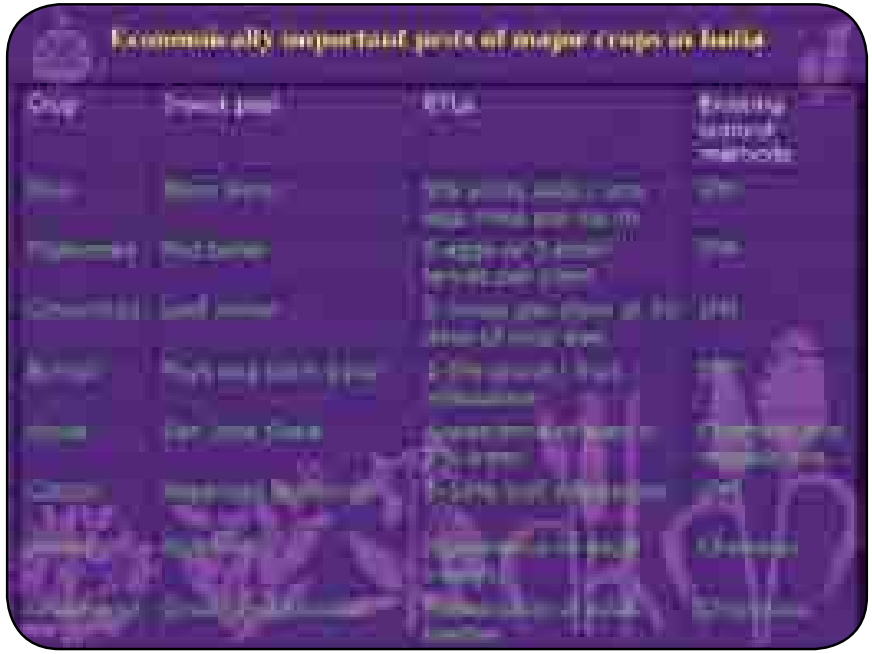


Excessive use of pesticides on persimmon fruit




Consumption of insecticides per unit area in some Asian countries
Country
Consumption
Taiwan
17.0
Japan
12.0
(Business Standard, 12 Jan. 2005)

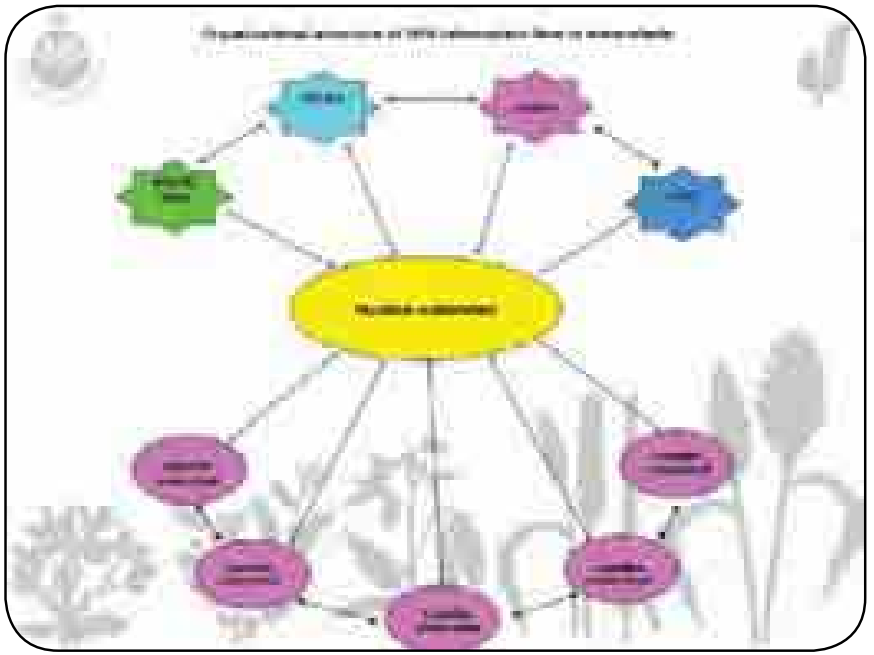

Existing and potential yields of some important crops


Economically important pests of major crops in India


Economically important diseases of major crops in India

Economic thresholds in groundnut crop

Pest	Intervention
Spodoptera/ *Helicoverpa*	20-25 % defoliation up to 40 days after emergence (DAE)
Leaf miner	5 mines/ plant at 30 DAE 10 mines/ plant at 45 DAE 15 mines/ plant at 60 DAE
Thrips	5/ thrips/ terminal
Jassids	5-10 jassids/ plant up to 30 DAE



IPM options adopted in watershed

- Training farmers in the diagnosis and management of pests
- Periodic monitoring of pests (insect through farmers interactions for determining the economic importance of various pests)
- Incorporation of economically suitable resistant varieties into the system
- Building knowledge on the role of natural predators
- Enhancing the role of natural enemies through augmentation
- Encouraging the production and adoption of biopesticides at village level
- Seed based application of chemical pesticides
- Adoption of bio-safer and protective clothing while using chemicals
- Networking farmers using watersheds for sharing information among and between farmers

Farmer collecting *spodoptera* larvae from trap crop

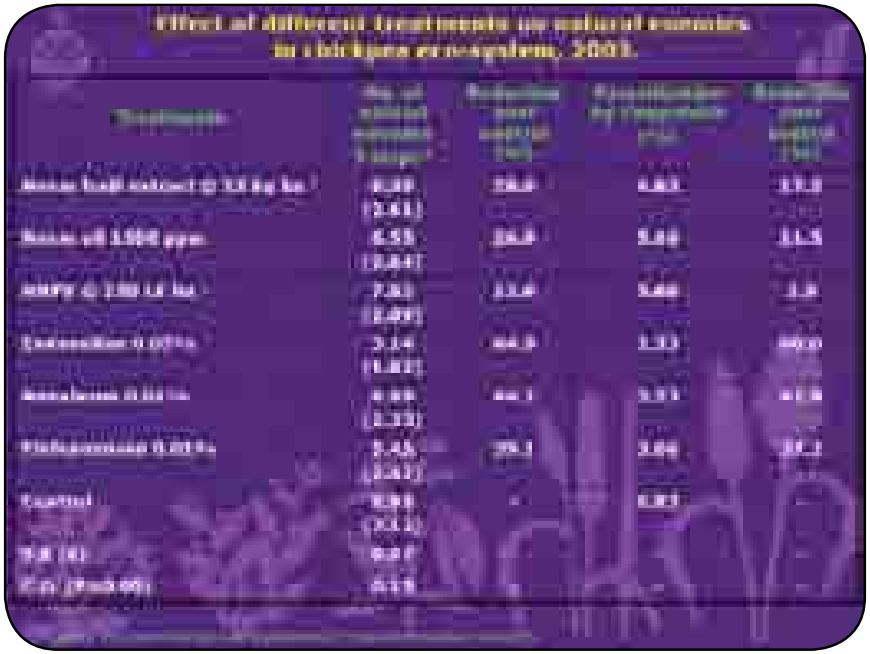
Neem twig with flowers and fruits

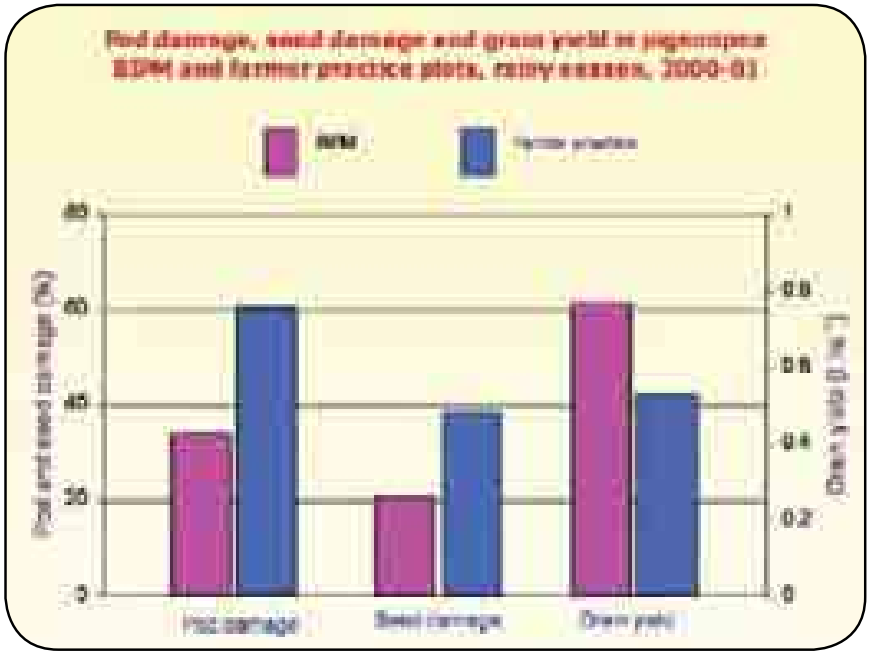
Helicoverpa larva infected with NPV

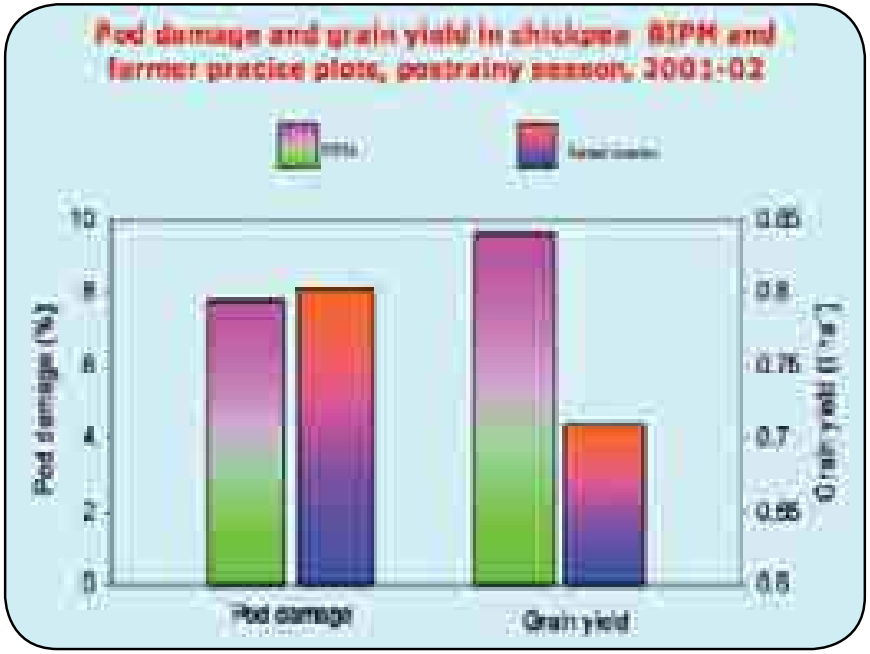
Red hairy caterpillar larva infected with NPV

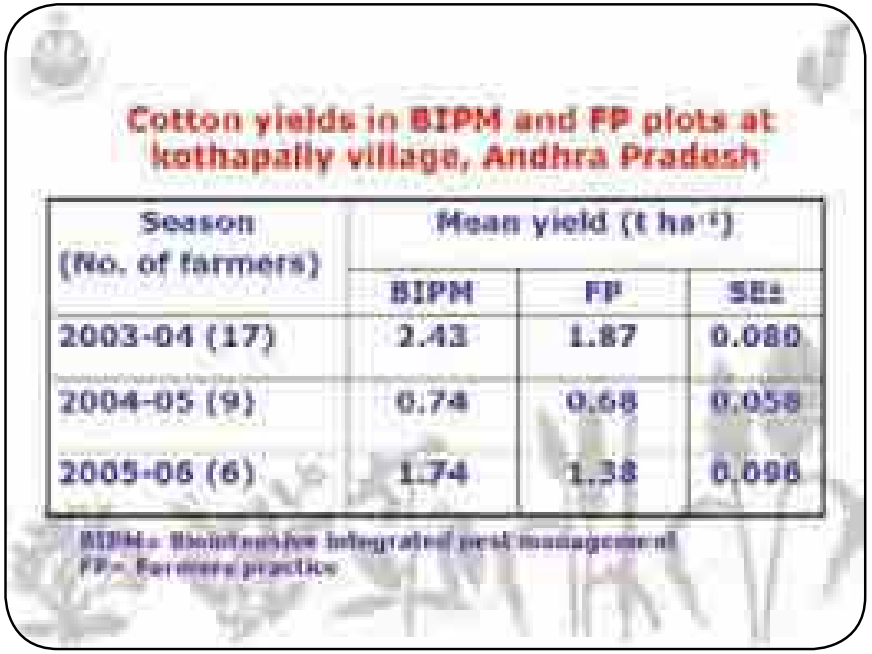
Red hairy caterpillars in an enclosure for virus production

Spraying of insecticide with bullock cart









Cotton yields in BIPM and FP plots at kothapally village, Andhra Pradesh

Season (No. of farmers)	Mean yield (t ha⁻¹)		
	BIPM	FP	SEm
2003-04 (17)	2.43	1.87	0.080
2004-05 (9)	0.74	0.68	0.058
2005-06 (6)	1.74	1.38	0.096

BIPM= Biointensive integrated pest management
FP= Farmers practice

Village	Cost reduction in IPM over farmer's practice (%)
Hamsanpalli, A.P.	21.5
Bollibaithanda, A.P.	36.1
Chincholi, A.P.	46.9
Kanjar, A.P.	55.8
Itagi, Karnataka	41.6

All the farmers in the village implemented IPM (Setaria Mosaic, ICMV) and used broad chemical sprays. Farmer's practice: Chemical sprays (8-9 times) on calendar basis

Training of researchers and farmers at ICRISAT in IPM and NPV production, 2002-06

Year	Researchers	Farmers
2002	238	28
2003	9	141
2004	100	197
2005	39	47
2006	140	870
Total	526	1283

Way forward

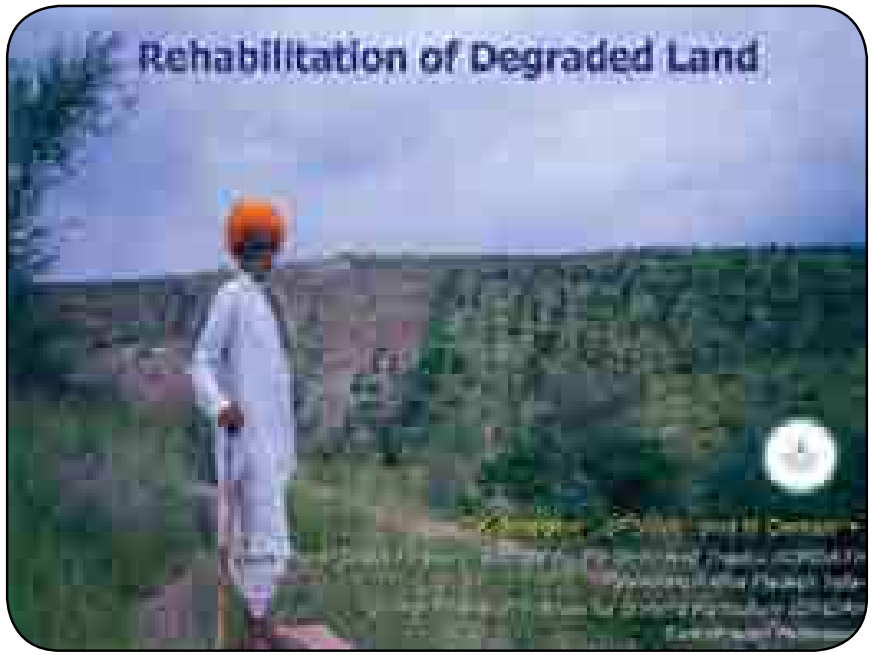
- Based on the availability of natural resources plant protection in Vertisols and Rewatbased systems need to be developed concurrently to avoid pest buildup in the whole system.
- Data on host residues or weed, host and water bodies is of high priority.
- Develop capacity at farm level to impart better knowledge in soil, water, nutrient and pest management in an integrated approach.
- Intensive monitoring of crops at their vulnerable growth by effective means such as pheromone and weather based advisory system.
- Farmers' participatory approach to update the technology dissemination to different groups/the system.

Cont...

Way forward

- Crop varieties with resistance to biotic stresses need to be identified and made available to farmers through farmers networks.
- Effective agronomic practices for augmenting natural enemies should be of high priority.
- Use of bio-pesticides and indigenous technologies as an alternative to toxic chemicals need to be encouraged.
- Farmers participatory approach to update the technology dissemination to different groups/the system.

Healthy pigeonpea crop



Background

- Wastelands – source of livelihood for vulnerable groups
- Fodder and fuel needs
- Cause of environmental degradation

Importance of Rehabilitation of Wastelands

- Fodder security
- Fuel security
- Minimize environment degradation
- Improved livelihoods

Land Degradation in India

Degradation type	Area (M ha)	Percentage of total area
Soil erosion by runoff	148.9	45.3
Sheet erosion	82.4	
Rill erosion	15.6	
Gully erosion	9.7	
Wind erosion	13.8	4.1
Loss of top soil	6.2	
Desert deformation	4.6	
Dust storms	2.9	
Chemical deterioration	15.8	4.9
Loss of nutrients	3.7	
Salinization	10.1	
Physical deterioration	13.8	3.9
Waterlogging	11.9	
Total	187.9	57.1


Participatory Approach to Rehabilitate Common Property Resources (CPRs) with Perennial Plantation
Consortium approach
(Govt. line departments, NGOs, CBOs, ICRISAT)
Collective Action


Incorporating multicuttable fodder grasses in low quality grazing lands


The Process
Engage the community to discuss about what could be done
Village stakeholder community
Village contribution (labor) and rules like social fencing and thrift saving
Soil and rainwater conservation structures
Plant useful grasses and saplings all over the area


Impact
Rehabilitated CPR at Devjika Thana, Bundi in Rajasthan, India: The PBA team with a blue bull calf found in the same area


Community-based Initiatives Rehabilitated Degraded Lands and Conserved Biodiversity
Collective action and convergence developed CPR in Rajasthan
All villagers are getting grass free of cost
Rs. 75000 per annum from surplus of grass to surrounding villages
Enhanced below- and above-ground biodiversity

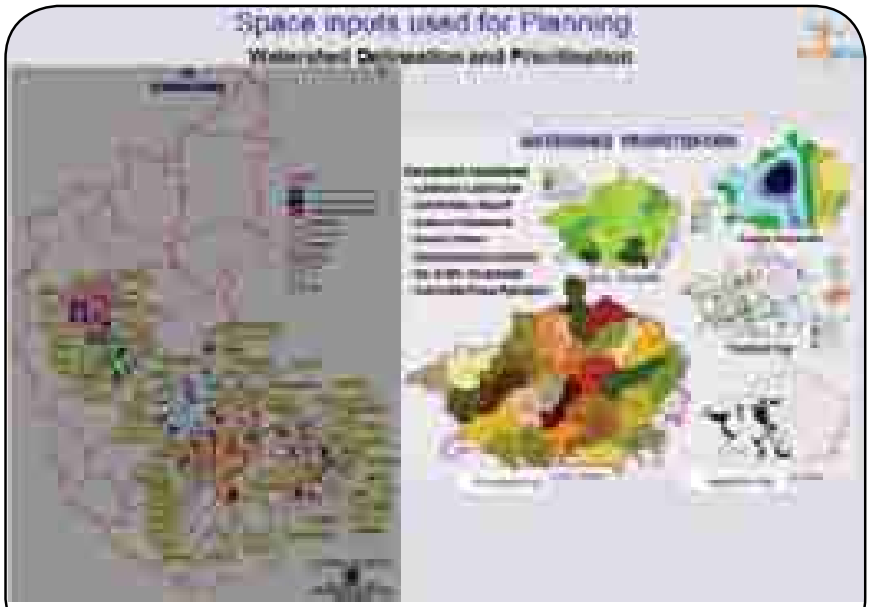

Employment generation
Nursery raising
Carbon trading
Improved livestock


Participatory approach to rehabilitate Common Property Resources with Biological Fencing

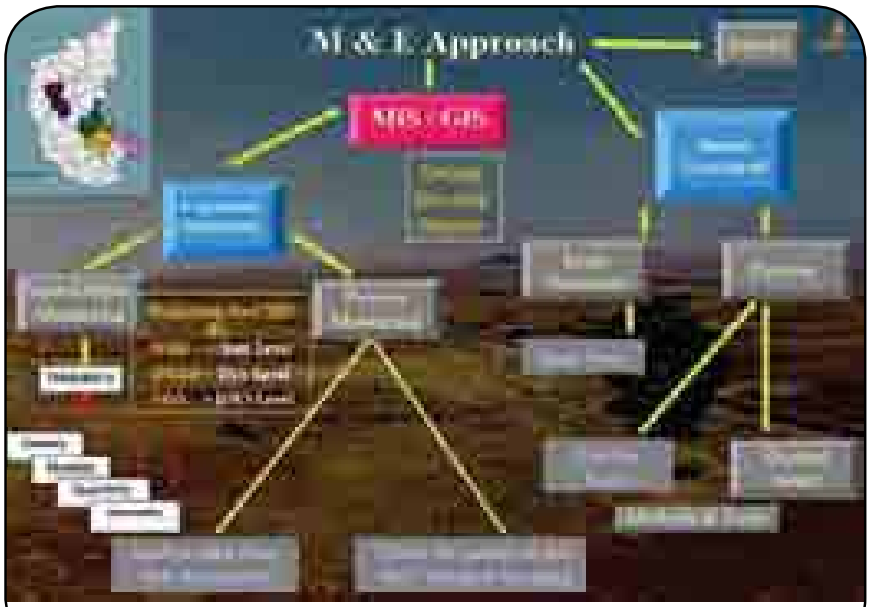

Rehabilitate waste lands with stress tolerant trees to enhance vegetative cover and decelerate land degradation
Use high-yield seed source (> 30% oil content)
Take appropriate soil nutrient amendments
Adopt Collective Action and involve communities
Additional Investments on CPR are the need of the day


Policy and Financial Incentives
Policy support to maintain and develop CPRs is needed
Enabling policies to empower landless and vulnerable groups for collective action are needed to be put in place
Policies supporting access and harvesting rights only for the landless and vulnerable groups are needed

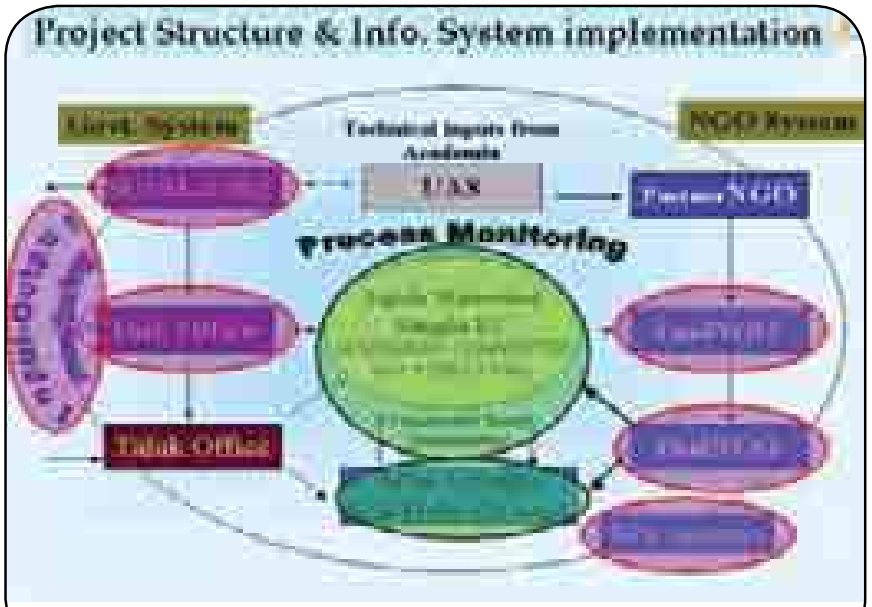

Best Bet Practice in M E & L of SUJALA Project
Role of Remote Sensing, GIS & IT
CWAP Workshop, ICRISAT


Space inputs used for Planning
Watershed Delineation and Prioritisation


Monitoring, Evaluation and Learning (M.E & L)
What is being monitored ?
Productivity Improvements
Natural Resource regeneration
Implementation Monitoring
CBO formation and Functioning
Capacity building
Participatory involvement
Income generating activity
Social Homogeneities
Institutional roles
Women empowerment
Employment opportunity / migration
Cattle stock Improvement
Equity and Transparency
Short and Long term impacts
Sustainability

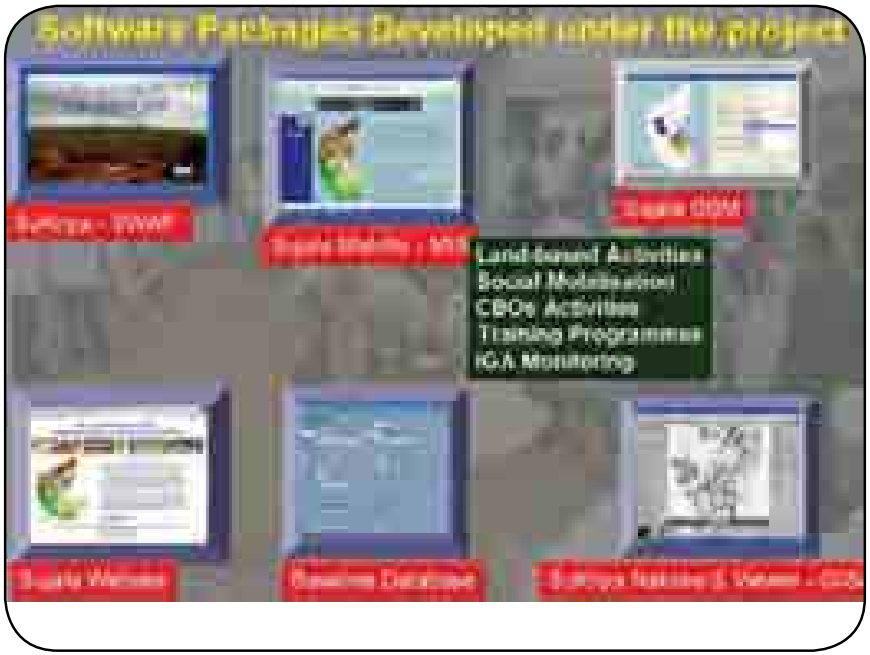

M & E Approach
MIS / GIS

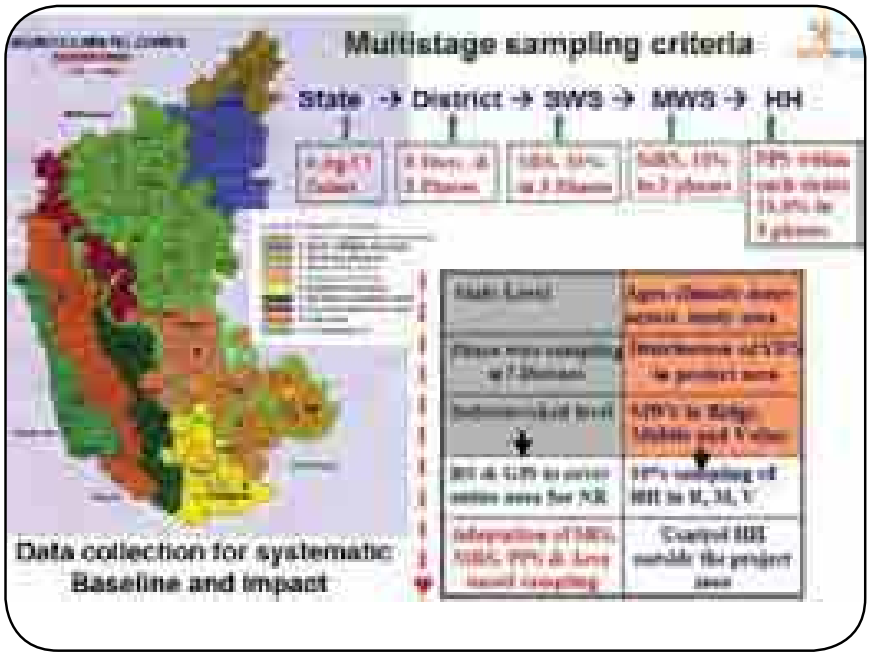

Use of I T at Different Stages of Watershed Development
Sujala Mahiti
SUJALA DSS
SUKRUTA
Training & Capacity building

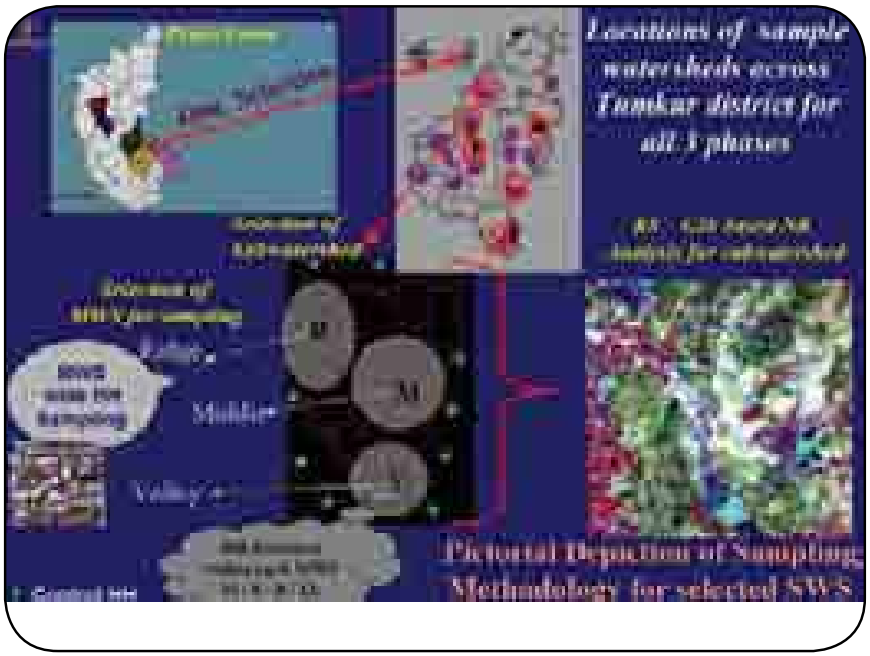

Project Structure & Info. System implementation
Technical Inputs from Academia
UAS
Process Monitoring

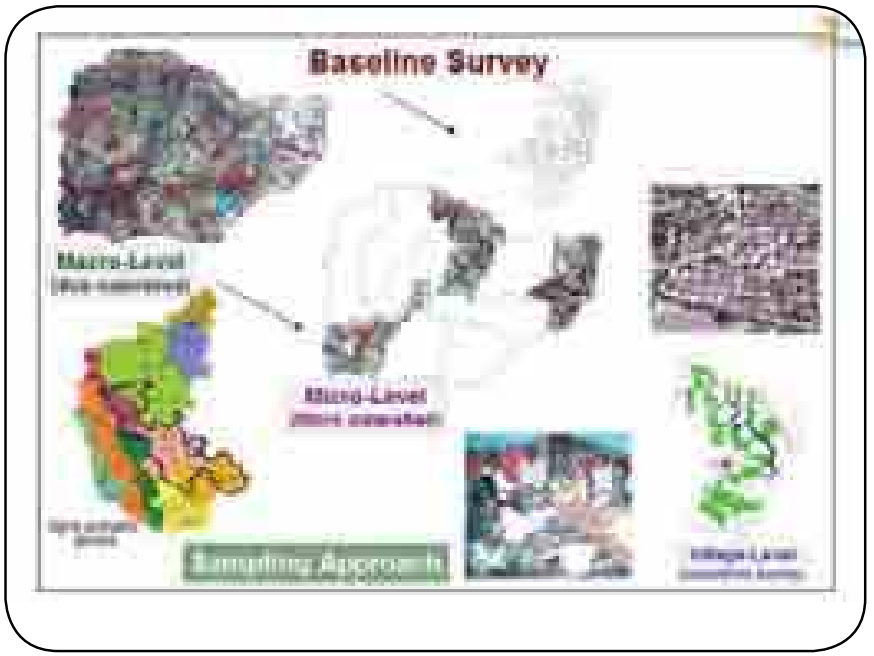

Sujala Watershed Development Project
Space Technology
- Capacity Building
- Participatory Planning
- Implementation
- Monitoring & Evaluation
- Impact Assessment


Data Collection Approaches
- Remote Sensing
- Household Surveys
- MIS / GIS data
- Participatory observations
- Field Measurements
- Focus Group Discussions
- Transect Walks
- Files, Records, Documents
- Informal discussions
- Expert judgement

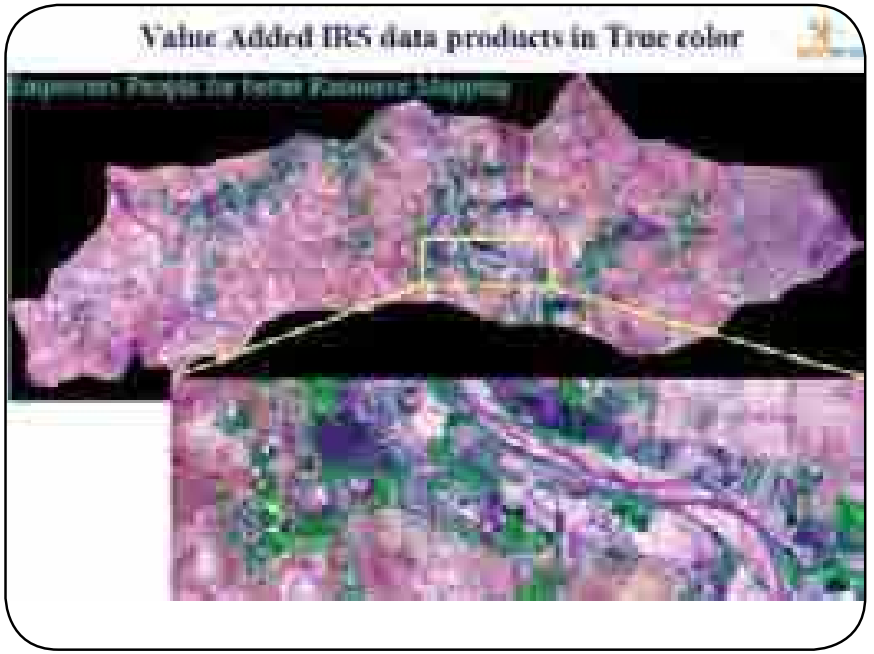

Software Packages Developed under the project
Land-based Activities
Social Mobilisation
CBOs Activities
Training Programmes
IGA Monitoring

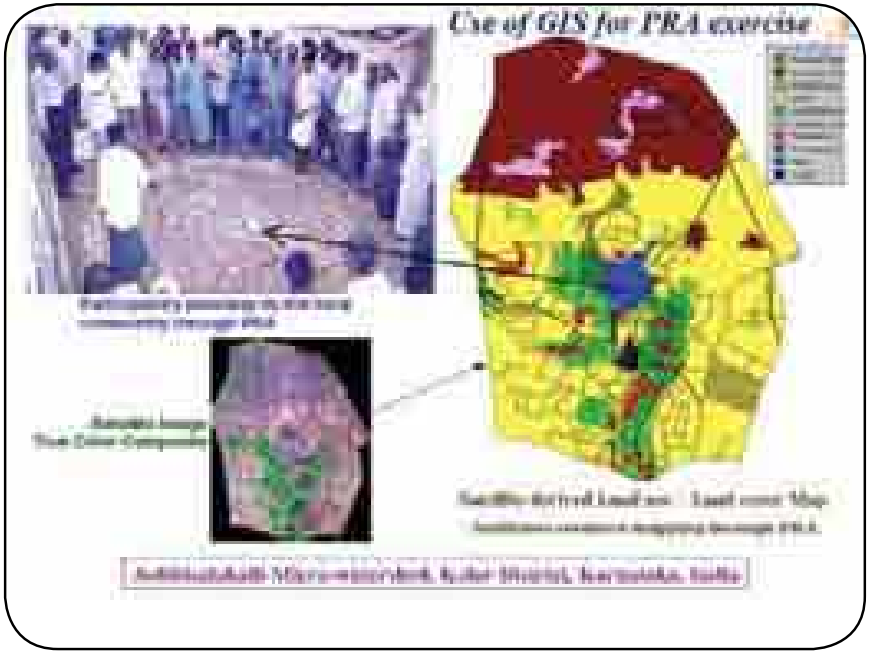

Multistage sampling criteria
State → District → SWS → MWS → HH
Data collection for systematic
Baseline and impact

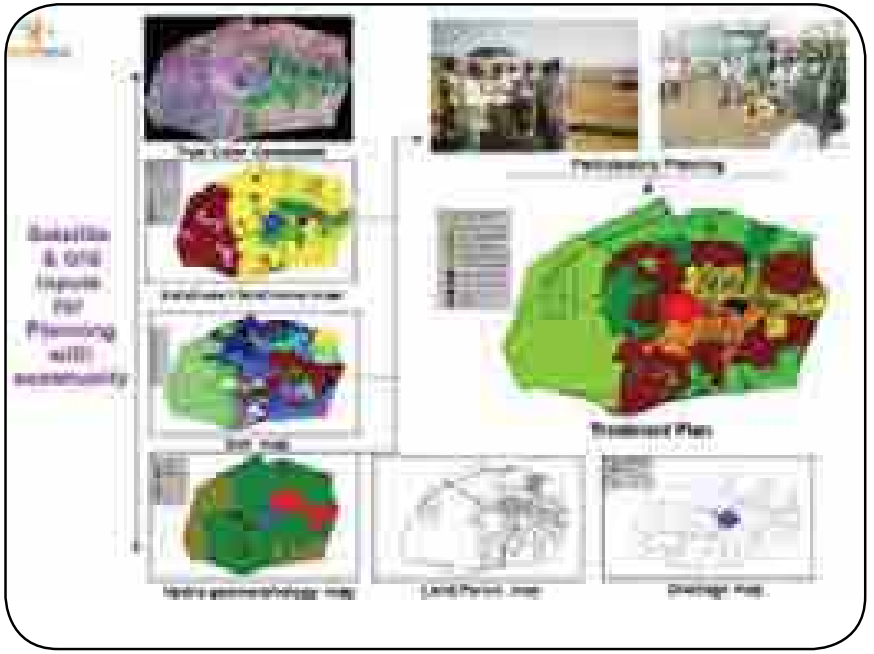

Locations of sample watersheds across Tumkur district for all 3 phases
Upper
Middle
Valley
Pictorial Depiction of Sampling Methodology for selected SWS


Baseline Survey
Macro-Level
Micro-Level
Sampling Approach


Base Line Database Creation

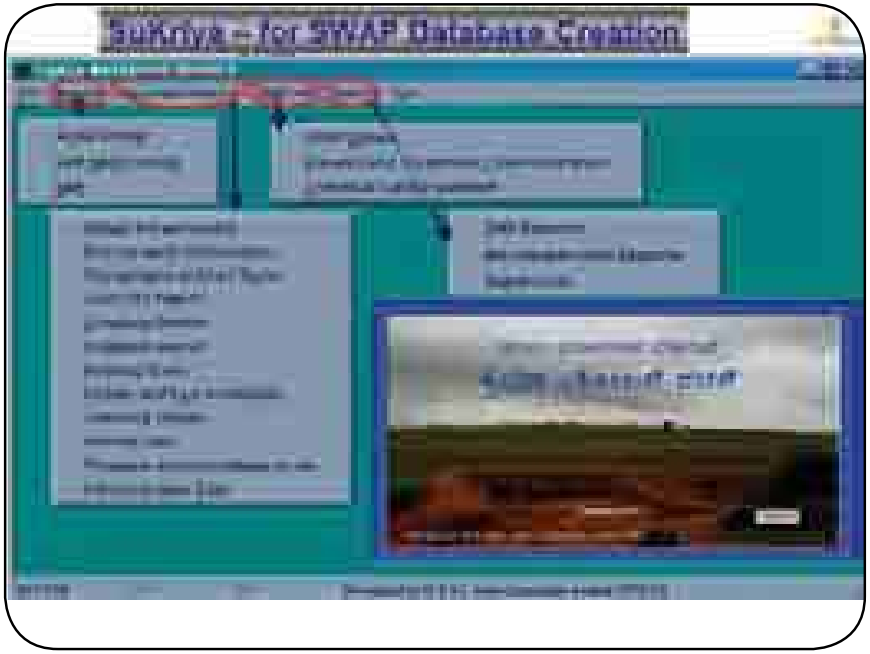

Value Added IRS data products in True color

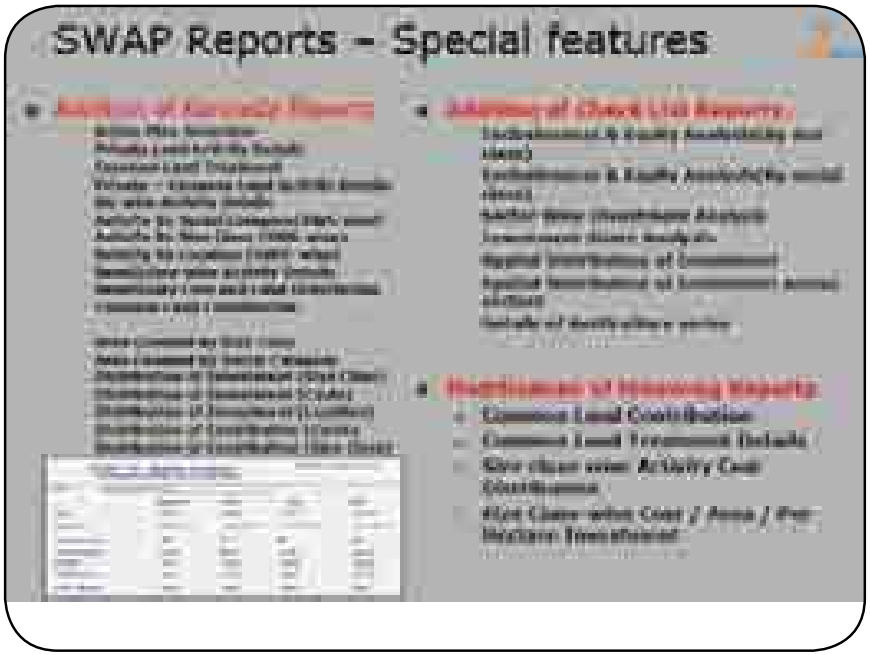

Use of GIS for PRA exercise

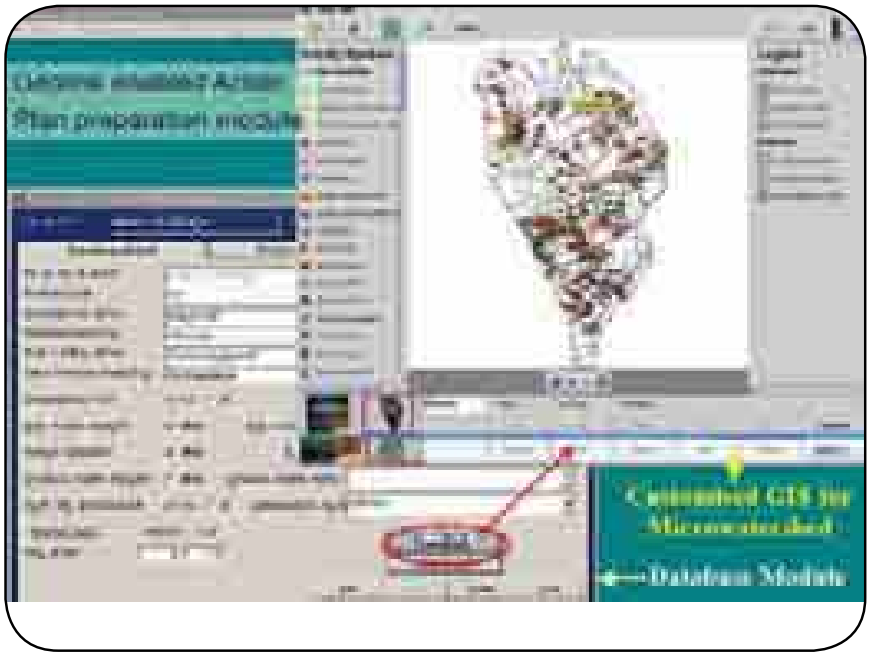

Satellite & GIS inputs for Planning with community

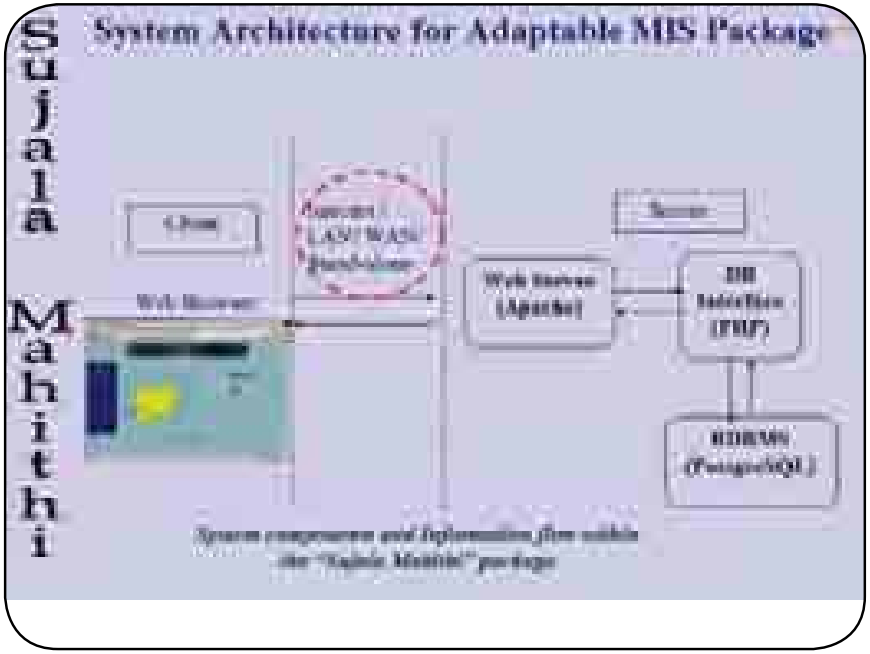

Participatory Action Plan Preparation
ACTION PLAN

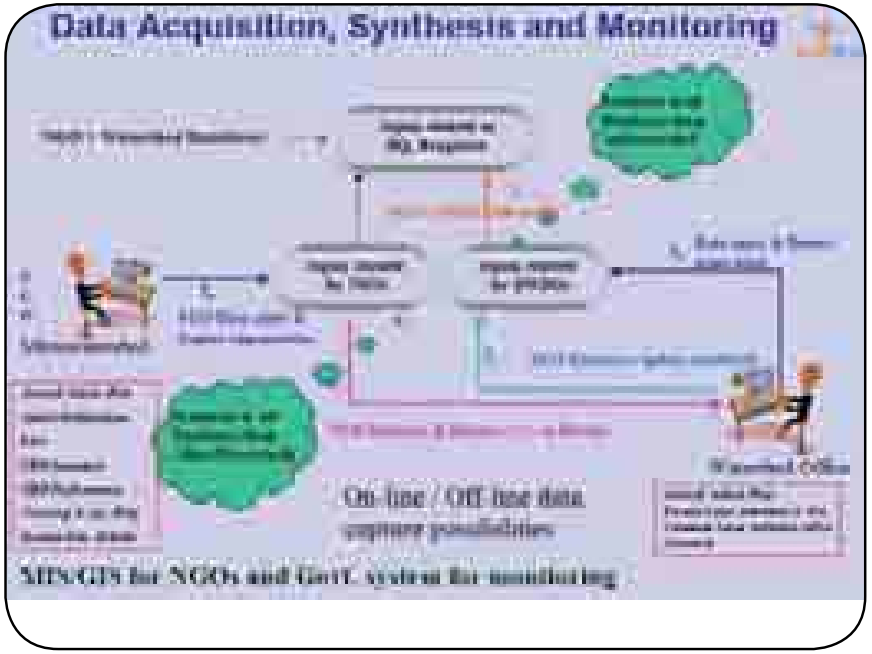

Sujala Watershed Action Plan (SWAP) Preparation
SUKRIYA
A Bi-lingual package for communities to prepare Integrated Watershed Development plan at local level


SuKriya – for SWAP Database Creation


SWAP Reports – Special features

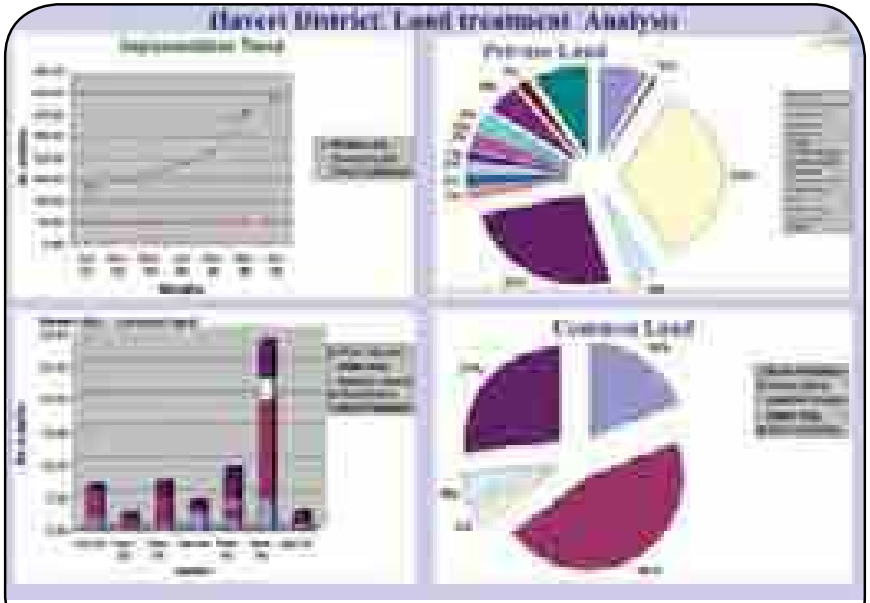

Plan preparation module
Database Module


Sujala Mahithi
System Architecture for Adaptable MIS Package
Web Server (Apache)
DB Interface (PHP)
RDBMS (PostgreSQL)

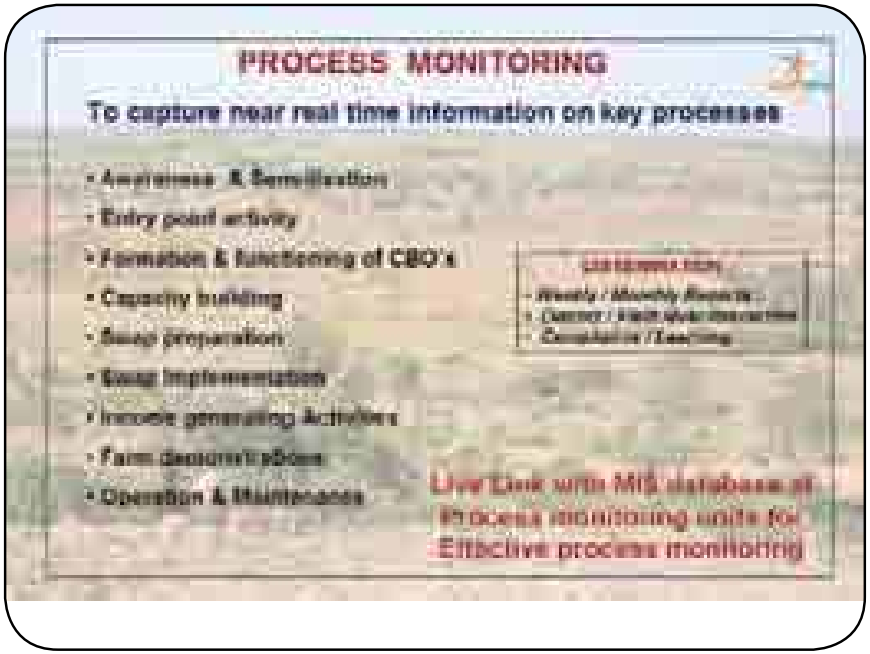

Data Acquisition, Synthesis and Monitoring
On-line / Off line data capture possibilities


Implementation of MIS / GIS Package at local level
• Database creation
• Data Flow
• Data Synthesis
• Monitoring at all levels of project
Project Head Quarters
Database update & Report generation on weekly basis. AUDIO Conference
District Level Synthesis

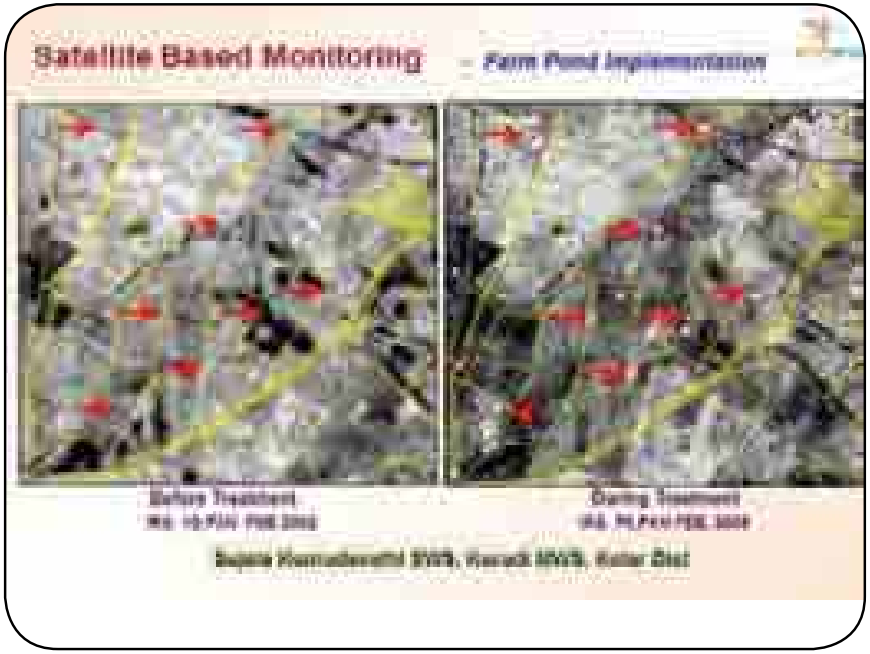

User Interface and Map zoom through Area Hierarchy for Query & Output Reports


Haveri District: Land treatment Analysis
Project Land
Common Land

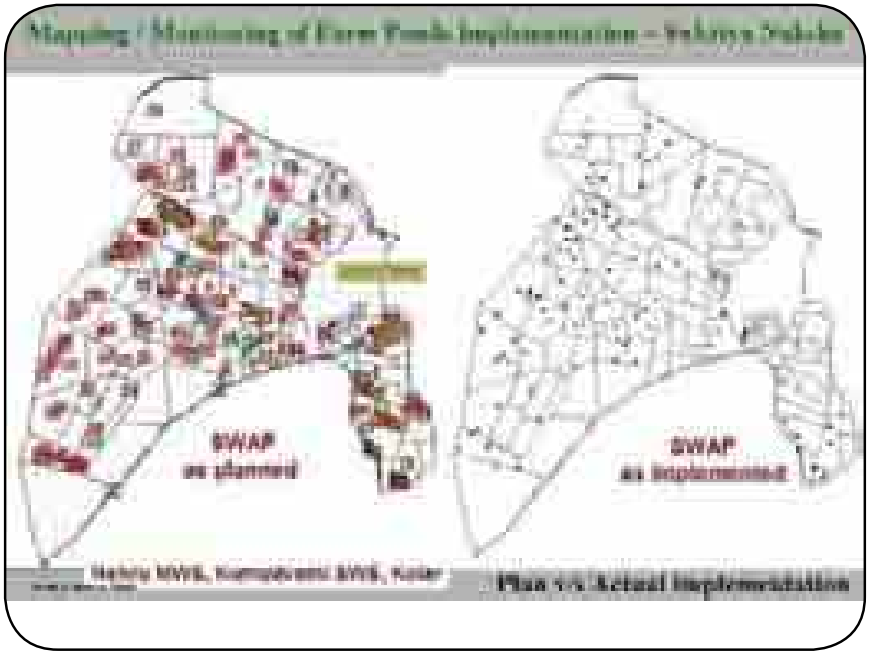

Website Design Sujala Project
Salient Features
Basic information on Sujala project objectives and area
Map clicks for navigation, query and information extraction
Important watershed documents available for browse and download
Implementation status Reports at State,District and Sub Watershed level
Phase wise reports update on monthly basis


PROCESS MONITORING
To capture near real time information on key processes
• Awareness & Sensitization
• Entry point activity
• Formation & functioning of CBO's
• Capacity building
• Bunds preparation
• Bunds implementation
• Income generating Activities
• Farm demonstrations
• Operation & Maintenance
Live Link with MIS database at process monitoring units for Effective process monitoring

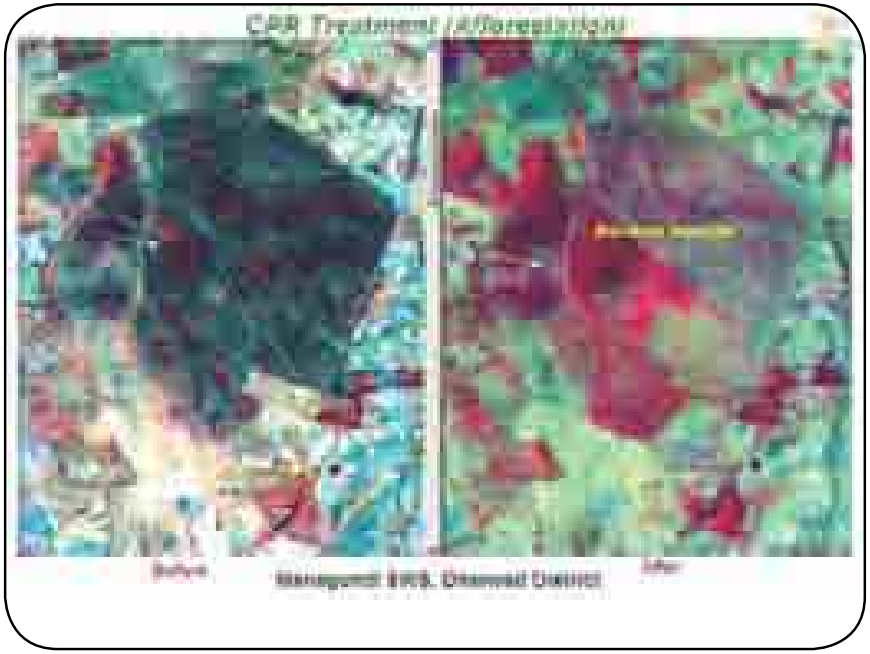

IMPACT ASSESSMENT
IMPACT
SHORT TERM
LONG TERM
HOUSEHOLD LEVEL
APPROACH
BEFORE AND AFTER
WITH AND WITHOUT


Satellite Based Monitoring
– Farm Pond Implementation


Monitoring of Farm Pond Activity


SWAP
as planned
SWAP
as implemented
Plan v/s Actual Implementation


Transformation in Treated Watersheds (Horticulture)


CAR Treatment / Afforestation


Afforestation Monitoring

Stepping towards greener path....
SUJALA
For more smiles ....

Institutional reform under participatory watershed programme

NK Sanghi

National Watershed Development Project for Rainfed Areas (NWDPRA)
Website: www.nwdpra.org

Context

- Delivery mechanism is the weakest link under the mainstream watershed programme
- Some provision has been made at Project level (as PIA) but very inadequate set-up exists at other levels (i.e. district, state or even national level)
- Innovative experiences on institutional reform have emerged through bilateral projects, state government initiatives, NGOs, etc.

Critical functions to be performed by institutions

- Administration
- Project management
- Capacity building
- Democratic decentralization to decision making
- Follow up support

Experiences on institutional reforms

FUNCTION	REFORM	SOURCE
Administration	Autonomous organization under Society Act	State government WS programme in Orissa, T.N.
Project management	PMU for project period	Bilateral projects in Orissa, A.P., Karnataka, etc.
Capacity building	Consortium of resource organizations	do
Democratic decentralization to decision making	Empowered village committee	DANWATSIP in Orissa, WS and Karnataka
Follow up support	Community managed resource centre	CRD - A.P., MWCADA

Restructuring of community based organizations under watershed programme

Existing CBOs

- Self Help Groups
- User Groups
- Watershed Association
- Watershed Committee

CONTEXT

- Except SHGs, all other CBOs have shown low sustainability
- Additional CBOs are needed under the changing scenario in watershed programme
- Sustainability of physical structures depends largely upon sustainability of social structures
- Innovative experiences on CBOs are scattered in different projects / schemes

Enhancing sustainability of existing CBOs

Self Help Groups (SHGs)

- Organization of leftover families in SHGs
- Development of book writers at village level
- Periodic ranking of SHGs regarding maturity
- Federation of SHGs at different levels
- Constitution of thematic sub-committees with the federation (s)

User Groups (UGs)

- Facilate UGs to either become SHGs (in case its members are homogeneous) or join different SHGs (if its members are heterogeneous)
- Encourage SHGs to become UGs particularly with respect to human use in common land, fisheries in common tank etc

User Groups (contd.)

- Improve the stake of UGs through the followings:
  - Adoption of demand-driven approach in planning of CPR
  - Collection of genuine contribution from actual users in advance (during the planning phase)
  - Formal allocation of user rights (as a part of the planning process)

User Groups (contd.)

- Working out modalities for repair, maintenance and protection of CPRs (during the planning phase)
- Adequate investment on capacity building of UGs as being done in case of SHGs

Watershed Committee (WC)

- Replace WC with GP – Haryali guidelines
- Replace WC with federation of women SHGs (APRLP)
- Begin with conventional type of WC and replace it with federation of women SHGs plus men SHGs (KAWAD, DANWADE)

Watershed Committee (contd.)

- Reconstitute the membership of existing WC by having representatives from not only women SHGs, but also men SHGs as well as from not only user UGs but also women UGs.
- Towards the end of the project, subdivide the above committee into two types of federations i.e. federation of SHGs (for management of revolving fund), and federation of UGs (for management of CPR) – MYRADA – Kadur

Watershed Committee (contd.)

- In situations where funds are to be released to GP (e.g. Haryali guidelines), functional integration may be facilitated between GP and federation of SHGs at village level in such a way that GP may receive funds under the project but execution of works and development of livelihoods may be carried out through federation of SHGs (A.P.)

Watershed Association (WA)

- Organization of small size area groups (for about 100 ha each) in addition to the original WA for the entire microwatershed. This should be done particularly in cases where all participants are residing in one large village
- Organization of habitation based associations (in addition to the original Watershed Association) particularly in cases where participants are spread over more than one habitation

Watershed Association (contd.)

- Organization of majority of members of the association into different SHGs so that they could develop harmony among themselves, articulate their views properly, carry out adequate preparation in smaller groups before coming for the meeting of WA, etc. (PIDOW – MYRADA)

Organization of new CBOs

GROUPS

- Self Help Groups (of men)
- User Groups (of women)
- Common Interest Groups (CIGs)
- Area Groups (AGs)

Organization of new CBOs

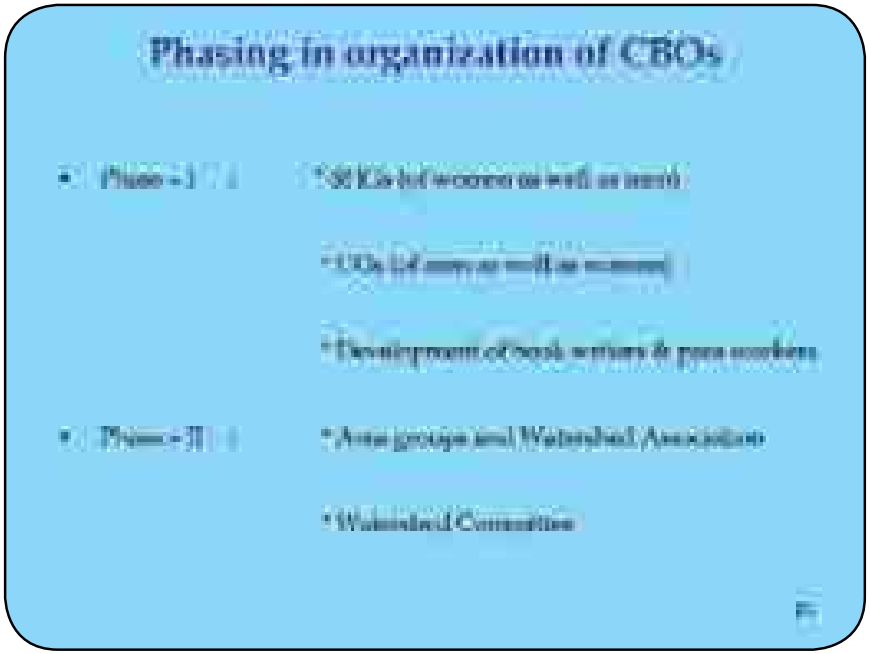
MANAGEMENT BODIES

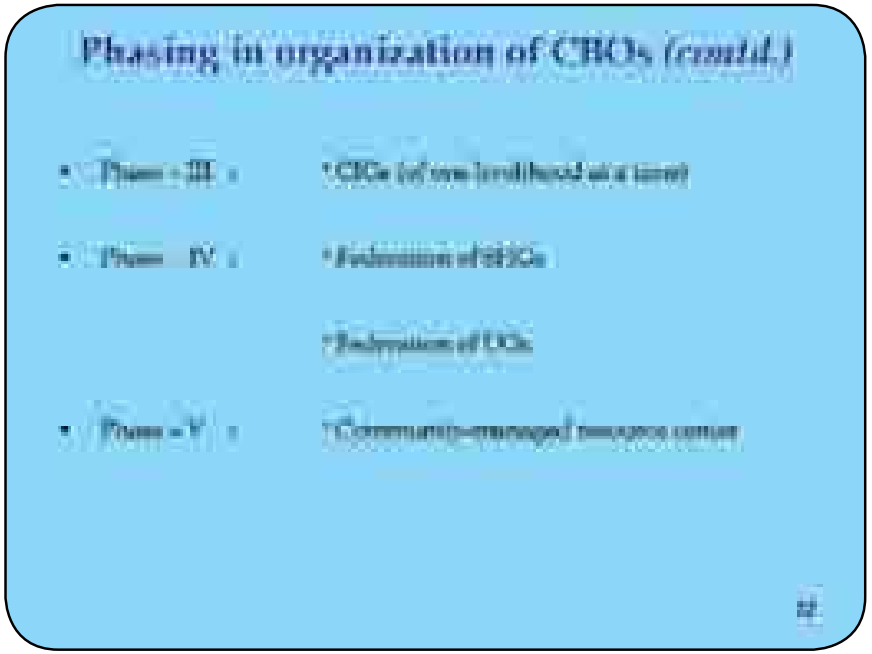
- Federation of SHGs
- Federation of UGs
- Community based resource persons
- Community managed resource centre

Organization of CBOs

GUIDING PRINCIPLES

- Beginning may be made with organization of adult members of all participating families in the village into women SHGs and men SHGs
- Afterwards other groups as well as management bodies may be organized by drawing members out of above SHGs
- Phasing of above CBOs may be carried out in such a way that they are organized as and when the need arises


Phasing in organization of CBOs
• Phase – I
• Phase – II


Phasing in organization of CBOs (contd.)
• Phase – III
• Phase – IV
• Phase – V

Understanding Impacts of Watershed Development Programs

Ravindra A, July 2007

Conventional Impact Assessment:

Mainly…

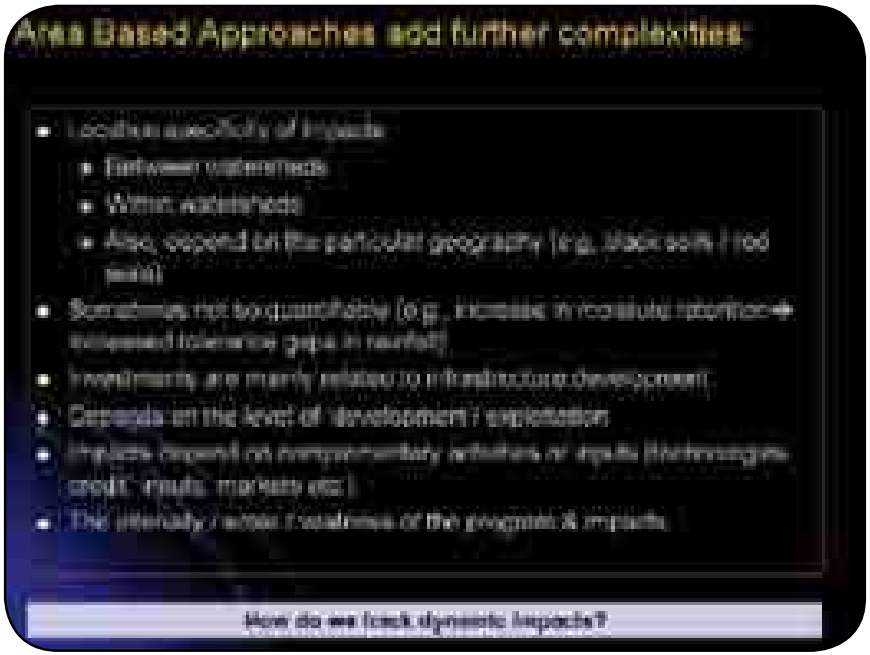
- LFA based indicators
- Economic analysis
  - Equity
  - Productivity
  - Cost-benefit
  - Etc..

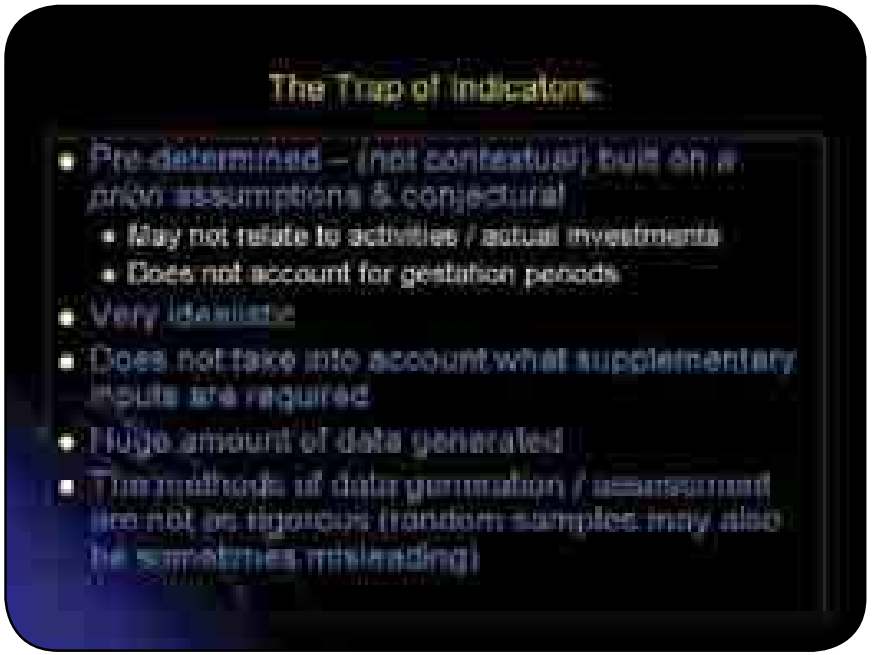
Purpose of an IA exercise:

Process Oriented Programs have complexities:

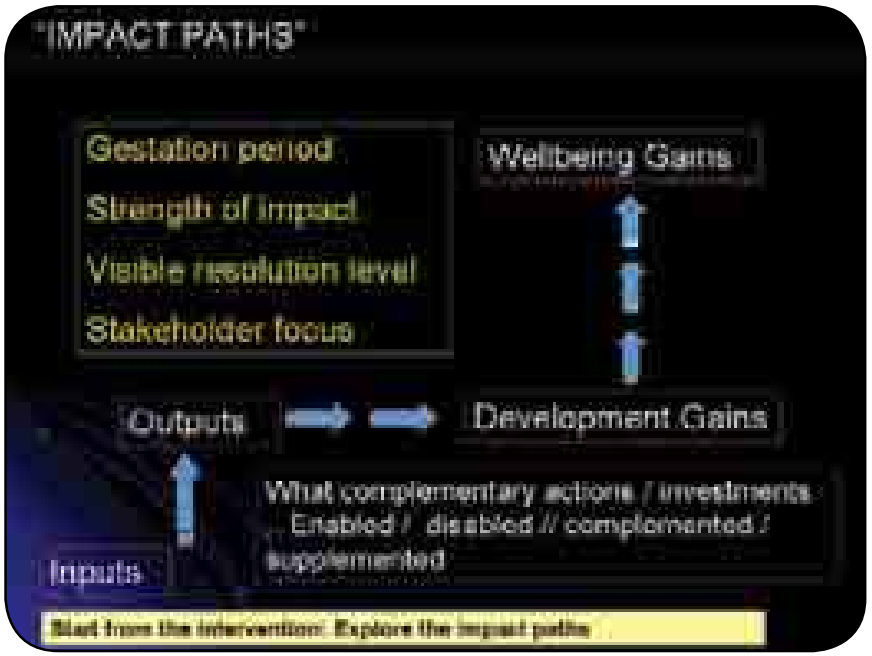
- Community based institutions
- Capacity building
- Participatory planning processes
- Revolving fund based approaches
- Indigenous knowledge systems

Impacts Would Also Be DYNAMIC


Area Based Approaches add further complexities
How do we track dynamic impacts?


The Trap of Indicators
Pre-determined – (not contextual) built on a prior assumptions & conjectural
May not relate to activities / actual investments
Does not account for gestation periods
Very expensive
Does not take into account what supplementary inputs are required
Huge amount of data generated
The methods of data generation / assessment are not as rigorous (random samples may also be sometimes misleading)


"IMPACT PATHS"
Process Centered Impact Assessment Method
Wellbeing Gains
Outputs
Development Gains
Inputs


"IMPACT PATHS"
Gestation period
Strength of impact
Visible resolution level
Stakeholder focus
Wellbeing Gains
Outputs
Development Gains
What complementary actions / investments
Enabled / disabled // complemented / supplemented
Inputs
Start from the intervention: Explore the impact paths

"IMPACT PATHS"
Evolve indicators from participatory exercises

Understanding Investments and Impacts

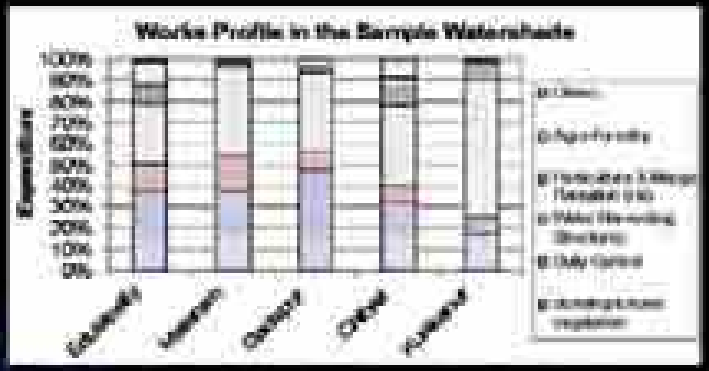
A quick study (2003-04) of 5 watersheds in

Some observations

Methodology

- Tracking Impact Paths
- Resource mapping
- Selection of sample areas/ structures/ institutions
- Primary data collection along with the farmers
- Household wise/ plot wise surveys
- Watershed level analysis

Profile of Investments



Investments pattern indicates.....

- Diversity of investments/ activities is low (an indicator of site specificity) except in Edulapally
- Absence of any focus on livestock
- Low emphasis in improving biomass
- Absence of any effort in crop diversification or productivity enhancement

Important missing links in the context of drought and livelihoods

- Investments on bunding and other soil conservation measures are more accessed by the poor, SCs & STs compared to the other investments.

Impacts of Water harvesting structures

- Availability of water at multiple locations
- Used for multiple purposes- drinking water for livestock, washing livestock, domestic uses, swimming by children etc
- Groundwater recharge
- Direct irrigation in limited cases
- Ameliorated drinking water problem in 2 watersheds

A multitude of impacts spread across that provide a basis for well-being but could not be captured in economic indicators

Impacts of Water harvesting structures...

- Storage capacity created 1002 cu.m to 25,680 cu.m.
- Cost of creating storage capacity ranges from Rs 18 to 531 per cu.m (high in checkdams compared to PTs)
- Water storage available upto December/ March

Impacts of Water harvesting structures...

- Edulapally 81% of the open wells are revived (desilted) after the recharge
- Irrigated area in the influence zone increased – 500% in Mallaram, 64% in Edulapally, & 54% of area brought under irrigation in Dadapur
- Increase in crop intensity, and net sown area
- Shift towards borewells & high value crops

Impacts of Water harvesting structures...

Quantification:

- Value of incremental production (VIP):
  - Ranges from 2.55 lakhs to 0.62 lakh Rs.
  - Ratio of VIP to cost of construction: 0.65 to 1.5 within one year
- Payback period : 2 years

Practice of high value crops & high rates of exploitation

Impacts of Water harvesting structures...

Complementary investments:

- Private investments : 1.74 times in Mallaram to 3.1 times in Dadapur
- Mainly for accessing groundwater: tank development, deepening of wells
- Differential (large farmers mobilising quickly and poor not able to)

Ability to mobilise complementary investments is a critical factor in Equity. Can it be made integral part of the watershed investments? Move towards complete

Impacts of Water harvesting structures...

Cases of Irrigated Horticulture inducing more vulnerability ....Need to be carefully examined.

No institutional mechanisms

No desilting

Not much need for repairs so far..

Impacts of Land Development

- Investments Rs.910 to 2300 per ac.
- 86% of bunds have good cross section
- 54% cases maintenance not required
- Of the remaining 46%
  - 89% no maintenance attempted
  - 11% repairs attended to

Bunds not maintained were mostly in common lands and lands which were not in use. Usage is important.

Impacts of Land Development

- Not allowing locally relevant interventions like pebble bunding in stoney lands resulted in poor impacts
- In fallow lands good impacts but only conservation investments are allowed but not land clearance

Technical appropriateness & local relevance are important factors.

Impacts of Land Development

- Moisture conservation
- Good ground water recharge
- Value of Incremental production over costs ranges from 0.44 to 3.78
- Minimum payback period is 2.5 years

Impacts on Ground Water

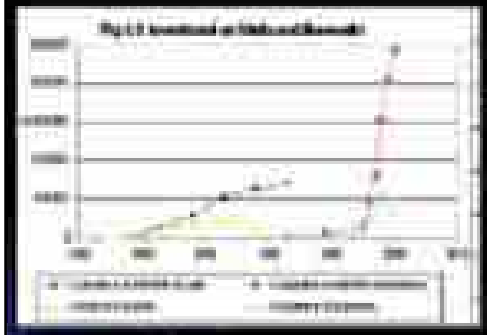


Table 14 Investment on borewells

	Annual Invest	Cumulat. Invest.
1983	10000	10000
1989	20000	30000
1995	95000	153000
1996	275,000	483000
1997	245,000	873000
1998	595,000	1533000
1999	471,000	2054000
2000	320,000	2434,000

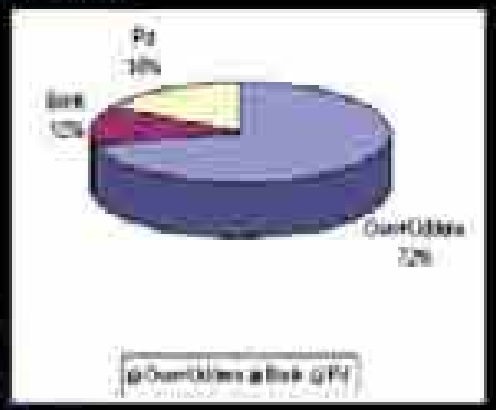
Impacts on Ground Water

Chityal

Impacts on Ground Water

Mallaram

Impacts on Ground Water



Mallaram : Source of investment

Impacts on Ground Water

- Chaotic growth in borewells
- Inequity & vulnerability
- Need for dovetailing..
  - Groundwater access plans & investments with watershed investments
  - Pre-negotiated Social regulation

Institutions

- The weakest link
- Even the vibrant institutions have become dormant
- WDF ranges from Rs. 40,000 to 1,30,000
  - Locked up in fixed deposit
  - No institutional norms
- SHGs linked to Velugu but no function is NRM
- No Functional Domains for the institutions established
- Institutions are not even recognised by the state later on

To Sum UP

- Substantial impacts
- Quick returns on investments
- But
- How to sustain the growth process
- How to maintain the assets

The needed shifts

From

Work Centricity

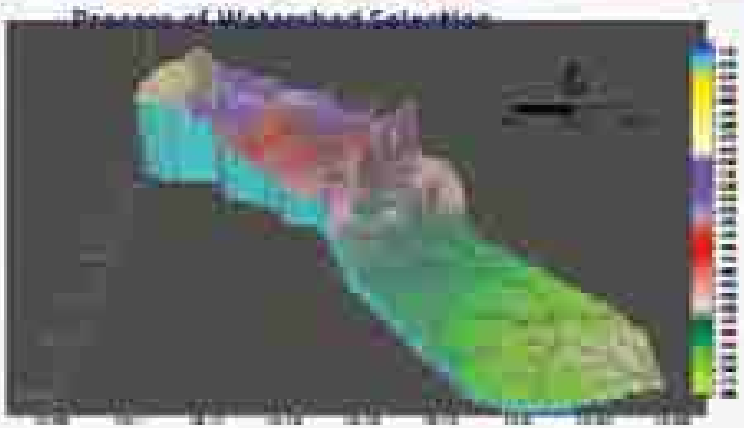
To

Institutions &

Resource management

But the Question is HOW ?

Process of Watershed Selection



YS Ramakrishna , KV Rao,

CRIDA,

Chapter contains info on

- Philosophy- based on guidelines and it's review
- Approaches being made use of
- New initiatives by Line Departments (APRLP,Sujala etc.)
- Watershed Selection on NRM related issues- Opportunities
- Policy guidelines

WARMA Guidelines of Haryana

The broad objectives of the IWDPRA are

- Conservation, development and sustainable management of natural resources including their use.
- Enhancement of agricultural productivity and production in a sustainable manner.
- Restoration of ecological balance
- Reduction in regional disparity between irrigated and rainfed areas.
- Creation of employment opportunities for the rural community including the landless

Guidelines of Haryana

- Harvesting every drop of rainwater
- Improving ecological balance
- Improving the socio-economic status of the rural community

WARASA Guidelines:

Demarcation and Prioritisation of Watersheds

- Identification of major drainage courses consisting of rivers, nullahs, other drainage lines etc.
- Micro watersheds demarcation (area of about 20000 to 30000 ha each) on SOI map
- Division of these sub-watersheds into sub watersheds (about 1000 to 5000 ha)
- Prioritisation of these sub watersheds may be carried out on the basis of
  - sediment yield,
  - runoff potential index,
  - degree of land degradation,
  - drought proneness, etc. (RSAC/LUS and data and maps of state level remote sensing agencies, etc.)

Methodology for prioritisation

- Further delineation of sub watershed into micro watershed above 500 ha.
- Prioritisation of these micro watersheds may also be done on the basis of similar parameters indicated.

ARTLUS Have provide the activity based on Sediment Yield Index/ Runoff Potential Index only.

Criteria for Eligibility of Watershed Villages

Final selection of villages may be conducted in an objective manner by using a combination of the above scientific parameters for the micro-watersheds and also the following additional parameters for the watershed village.

- Location in upper reaches of watershed
- Significant proportion of arable land under private cultivation(preferably 60% or more).
- Willingness of community to participate and contribute to the program and take up responsibility of post project maintenance of the created assets

Who would be providing this information?

Criteria for selection of watersheds under Haryali Programme

Mostly oriented towards economic factors rather than the severity of land degradation or agricultural productivity.

- Availability of information for all watersheds with in a district is difficult
- Responsible agency – Not specified

NWDPRA Guidelines

Criteria for selection of watersheds

Physical characteristics

a) Dry and drought prone villages, in any case the proportion of irrigated area may not exceed the average for the state or Tehsil/Block whichever is lower.

b) Villages with noticeable soil erosion, land degradation, resource depletion or water scarcity problems.

c) Villages in the upper part of drainage systems

d) The size of a watershed project should be around 1000ha (but not less than 500ha).

e) Well defined watersheds with the village boundaries coinciding to the greatest extent possible with the watershed boundary. As far as possible, Watershed encompassing one village is ideal.

f) Coastal sloping aquifers does not include high water demanding and long duration crops like sugarcane, banana etc. and

g) If such crops are grown in small pockets in the watershed, the villagers should agree that the area under such crops will not be extended during implementation or after completion of the watershed development project.

Criteria for selection of watersheds

Prioritisation of watersheds

Based on the Methodology developed by AISLUS (Kurale et al 1978, Bali & Kurale, 1977, Kurale et al 1977)

Derives the Erosion Intensity mapping units comprising

Sediment yield index for each of the watershed as a single factor.

Maiden effort in the prioritisation of watersheds.

MoA proposes for making use of this data under NWDPRA programme.

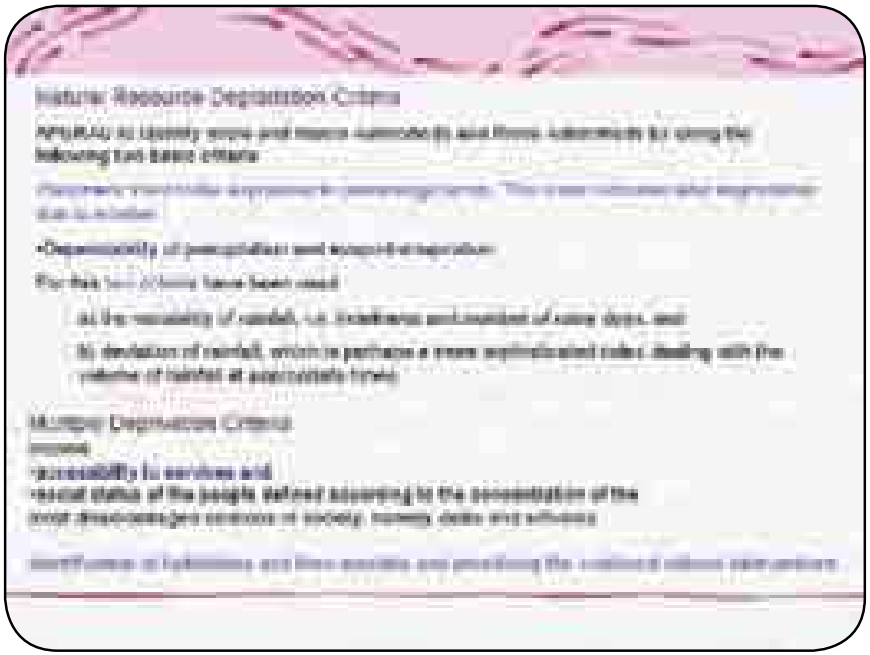
Watershed Atlas of India contains

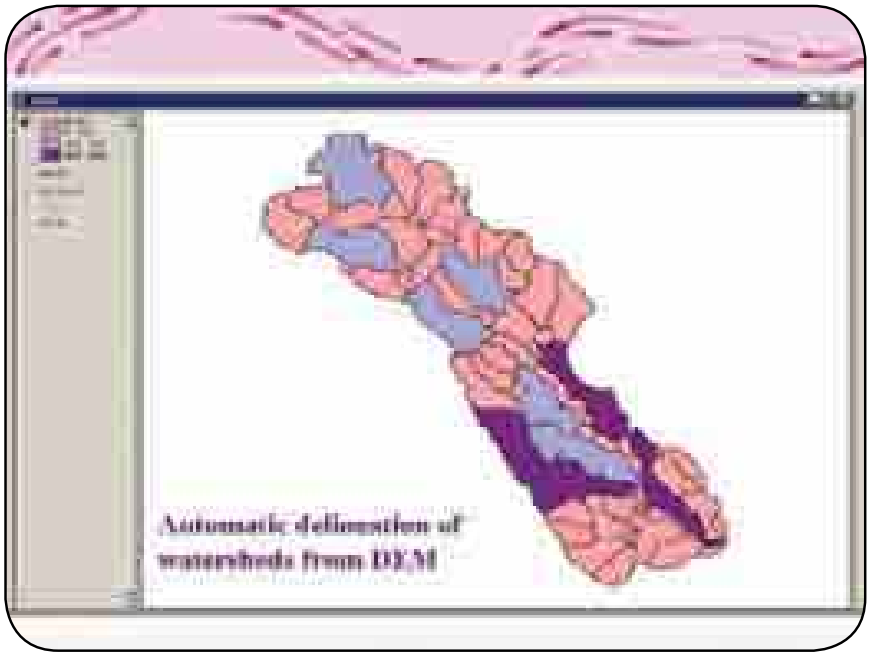
Brighton	Number	Circulation	Sub-subdivisions	Wisconsin	Total Area of WDC (Sq.Km)
1	7	63	31	393	398.83
2	8	42	150	936	929.12
3	6	14	55	230+	191.55
4	8	34	175	1100	1136.68
5	8	38	76	515	429.51
6	6	44	154	186.6	173.43
Total	37	1 142	998	3277	3259.3

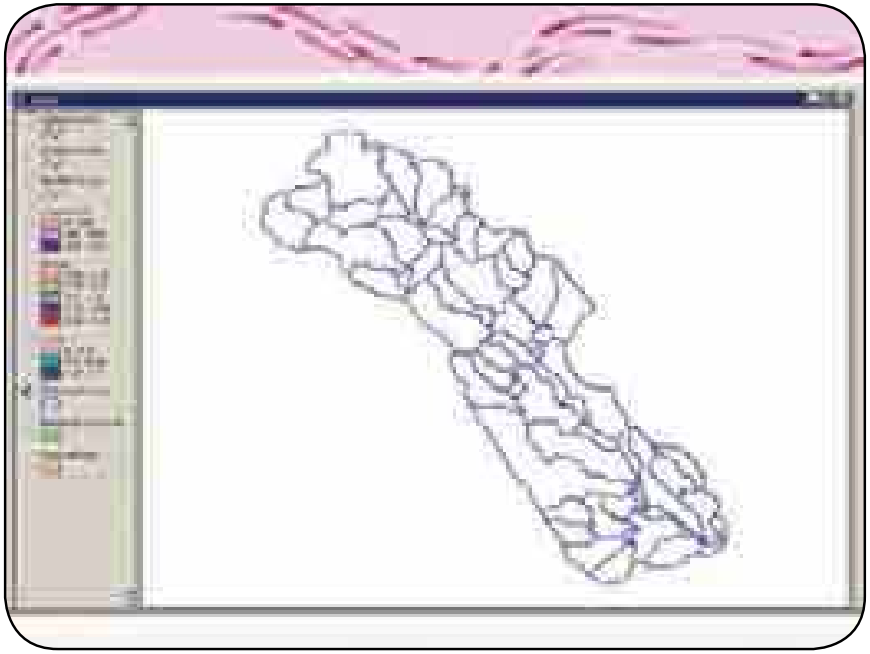
APRLP Method

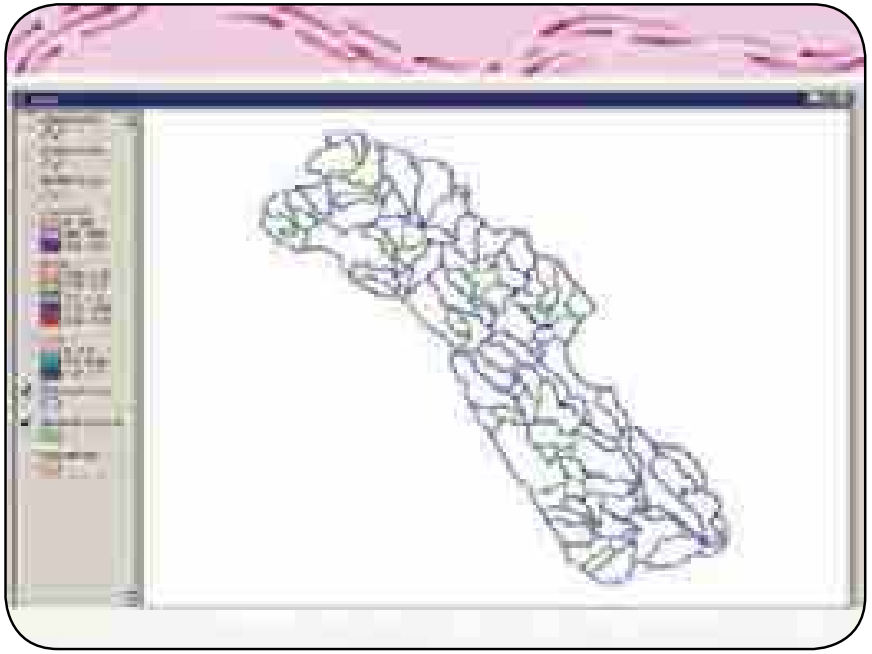
Villages/watersheds & Mandals

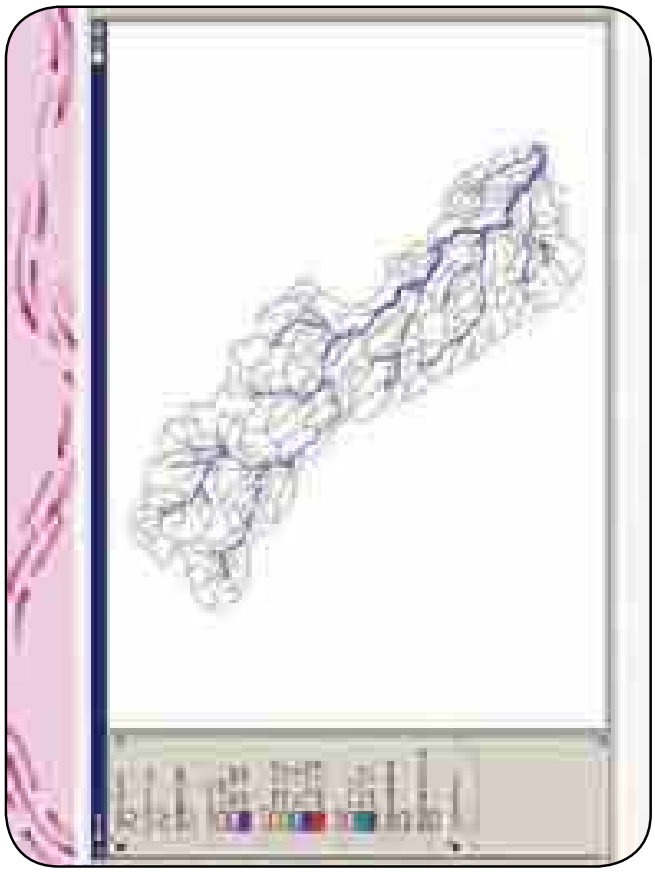
Technical:

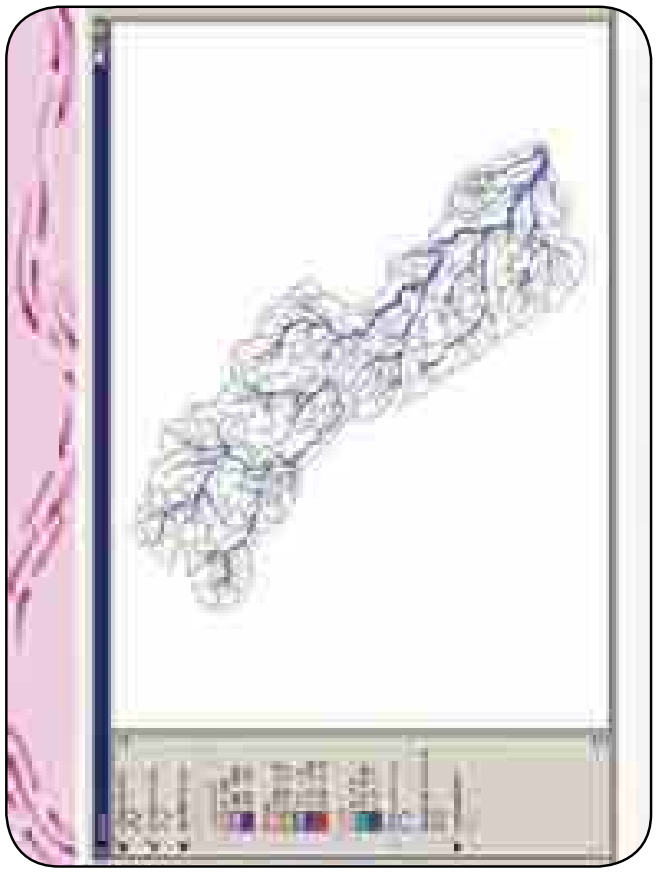

Natural Resource Degradation Criteria
•Dependability of precipitation and evapotranspiration
Multiple Degradation Criteria
•accessibility to services and

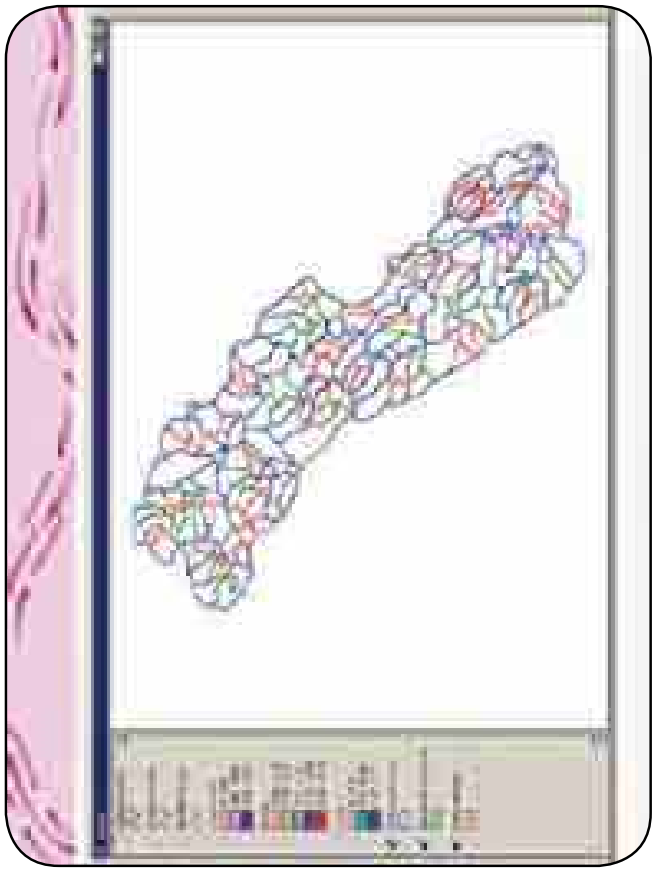

Automatic delineation of
watersheds from DEM

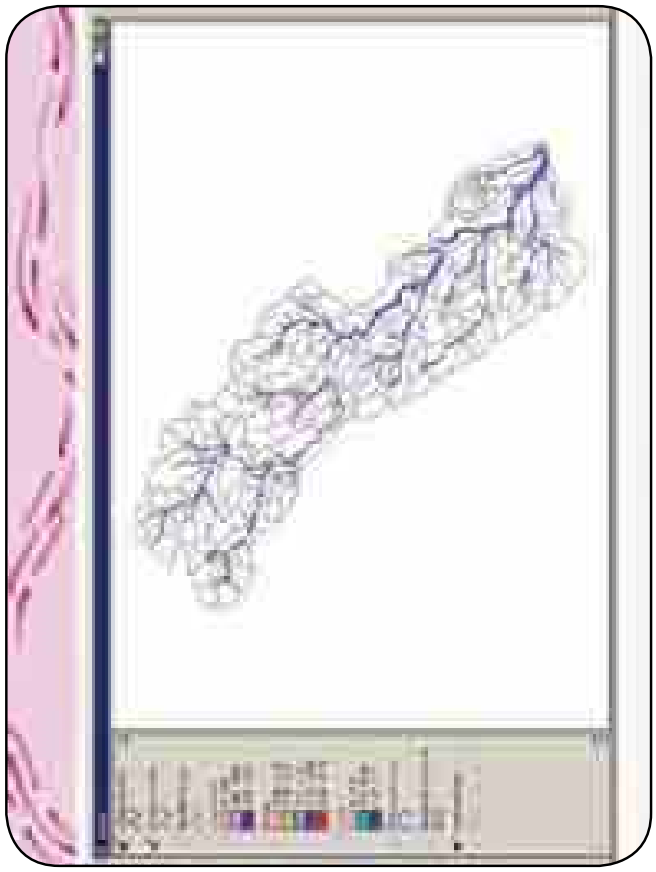


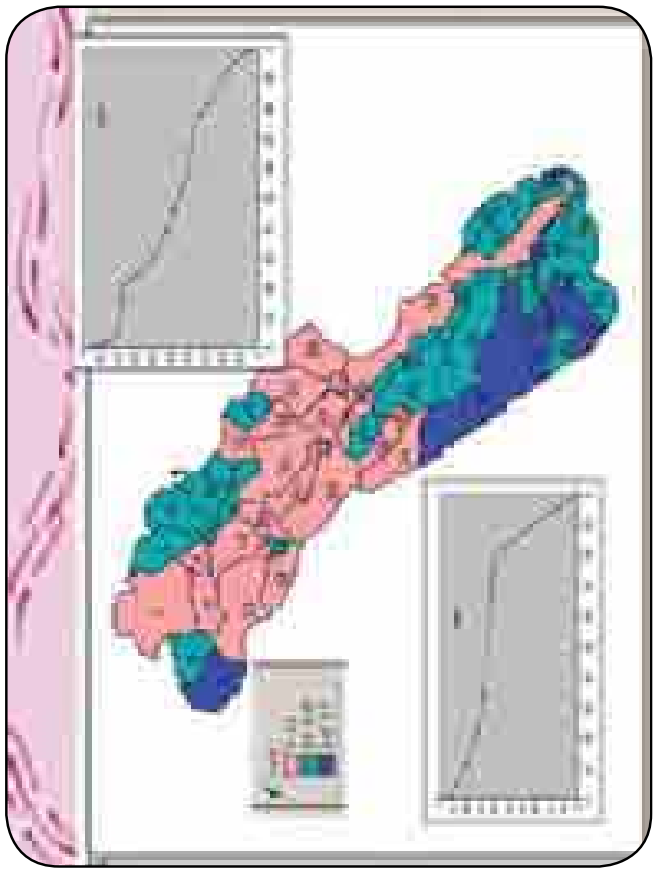


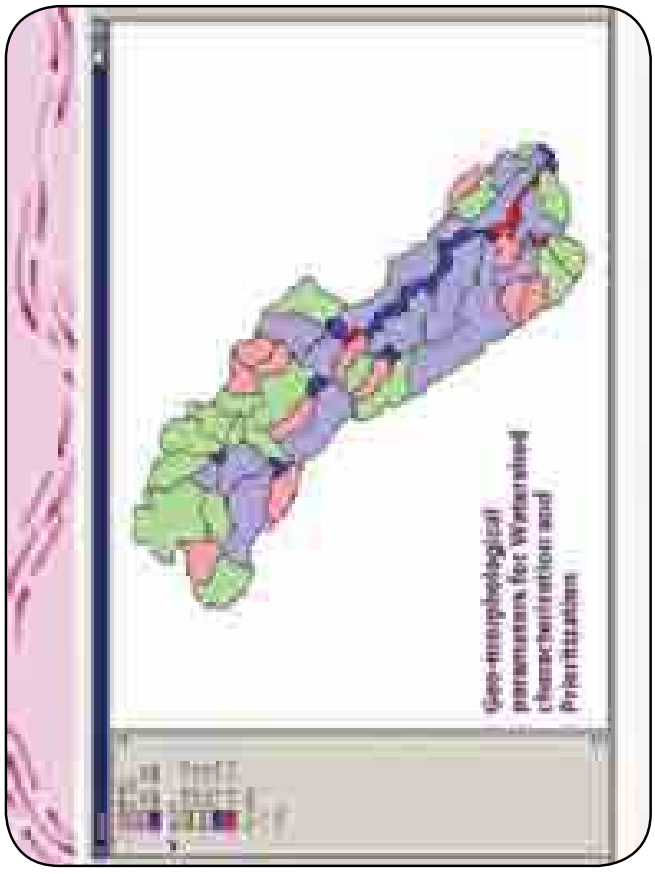


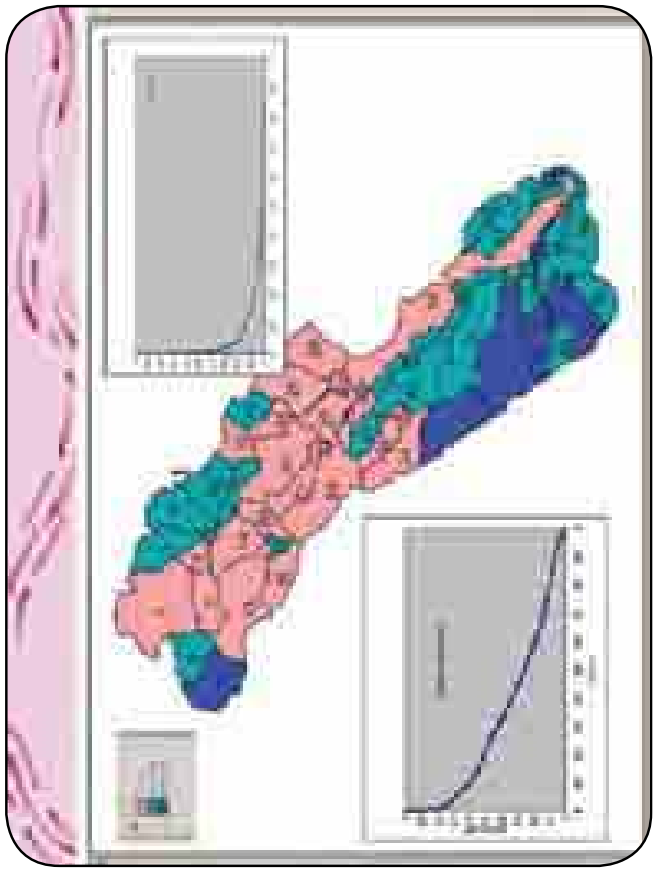


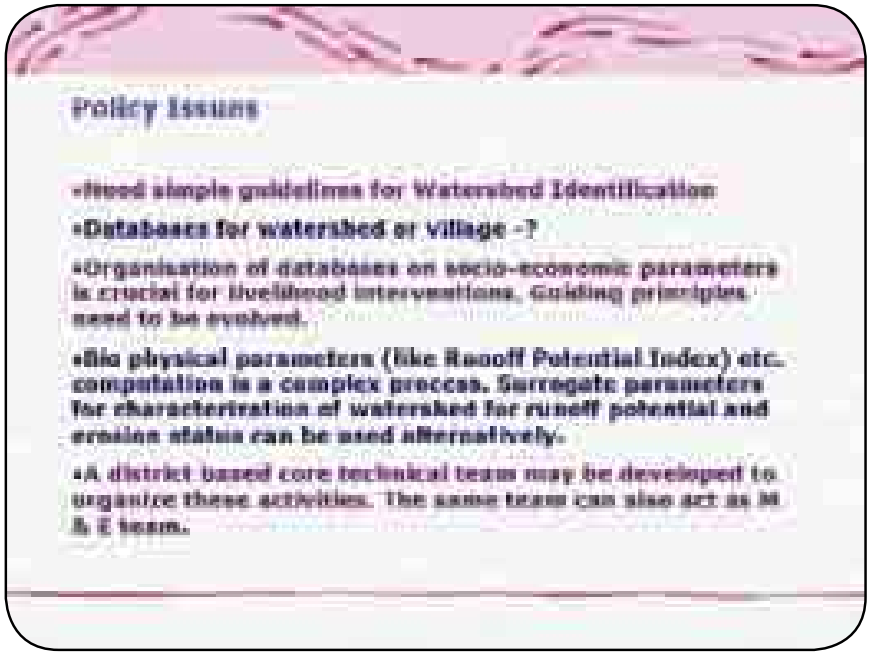











Policy Issues
•Need simple guidelines for Watershed Identification
•Databases for watershed or village -?
•Organisation of databases on socio-economic parameters is crucial for livelihood interventions. Guiding principles need to be evolved.
•Bio physical parameters (like Runoff Potential Index) etc. computation is a complex process. Surrogate parameters for characterisation of watershed for runoff potential and erosion status can be used alternatively.
•A district based core technical team may be developed to organize these activities. The same team can also act as M & E team.

Sustainable Farming Systems for Natural Resource Conservation in Arid Watersheds and Index Catchments

By
T K Bhati

Central Arid Zone Research Institute,
Jodhpur 342 003, Rajasthan

Hot-arid Ecosystems of India

Total area : 32 M ha

Distribution of area in different states (%)

Districts of Rajasthan Affected by Aridity

Agroclimatic zones	Districts
• Arid western plains (IA)	Jaisalmer, Barmer, Bikaner, W-Jodhpur & W-Churu
• Irrigated N-W plains (IB)	Ganganagar, Hanumangarh, W-Bikaner & W-Jaisalmer
• Transitional plains of inland drainage (IIA)	E-Jodhpur, Nagaur, Jhunjhunu, Sikar
• Transitional plains of Luni Basin (IIB)	Jalore, Pali, Nagaur, Jodhpur, Barmer

Endowment & Threats to Agricultural Productivity

Geography & soils	Undulated topography with interspersed rocky terrain. Light textured crust prone soils.
Climate	Low and erratic rainfall, high PET due to intense solar radiation, temperature & wind
Drought	Recurring feature of arid zone
Water	Scarce, G.W. meager and mostly saline
Animal	Very high population (20.5 m)
Vegetation	Negligible ground cover of poor forage productivity (0.4-0.5 t/ha)
Socio-economic status	High population pressure (22.4 m) illiteracy, uncontrolled grazing, subsistence farming and poor economic base.

Land Resource of Arid Districts of Rajasthan

Districts	Total Area (M ha)	Cultivated area (M ha)	Fallow/Pasture/ arable waste lands (M ha)
Barmer	2.64	1.70	0.84
Bikaner	2.72	1.18	1.40
Churu	1.68	1.17	0.42
Ganganagar	2.06	1.36	0.58
Jaisalmer	3.61	0.53	3.26
Jalore	1.06	0.89	0.16
Jhunjhunu	0.59	0.42	0.08
Jodhpur	2.28	1.64	0.57
Nagaur	1.77	1.21	0.16
Pali	1.64	0.76	0.16
Sikar	0.77	0.63	0.09
Total	20.81	10.53	7.25

Status of Rainfall, Growing Season and Drought in Arid Districts of Rajasthan

District	Avg. rainfall (mm)	Rainfall range (mm)	CV (%)	Crop growing season (wks)	Drought years (%)
Jodhpur	346	244-424	20-55	9-12	36
Bikaner	258	237-339	30-65	8-10	64
Jaisalmer	185	144-311	49-81	4-7	69
Barmer	269	207-343	27-70	8-11	64
Churu	328	256-376	42-60	11-12	36
Jhunjhunu	445	402-540	30-40	14-15	08
Sikar	460	429-504	25-40	12-15	08
Nagaur	369	315-490	25-50	11-14	47
Pali	472	389-619	21-55	14-15	64
Jalore	421	373-490	21-50	11-15	50

Surface and Ground Water Resources of Arid Rajasthan

- Surface water resource :
  - Luni basin – 858 x 10^6 m^3
  - IGNP – 1727 x 10^6 m^3 to 2961 x 10^6 m^3
- Groundwater resource : 2435 x 10^6 m^3 to 2957 x 10^6 m^3
- Area under different basins
  - Luni basin – 34.75 lakh ha
  - Gubia catchment – 0.41 lakh ha
  - Bandi catchment – 0.12 lakh ha
  - Sukdi – 1.94 lakh ha
- 33% G.W in Barmer, Jaisalmer, Pali and Bikaner have SAR >18
- High RSC [Av. 3.1 meL^{-1}] in GW of Jhunjhunu, Nagaur and Sikar

Human and Livestock Resource in Arid Districts of Western Rajasthan

District	Human population (M)	Density (No/Sq.km)	Livestock ACU (M)	Density (No/Ha)
Barmer	1.44	0.51	1.66	0.58
Bikaner	1.21	0.44	1.20	0.44
Jaisalmer	0.36	0.09	0.40	0.10
Ganganagar	2.62	1.27	2.49	1.21
Pali	1.49	1.20	1.47	1.19
Jalore	1.14	1.07	1.08	1.02
Sikar	1.84	2.39	1.23	1.59
Jodhpur	2.15	0.94	1.49	0.65
Nagaur	2.15	1.21	1.74	0.98
Jhunjhunu	1.58	2.68	0.92	1.55

Traditional Farming Systems

- Mixed cropping of dryland crops
- Pearl millet/*kharif* legume/oilseed based sole cropping
- Tree/shrub/grass-based agroforestry
- Livestock-based farming
- Irrigated agriculture

Crop Diversification

Productivity and Net Returns from Dryland Crops in Arid-Ecosystem at Jodhpur

Crops	Area (%)	Grain & fodder yield (kg/ha) over sole control								Avg. net return (Rs/ha) over sole control
		1:2		1:3		1:4		1:5		
		G	F	G	F	G	F	G	F	
Moth bean	2.5	760	1250	810	1400	880	1600	960	1700	1250
Mung bean	1.5	740	1300	800	1500	860	1650	920	1800	1350
Pearl millet	1.0	850	1800	900	1950	950	2100	980	2200	1500
Cluster bean	1.0	640	2050	680	2200	720	2350	750	2500	1560
Sesamum	0.5	370	1000	390	1100	*	*	*	*	620

G = Grain; F = Fodder; * crop was not grown

Yield of Various Dryland Crops and P.cineraria as Influenced by Tree-Crop Competition

Crops	Grain yield (q/ha) radial distance from the tree pole (meter)				P.Cineraria	
	2	3	4	5	Dry leaves & twigs (q/ha)	Fuel yield (q/ha)
Mung bean	0.75	1.12	1.25	1.25	8.00	20.00
Moth bean	0.16	0.62	0.84	1.13	10.50	25.00
Cowpea	1.00	1.75	1.50	1.75	8.50	22.00
Pearl millet	7.80	10.87	13.38	13.88	6.50	18.00

Growth of *T.undulata* as Influenced by the Association of Dryland Crops

Crops	Crop yield (q/ha)		Growth of *T.undulata*	*T.undulata* growth with crops over sole plantation (%)
	Grain	Fodder/ leaf	MAI (cm)	
Pearl millet	3.50	21.11	55.0	-29.2
Moth bean	1.35	4.44	69.0	-11.2
Cluster bean	1.11	2.92	81.0	+4.2
Sesamum	1.51	–	84.0	+8.1
Senna	5.12	4.12	68.0	-12.5
Sole plantation	–	–	77.7	–

Important trees, Shrubs & Grasses for Silvi-pasture Development in Western Rajasthan

Rainfall (mm)	Trees/shrubs	Grasses/pasture legumes
150-250	*Acacia leviilla, A.tortilis subsp.raddiana, A.senegal, Ziziphus nummularia, Prosopis cineraria*	*Lasiurus sindicus, Cenchrus ciliaris, Panicum antidotale*
250-350	*A.tortilis, C.myrtus, Z.nummularia, P.cineraria, A.leibbek, A.senegal, C.polygonoides, Z.oxiphylla, H. hirsuta*	*C. ciliaris, C. setigerus, Lasiurus*
350-500	*Anogeissus, Albizzia amara, Hintegrifolia, A.leibbek, A.tortilis, H.hirsuta, Z.nummularia*	*C. ciliaris, D.annulatum, I.pregrinus Clitoreia*

Integration of Alternate Landuse Systems in Farming System Perspective (7 ha)

Alternate land use system	Area
Farm forestry	25%
Agri-horticulture	30%
Agrisilviculture	15%
Agri-pasture	15%
Silvi-pasture	15%

Fruit Crops for Arid Areas of Rajasthan

District	Unirrigated	Irrigated
Barmer, Jaisalmer, Bikaner	Ber, Kair, Pilu	Ber, Pomegranate, Guava, Date palm, Gonda, Lime, Kinow, Papaya
Sriganga Nagar	Ber, Gonda	Malta, Mosambi, Kinow, Lime, Lemon, Papaya
Jodhpur, Churu, Nagaur, Jhunjhunu, Sikar	Ber, Kair, Gonda	Pomegranate, Anola, Karonda, Lime, Lemon, Guava, Bael
Jalore, Pali	Ber, Gonda, Karonda, Pilu	Pomegranate, Anola, Sapota, Guava

Major Soil Groups, Problems and Solutions for Sustainable Agriculture in Arid Rajasthan

Soil group	Problems	Solutions
Dune complex & dune hummocky soils	Severe wind erosion, shifting sand, low WHC & fertility	Sand dune stabilization, shelter belt & wind breaks, silvi pasture, agri-pasture
Light textured soils	Wind erosion, water erosion, low WHC & fertility accumulation	Alternate land use systems, arable farming, wind breaks and boundary plantation, ley farming, soil & water conservation measures
Medium textured soils	Low WHC and fertility, soil salinity & alkalinity, shallow depth	Arable farming, alternate land use system, agro-horti, HWH, IPWH, INM, soils and water conservation measures, rabi crop on conserved moisture

Previous slide contd..

Soil group	Problems	Solutions
Fine textured soils	Soil salinity & alkalinity, water logging, shallow depth	Proper drainage, use of soil amendments, alternate landuse systems, agrohorticulture, rabi crops on conserved moisture, field boundary
Shallow gravelly soils	Water erosion, soil depth, poor fertility	Afforestation, gully control measures, stabilization of nala banks, silvi pasture
Stony wastelands and hill shallow soils	Water erosion, poor soil cover, low fertility	Plantation of MPTS, silvi-pasture

Conclusion

- Agricultural sustainability and economic stability of Indian arid zone is achievable through INRM approaches WS/IC/VD.
- For success and sustainability, the programmes should be implemented and managed in convergence and consortium mode. This should lead to effective institutional building for proper PPM.
- The programmes should be backed up by logistic support on market linkages, formation of cooperatives and other social upliftment programmes.
- At farm level innovative ALVS suitably dovetailed with livestock husbandry needs to be adopted in FSD mode.

About ICRISAT®

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is a nonprofit, non-political organization that does innovative agricultural research and capacity building for sustainable development with a wide array of partners across the globe. ICRISAT's mission is to help empower 600 million poor people to overcome hunger, poverty and a degraded environment in the dry tropics through better agriculture. ICRISAT belongs to the Alliance of Centers of the Consultative Group on International Agricultural Research (CGIAR).

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