Andhra Pradesh Farmer Managed Groundwater Systems Project (APFAMGS Project)

Demand Side Groundwater Management (DSGM)

10-12 December 2008

For:
The Officers of the Andhra Pradesh State Ground Water Department
Government of Andhra Pradesh

Venue:
BIRDS International Learning Centre,
Muthyalapadu village, Chagalamarri Mandal, Kurnool District, AP

Organizers:
Food and Agriculture Organization (FAO) of The United Nations (UN)
Bharati Integrated Rural Development Society (BIRDS)
Andhra Pradesh Farmer Managed Groundwater Systems (APFAMGS) Project

Completion Report

Technical Support Team
Block No. A2(C), HUDA Complex, Tarnaka, Hyderabad – 500 007
Andhra Pradesh, INDIA. Phone: +9140 27014730/4936, Fax: +9140 27014937
Email: plapfamgs@sify.com; http://www.apfamgs.org

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FOREWORD

Andhra Pradesh Farmer Managed Groundwater System (APFAMGS) Project a National Executed (NEX) project of Food & Agriculture Organization (FAO) has been successfully working with groundwater dependent farmers in 650 villages in seven districts of Andhra Pradesh adopting the concept of Demand Side Groundwater Management (DSGM). Farmers adopting the DSGM approach have been successful in managing groundwater depletion, while avoiding risks and improving their economic returns

The impact of the APFAMGS interventions have been brought to the notice of various government agencies in the State as well as at the Centre from time to time. Regular interactions with the Director, Andhra Pradesh State Groundwater Department (APSGWD) and his exposure to the different villages encouraged him to approach APFAMGS for conducting a training workshop and exposure visits to the officers of the department

APSGWD through their letter no 8390/HPII (2)/2008 dated 25 Nov 2008 requested APFAMGS to conduct training for 25 officers drawn from the different districts and the head office on Demand Side Groundwater Management from 10-12th Dec 2008.

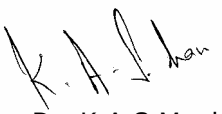
APFAMGS organized the training at the BIRDS training farm at Muthyalapadu, Allagadda, Kurnool district. The training was attended by all the nominated officers. The Deputy Director Nandyal and Kurnool extended their support in the logistics as well as took time to participate in the Inaugural and the Closing programme. All the participating officers showed keen interest in the class room lectures and more importantly in their interaction with the farmers.

The Completion report is compilation of all the lecture notes, presentations and the handouts of the field visit made available during the training. Summary of the evaluation feed back and the back at office tasks is also included for follow-up by the Department.

APFAMGS expresses its sincere thanks to Sri.S.P.Tucker, Principal Secretary Irrigation for encouraging the Director Groundwater to provide exposure to officers of the department on the farmer managed groundwater systems. Special thanks are to Sri. B.M.Murali Krishna, Director and his colleagues in the department for their initiative and close follow-up.

This training would not have been successful without the co-operation and support of all the participants. APFAMGS is hopeful that the learning's from the training will help the officers in designing their future work plan as well as encourage them to increase their faith on the ability of farmer communities in technical data collection and sustainable groundwater management.

APFAMGS dedicates this workshop in memory of Late Sri.Kanneganti Sridhar, Consultant APFAMGS, who met with a tragic accident on 1st Dec 2008 who was regularly interacting with the department for the conduct of the training workshop.



18 December 2008

Dr. K.A.S.Mani
Project Leader
APFAMGS

GOVERNMENT OF NDHRA PRADESH
GROUND WATE DEPARTMENT

From

Sri. B.M.Murali Krishna Rao,
M.Tech., FIE., C.Eng (I)..
Director (FAC),
Ground Water Department,
BRKR Govt.Offices Complex,
7th & 8th Floors, B-Block,
Tank Bund Road,
HYDERABAD – 500 063.

To

Sri Valaperla Paul Raja Rao,
Executive Director – Birds
H.No.26/130 B1, Gnanapuram,
Nandyal (RS) – 518502
Kurnool District.

Lr.No.8390/HPII(2)/2008, Dated:25.11.2008

Sir,

Sub: Andhra Pradesh Ground Water Department – Hydrology Project-II – Financial Year 2008-09 – Trainings - Demand Side Ground Water Management (DSGM) Awareness raising to users of Ground Water by the Officers of the Ground Water Department - Nominations providing - Regarding.

Ref: 1) Your Lr.No.Nil, Dt: 07.08.2008.
2) This Office Letter.No 8390/HPII(2)/2008, Dt: 06.11.2008.

*****

With reference to the subject and your letter at reference cited above, I am herewith nominating the departments officers as per list enclosed for attending the training programme on Demand Side Ground Water Management from 10th December 2008 to 12th December 2008 at your training institute / organization.

Hence you are requested to provide the training as per schedule with necessary logistics, to the Twenty Five (25) participants of this Department.

You are also requested to provide the invoice along with advanced stamp receipt for processing payment. Further you are also requested to communicate the course completion report of the participants after providing the above training.

Yours Faithfully,

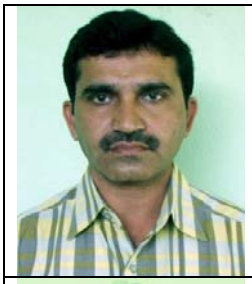
DIRECTOR (FAC)

Encl: List of participants

1. LIST OF PARTICIPANTS

Photographs	Name and Address
	**K. S. Sastry** Asst. Director (Hg) O/O The Deputy Director, Groundwater Department, Balaga, Hospital Junction, Srikakulam Phone : 08942-278739 email: kompella_sastry@yahoo.com
	**R. K. M Raju** Asst. Hydrogeologist, Vizianagaram # 4-49.22 lawson bay colony, visakapatnam–17 Phone : 0891-2728443/9440424819 Email : rkm_raju24@yahoo.com
	**Mr. C.C.S.Rao** Asst. Hydrogeologist Flat no:3, D.No: 3-2-9/6, Ranga Residency, opposite to pedda waltair, visakapatnam – 17 0891-2798750 / 9490223259 cheelacsrao@gmail.com
	**G. Srinivasa Rao** Asst. Hydrogeologist 2-272, indira gandhi lane, opp III APSR anjaneya nagar, ramanayyapeta, kakinada – 533005 08812-252972 / 9441437351 rao_geologist@gmail.com
	**G. Satyajeevan** Asst. Hydrogeologist Groundwater Department, sitarampuram, kadiyalavari street, vijayawada 0866-2440193 / 9949458883 gsjeevan_rao@gmail.com
	**G. Narasimulu** Asst. Hydrogeologist Flat no:S-2, saisudarshan appartment, 7/2 chandramouli nagar - Guntur - 522007. 0863-2230767 / 9394153117 varahaphy@gmail.com

	**Dr. A. Madhava Rao** Asst. Hydrogeologist Flat no: F-2, saidrsan appartment, 5/3 chandramouli nagar, Guntur - 522007. 08592-233118 / 9441915771 madhava_alapati@yahoo.com <madhava_alapati@yahoo.com>
	**M. Nagamalleswara Rao** Asst. Director (Hg) O/O The Deputy Director vedamvari agraharam, 1st cross road, near vijaya mahal, rly gate, Nellore 0861-2327104 / 9948373817 gwatnellore@yahoo.co.in <gwatnellore@yahoo.co.in>
	**K. Govardhana Reddy** Asst. Hydrologist O/O The Deputy Director, Groundwater Department, Naidu buildings, Chittoor - 517001. 08572-232837 / 9849011517 chittoor_dd@yahoo.co.in <chittoor_dd@yahoo.co.in>
	**G. Veeranarayana** Asst. Hydrogeologist 16/563, Masapet, Kadapa - 516001. 08562-244076 / 9948373819 sgwdedp@rediffmail.com <sgwdedp@rediffmail.com>
	**C. V. Ramanna** Asst. Director (Hg) Groundwater Department, Ramnagar, Anantapur 08554-278905 / 9440087273 ddgwdatp@sify.com <ddgwdatp@sify.com>
	**P. Purushottam Reddy** Deputy. Director (Hg) Groundwater Department, NH 7 road, krishna nagar, B.Camp (po), Kurnool - 518002. 08518-229467 / 9848886545 ppreddy_2002@yahoo.com <ppreddy_2002@yahoo.com>

	**T. Sudhakar Reddy** Deputy Director H.No: 1-168/1,Prabhat nagar, Chaitanyapuri, Hyderabad - 500060. 9440866849
	**G. Nageswara Rao** Asst. Hydrogeologist H.No: plot 30&31, ramachandra singh colony, opp andhra bank and beside uppal bus depot, peerjadguda,Hyderabad. 9441789239
	**S. Chandra Shekar** Asst. Director (H) O/O The Deputy Director, Groundwater Department, Rangareddy, Medak District. 9948078549
	**P. Srinivasu Babu** Asst. Geophicist O/O The Deputy Director, Groundwater Department, subash nagar, nizamabad - 503002. 9440012607 palukurithejo@yahoo.com <palukurithejo@yahoo.com>
	**G. Mohan** Asst. Hydrogeologist O/O The Deputy Director, Groundwater Department, near chain gate, nirmal - Adilabad district. 9441869269 g_mh@rediff.com <g_mh@rediff.com>
	**N. Raji Reddy** Asst. Hydrogeologist H.No: 1-7-1174, Advocates colony, hanamkonda, warangal - 506001. 9440987940 nagavelii.rajireddy@yahoo.com <nagavelii.rajireddy@yahoo.com>

	**G. Pulinder Reddy** Asst. Hydrogeologist H.No: 2-5-317, Nakkalagutta, Hanamkonda - 506001. 9885253529 pulindhargangula@yahoo.co.in <pulindhargangula@yahoo.co.in>
	**D. Ramesh Kumar** Asst. Hydrogeologist H.No: 6-1-58, VDO's colony, Khammam - 507002. 9866631720 dr_dhranikota@yahoo.co.in <dr_dhranikota@yahoo.co.in>
	**G. Bhoopal** Asst. Hydrogeologist B/O . G.Yadaiah, Flat no: 404, Kundan towers, opp to HRD Degree college, Narayanaguda, Hyderabad – 29 9440515312
	**N. Srinivas** Asst. Director (Hg) O/O The Deputy Director, Groundwater Department, 8th floor, B.R.K.R government offices complex, near tank bund, Hyderabad - 500 036 9948373842 srinalluri@rediffmail.com <srinalluri@rediffmail.com>
	**Padma Prasad** Asst. Director (H) O/O The Deputy Director, Groundwater Department, 8th floor, B.R.K.R government offices complex, near tank bund, Hyderabad - 500 036 9948373848 padmaprasadk@yahoo.com <padmaprasadk@yahoo.com>
	**Dr. K. Chalapathi Rao** Asst. Hydrogeologist 92/3 RT, Happy home Appartments, opp. Multi sports complex. Vijayanagar colony, Hyderabad - 500 057 9866619560 apsgwd@sify.com <apsgwd@sify.com>

<table>
<tr><td>  </td><td>G. Vignaneswar
Asst. Hydrogeologist
29-178-4, SBI colony,
Nandyal - 518 502, Kurnool District
9440882581</td></tr>
<tr><td>  </td><td>K. Venu Gopal
Deputy Director
O/O The Deputy Director,
Groundwater Department, SRBC Nandyal,
Tekke, opp 2 town police station.</td></tr>
<tr><td colspan="2">G. Subrahmanyam
Asst. Hydrogeologist
O/O The Deputy Director,
Groundwater Department, SRBC Nandyal,
Tekke, opp 2 town police station.
08514-243035 / 9866006946</td></tr>
<tr><td colspan="2">P.S. Vijaya Kumar
Asst. Hydrogeologist
O/O The Deputy Director, gunuru complex,
above state bank of india, thadithota,
Rajahmundry, East Godavari District
0883-2469530 / 9989154927</td></tr>
</table>

2. LEAD FACULTY

Sno	Name of the Faculty	Name & Designation
1.		**Dr. K. A. S. Mani** Water Resources & GW Data Base expert & Project Leader, FAO-APFAMGS Project
2.		**Dr. S. V. Govardhan Das** Groundwater resources & Social Development expert, FAO-APFAMGS Project
3.		**Dr. P. S. Rao** National Programme Coordinator, Land and Water, FAO, India.
4.		**Ch. Rambabu** Director – GVS Madanapalli, Chittoor District
5.		**S. Ravi shankar** Consultant – Agriculture FAO – APFAMGS Project
6.		**Y. Sudhakar** World Education Hyderabad.
7.		**O. Sampath Kumar** Software Programmer MICROWARE Corporation New Delhi
8.		**Farmers** Famer Resource Persons from Hydrological Unit Networks (HUNs)

3. WORKSHOP SCHEDULE

Day One: 10th December, Wednesday

Time	Session	Faculty/Facilitator
09.30	Registration	Sri. Nagaraju, BIRDS
10.00	Inaugural Ceremony	Sri. V. Paul Raja Rao, BIRDS
10.30	Introduction of the participants	Sri. V. Paul Raja Rao
11.00	**Tea**	
11.30	The concept of DSGM	Dr. P. S. Rao, FAO
12.00	Participatory Hydrological Monitoring	Dr. S. V. Govardhan Das, APFAMGS
13.00	**Lunch**	
14.00	Field visit: Ramakrishnapuram	Sri. G. Nagaraju, BIRDS
17.00	**Refreshment**	
18.30	Kalajatha (Cultural Program)	Sri. G. Anil, APFAMGS Project

Day Two: 11th December, Thursday

Time	Session	Faculty/Facilitator
09.30	Participant's Recapitulation of day one	Sri. Y. Sudhakar, WEI
10.00	Social Action in DSGM	Sri. Ch. Rambabu, GVS
11.00	**Tea**	
11.30	Crop Water Budgeting	Dr. S. V. Govardhan Das
12.30	Farmer Water Schools	Sri. Y. Sudhakar WEI / Dr.P.S.Rao
13.30	**Lunch**	
14.30	CWB Demonstration	Smt. K. Sridevi, HUN member, Pedavagu HU
15.30	**Tea**	
16.00	Gallery Walk to FWS Sessions	Sri. Y. Sudhakar
17.30	**Refreshment**	
19.00	Open Air Cinema	Sri. G. Anil

Day Three: 12th December, Friday

Time	Session	Faculty/Facilitator
09.00	Participant's Recapitulation of day two	Sri. Y. Sudhakar
09.30	Crop Water Efficiency	Sri. S. Ravi shankar, APFAMGS
09.45	Habitation Resource Information System (HRIS) and Information Kiosk	Sri. O. Sampath Kumar, MICROWARE
10.30	**Tea**	
11.00	Field visit: Mudurallapalle	Sri. S.Ravi shankar and Sri. G. Nagaraju
13.00	**Lunch**	
14.00	Lessons from APFAMGS experience	Dr. K. A. S. Mani, APFAMGS
15.00	Participant's Back at Office Action Plan	Dr. K. A. S. Mani / Dr.P.S.Rao
15.45	Training Evaluation	Sri. Y. Sudhakar
16.00	**Valedictory session**	Sri. V. Paul Raja Rao
16.30	**High Tea and Close**	

4. Session Wise Presentation

Concept of Demand Side Groundwater Management

Dr.P.S.Rao, National Program Co-ordinator, FAO
PS.Rao@fao.org

Conventional Approaches to water management

- Controlling (denying) access
- legislating
- advising (dictating)
- designing projects/schemes for recharge, watershed etc
- Top down approach (Bureaucratic)
- Make easy choices

Focus on Supply Side

Alternative Approach

- Free access
- Institution Building
- Provide Knowledge and Skills
- Manage water use -Improve efficiency, increase water productivity-without negative economic impacts
- Bottom up approach (Stake holder driven)
- Change the way we think about groundwater
- Make Difficult choices

Focus on Demand Side

Pre-Requisites for Demand Side Management Approach

- Appropriate institutional structure –Operational level
- Improved knowledge base of stake holders, planners
- Access to Critical Information
- Decentralized Planning
- Stakeholders participation in decision making

Critical components Demand Side Management Approach

Change perceptions on water use

Plan water use matching with availability

Build capacity- Non Formal Education techniques

Innovate methods in efficient water use

Water use be made cost effective

Reallocate Investments from big structures to communities

Create awareness at political level

Instruments for Change

Institution & Gender

Governance

Demystify science & Technology

Democratic Decision Making

Self Regulation (as opposed to Regulatory)

Linkages

Institution & Gender

Community Institution at habitation level federated at Drainage level

Equal Representation of all stake holders

Effective participation, democratic decision making

Pressure group

Lobbying

Governance

- Decentralized local level governance
- Stakeholders exercise their control in managing the resources optimally
- Different users (Direct/indirect) including marginalized and poor participate in management
- Evolve local plans and rules for sharing and equity

Demystify science & Technology

- Enhance Capacity and skill of communities
- Involve communities in technical data collection
- Use community assets for monitoring - instead of dedicated monitoring wells
- Offer systematic technical training without dilution of technology
- Share data with community
- Engage community to deliberate on data

Democratic Decision Making

- Create Awareness on resource availability
- Appreciate Resource distribution in space and time
- Improve water use efficiency
- Identify appropriate water use system matching with resource
- Form pressure group to implement sustainable practices

Self Regulation

- Make tough choices
- Wary of Incentives
- Incorporate market intelligence
- Shift water use to non traditional areas
- Prioritize on economics of water

Linkages

- Sensitise decision makers at different levels
- Lobby for just use of common good
- Invest funds in building knowledge
- Initiate data collection in partnership with community
- Influence all elected bodies
- Incorporate Demand Side Approaches at policy levels

Concept of Demand Side Groundwater Management (DSGM)

Dr. P.S.Rao, FAO-New Delhi

Background

Groundwater depletion is a phenomenon that has been witnessed in large parts of India especially in the states of Punjab, Haryana, Gujarat, Rajasthan, Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu over the last three decade. The main cause for depletion undoubtedly is due to the overexploitation of the available groundwater resources. Many of the reasons for over-exploitation of groundwater can be traced to a range of political, social, economic, administrative and developmental programmes that have been implemented by the Central and State governments, in the name of improving the life of people in different social strata. Unfortunately many such programmes have very limited outlook on their negative impacts and long term sustainability.

Range of incentives offered under various developmental programmes have been the principle cause for over-use as well as abuse of precious ground water resources leading to a point where groundwater pumping is far more than the recharge. Most of such developmental programmes have triggered steep decline in groundwater levels leading to water shortages, water quality degradation affecting the drinking water supply and agriculture production system.

Planning commission's Expert committee group on groundwater (2007) observed that more than 55% of all irrigation water needs are met from groundwater, and more than 80% of all rural water supplies are groundwater dependent. Additionally all the cottage and small scale industries are dependent on groundwater. Increasing demand for groundwater over the years has also been due to the failure of surface irrigation projects to deliver water to farmers in the required time and in the desired quantities. This has forced more and more farmers and rural water supply agencies to invest huge sums on dependable irrigation source by way of drilling of bore wells.

It is estimated that currently there are over 20 million groundwater structures in the country. More than 15% of these structures have been abandoned due to lowering of groundwater water levels or deterioration in groundwater quality. Another 15% of the wells are functional only for 3-6 months in a year. Over-exploitation of groundwater is thus a matter of great concern that has to be handled in a way so as to limit the serious fallouts from failing wells.

The government of India has approached the issue of groundwater level decline largely through regulations to ensure exploitation of ground water resources does not exceed the recharging possibilities, as also to ensure social equity. The policy states that Central and State governments shall work together to prevent negative environmental consequences of

over exploitation of ground water. Ground water recharge projects should be developed and implemented for improving both the quality and availability of ground water resource.

Following the recommendation of the Water policy the central government drafted model bills for regulating groundwater over pumping and made it available to the States for implementation. The model bill recommended the states to establish Ground Water Authority, notify areas subjected to groundwater over-pumping, control and regulate ground water development, implement groundwater recharge structures and take penal action against those who go against the bill.

State governments including Andhra Pradesh, Goa, Tamil Nadu, Lakshwadeep, Kerala, Pondicherry, Maharashtra, West Bengal have enacted the Groundwater Legislations, while other States are in the process of implementing them.

Governance on the stressed groundwater system supported by the Water policy legislation have provided the state's the power to control the over-pumping of groundwater as well initiate steps to reverse the groundwater decline. Armed with all powers and authority after the passage of legislation in the various assemblies the governments agencies conferred with the authority to implement the bills have been confronted with issues that are unrelated to technical aspects of water but more related to fundamental issues like drinking water availability, water quality, social in equalities, individual rights, access to water source, role of vested interest groups, conflicting outlook between surface and groundwater users etc.

Implementation of the legislation which is largely a technical interpretation of groundwater issues in a complicated socio-political environment has been more or less a non starter. The inherent conflict between techno-legal interpretation of the groundwater scarcity in relation to social, economic and institutional processes has emerged as a challenge to implementation of the bill.

While the governments have been struggling to enforce regulatory approaches to groundwater governance, other institutions in the Non Governmental Sector and International Agencies through various developmental programmes have been exploring alternative approaches to water governance that adopts non-regulatory participatory approaches towards encouraging farmers to reduce groundwater pumping.

Demand Side Groundwater Management (DSGM)

Demand Side Groundwater Management as accomplished by APFAMGS refers to a broad range of techniques in conservation practices (soil, land, water, crops) that are adopted

voluntarily by individual farmers from several habitations simultaneously leading to improvement in groundwater availability across the Hydrological unit. DSGM is adopted as a solution to the collective problem of failing wells due to groundwater over use.

The concept of DSGM adopts the principles of equity, common vision, participation, transparency, and accountability. Demand Side Management concept aims at improving the efficiency of crop water use which is an outcome of long process of capacity building of farmers with new knowledge and skills along with demystification of the science adopting the Farmer Water School approach. Demand Side Management concept to be effective requires voluntary participation of all groundwater user farmers belonging to different social strata with no incentives/subsidies provided for participation.

DSGM requires a good appreciation of the groundwater resource availability and its variations in space and time; as a result the farmers need to enter into co-operative alliances with the fellow farmers in the upstream and downstream. Institutions such as Hydrological Unit Network (HUN) have emerged as the main vehicle to federate the farmers from the habitation level Groundwater Management Committees (GMC).

As part of DSGM farmers adopt various strategies for getting the same or greater returns/benefits pumping less water from the ground. The farmers have demonstrated in several hundred villages that Ground Water use could be reduced appreciably through relatively simple practices at the farm level and by adopting new water saving techniques. The greatest advantages with respect to Demand Side approaches have been in the form of postponement of new investments until such time when all the existing systems are operated efficiently. Elimination of the need for spending large amounts of capital for newer capacities has considerably reduced the risks on farmers at a time when suicidal deaths are on the increase.

Ownership of the problem of groundwater decline by the farmers, supported by technical data collection leading to knowledge and sharing has led to reduction in groundwater pumping. Over the 4 years the water savings achieved grew progressively beginning with 3 Hydrological Units in 2004, 38 in 2005, 59 in 2006 and 63 in 2007. The water savings realized have been through a chain of events in a hydrologic year beginning with data collection, assessing the resource prior to Rabi season followed by practicing of appropriate crop choice, adopting water saving methods and improving water use efficiency as a logical outcome. Analysis of the data collected shows the project gains in the area of reduction in groundwater pumping, controlling decline in water levels, diversification of cropping system, abstaining from Paddy are across the project area.

The groundwater savings achieved by the project have been by adopting following methods:

Diversification of cropping systems

As part of the farmers approach to reduce groundwater pumping, diversification of cropping system have been practiced over the last four years. 160% change in cropping system has been witnessed. While initially the number of crops in the project area was only 14 it has increased to 32 and is continuing to increase. The crop diversification has been largely towards low water consuming crops. Even in high water consuming crops like Paddy, Sugarcane, Banana, Turmeric and Mulberry practices that can reduce groundwater have been adopted. Food security and improved nutrition have never been compromised while changing the cropping systems.

Reduction in area under paddy

The most preferred crop in the seven districts forming part of the project area is the high water guzzling paddy crop and in limited areas under sugar cane and banana. Even while groundwater levels continue to fall steeply, paddy still continues to be the preferred crop by all groundwater users be it big, medium or small farmers. Knowledge on the groundwater crisis by the farmers in the project area, prompted the GMC's and HUN's to develop crop plans that addressed the issue of groundwater decline. The crop plans developed after the water balance estimation, aims at reduced groundwater pumping from wells. One of the water saving method adopted by the farmers has been reducing water use for paddy or shifting to crops that have high returns with low water foot print. In certain areas where water logging conditions are being witnessed due to the soil conditions the shift away from paddy appears difficult for the present.

Reduced in groundwater pumping

Analysis of field data from number of Hydrological units shows that groundwater pumping for agricultural use is significantly reduced by a number of farmers in the project area. In 32 hydrological units groundwater pumping is reduced as compared to earlier years while in 18 hydrological units there is significant moderation in pumping. In 8 other hydrological units reduced pumping by individual farmers has not led to a significant impact at the Hydrological Unit level.

Reduction in groundwater pumping from the earlier year's has largely been achieved through Improved Water use efficiency. Different types of water saving techniques / methods have been practiced in chillies, Groundnut, Sunflower, sweet orange, rice, etc.

Training on Demand Side Groundwater Management (DSGM)
10-12 December 2008, BIRDS International Learning Centre,
Muthyalapadu village, Kurnool district, AP

Participatory Hydrological Monitoring (PHM)

DR. S. V. GOVARDHAN DAS
Advisor - Water Management
Technical Support Team (TST), AFPAMGS Project

Scheme of Presentation

- Genesis
- Definition
- The Concept
- The Need
- Opportunities
- Objectives
- Key Strategies
- Key Stakeholders
- Steps in PHM Process
- Training Content
- Lessons

Genesis

- APWELL Project (1995-2003)
  - Community Borewell Irrigation Schemes
  - Small and Marginal Farmers
  - Drought prone districts
  - About 3500 borewells commissioned
  - Declining water levels
  - PHM Pilot: 7 Hydrological Units (1999)
- APFAMGS Project (2003-2009)
  - Blown up version
  - Knowledge based approach

Definition

- Participatory Hydrological Monitoring or PHM refers to a set of activities carried out to keep track of the changes in a hydrological unit by the users themselves with little input from outsiders

The concept

- People should be encouraged to monitor and manage their own groundwater system
- People managed groundwater system is possible with interface of scientific know how and indigenous wisdom
- Introduction of simple tools and skills would enable people to manage their groundwater systems

The need

- Mushrooming of borewells
- Depleting groundwater resource
- Futile investments leading to suicides
- Is legislation enough?
- Who is affected?
- Who should understand the hydrology?
- Who is capable of taking remedial action?

Opportunities

- Field testing of the PHM approach with Dutch funding
- Putting up the hydrological monitoring system
- Users can understand the aquifer system within which they are operating
- Community capacity building
- Institution building around water
- Initial support (technical and non-technical support of the project)
- Can supplement the regulatory efforts

Objectives

- Discussion triggered at the community level about rainfall - draft - water level relationship
- Water use plans are evolved by the community based on utilizable groundwater resources
- People managed groundwater systems

Key Strategies

- Interface between scientist and farmer
- Multi-disciplinary Teams
- Kalajatha for general awareness generation
- Farmer monitoring of groundwater system
- Scientific assessment of groundwater resource
- Initial handholding by Multi-disciplinary Teams
- Presentation of scientific facts to the farmers
- Non-formal education method of communication
- On-farm demonstrations
- Hand-holding and Handing over

Key Stakeholders

- Groundwater Users (men and women)
- Multi-disciplinary Teams
- Non Governmental Organizations
- Technical Support Organizations
- Government Departments
- Similar projects/agencies
- Elected representatives of people
- Peer groups
- Funding Agencies

Steps in PHM process

1. Reconnaissance/meeting with opinion leaders
2. Kalajatha
3. Delineation of Hydrological Unit
4. Resource Inventory
5. Base Document

Steps in PHM process

6. Site identification: RG stations and observation wells
7. Social feasibility study
8. Procurement of equipment/material
9. Establishing Hydrological Monitoring Network
10. Supply of equipment to community

Steps in PHM process

11. Farmer training: PHM Module 1
12. Farmer data collection/handholding
13. Farmer data recording/handholding
14. Erection of Display boards/data display
15. Farmer training: PHM Module 2



Steps in PHM process

16. Formation of Groundwater Monitoring Committee
17. GMC training: PHM Module 3
18. Crop Water Budgeting exercise
19. GMC training: PHM Module 4
20. Handholding and Handing over


Training Content

PHM Module 1:

- Hydrological cycle
- Factors governing groundwater behavior in space and time
- Aquifer types and characters
- Causes for depletion of groundwater resource
- Causes for environmental pollution
- PHM: Concept and content
- PHM equipment/material: working principles
- Demonstration of measuring SWL, PWL, Discharge and Rainfall
- Farmer practice sessions

Training Content

PHM Module 2:

- Hydrological Monitoring Record
  - Entering secondary data in HMR
  - Entering Rainfall data in HMR
  - Entering SWL data in HMR
  - Entering PWL data in HMR
  - Entering Discharge data in HMR
- Updating on display boards
  - Updating Rainfall type display board
  - Updating Water level type display board
  - Updating HU type display board

Training Content

PHM Module 3:

- Conduct of a meeting
- Book keeping
  - Record of meetings
  - Income & expenditure statements
  - Hydrological Monitoring Record
  - Filing of all primary and secondary resource information
- Operation and maintenance of PHM assets
- Legislation pertaining to groundwater and institutions involved in groundwater management
- Water sharing agreements models

Training Content

PHM Module 4:

- Rabi resource inventory
- Collection of farmer level crop-plans for rabi
- Working with the CWB spreadsheet
- Options for efficient use of groundwater
- Non Formal Education methods of communication
- Conducting CWB Workshop
- Conducting Rabi Crop adoption survey

Staff Training

- PHM Module 1 to 4
- Base document compilation
- PHM data analysis
- Presentation of analytical studies
- O&M of PHM assets
- GIS and GPS
- Case study writing
- Exposure visits
- Teachers/school children motivation

Lessons

- Trainings are best timed before actual grounding of an activity
- Kalajatha is very effective in demystifying science
- Villages where groundwater depletion is a recent phenomenon can be motivated by exposure visits
- Usage of flip-charts, audio-visuals, stories, live models, demonstration and practice method is very effective in farmer training
- It is essential to fix the responsibility of PHM tasks on individual members of the community

Lessons

- Display boards trigger lot of discussion around the status of groundwater
- Farmer Melas serve as good platform for farmer-to-farmer interaction
- Data gaps result from seasonal observation wells
- Hand Pumps and other wells can be converted as Observation Wells
- Local support system need to be developed to ensure timely services
- Additional stocks of equipment, including HDPE pipe and Water Level Indicators is needed to avoid data gaps

Lessons

- Ground Water Quality need to be part of Hydrological Monitoring, at least in problem areas
- Base Document should be ready before physical intervention, lest we lose the opportunity to compare the pre and post intervention scenario
- GIS can play a major role in visual data display
- Data analysis and sharing is effective in NFE mode
- Linkages with Govt. Departments help farmers in accessing different schemes
- Inviting Government Officers for workshops/ trainings is an effective way of building up functional linkages

Lessons

- The Telugu Newsletter not only helped in cross learning but also demystifying Hydrological Science
- Motivating School Children could prepare the future citizens in a better way to cope up with challenges in groundwater management
- There is a need to encourage competition, all levels, for better motivation to work
- Farmer to farmer training is more effective than Facilitator to Farmer training
- The farmer collected data can be sold to research institutions

THANK U

APWELL Project

Judicious Management of Groundwater through Participatory Hydrological Monitoring

A M a n u a l

ARCADIS EUROCONSULT

Profile of R.Krishnapuram village

The village 'Ramathirtham Krishnapuram' (R.K.Puram) is located in the south-southeast of Kurnool district, Allagadda mandal, which is about 135 km from district headquarters. The village lies between the longitudes 78° 35' 10" and 78° 36' and latitudes 15° 05' 00" and 15° 07' 01". As such it falls in the Survey of India toposheet no. 57 I/12 (1:50,000). This village is situated in Peddavagu Hydrological Unit (HU).

Population

The total population of the village is 2091, 1603 men and 1028 women, which gives a sex ratio of 967 females for 1000 men. Children, below the age of 18, are 40% of the population. The economically active population is around 42%.

Item	Particulars	Units
Population	Total population	2091
	Male	1063
	Female	1028
	Households	404
Community (Households)	SC	60
	ST	1
	BC	235
	DC	108
Occupational Status	Agricultural labor	20%
	Rural artisans	2%
	Agriculture	78%

Basic information of R.K.Puram village

S.No	ITEM	DETAILS
1	Cultivable Area	480 ha.
2	Bore wells	164
3	Observation wells	10
4	Discharge measuring wells	5
5	Average rainfall	741 mm.
6	Irrigated Area	272.58 ha.
7	Rainfed area	121.1 ha.
9	No. of raingauge stations	1

Institutions and facilities in the village:

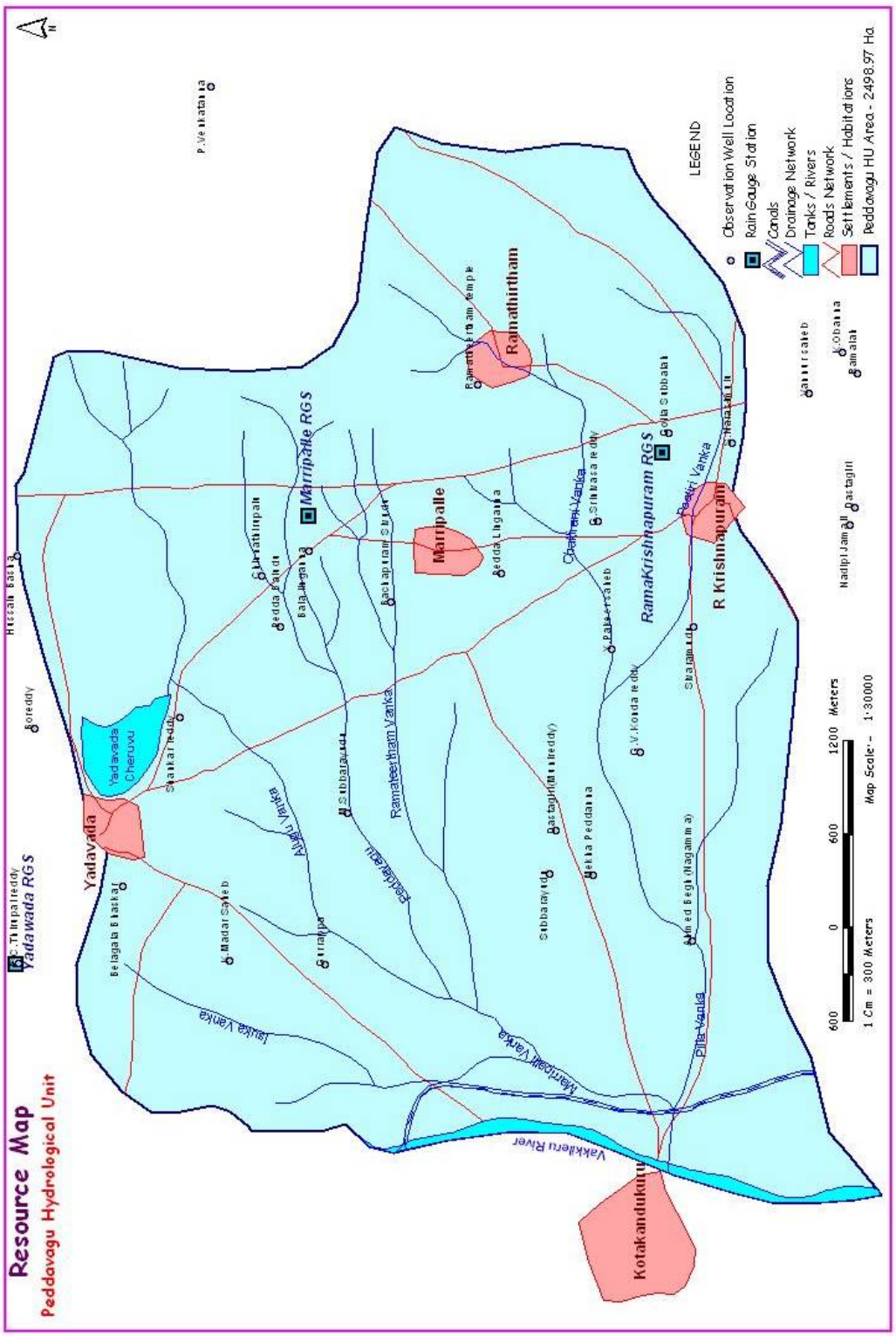
The available infrastructure in the village consists of an upper primary school, a post office and a drinking water tank. The water is pumped to this overhead tank and supplied through

taps to the entire village to meet drinking needs of village. Apart from this, there are seven bore wells fitted with a hand pump.

There are representatives from two dairy cooperative societies (Vijaya (Govt.) and Nandi (Private)) in the village to collect milk from farmers. They supplies minimum of 360 liters of milk per day. Two Stone Crushers are out side of the village and its contract period is of 3 years and some royalty amount was paid by the Stone Crusher's management to Grama Panchayathi. This amount was utilized for cement Roads laid in the streets. But, nearly 10 acres of land was damaging with fly ash which is being delivered by the Stone Crusher Unit.

Agriculture:

For agricultural practices, most of the farmers are practicing traditional methods using wooden and iron implements. For land preparation and ploughing, bullocks are used. Very few farmers use tractors. For sowing wooden seed drills are used. Manual labor is engaged for weeding and for the application of pesticides. Sprayers are operated manually. The most common method of irrigation is furrow irrigation. Farmers adopt sprinkler, drip, alternate furrow, check basin, silt application for crops. For certain crops like, sunflower and groundnut, farmers make use of multicrop threshers for separating the seed materials. The major extent of area covers with redgram, Okra, jowar etc., in Kharif season & groundnut, blackgram, greengram etc., are seasonal crops in rabi season.


Resource Map
Peddavagu Hydrological Unit
Yadawada RGS
Marripalle RGS
RamaKrishnapuram RGS
R.Krishnapuram
Ramathirtham
Marripalle
Yadavada
Yadavada Cheruvu
Kotakandukuru
Vakkileru River
LEGEND
Observation Well Location
Rain Gauge Station
Canals
Drainage Network
Tanks / Rivers
Roads Network
Settlements / Habitations
Peddavagu HU Area - 2498.97 Ha.
1 Cm = 300 Meters
Map Scale - 1:30000
600
0
600
1200 Meters

Field visit to R.Krishnapuram habitation

Date: 10th December 2008, 14.00 to 17.00 hrs

Lead faculty/coordinators: Mr.Nagaraju & Mr.Anil

Place: R.Krishnapuram, Allagadda Mandal, Kurnool district.

Project interventions

Participatory Hydrological Monitoring (PHM) As a part of PHM network, Andhra Pradesh Farmer Managed Groundwater Systems (APFAMGS) project have established Rain Gauge (RG) station for monitoring daily rainfall, Observation (OBW) for monitoring of groundwater levels (Static Water Level (SWL), Pumping Water Level (PWL) & discharge) measurements. The data collected is used in the computation of Crop Water Budget (CWB) prior to Rabi season. CWB creates the awareness on appropriate crops to be adopted matching with the utilizable groundwater resource

Groundwater Management Committee (GMC)

Several Community Based Organisations (CBOs) already exist for managing intervention by government and non-governmental organizations. Most of the institutions are formed with specific objective. Apart from these issue specific institutions, there is the panchayat raj body duly elected by village people. Wherever possible, existing institutions dealing with water are activated to take up PHM towards promoting the concept of Demand Side Groundwater Management. Where there are no institutions working for sustainability of water resource, a new GMC are formed.

GMCs bring on centre stage discussions about the status of groundwater and create opinions on its restoration and management. The capacities of the GMC members are periodically built to ensure effective data collection and dissemination of the information to larger audience. The GMC members are nominated by Gramasabha. GMC in R.Krishnapuram is registered under Mutually Aided Cooperative Societies (MACS) Act on 23rd March 2001.

The Registration No. is A.M.C./KNL ID.C.O./200l /252 on 23rd March.

Now MACS is acting as Groundwater Monitoring Committee (GMC) since 2003 to fulfill APFAMGS project activities successfully.

List of GMC Members

S.No.	Name of the Farmer	Designation
1	G.V. Konda Reddy	President
2	M. Lakshmi Govinda Reddy	Vice President
3	K. Veerachari	Secretary
4	M. Dastagiri	Director
5	M. Sivanaddappa	Director
6	Jagan Mohan Reddy	Director
7	G. Lakshmi Reddy	Director
8	L. Savithramma	Director
9	M. Hussainbee	Director

Groundwater Monitoring Committee (GMC) activities

- Regular monitoring of rainfall data through rain gauge station, measuring of water levels in Observation wells, & discharge measurements
- Data collection, Recording & Dissemination through display boards
- Updating the resource inventory
- Owning of PHM assets & proper maintenance
- Establish linkage with line departments & Non-Governmental Organizations
- Conduct health camps to enhance women participation in project activities
- Collection of crop plans & crop adoptions of Rabi
- Follow up of CWB decisions
- Conduct Regular monthly Meetings
- Select participants list for various trainings & regular monitoring on attendance.
- Dissemination of discussions held at FWS-FMGS sessions in Mandal Mahila Samaikhyas (MMS) meeting, Village Organization meetings etc.,

Achievements

- Regularly share CWB results through pamphlets to bring awareness to the farmers on available groundwater situation for crop choices.
- Maintenance of Multi crop Thresher obtained through contribution of FAO (for taking part in Season-long ToT in Okra) and GMC.
- Conducted Grama sabhas inviting the farmers of the village
- Specially designed wall painting & model on water level fluctuations based on rainfall data.
- Organized Kalajatha, & Health camps

- Introduced new varieties of crops by procuring from research stations, progressive farmers, National Seed Corporation (NSC, nandyal) etc.,
- Motivated the farmers to participate in special occasions like World Water Day, World Food Day, World Women's Day etc.,
- Repaired hand pumps on behalf of GMC, which were not functioning
- Arrangement of taps for water supply line to arrest the leakage of drinking water
- Veterinary health camps were organized with collaboration of panchayat
- Cleaning of Ground Level Service Reservoir (GLSR) tanks of village every two months.
- Sanitation activities to control spread of diseases.
- The MACS Society has total savings of Rs.3 lakhs nearly, Share capital, welfare fund, debit fund and others nearly Rs. 2.20 lakhs
- Procuring and selling fertilizers

Thus GMC influenced the farmers of R.K.Puram village such that the following changes were observed.

- Change of crop according to available groundwater
- Growing short duration crops in rabi
- Advance sowing of crops to escape water scarcity during critical stages
- Reduced the extent of water demand crops like rice, cotton etc., than previous years.
- Adopted different water use efficiency practices like check basin in groundnut, alternate furrow in pigeon pea etc.,, water saving techniques like sprinkler, rain gun & drip etc.,

Hydrological Unit at a Glance

Name of the Hydrological Unit	**:** Peddavagu HU
Name of the Mandal	: Allagadda
Geographical area	: 2499 ha
No of the Panchayats	: 4
No of Habitations	: 5
No. of Families	: 1316
Population	: Male: 3877 Female: 3928 Total: 7805
Irrigation water sources	: Tanks: 1 Open Wells: 0 Bore Wells: 248
Ground water recharge structures	: Check dams-14, Kuntas - 4 Farm ponds-12, Rock Fill Dams-40
No. of Observation Wells	: 30 No of Rain Gauge Stations : 3

Land use Particulars Under	**:** Surface water	: 52.2 Ha
	Ground water	: 1520.5 Ha
	Rain fed	: 528.8 Ha
Major crops grown	**:** Groundnut, Black gram, Green gram, Rice, Red gram, Okra, Bengal gram, and Mango	

Hydrological Unit Network (HUN):

Name of the Hydrological Unit Network	: Peddavagu HUN		
Registered under society act Reg NO	: 660/07		
Date of formation	: 15-11-2004		
Members: Male	: 5	Female: 4	Total: 9
President	: G.V.Konda Reddy		
Secretary	: Arifa		

Groundwater Monitoring committee (GMC):

No of the GMCs: 4 Members: *Male: 21 Female: 17 Total: 38*

Formation of HUN:

HUN is federation of 4 GMC in Peddavagu Hydrological Unit. Nominated members from the different GMC make up the HUN. HUN is the focal point where the CWB is conducted and provides the platform for consolidating views of individual GMC's on crop plans and water use. Two members viz., President & Secretary of GMCs in each habitation are involved in selection of members. Gender equity is ensured in the selection of HUN members. For the sake of recognition of Peddavagu HUN, it has been registered under societies act in December 2006.

List of HUN members

S.No.	Name of the Member	Designation	Village
1	G.V.Konda Reddy	President	RKpuram
2	Boreddy	Vice president	Yadawada
3	M.Arifa	Secretary	K.Kandukur
4	K.Veera achari	Joint Secretary	RKpuram
5	S.Chinna Thirupal	Treasurer	Marripalle
6	G.Ramakka	Member	RK puram
7	R.Pakiramma	Member	Marripalle

Objectives of HUN

- To manage water resources at HU level
- To provide services as an extension support for water and crop management.
- To implement and mobilize government programmes related to water and agriculture.
- To improve stakes of women in groundwater regulation and management.
- To facilitate capacity building for implementing activities related to groundwater and crop management.

- To strengthen and help the GMCs in proper management of their resources.
- To lobby and advocate at Mandal level.
- To take up people's monitoring on ground water activities implemented by the Government & NGOs.
- To act as a pressure group in making farmer friendly policies by the government.

Peddavagu Hydrological Unit Network (HUN) Achievements

1. Consolidation of all habitation level resource inventory.
2. Data collection of Crop plans and Crop Adoptions.
3. Groundwater management
    a. Calculating crop water requirements
    b. Planning and adopting suitable crops according to availability of groundwater
    c. Adopting Water Use Efficiency methods
    d. Designing and implementing experiments related to crop and water
    e. Promoting organic practices in agriculture
    f. Resolving crop water related issues
4. Resolving GMC level issues
5. Organized health camps and avenue plantation
6. HUN registration
7. Specially designed wall painting on water level fluctuations based on rainfall data
8. Implementation of Peddavagu CWB workshops (2004 to 2008 yearwise) & follow-up decisions.
9. Participated in Hydrological Unit Network (HUN) bylaws setting to take decisions for registration of HUN.
10. Follow up of GMCs decision making after CWB workshop
11. Development of models, visuals etc., for effective delivery of the FWS session content.

12.Linkages with line departments

2006-07

Through Agriculture Department:

Sprinklers & Drip

S.No	Habitation	No. Of Units & Drips	Subsidy (Rs)	Farmer Contribution (Rs)
1	R.Krishnapuram	5 Units + 1 Drip	31375 + 14400	31375 + 9600
2	Marripalle	3 Units + 5 Drip	18825 + 72000	18825 + 48000

Pheromone Traps

S.No	Habitation	No. of Farmers	No. of Traps
1	Marripalle	30	120

Vermi-Compost Units

S.No	Habitation	Farmer Name	Subsidy (Rs)	Farmer Contribution (Rs)
1	Marripalle	Siva Sankar	3750/-	1875/-
2	Yadawada	Srinivasa Reddy	3750/-	1250/-

Through DWMA (District Water Management Agency)

S.No	Habitation	No. of Check Dams	Value (Rs/-)
1	R.Krishnapuram	2	3,00,000*2 = 6,00,000 /-

Through Horticulture Department – Tarpaulins

S.No	Habitation	No. of Farmers	Subsidy Value
1	Marripalle	12	10,212 /-
2	R.Krishnapuram	5	4,255 /-
3	Yadawada	3	2,553 /-

Through Forest Department – Plantation along the Foothills & Roadside

In Marripalle village some useful plants like neem, subabul, Glyricedia, pongamia and some other plants were provided to the HUN.

Through Health Department – Health Camps for Chicken Gunia

The health department conducted the health camps regarding the controlling of chicken gunia in the villages of R.Krishnapuram and Marripalle with the HUN support.

2007-08

Through NREGS (National Rural Employment Guarantee Scheme)

Desiltation of Check Dams

S.No	Habitation	Value (Rs /-)
1	Marripalle	7,25,000 /-
2	R.Krishnapuram	
3	Yadawada	

Desiltation of Tanks

S.No	Habitation	Value (Rs /-)
1	Marripalle	3,00,000 /-

Desiltation of Percolation Tanks

S.No	Habitation	Value (Rs /-)
1	R.K Puram & Kota Kandukuru	3,00,000+1,20,000/-

Desiltation of Irrigation Canals

S.No	Habitation	Value (Rs /-)
1	Yadawada	4,25,000 /-

Sprinklers through Nandi Company

S.No	Habitation	No of Units	Value (Rs /-)
1	Yadawada	10	24,000 /-

KALAJATHA

(Rural folk art as communication medium in APFAMGS Project)

Date: 10th December 2008, 18.30 to 20.00 hrs

Lead faculty/coordinators: Mr.Anil & Mr.Nagaraju

Place: Muthyalapadu Farm, Chagalamarri Mandal, Kurnool district.

Introduction

Kalajatha is a local art forum that is used by the APFAMGS project as a means of communication. It is a part and parcel of this region's ancient culture and is recognized as a living fossil. It is a combination of dance, music and actions, consisting of the following art forms:

- General folklore
- Prose narrative
- Song cum dance, game music, verse and ballad
- Drama
- Art, craft and architecture
- Riddles
- Dialogues

The style and content of this art form are determined by the following factors:

- Local customs
- Festivals
- Geographical location
- Local language
- Local food and drink
- Local beliefs
- Local proverbs

Kalajatha is very popular because it refreshes the body senses and enriches the mind with strong underlined messages. The entire process is joyful experience. It is well appreciated and accepted. It is the best tool to disseminate information across the communities, without diluting the quality.

Methodology and Process

Local *kalajatha* teams are identified, so as to preserve local dialect to make communication more effective. Another added advantage of local *kalajatha* team is their familiarity with

location which in turn helps them to pick up suitable examples and riddles to make a lasting impression on audience.

Initially two to three teams are identified based on their previous experience and performance skills. One team is finalized for each operational area. The project concept and script are provided to the teams and liberty is given to add songs and dialogue as per the audience's response without diluting the message.

A team of experts finalizes the curriculum after thorough consultations with all those concerned. The maximum duration of the program is two and half hours. An action plan for *kalajatha* show is prepared for all the villages and villagers are informed well in advance, taking their convenience into account. Based on the suggestion of opinion leaders, the venue is selected. The main selection criterion is the suitability for women's participation.

The *kalajatha*s are conducted covering all the habitations. In some habitations, talented farmers and youth participated in the program by singing songs and playing the musical instruments. Messages and their respective forms are as follows:

- Role play – water management and organic farming, sanitation, gender and institutions role.
- *Palle sudhulu*– (poetry/dance) water management, handling and data collection of hydrological equipments.
- Songs - Project concept and agriculture and gender
- Skit – local issues (identified one day in advance by staff)

After every show, feed back is taken from the village elders. Informal comments from people are also carefully recorded. Later the content is further fine tuned. Some additional topics are also included in different villages based on the village specific issues without disturbing the project concept.

The Reach

In every habitation, at least about 350 people (including children) are gathered to view the show and understand the content of the project and its activities. So far around 554 shows have been organized in the APFAMGS Project in the first phase. A total of 1,93,900 people are covered, in 62 Hydrological Units. In the second phase, around 180 shows are conducted with revised content to spread the results of crop water budgeting to a larger community for better understanding on the dynamics of water plan, usage and its impact on ground water scenario.

Methods of Mass communication

In addition to *kalajatha*, the project also uses video cassette which are the products of different programs, filmed and later edited as short duration films and clippings. The Crop Water Budget workshop, Farmer water school sessions, etc., are popular videos viewed on demand by the farmers. So far ten exclusive films are produced by the project.

The highlight of the project is the production of an Audio cassette, **JALACHAKRAM, (hydrological cycle**) penned by famous people's poet *Gorati Venkanna.* In these nine songs, the author beautifully blended the rural nostalgia with project activities. It is being heard by communities all over 634 habitations spread in seven districts of Andhra Pradesh state.

Social Action
in
Demand Side Groundwater Management

Ch.Ram Babu

Role of Community in groundwater management

APFAMGS project believes technology alone cannot solve the problem of overexploitation of groundwater

Science of groundwater needs to be demystified

People (groundwater users) alone can change the situation

People's institutions need to be strengthened to enable discussions on groundwater crisis

community need to be prepared to participate in technical data collection

Groundwater issue need to emerge as a community problem

Simple techniques need to be used make groundwater management understood by all

Focus on reducing groundwater pumping rather than creation of new sources

Train farmers to adopt numerous steps at the farm level for improving crop water efficiency

implement water saving techniques

Importance of People's Institutions

People's collective rather than individuals need to be focused

Support or organize people's institution at local habitation level

Federate Habitation level institutions at the micro basin level

Establish Multi layer institution

Institutions enable farmers overcome selfish interests

- **provide forum for collective learning and exchange of knowledge**
- **help consolidate individual views of farmers for collective action**
- **exerts pressure on individuals to develop a common perspective for managing groundwater distress**
- **promotes local governance (ban on drilling, well spacing, control pollution)**
- **help trigger common action at farm level by individual farmers**

Institutional set up under APFAMGS

Multilayer Community based institutions established for Demand Side Groundwater Managing (DSGM)

DSGM promotes alternative approach to management of groundwater resources

- involves equal participation of men and women
- calls for larger community participation in decision making
- knowledge based initiative without offering any incentives

Men and women Farmers need to undergo training and qualify for taking up technical data collection

Voluntary participation without any financial support for data collection

Technical Data needs to be shared with entire community using display boards

Technical Data collected should form the basis for deciding amount of groundwater pumped

Institutional structure

- Groundwater monitoring committees (GMC-555) at village/habitation level
- Groundwater management committees (HUN-63) at hydrological unit level-registered legal bodies
- Groundwater management committees (NGN-9) at sub-basin level
- District/Basin level GMC network (DLN-1) at Gundlakamma
- Groundwater management committee (Jala-Jana-Vedika) at State level

GMC Activities

- Convene GMC meeting to discuss common issues related to water and other related issues
- Provide equal opportunities for men and women in discussions
- Record discussions in minutes book and follow up on action points
- Motivate farmers to collect & record technical data (rainfall, groundwater levels, discharge, quality, stream flows)
- Supervise the data collection and quality of work relating to any construction
- Disseminate data using display boards
- Maintain the equipment and repair it as and when required
- Share data at the hydrological unit level
- Identify issues related to water and agriculture and resolve local issues
- Conduct exposure visits
- Implement results of crop water budget
- Regular Liaison with HUN
- Avoid over exploitation of ground water resources
- Discuss and encourage improved water use efficiency without any
- Share their experiences related to ground water
- Implement farmer water schools
- Maintain accounts systematically
- Lobby with line departments for availing various government schemes and programmes

Groundwater Monitoring Committees (GMC)

Project level details of the Ground water Monitoring Committiees (GMCs)

Sl.No.	Name of PNGO	No of Habitations	No. of GMCs	Male	Female	Total
1	BIRDS	74	69	394	300	694
2	CARE	60	59	283	218	501
3	CARVE	75	68	387	258	645
4	DIPA	82	82	429	313	742
5	GVS	77	43	265	180	445
6	PARTNER	70	56	326	198	524
7	SAFE	70	70	355	220	541
8	SAID	54	52	285	227	512
9	SVA	72	56	262	176	438
TOTAL		634	555	2986	2090	5042

Activities of registered HUNs

- HUN's have taken over the project activities from June 2008
- Maintain all records to meet all legal requirements
- Receive funds form NGO's and implement the programme as per the work plan
- Report regularly to NGO
- Ensure annual audit
- Maintain regular contacts with GMC
- Conduct FWS at habitation level
- Conduct CWB exercise
- Develop models, visuals for FWS
- Organize annual Field day
- Conducting long term /short term experiments
- Provide exposure trips
- Promote data sales for maintaining infrastructure
- Conduct farmer officer workshops
- Disseminate all government schemes to GMC's
- Conduct regular elections

Details of Registered HUN's

Project Level Details of the Hydrological Unit Net-work (HUN) Committees

Sl.No.	Name of PNGO	No of Habitations	No. of HUNs	Male	Female	Total
1	BIRDS	74	11	136	110	246
2	CARE	60	3	38	20	58
3	CARVE	75	13	153	123	276
4	DIPA	82	5	104	96	200
5	GVS	77	4	82	60	142
6	PARTNER	70	6	98	93	191
7	SAFE	70	7	116	93	209
8	SAID	54	7	82	74	156
9	SVA	72	7	101	89	190
TOTAL		634	63	910	758	1668

Office Bearers

- **President:**
- **Vice President**
- **Secretary**
- **Joint Secretary**
- **Treasurer**
- **Managing committee members**

Gender role in Institution

- Role of women in managing groundwater is critical.
- 50% of women participation is aimed in all the institutions
- Reservation for women for certain positions in Institutions
- Women encouraged to take a lead role in technical data collection
- Gender specialists /facilitators/Village co-ordinators employed to ensure women participation
- 111 women presidents, 378 secretaries, 59 vice presidents are office bearers of 555 GMC
- 7 women presidents, 31 secretaries, 4 vice presidents are office bearers in 63 HUN's

Training and exposure: HU level

- GMC leaders have been provided training in managing their day-today business. The topics include:
  - roles and responsibilities
  - leadership qualities
  - Gender sensitivity
  - book keeping
  - conflict management
  - Maintenance of assets
  - Mobilization of funds
  - Developing vision documents
  - developing linkages with departments
  - exposure visits are also part of trainings

Social Action in DSGM

Ch.Rambabu, GVS

Formation and Strengthening of Institutions:

AS a part of implementation of APFAMGS project activities in 40 mandals in 303 Panchayats covering with 7 districts in Andhra Pradesh. To carryout and increase the participation of farmers in Project activities 555 GMCs, 63 HUNs and 9 NGN at basin level of Project operational area were formed to monitor and disseminate the key messages around the groundwater and CWB (Crop Water Budget) exercise results. All Sixty three HUNs in the Nine PNGOs areas were registered under Society/MACS Act in the year 2006. Project is encouraging the respective HUNs/NGNs to establish the linkages with line departments.

Institutional structure

- Groundwater monitoring committees (GMC) at village/habitation level
- Groundwater management committees (HUN) at hydrological unit level
- Groundwater management committees (NGN) at sub-basin level
- District/Basin level GMC network (DLN) at Gundlakamma
- Groundwater management committee (AGUA) at State level

Groundwater Monitoring Committees (GMC)

As the groundwater is an exhaustive and collective resource, there is a need to have an understanding of the local groundwater systems. In the village context, several people's institutions already exist due to intervention by government and non-government organizations (NGOs), mostly formed with an activity specific. The project management tried to use existing people's institutions dealing with water to promote the PHM concept and content of the activity. Due to the focus of each existing people's institution is specific; a new groundwater monitoring committee (GMC) was formed with equal representation of men and women, as per the suggestion of the community.

Project level details of the Ground water Monitoring Committees (GMCs)

Sl.No.	Name of PNGO	No of Habitations	No. of GMCs	Male	Female	Total
1	BIRDS	74	69	394	300	694
2	CARE	60	59	283	218	501
3	CARVE	75	68	387	258	645
4	DIPA	82	82	429	313	742
5	GVS	77	43	265	180	445
6	PARTNER	70	56	326	198	524
7	SAFE	70	70	355	220	541
8	SAID	53	52	285	227	512
9	SYA	72	56	262	176	438
TOTAL		**633**	**555**	**2986**	**2090**	**5042**

Activities of HUNs:

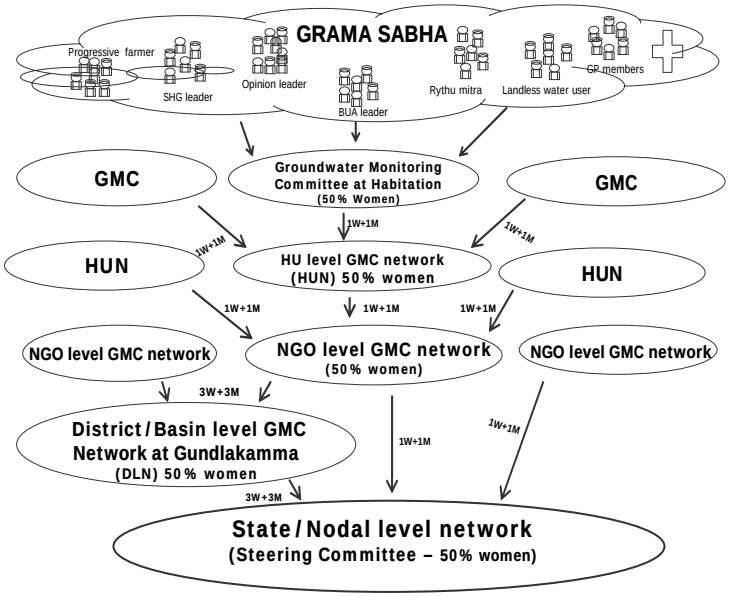
Net working of these HUNs at basin level (NGN) will achieve the broader objective of the project. In the Beginning of this year, NGN was formed to monitor the activities of HUNs and implementation of decisions taken at Basin level. The president and Secretary of each HUN will form as NGN committee. NGN members will meet based on the need and to plan events like World Water day, world Food day and different kinds of workshops for the benefit of farmers.

- Conducting FWS sessions at cluster / village level
- Conducting of CWB exercise
- Development of models, visuals for effective delivery of the session content
- Organize FWS Field day at Basin level
- Conducting long term /short term experiments and short studies

Project Level Details of the Hydrological Unit Network (HUN) Committees

Sl.No.	Name of PNGO	No of Habitations	No. of HUNs	Male	Female	Total
1	BIRDS	74	11	136	110	246
2	CARE	60	3	38	20	58
3	CARVE	75	13	153	123	276
4	DIPA	82	5	104	96	200
5	GVS	77	4	82	60	142
6	PARTNER	70	6	98	93	191
7	SAFE	70	7	116	93	209
8	SAID	53	7	82	74	156
9	SYA	72	7	101	89	190
TOTAL		**633**	**63**	**910**	**758**	**1668**

GROUNDWATER MONITORING/MANAGEMENT COMMITTEE CONCEPT



Roles and responsibilities of members in GMC / HUN / NGN / AGUA

President:

- The president shall have overall supervision and control over the affairs of the society.
- The president shall preside over all the Managing Committee and General Body meetings. (In the absence of both, the member present may choose a person from among the members to preside over the meeting).
- All questions except those relating to amendment of bye-laws are dealt with separately in the bye-laws, shall be decided by a majority of votes of the members present and voting. When votes are equal, the president/chair person of the meeting shall have a casting vote.

Vice President

- The Vice-President shall discharge the duties, perform the functions and exercise the powers of the president during the vacancy in the office of the president, or in the absence of the president for more than one month or on delegation of powers by the President of the Society or by the Managing Committee.

Secretary

- to convene and attend the meetings of the board and General Body and other committees and take action for implementation of the resolutions passed at these meetings;
- to maintain records and be the custodian of the properties of the society;
- to manage the funds and maintain the accounts and day to day management of the affairs of the society and furnish all statutory returns to the authorities concerned;
- as and when the employees are appointed to exercise administrative control over all employees
- to endorse, sign, encash, cheques, transfer, negotiate promissory notes, securities and other instruments on behalf of the society along with such office bearers as the board may resolve;
- to sign on behalf of the Society and carry out its correspondence;
- to be a member on all committees constituted by the Board, except otherwise specified by the Board or in the bye-laws;
- to sue under the authority of the Board or to be sued on behalf of the Society;
- to perform all other functions as may be assigned by the General Body / Board / President from time to time;
- To do all that is necessary to carry on the day-to-day functioning and business of the Society.

Joint Secretary

- The Joint-Secretary shall discharge the duties, perform the functions and exercise the powers of the Secretary during the vacancy in the office of the Secretary, or in the absence of the secretary for more than one month or on delegation of powers by the Secretary of the Society or by the Managing Committee.

Treasurer

- In accordance with the decisions of the Managing Committee, conduct bank transactions and bank accounts.
- Within 3 months since the date of registration, the treasurer should develop guidelines and procedures for efficient financial management. After approval of the same by the Managing committee, the treasurer is responsible for enforcement in the organization.
- Treasurer is responsible for proper and compulsory maintenance of financial records. The list of financial records being maintained shall be publicly displayed in the office of the HUN.
- Receipts and Payments, Income & Expenditure, Purchases and sales, etc. shall be done strictly in accordance with the procedures approved by the managing committee.
- Financial plans, financial reports etc. should be prepared in compliance with the indicated procedures and shall be shared in proper manner with the concerned actors (Govt. organizations, Donors, Internal responsible persons, etc.).
- Should ensure that the financial agreements and MOUs signed on behalf of the HUN are strictly followed.
- Should be responsible to ensure that all the financial transactions are conducted strictly in accordance with the existing legal framework.
- Responsible for completing the audit in time and audit reports shall be sent to all the concerned.

Managing committee members

- The Managing Committee of the Society subject to the regulations, if any, in the bye-laws and subject to the resolutions passed by the General Body shall be enabled with the following powers and functions.
- recommend the admission of member to General Body;
- Recommend removal of the members disqualified under the bye laws of the Society.
- cause the audit of the accounts of the society within the time prescribed and place the audit report before the General Body;
- decide matters connected with the day to day management of the Society;
- Fix the staffing pattern, qualifications, pay scales and other allowances to the employees of the society, subject to the availability of the administrative and contingent fund and approval of the General Body.
- rectify the defects noted in the reports of audit
- Suspension of any officer or servant of the society under circumstances leading to such action
- initiate action for prosecution of any person who may have incurred criminal liability under the provisions of the AP Societies Act, 1860 for the time being in force or as may be amended from time to time or any other law for the time being in force;
- prepare the list of membership fee and other forms of financial defaulters and place before the General Body;

- Give information on the affairs of the society to the supervisory council, the Registrar, and any other party with which society has an association.
- place annual report, annual financial statement, annual plan and budget before the General Body;
- ensure society education of the members, officers and the servants of the society;
- prepare and place before the General Body, information or reports or statements relating to;
    - disposal of properties;
    - deficits in cash or stocks;
    - proposals for creation of reserves and other funds;
    - writing off assets or properties
    - removal of membership;
    - contributions to society's financial resources;
    - expulsion of member who has acted adversely to the interests of the society;
    - appointment of internal auditors and consideration of their reports and follow up action;
- To do all such acts as may be delegated by the General Body from time to time.

Objectives of NGN:

- To manage water resources at NGN (PNGO) operational area
- To provide services as an extension support for water and crop management.
- To implement and mobilize government programmes related to water and agriculture.
- To improve stakes of women in groundwater regulation and management.
- To facilitate capacity building for implementing activities related to groundwater and crop management.
- To strengthen and help the HUNs in proper management of their resources.
- To lobby and advocate at Mandal and District level.
- To take up people's monitoring on ground water activities implemented by the Government & NGOs.
- To act as a pressure group in making farmer friendly policies by the government

Resource mobilization:

Identifying local resources and mobilizing them is very critical in sustainability of GMCs/HUNs. Since last four years, PNGO staff encouraged respective HUNs and GMCs to establish good relations with government departments like Agriculture, Horticulture, Banks, Mandal and District administrative offices and mobilized about 138 million rupees.

Training on Demand Side Groundwater Management (DSGM)
10-12 December 2008, BIRDS International Learning Centre,
Muthyalapadu village, Kurnool district, AP

Crop Water Budgeting

DR. S. V. GOVARDHAN DAS
Advisor - Water Management
Technical Support Team (TST), AFPAMGS Project

Scheme of Presentation

- Definition
- Pre-conditions
- Pre-CWBW Activities
- CWB Workshop
- Post-CWBW Activities
- Observed changes
- CWB spreadsheet

Definition

- A set of activities carried out to compare estimated groundwater balance available for Rabi season with farmer crop plans, in a Hydrological Unit

- Estimations are based on:
  - Farmer collected data
  - GEC Norms
  - ANGRAU Norms

Pre-conditions

- Hydrological Monitoring Network established
  - Rain Gauge Stations
  - Observation Wells
- Farmers trained in data collection, recording and display
- Farmers collected hydrological data at least for one Hydrological Year

Pre-CWBW Activities

- Computation of hydrological data
- Resource Inventory Updating
- Crop Plan meetings
- Working with the CWB Package
- CWB Workshop Planning Sessions
- Material preparation
- Invitations (all the groundwater users in the HU)

Pre-CWBW Activities

- Estimation of groundwater recharge
  - Rainfall data collected by farmers
  - Extent of each geological formation estimated by farmers and staff
  - Standard recharge rates, per GEC 97 norms
- Estimation of groundwater draft
  - Well Census by farmers per September
  - Average well discharge data collected by farmers
  - Average pumping hours
- Computation of groundwater balance
  - beginning of Rabi
  - Automated in Excel spreadsheet

Recharge Rates of GEC

SN	Rock type	Recharge Rate as % of RF
1	Hard rock, without fractures	1%
2	Phyllites and Shales	4%
3	Granulites	5%
4	Hard Sandstone/Limestone	6%
5	Soft Basalt	7%
6	Laterite	7%
7	Soft Sandstone	8%
8	Granitic rock, with clay	8%
9	Western Coast	10%
10	Granitic rock, without clay	11%
11	Fractured Basalt/Limestone	13%
12	East Cost	16%
13	Indo Gangetic Alluvium	22%

Pre-CWBW Activities

- Farmer Crop Plan
  - Well-wise, farmer-wise record kept
  - Data updated through group exercises
- Crop-Water Requirement
  - Arial extent of each crop computed
  - Standards of the ANGRAU
- Projection of water requirement for Rabi
- Projection of groundwater requirement for Rabi

CWB Workshop

- Conducted at HU Level
- Anchor and Presenters
- Large banners, clay/wooden models, posters, flexi-boards
- Sequence of presentations:
  - Groundwater Recharge (June-September)
  - Groundwater Draft (June-September)
  - Groundwater Balance, end of September
  - Farmer Crop Plan for Rabi
  - Projected Water requirement for Rabi crops
  - Comparison of demand-supply (deficit or surplus)
  - Comparison with situation in preceding CWB workshops
- Brainstorming: Probable changes in crop-plan
- Scheduling of habitation level follow-up meetings

Post-CWBW Activities

- Habitation level sharing of CWBW results
- Creating platform for decision making
- Listing of agreed changes
- Encouraging women participation
- Crop Adoption Survey (CAS)
- Analysis of changes in cropping, irrigation, etc.
- Computation of groundwater balance, based on CAS
- Comparison of CAS data of the present year with that of previous year

Observed Changes

- CAS data for Rabi 2005 and 2006 is now available for the entire APFAMGS project area
- A comparative analysis of CAS data of two years is done in the Newsletter (Telugu).
- Main crops in APFAMGS area, grown in Rabi 2005 were:
  - sun-flower, rice, groundnut, citrus, sajja, red-gram, jowar, chilly, tomato, ragi, sugar-cane, mango and vegetables

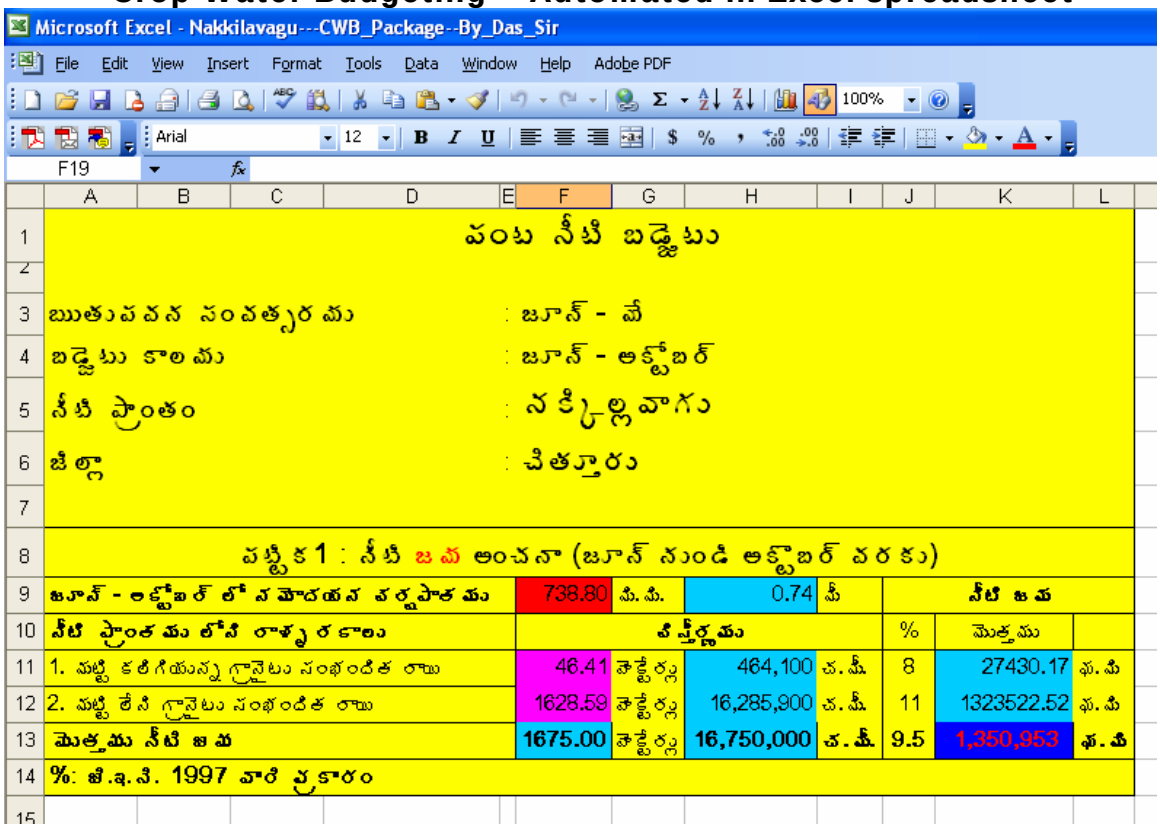
Observed Changes

In Rabi 2006, in APFAMGS area:

- Sun-flower retains its first place
- Area under rice and red-gram reduced by almost half
- There is a drastic reduction of area under red-gram and sajja
- The area under chilly dramatically increased from 2,000 to 11,000 acres
- Other crops are grown in more or less the same extent

Thanku

Crop Water Budgeting – Automated in Excel spreadsheet



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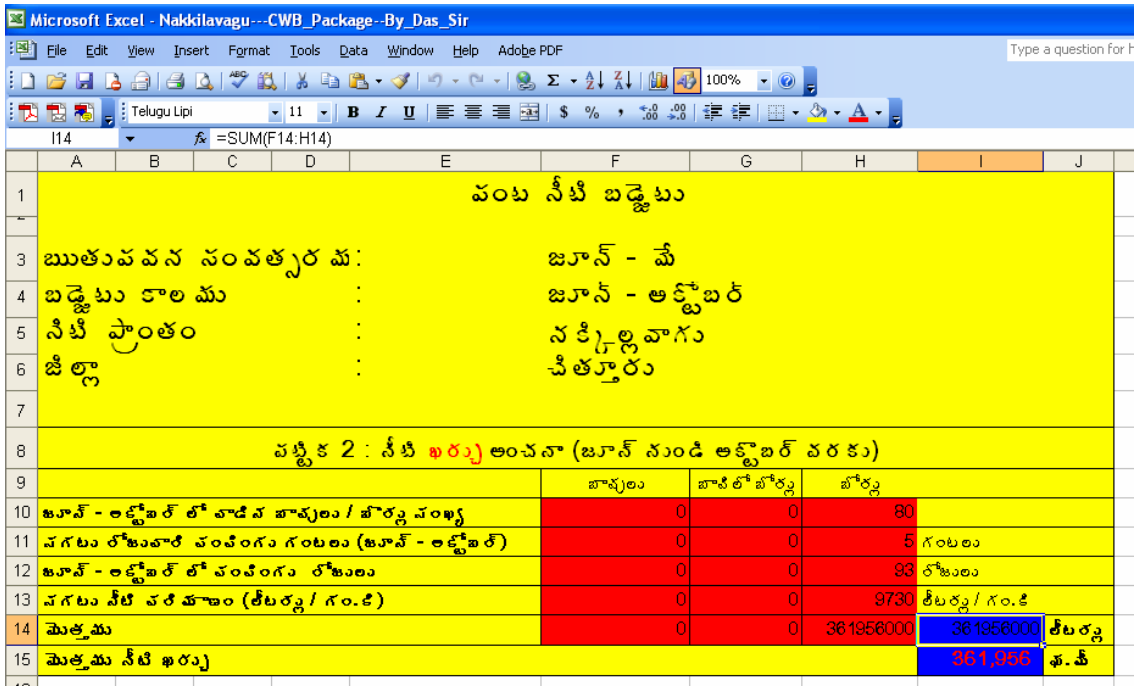
F19

	A	B	C	D	E	F	G	H	I	J	K	L
1	పంట నీటి బడ్జెటు											
2												
3	ఋతుపవన సంవత్సరము			: జూన్ - మే								
4	బడ్జెటు కాలము			: జూన్ - అక్టోబర్								
5	నీటి ప్రాంతం			: నక్కిల్లవాగు								
6	జిల్లా			: చిత్తూరు								
7												
8	పట్టిక 1 : నీటి జమ అంచనా (జూన్ నుండి అక్టోబర్ వరకు)											
9	జూన్ - అక్టోబర్ లో ఎదురయ్యే వర్షపాతము					738.80	మి.మీ.	0.74	మీ		నీటి జమ	
10	నీటి ప్రాంతము లోని రాళ్ళరకాలు					విస్తీర్ణము				%	మొత్తము	
11	1. మట్టి కలిగియున్న గ్రానైటు సంభందిత రాయి					46.41	హెక్టేర్లు	464,100	చ.మీ	8	27430.17	ఘ.మీ
12	2. మట్టి లేని గ్రానైటు సంభందిత రాయి					1628.59	హెక్టేర్లు	16,285,900	చ.మీ	11	1323522.52	ఘ.మీ
13	మొత్తము నీటి జమ					1675.00	హెక్టేర్లు	16,750,000	చ.మీ	9.5	1,350,953	ఘ.మీ
14	%: జి.ఇ.సి. 1997 వారి ప్రకారం											
15												



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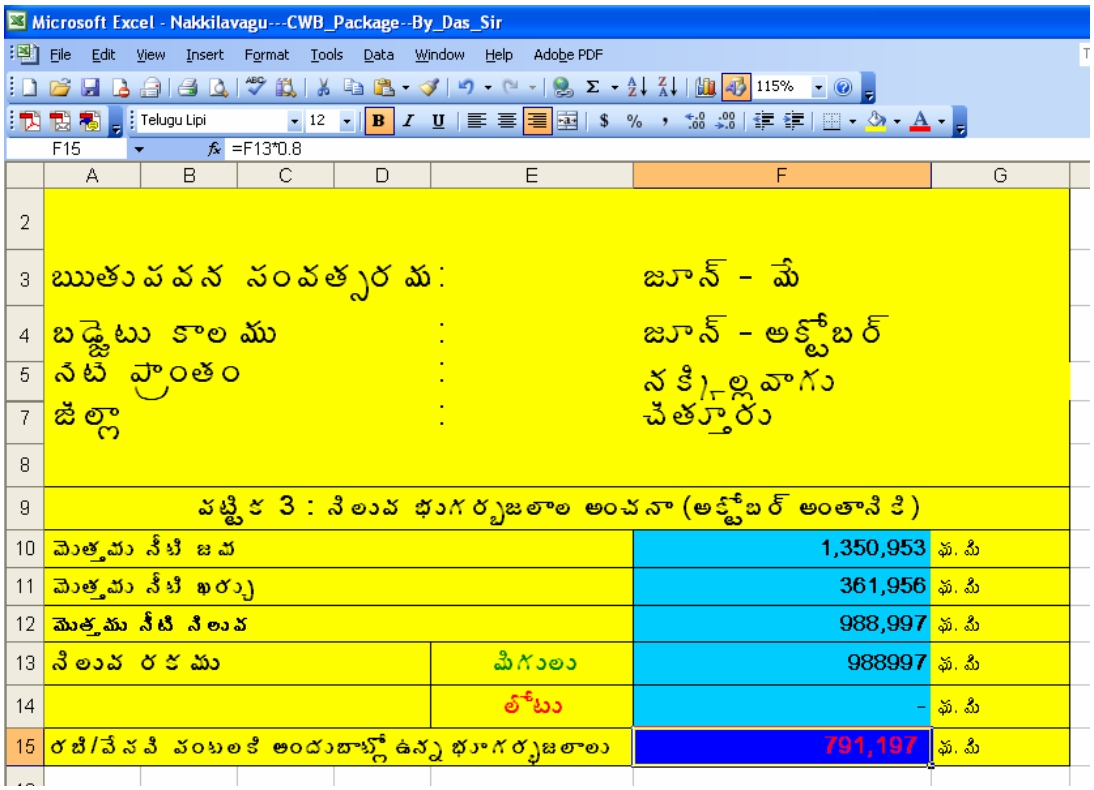
I14 =SUM(F14:H14)

	A	B	C	D	E	F	G	H	I	J
1	పంట నీటి బడ్జెటు									
2										
3	ఋతుపవన సంవత్సరము:					జూన్ - మే				
4	బడ్జెటు కాలము :					జూన్ - అక్టోబర్				
5	నీటి ప్రాంతం :					నక్కిల్లవాగు				
6	జిల్లా :					చిత్తూరు				
7										
8	పట్టిక 2 : నీటి ఖర్చు అంచనా (జూన్ నుండి అక్టోబర్ వరకు)									
9						బావులు	బావిలో బోర్లు	బోర్లు		
10	జూన్ - అక్టోబర్ లో వాడిన బావులు / బోర్ల సంఖ్య					0	0	80		
11	పగటి రోజువారీ పంపింగు గంటలు (జూన్ - అక్టోబర్)					0	0	5	గంటలు	
12	జూన్ - అక్టోబర్ లో పంపింగు రోజులు					0	0	93	రోజులు	
13	పగటి నీటి పరిమాణం (లీటర్లు / గం.కి)					0	0	9730	లీటర్లు / గం.కి	
14	మొత్తము					0	0	361956000	361956000	లీటర్లు
15	మొత్తము నీటి ఖర్చు								361,956	ఘ.మీ



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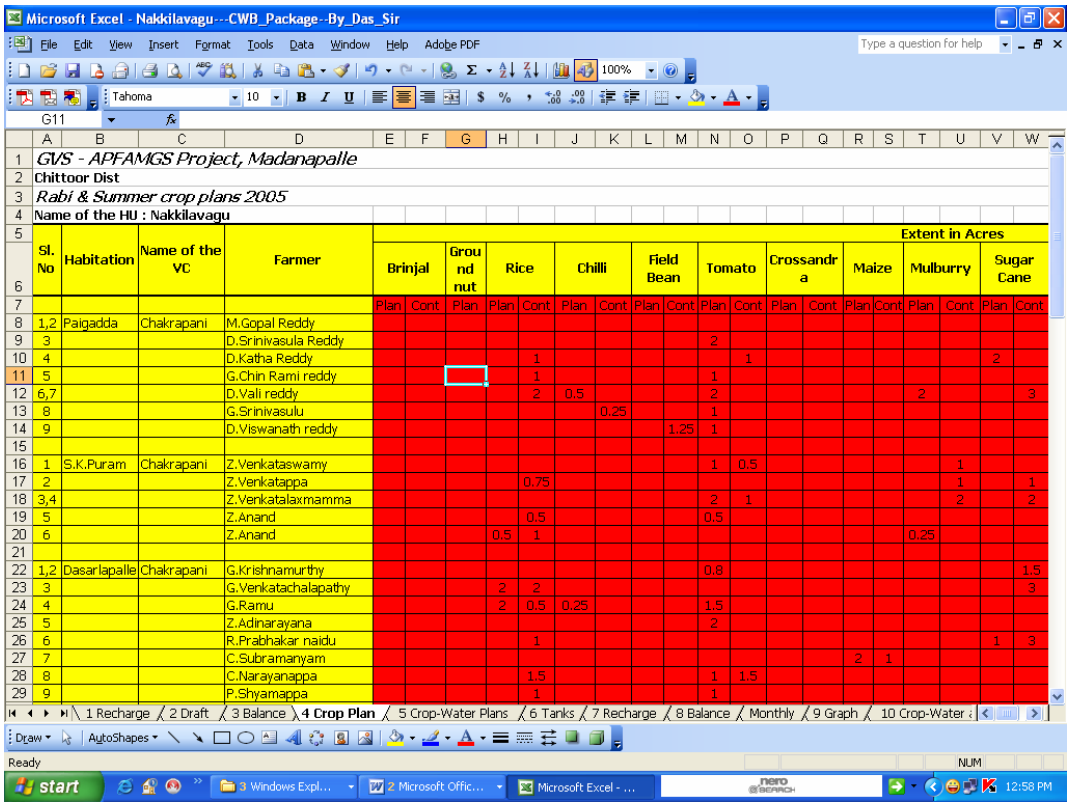
F15 =F13*0.8

	A	B	C	D	E	F	G
2							
3	ఋతుపవన సంవత్సరము:					జూన్ - మే	
4	బడ్జెటు కాలము	:				జూన్ - అక్టోబర్	
5	నటే ప్రాంతం	:				నక్కిల్లవాగు	
7	జిల్లా	:				చిత్తూర్	
8							
9	పట్టిక 3 : నీలువ భుగర్భజలాల అంచనా (అక్టోబర్ అంతానికి)						
10	మొత్తము నీటి జవ					1,350,953	ఘ. మీ
11	మొత్తము నీటి ఖర్చు					361,956	ఘ. మీ
12	మొత్తము నీటి నీలువ					988,997	ఘ. మీ
13	నీలువ రకము			మిగులు		988997	ఘ. మీ
14				లోటు		-	ఘ. మీ
15	రబీ/వేసవి పంటలకి అందుబాట్లో ఉన్న భూగర్భజలాలు					791,197	ఘ. మీ



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G11

GVS - APFAMGS Project, Madanapalle
Chittoor Dist
Rabi & Summer crop plans 2005
Name of the HU : Nakkilavagu

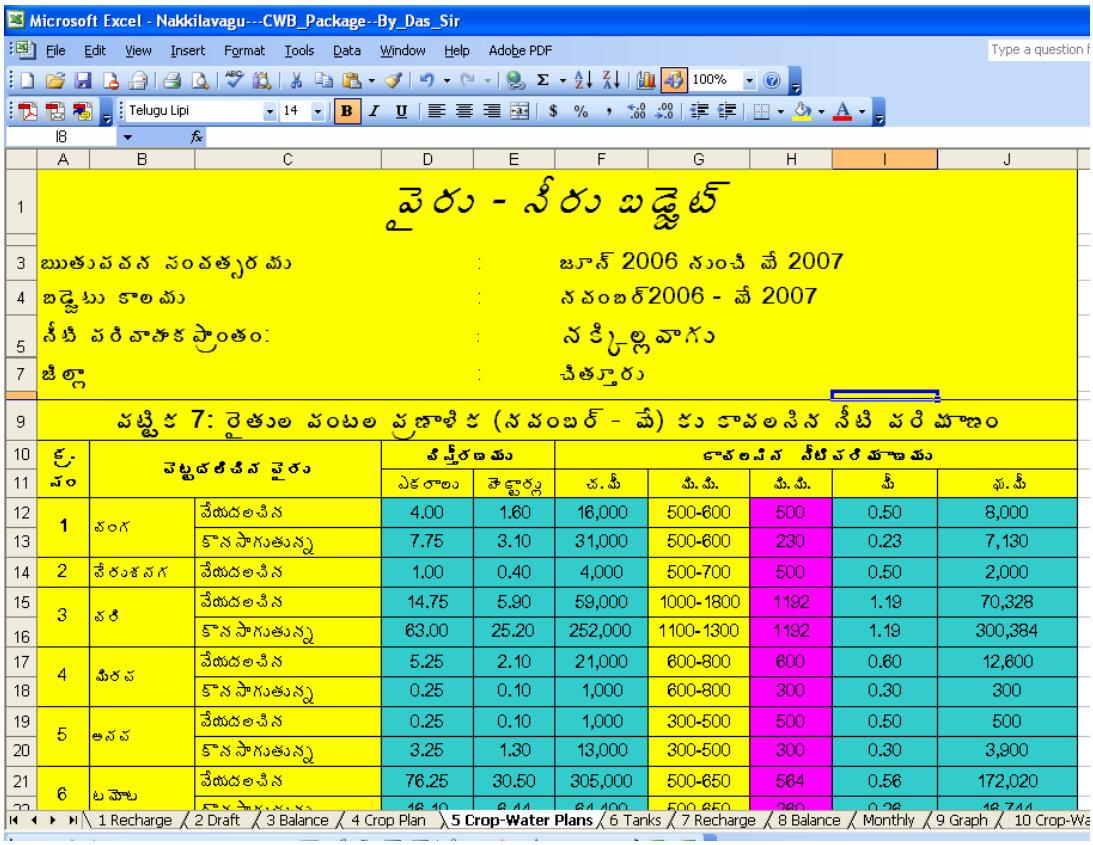
Sl. No	Habitation	Name of the VC	Farmer	Extent in Acres																	
				Brinjal		Ground nut	Rice		Chilli		Field Bean		Tomato		Crossandra		Maize		Mulburry		Sugar Cane	
				Plan	Cont	Plan	Plan	Cont	Plan	Cont	Plan	Cont	Plan	Cont	Plan	Cont	Plan	Cont	Plan	Cont	Plan	Cont
1,2	Paigadda	Chakrapani	M.Gopal Reddy																			
3			D.Srinivasula Reddy										2									
4			D.Katha Reddy					1						1							2	
5			G.Chin Rami reddy					1					1									
6,7			D.Vali reddy					2	0.5				2						2			3
8			G.Srinivasulu							0.25			1									
9			D.Viswanath reddy									1.25	1									
1	S.K.Puram	Chakrapani	Z.Venkataswamy										1	0.5						1		
2			Z.Venkatappa					0.75												1		1
3,4			Z.Venkatalaxmamma										2	1						2		2
5			Z.Anand					0.5					0.5									
6			Z.Anand				0.5	1											0.25			
1,2	Dasarlapalle	Chakrapani	G.Krishnamurthy										0.8									1.5
3			G.Venkatachalapathy				2	2														3
4			G.Ramu				2	0.5	0.25				1.5									
5			Z.Adinarayana										2									
6			R.Prabhakar naidu					1													1	3
7			C.Subramanyam														2	1				
8			C.Narayanappa					1.5					1	1.5								
9			P.Shyamappa					1					1									

1 Recharge / 2 Draft / 3 Balance / 4 Crop Plan / 5 Crop-Water Plans / 6 Tanks / 7 Recharge / 8 Balance / Monthly / 9 Graph / 10 Crop-Water

Draw AutoShapes

Ready NUM

start 3 Windows Expl... 2 Microsoft Offic... Microsoft Excel - ... 12:58 PM



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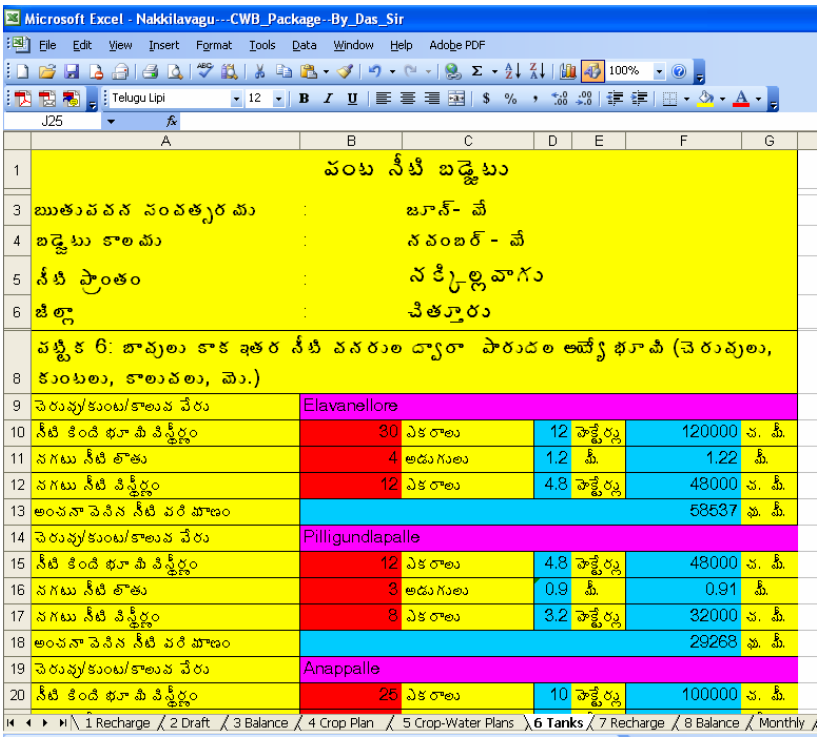
పైరు - నీరు బడ్జెట్

ఋతుపవన సంవత్సరము	:	జూన్ 2006 నుంచి మే 2007
బడ్జెటు కాలము	:	నవంబర్2006 - మే 2007
నీటి పరివాహక ప్రాంతం:	:	నక్కిల్లవాగు
జిల్లా	:	చిత్తూరు

పట్టిక 7: రైతుల పంటల ప్రణాళిక (నవంబర్ - మే) కు కావలసిన నీటి పరిమాణం

క్ర.సం	పెట్టదలిచిన పైరు		విస్తీర్ణము		కావలసిన నీటిపరిమాణము				
			ఎకరాలు	హెక్టార్లు	చ.మీ	మి.మీ.	మి.మీ.	మీ	ఘ.మీ
1	వంగ	వేయదలచిన	4.00	1.60	16,000	500-600	500	0.50	8,000
		కొనసాగుతున్న	7.75	3.10	31,000	500-600	230	0.23	7,130
2	వేరుశనగ	వేయదలచిన	1.00	0.40	4,000	500-700	500	0.50	2,000
3	వరి	వేయదలచిన	14.75	5.90	59,000	1000-1800	1192	1.19	70,328
		కొనసాగుతున్న	63.00	25.20	252,000	1100-1300	1192	1.19	300,384
4	మిరప	వేయదలచిన	5.25	2.10	21,000	600-800	600	0.60	12,600
		కొనసాగుతున్న	0.25	0.10	1,000	600-800	300	0.30	300
5	అనప	వేయదలచిన	0.25	0.10	1,000	300-500	500	0.50	500
		కొనసాగుతున్న	3.25	1.30	13,000	300-500	300	0.30	3,900
6	టమోటా	వేయదలచిన	76.25	30.50	305,000	500-650	564	0.56	172,020

1 Recharge | 2 Draft | 3 Balance | 4 Crop Plan | 5 Crop-Water Plans | 6 Tanks | 7 Recharge | 8 Balance | Monthly | 9 Graph | 10 Crop-Wa



Microsoft Excel - Nakkilavagu---CWB_Package--By_Das_Sir

పంట నీటి బడ్జెటు

ఋతుపవన సంవత్సరము	:	జూన్- మే
బడ్జెటు కాలము	:	నవంబర్ - మే
నీటి ప్రాంతం	:	నక్కిల్లవాగు
జిల్లా	:	చిత్తూరు

పట్టిక 6: బావులు కాక ఇతర నీటి వనరుల ద్వారా పారుదల అయ్యే భూమి (చెరువులు, కుంటలు, కాలువలు, మొ.)

చెరువు/కుంట/కాలువ పేరు	Elavanellore					
నీటి కింది భూమి విస్తీర్ణం	30	ఎకరాలు	12	హెక్టేర్లు	120000	చ. మీ.
నగటు నీటి లోతు	4	అడుగులు	1.2	మీ.	1.22	మీ.
నగటు నీటి విస్తీర్ణం	12	ఎకరాలు	4.8	హెక్టేర్లు	48000	చ. మీ.
అంచనా వెసిన నీటి పరిమాణం					58537	ఘ. మీ.
చెరువు/కుంట/కాలువ పేరు	Pilligundlapalle					
నీటి కింది భూమి విస్తీర్ణం	12	ఎకరాలు	4.8	హెక్టేర్లు	48000	చ. మీ.
నగటు నీటి లోతు	3	అడుగులు	0.9	మీ.	0.91	మీ.
నగటు నీటి విస్తీర్ణం	8	ఎకరాలు	3.2	హెక్టేర్లు	32000	చ. మీ.
అంచనా వెసిన నీటి పరిమాణం					29268	ఘ. మీ.
చెరువు/కుంట/కాలువ పేరు	Anappalle					
నీటి కింది భూమి విస్తీర్ణం	25	ఎకరాలు	10	హెక్టేర్లు	100000	చ. మీ.

1 Recharge | 2 Draft | 3 Balance | 4 Crop Plan | 5 Crop-Water Plans | 6 Tanks | 7 Recharge | 8 Balance | Monthly

Microsoft Excel - Nakkilavagu---CWB_Package--By_Das_Sir

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Telugu Lipi 11 — 115% — K13 =SUM(K11:K12)

	A	B	C	D	E	F	G	H	I	J	K	L
1	పంట నీటి బడ్జెటు											
3	ఋతుపవన సంవత్సరము	: జూన్- మే										
4	బడ్జెటు కాలము	: నవంబర్ - మే										
5	నీటి ప్రాంతం	: నక్కిల్లవాగు										
6	జిల్లా	: చిత్తూరు										
8	పట్టిక 7 : నీటి జమ అంచనా (నవంబర్ నుండి మే వరకు)											
9	జూన్ - అక్టోబర్ లో నమోదయిన వర్షపాతము					158.64	మి.మీ.	0.16	మీ		నీటి జమ	
10	నీటి ప్రాంత ములోని రాళ్ళ రకాలు					విస్తీర్ణము				%	మొత్తము	
11	1. మట్టి కలిగియున్న గ్రానైటు సంభందిత రాయి					46.41	హెక్టేర్లు	464,100	చ.మీ.	8	5889.99	ఘ.మీ
12	2. మట్టి లేని గ్రానైటు సంభందిత రాయి					1628.59	హెక్టేర్లు	16,285,900	చ.మీ.	11	284195.47	ఘ.మీ
13	మొత్తము నీటి జమ					1675.00	హెక్టేర్లు	16,750,000	చ.మీ.	9.5	290,085	ఘ.మీ
14	%: జి.ఇ.సి. 1997 వారి ప్రకారం											

Microsoft Excel - Nakkilavagu---CWB_Package--By_Das_Sir

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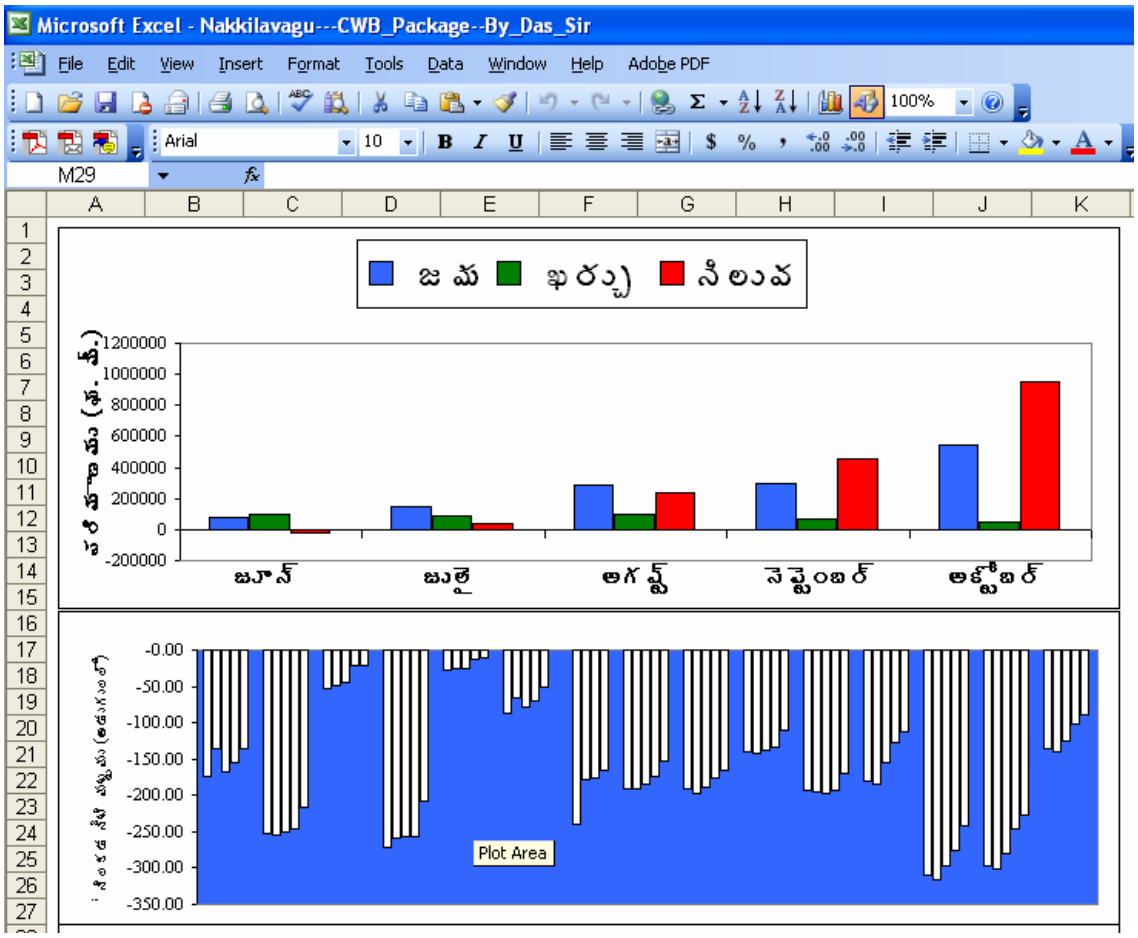
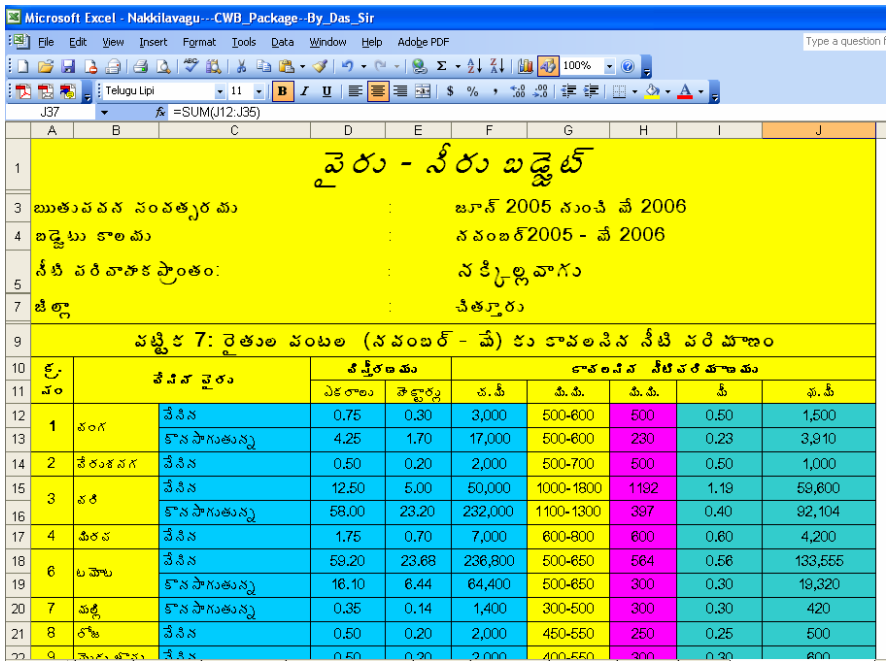
Telugu Lipi 11 — 110% — I12

	A	B	C	D	E	F
1	పంట నీటి బడ్జెటు					
3	ఋతుపవన సంవత్సరము:	:	జూన్ - మే			
4	బడ్జెటు కాలము:	:	జూన్ - అక్టోబర్			
5	నీటి ప్రాంతం:	:	నక్కిల్లవాగు			
6	జిల్లా:	:	చిత్తూరు			
9	పట్టిక 8: మే అంతానికి భూగర్భజలాల నిలువ అంచనా (రైతు పంట ప్రణాళిక ఆధారంగా)					
10	రైతుల పంటల ప్రణాళిక (నవంబర్ - మే) కు కావలసిన నీటి వరి మాణం			పట్టిక 5	1,225,068	ఘ. మీ.
11	బావులు కాక ఇతర నీటి వనరుల ద్వారా పొరుదల అయ్యే భూ మీ (చెరువులు, కుంటలు, కాలువలు, మొ.)			పట్టిక 6	228048.7805	ఘ. మీ.
12	అంచనా వెసిన భూగర్భజలాల ఖర్చు (నవంబర్ నుండి మే వరకు)			5-6	997,019	ఘ. మీ.
13	నీటి జమ అంచనా (నవంబర్ నుండి మే వరకు)			పట్టిక 7	290,085	ఘ. మీ.
14	నీటి పొరుదల ద్వారా జమ అయ్యే భూగర్భజలాలు (నవంబర్ నుండి మే వరకు)			పట్టిక 1	27,558	ఘ. మీ.
15	రబీ/వేసవి పంటలకి అందుబాట్లో ఉన్న భూగర్భజలాలు (అక్టోబర్ అంతానికి)			పట్టిక 3	791,197	ఘ. మీ.
16	అంచనా వెసిన భూగర్భజలాల జమ (నవంబర్ నుండి మే వరకు)				1,108,841	ఘ. మీ.
17	అంచనా వెసిన భూగర్భజలాల నిలువ (మే అంతానికి)				111,822	ఘ. మీ.
18	నిలువ రకము			మిగులు	111822	ఘ. మీ.
19				లోటు	-	ఘ. మీ.

1 Recharge / 2 Draft / 3 Balance / 4 Crop Plan / 5 Crop-Water Plans / 6 Tanks / 7 Recharge / 8 Balance / Monthly / 9 Graph





వైరు - నీరు బడ్జెట్

ఋతుపవన సంవత్సరము	: జూన్ 2005 నుంచి మే 2006
బడ్జెటు కాలము	: నవంబర్2005 - మే 2006
నీటి పరివాహక ప్రాంతం:	: నక్కిల్లవాగు
జిల్లా	: చిత్తూరు

పట్టిక 7: రైతుల వంటల (నవంబర్ - మే) కు కావలసిన నీటి పరిమాణం

క్ర.సం	పేరు వైరు		విస్తీర్ణము		కావలసిన నీటిపరిమాణము				
			ఎకరాలు	హెక్టార్లు	చ.మీ	మి.మీ.	మి.మీ.	మీ	ఘ.మీ
1	వంగ	పేనిన	0.75	0.30	3,000	500-600	500	0.50	1,500
		కొనసాగుతున్న	4.25	1.70	17,000	500-600	230	0.23	3,910
2	పేరంకవగ	పేనిన	0.50	0.20	2,000	500-700	500	0.50	1,000
3	వరి	పేనిన	12.50	5.00	50,000	1000-1800	1192	1.19	59,600
		కొనసాగుతున్న	58.00	23.20	232,000	1100-1300	397	0.40	92,104
4	మిరప	పేనిన	1.75	0.70	7,000	600-800	600	0.60	4,200
6	టమోట	పేనిన	59.20	23.68	236,800	500-650	564	0.56	133,555
		కొనసాగుతున్న	16.10	6.44	64,400	500-650	300	0.30	19,320
7	మల్లి	కొనసాగుతున్న	0.35	0.14	1,400	300-500	300	0.30	420
8	రోజ	పేనిన	0.50	0.20	2,000	450-550	250	0.25	500

Farmer Water Schools (FWS)

WORLD EDUCATION

FWS conceptualization

APFAMGS adopted FFS approach:

- Discovery and experiential learning process
- Farmers master concepts of groundwater management
- Empower to effectively manage collective resource.

FFS Approach: Origin & Objectives

- FFS: brown plant hopper infestation in paddy
- Main objectives:
  - Improve farmers analytical and decision-making skills,
  - Develop an understanding of ecological principles & pest population dynamics
  - End dependency on pesticides
- Principles of Nonformal education & Discovery Learning
- Farmers select/transform technologies
  - to fit the specific ecological and economic conditions, and
  - contribute to overall food production

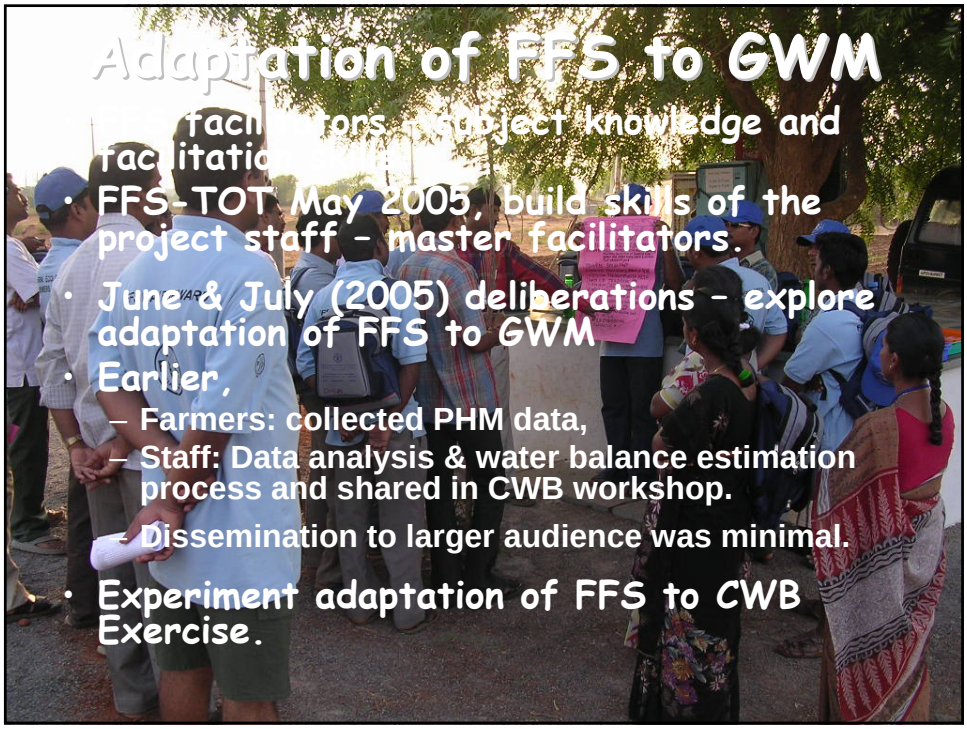
Farmers understand:
- issues affecting their livelihood
- Need for debate and concerted action to protect their interests

AESA: Heart of FFS

Observation

Analysis

Decision-making



Favorable Factors

- Farmer volunteers trained to measure and record PHM data;
- GMCs formed;
- PHM training modules available;
- No additional financial resources required;
- Season-Long TOT – Staff capacities & confidence built;
- FWS – Timely input of GWM concepts;
- Experiential & discovery learning process;
- Farmer friendly models – active input from farmers;
- Indigenous water management practices can be explored;
- Higher degree of sustainability; and
- Joint management of scarce water resources.

Challenges

- Limited field tests in groundwater.
- Results not immediately visible as in agriculture.

Selection of HUs

- Physical works completed before June 2005.
- Hydrological data collection started before June 2005.
- Farmers motivated to generate hydrological data record between June-October 2005.
- Farmers possess skills to generate continuous hydrological data.

Selection of participants

- resident of the HU,
- groundwater user farmer,
- age group: 20 – 45 years,
- women participation: 40%-50%
- active participant/volunteer in project activities,
- ability to articulate groundwater concepts,
- nominated by GMC.

FFS-CWB 2005-06 Impact

- **Farmer participants showed increased initiative to:**
  - understand and discuss groundwater dynamics;
  - analyze the PHM data;
  - calculate water balance estimation;
  - share the learning of each session in GMCs;
  - present water balance estimation results in CWB workshops; and
  - disseminate key messages.

FFS-FMGS 2006-07:

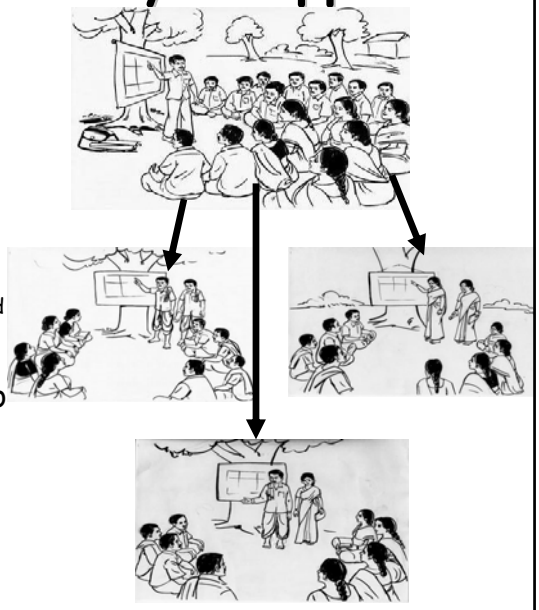
- Sixteen sessions –one full hydrological cycle.
- Session guides in Telugu.
- Visuals and models for each FWS session.
- HIV & AIDS as special topics.
- Group dynamics.
- FFS-FMGS Field Days organized by PNGOs.

FFS-FMGS: Multi-cycle approach

Reach large number of farmers;

Simultaneous learning-teaching process:

- Farmer participants of first cycle facilitate 2nd cycle.
- FWS cycles one and two run simultaneously with gap of two to four days
- **1st Cycle – 37 FFS**
- **2nd Cycle – 296 FFS**



Kenya - Exchanges

- Kenya visit 1st to 13th May 2006.
- APFAMGS, & AMEF Staff & farmers.
- Visited 5 FFS in different villages
- Farmers and the staff impressed:
  - -Self finance mechanism for FFS,
  - -Farmer group registration and networking
  - -Income generation activities
  - - Research station use FFS to test their ideas
- 2weeks FFS-TOT Benjamin, Titus and Godric Khisa – July & Aug'06
- Special topics, Group dynamics, Income generation activities for sustainability of FFS.

FWS 2007-08

- Session guides revised.
- Improvements in models.
- HESA framework revised.
- HUNs encouraged to organize & conduct FWS.
- HUNs encouraged to organize FWS field days.

FWS 2008-09

- FWS planning workshops for HUN members & farmer facilitators.
- Funds transferred to HUNs for FWS management.

Farmer Water Schools [FWS]

Participants discuss:

- **groundwater concepts & availability,**
- **impact on crop growth,**
- **role of institutions in sustainability and**
- **gender equity.**

Hydro-ecosystem Analysis

Observe

- **Recharge factors,** like amount of rainfall, surface water, and rock & soil formation.
- **Discharge** factors – no. of borewells, pumping hours/days, average discharge




Analyze data [Discussion / Sharing]

Reach decisions on crop plans & management of groundwater

FWS objectives:

- Empower farmers with knowledge and skills to measure recharge & draft
- Sensitize farmers on the need for collective action
- Sharpen the farmers' ability to make critical and informed decisions on crop plans
- Sensitize farmers on new ways of thinking and resolving issues



Typical FWS:

- **Full hydrological year [June–May]**
- **25 to 30 farmers participants**
- **Meet once every 15/20 days**
- **Primary learning material: HU & farmer field**
- **Field school close to the farming plots**
- **Participants learn together in small groups of five to maximize participation**



Typical FWS [contd.]:

- 3 activities: HESA, special topic, and group dynamics activity
- FWS participants compare farmer and experimental plots
- Several additional field studies depending on local field problems
- Ballot Box Exercise: Pre- and post-test are conducted
- CWB Workshop & Field Day
- Quality Assurance Checklist



FWS & GMC/HUN

- GMCs involved in FWS preparation meetings to determine needs, recruit participants and discuss logistics
- Farmer participants share their learning from each FWS session at GMC meetings
- HUNs take lead in the organization and conduct of Field Day

FWS: Expected Outcomes

- Farmers as experts
- Farmers as PHM trainers
- Farmers as researchers/scientists
- Farmers as organizers, planners, advocates, activists
- Farmers as policymakers

FWS Reach

Hy.Year	FWS	Participants		
		F	M	Total
2004-05	14	110	262	372
2005-06	43	455	776	1,231
2006-07	333	3,448	5,468	8,916
2007-08	314	3,741	5,719	9,460
2008-09	174			5,220

FWS Costs

Hy.Year	FWS	Partici pants	Expn (Rs.)	FWS Cost (Rs.)	FWS cost $	Session Cost (Rs.)	Session Cost $	Per Part cost (Rs.)	Cost/Par t $
2006-07	333	8,916	7,244,935	21,757	463	1,360	29	813	17.29
2007-08	314	9,460	2,471,964	7,872	167	492	10	261	5.56
2008-09	174								

ఆంధ్రప్రదేశ్ రైతుల భూగర్భజలయాజమాన్య పథకం (ఏపిఫామ్స్ ప్రాజెక్టు)

భారతి ఇంటిగ్రేటెడ్ రూరల్ డెవలప్‌మెంట్ సొసైటీ (బార్డ్స్)

పాలంబడి శిక్షణ ఉత్తీర్ణ పత్రం

ఏపిఫామ్స్ ప్రాజెక్టు సహకారంతో జూన్ 2006 - మే 2007 నీటి సంవత్సరంలో ప్రతి పదిహేను రోజులకొకసారి (16 సెషన్స్) ఒక సంవత్సరం పాటు _____ గ్రామంలో నిర్వహించిన "పాలంబడి విధానంలో రైతుల భూగర్భజల యాజమాన్యము" తరగతుల యందు శ్రీ/శ్రీమతి _____ భాగస్వామ్య రైతు/సదుపాయ కర్తగా పాల్గొని విజయవంతంగా శిక్షణపూర్తి చేసారు.

స్థలం : ఆళ్ళగడ్డ
తేది :

రాష్ట్ర సమన్వయకర్త
పరల్డ్ ఎడ్యుకేషన్
హైదరాబాద్

ఎగ్జిక్యూటివ్ డైరెక్టర్
బార్డ్స్ - ఏపిఫామ్స్
ఆళ్ళగడ్డ

Thank You

Farmer Water Schools (FWS)

Y.Sudhakar -World Education, Hyderabad

Farmer Water School (FWS) approach has been adopted for promoting group learning aimed at improving skills and knowledge amongst the farmers. 30 Farmers meet as a school once every 15 days, continuously for 12 months (June–May) to discuss and diagnose the different problems related to groundwater resource availability based on the data they have collected. Farmers are enabled with Non formal Education Tools to understand complex issues and are supported with short and Long Term Experiments to identify solutions for solving the various problems.

FWS is facilitated through farmer facilitators who are one among them who are already trained from external resource persons. Topics covered include geology, hydrogeology, water cycle, soil, land use, cropping system water availability, organic farming, water use efficiency, gender role in water sharing, crop planning and issues on HIV/AID's affecting the farming sector. At the project level close to 300 schools are functional at any point of time attended by nearly 10,000 farmers.

Under the FWS, Science and technology is made simple and relevant for day to day application by the farmers. FWS provides farmers with technical tools, skills, capacity, and knowledge to monitor the different parameters that give an understanding on the water resources availability and changes with time. Adopting the FWS methodology farmers within a Hydrological Unit carry out Water balance exercise annually for guiding them in their crop planning matching with water availability. FWS also provides opportunity to experiment with various options for sustainable agriculture and livelihoods.

Salient features of a typical FWS:

- Lasts a full hydrological year [June–May].
- Between 25 and 30 farmers participate in an FWS.
- Farmers meet once every 15/20 days.
- Primary learning material: HU & farmer field.
- Field school adjacent to the farming plots.
- Participants learn together in small groups of five to maximize participation.
- FWS educational methods are experiential, participatory and learner-centered.
- Each FWS meeting includes at least three activities: hydro-ecosystem analysis, a special topic, and group dynamics activity.
- FWS participants conduct a study comparing farmer and experimental plots.
- FWS often includes several additional field studies depending on local field problems.
- Ballot Box Exercise: Pre- and post-test are conducted.

- Crop-Water Budgeting (CWB) exercise is undertaken at the end of each monsoon.
- Field Day: share learning and results of their studies.

Pre-FWS activities

Prior to beginning FWS in the field, a series of meetings need to be organized involving opinion leaders, progressive farmers, sarpanch, and other influencing leaders of the village. The following are pre-FWS activities that are organized:

Rural communities respect suggestions given by their elders. These elders in the village are referred to as opinion leaders. Convincing them is essential to gain the confidence of the community. It will be an advantage if opinion leaders accept the concept and its dissemination in their village.

Meetings are organized in the village involving the farming community in the presence of opinion leaders. The project staff can address the target audience and introduce the concept of FWS and its relevance to the community.

After explaining the criteria for participating in FWS, enthusiastic farmers are selected to participate in the year long FWS activities.

The selected participants are oriented by explaining the concept of Farmer Water School and the criteria for participation.

Farmers are involved in listing their training needs. Based on their requirement, an FWS curriculum is designed which is used to begin the year long FWS activities.

A Hydrological unit is selected keeping in view the early completion of all physical works, beginning data collection and presence of enterprises farmers who are ready to generate hydrological data continuously.

Essential Elements of FWS:

The Learning group: Farmers within a hydrological unit come together to explore, discuss, experiment, and thereby, become better informed about their hydrological unit, concepts of groundwater, and crop-water management. Usually a group of 30 farmers meet once in every 20 days to engage in a discovery and experiential learning activity. The group consists of both men and women farmers. The group provides an ideal opportunity for sharing of experiences and mutual learning. Further, these periodic meetings strengthen

existing farmer institutions or may lead to the formation of new institutions for sustainable groundwater management.

For effective learning, this group of farmers is further divided into small learning groups. Farmer participants remain in their small learning groups throughout the entire FWS cycle. Engaging in discussions, setting up experiments, conducting observations, sharing responsibilities (FWS management), etc. help them to become more cohesive learning groups and ensures effective participation.

Hydrological Unit and the farmers' field: FWS curriculum comprises of practical, hands-on topics. In FWS, the hydrological unit, and the farmer's field are the primary learning material. Farmers engage in a discovery and experiential learning process to gain better understanding of the rock formation, soil types, drainage pattern, rainfall pattern, and cropping system. They also develop sensitivity to observe and analyze the interplay between these factors to make decisions on crop-water management.

Curriculum: The FWS curriculum follows the natural hydrological cycle. For example, in the Indian subcontinent it would start in June and continue through May – encompassing the South-west monsoon, and the north-east monsoon. This enables farmer participants to discuss all aspects of the hydrological cycle, its interplay with the physical features of the hydrological unit, factors influencing groundwater recharge and draft, and elements in crop-water management.

The curriculum includes

- Long-term experiments & Short studies – especially those related to crop-water, soil moisture, water-levels measurement, etc.
- Special topics based on farmers emerging needs,
- Icebreakers,
- Energizers, and
- Team building exercises.

The FWS curriculum should reflect the local needs of the farmers and the physical features of the particular hydrological unit. Adaptation of the generic FWS curriculum to the local needs is made possible by organizing FWS planning meetings before the conduct of each FWS session. In these planning meetings, farmer facilitators (including participants of the first cycle):

- Identify and discuss content appropriate to local needs;
- Develop session guides - identify methods and develop appropriate models, and posters;
- Brainstorm ways of making farmer training sessions an exercise in discovery-learning;
- Identify locations where farmers could observe geological formations and structures; and
- Identify special topics relevant to the local needs.

All learning activities are based on experiential (learning-by-doing), participatory, hands-on work. This builds on adult learning theory and practice. Observation, analysis, discussion, and decision making are the key learning principles. The emphasis is not only on “how” but also on “why”.

Facilitator: Active participation in FWS is a prerequisite to become a facilitator. FWS uses two simultaneous cycles of implementation to reach large number of farmers. The first cycle is facilitated by experienced facilitators. Farmer participants from the first cycle form into pairs to organize the second cycle of FWS in their habitations. This second cycle progresses simultaneously along with the first cycle; but, with gap of one week between the sessions of the two cycles.

Before the conduct of each FWS session, farmer facilitators (including participants of the first cycle) participate in a planning meeting to discuss the content, methods, materials (models, posters, etc.), and finalize session guide. Using the aid of the session guide, farmer facilitators facilitate the FWS session.

The conventional FFS model stipulates that all facilitators need season-long training to learn facilitation skills, learn to grow crops with their own hands, and develop management skills; i.e. they need to be FFS graduates. The FWS farmer participants from the first cycle shared that it is much easier for them to facilitate an FWS session immediately after participating in a session planning event, and experiencing the learning in a FWS session; all of which happen within a span of a week. This they say ensures effective transfer of learning. The session guides which elaborate the facilitation process serve as a ready reference to farmer facilitators. Further, an observer (experienced staff of the implementing agency or facilitators of the first cycle) participates in the second cycle to observe and provide need-based assistance to the facilitators of the second cycle.

Crop-water Budget Workshop: The CWB exercise involves estimation of the groundwater balance based on the total recharge and draft for the particular monsoon season. This estimation helps farmers make informed decisions on the crops to be sown.

FWS participants organize CWB Workshops at the Hydrological Unit level. The workshop acts as a platform for sharing information pertaining water balance, cropping pattern, and groundwater dynamics of the HU. Following this, the farmers discuss the crop plans and make informed decisions in accordance with the available groundwater balance.

Field day: Completion of the FWS training cycle is followed by a graduation ceremony and presentation of certificates. Graduation takes place at the end of the hydrological year and this marks the climax of the learning process. During the graduation ceremony, the graduates showcase their experiences and learning from participation in FWS to the members of their community.

Farmer institutions take lead in organizing and conducting the Field Day. Government officials and people's representatives are invited. Thus, the Field Day gives these farmer institutions greater visibility and provides them a platform to emerge as a critical pressure group on groundwater management in the district.

Crop Water Efficiency

S.Ravi Shankar
Consultant-Agriculture

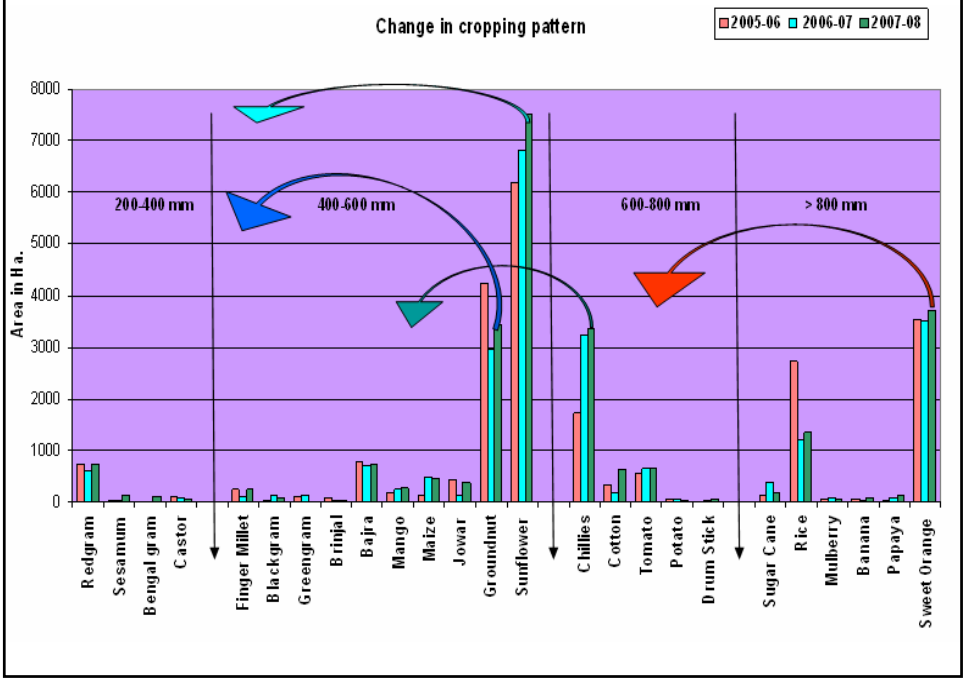
Presentation to GWD officials on 12-12-08

Water Saving techniques adopted by the farmers

- **Crop diversification**
- **Changes in cropping pattern**
- **Improved water use efficiency**
  - Practicing water efficient irrigation methods
  - Use of water saving devices
  - Water Conservation measures
- **Minimize all external inputs to reduce water application**
  - Promotion of vermi-compost
  - Increase water retention through green manure and leguminous crops
  - Promotion of botanical extracts
- **More crops per drop**
  - **Intecropping**
  - **Mixed cropping**

Crop diversification

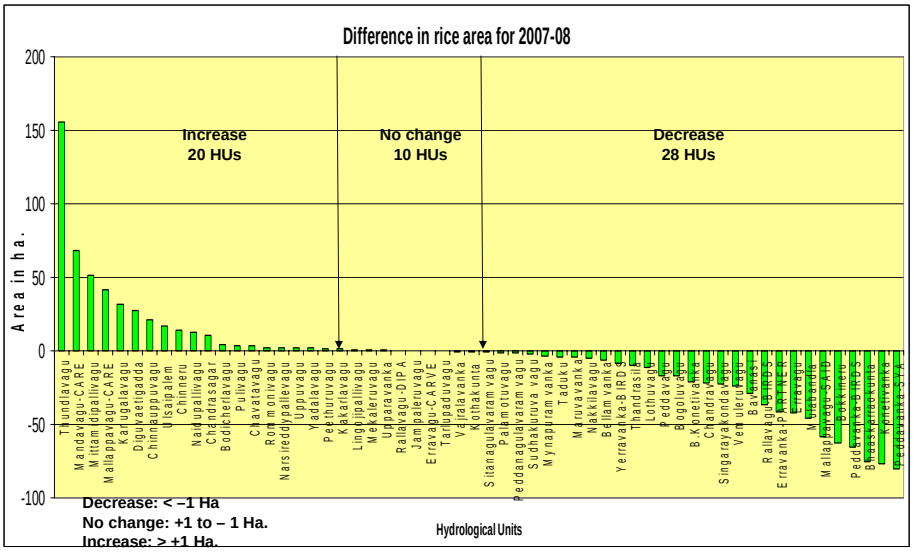
Water Required	2004-05	2005-06	2006-07	2007-08
200-400 mm	Pearlmillet Brinjal, Redgram,	Black gram, Greengram, Brinjal, Redgram, Pearlmillet	Black gram, Greengram, Water melon, Brinjal, Sesamum, Bengalgram, Pearl millet, Redgram, Beans,	Black gram, Greengram, Water melon, Brinjal, Sesamum, Bengalgram, Pearl millet, Redgram, Coriander,
400-600 mm	Finger millet, Groundnut, Sorghum, Onion, Sunflower, Mango	Finger millet, Castor, Onion, Groundnut, Okra, Sorghum, Maize, Sunflower, Mango	Finger millet, Castor, Onion, Groundnut, Sorghum, Maize, Sunflower, Mango, Curry leaf,	Finger millet, Castor, Onion, Groundnut, Sorghum, Maize, Okra, Crossandra, Sunflower, Mango,
600-800 mm	Chillies, Tomato	Chillies, Cotton, Tomato, Potato,	Chillies, Cotton, Tomato, Potato,	Chillies, Cotton, Tomato, Potato, drumstick
Above 800 mm	Rice, Sweet Orange, Sugarcane,	Sweet Orange, Rice, Banana, Sugarcane, Turmeric,	Rice, Sweet Orange, Sugarcane, Turmeric, Mulberry	Rice, Sweet Orange, Turmeric, Banana, Mulberry, Papaya
No. of Crops	14	23	27	30



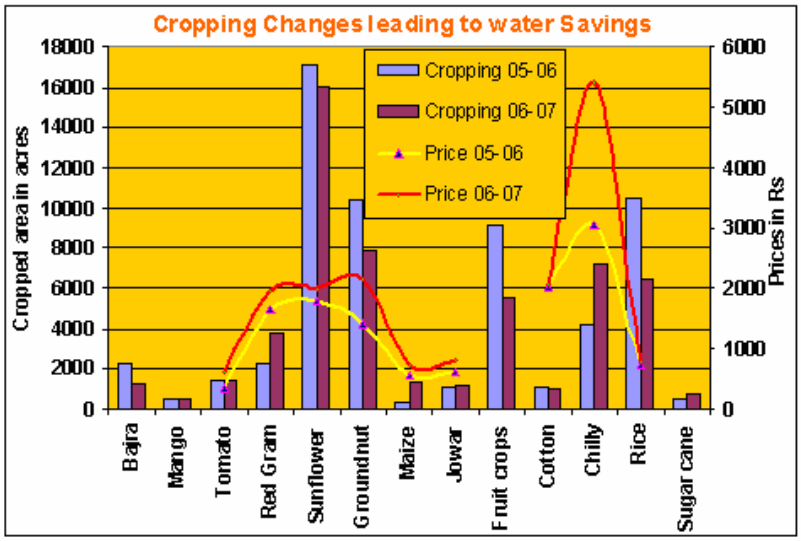
Crop Water Requirements adopted by APFAMGS Project

S.No	Crop	Water requirement range (mm)
1	Rice	900-2500
2	Groundnut	500-700
3	Sunflower	500-700
4	Tomato	600-800
5	Sugarcane	1500-2500
6	Red Gram	350-450
7	Chillies	500-800
8	Cotton	700-1300
9	Blackgram	350-400
10	Gingelly	200-400
11	Sweet orange	900-1200
12	Bajra	350-400
13	Sorghum	450-650
14	Bhendi	450-600
15	Brinjal	500-600
16	Ragi	350-500
17	Onion	350-550
18	Maize	500-800
19	Mango	350-600
20	Mulberry	1500-2000
21	Bengal gram	350-500
22	Banana	1200-2200
23	Coriander	250-350
24	Betel vine	500-1100
25	Turmeric	1000-2000
26	Crossandra	300-600
27	Guava	350-600
28	Pomegranate	350-600
29	Castor	400-650
30	Carrot	350-400
31	Potato	500-700
32	Water melon	350-400
33	Wheat	450-650

Reducing rice in Rabi



Market Intelligence



Water Saving technique	% of water Reduction applied	Crops
SRI Paddy	40	Paddy
Sprinkler	30-50	Groundnut, Vegetables, Bengal Gram, Chillies,
Drip	60-80	Sweet Orange, Banana, Papaya, Mango, SugarCane
Alternate Furrow Irrigation	25-30	Chillies, Sun Flower, vegetables
Check Basin	15	Groundnut
Application of Mulch	10	Sweet orange, Groundnut Chillies

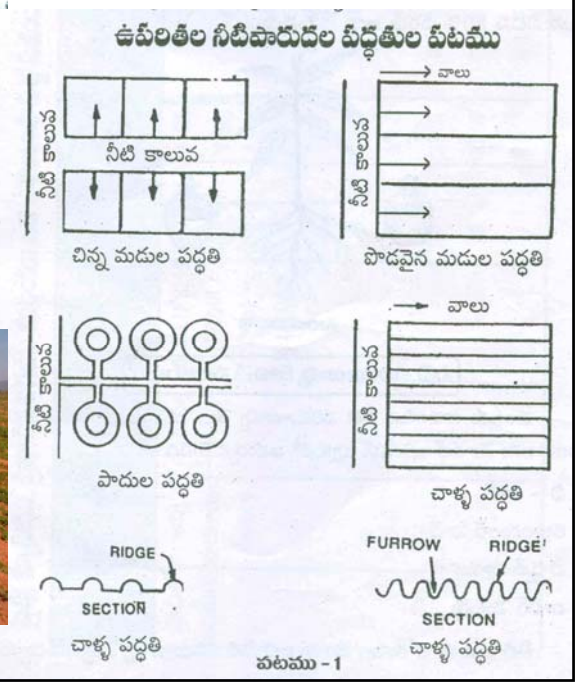
Improved Water Use Efficiency

i. Practicing water efficient irrigation methods (3.2 mcm)

Year	SRI (cu.m.)	Check basin (cu.m.)	Alternate furrow (cu.m.)	Alternate wetting & drying (cu.m.)	Ridges & furrow (cu.m.)	Total Reduction in water use (cu.m.)
2005-06	139376	55770	87720			**282866**
2006-07	81344	145830	511680	5952		**744806**
2007-08		802530	344210	18720	1014642	**2180102**
					Grand Total	**3207774**

SRI paddy

Border strip in groundnut



ii. Use of water saving devices (19.4 mcm)

Year	Sprinkler (cu.m.)	Drip (cu.m.)	Drip & mulching (cu.m.)	Rain gun (cu.m)	PVC pipes (cu.m.)	Total Reduction in water use(cu.m)
2005-06	3046440	1533834		9625		4589899
2006-07	2208870	2055669		5390		4269929
2007-08	3293682	4104334	92400		3072848	10563264
					Grand Total	19423092

iii. Water conservation measures : 1.74 mcm

Year	VermiCompost (cu.m.)	Paddy straw / husk mulching (cu.m.)	Double ring & mulching (cu.m.)	Total Reduction in water use (cu.m.)
2005-06	343968	14280	27600	**385848**
2006-07	411788	2750	15720	**430258**
2007-08	565402	97538	264090	**927030**
			Grand Total	**1743136**

Minimizing External Inputs

1.Reduction of inorganic fertilizers (Urea, SSP, MOP & DAP) through Vermicompost application to the soil (2,18,601 tonnes)

Year	Reduction of inorganic fertilizers (Tonnes)		
	Urea	SSP	MOP
2005-06	5136	49646	1985
2006-07	6148	59434	2377
2007-08	8493	82099	3283
Grand Total	**19777**	**191179**	**7645**

2. Reduction of Inorganic fertilizers (Urea) by adopting leguminous crops equivalent to 3544 tonnes

Crop	Reduction in Urea (Tonnes)		
	2005-06	2006-07	2007-08
Redgram	236	191	241
Bengal gram	1	1	15
Blackgram	8	38	20
Greengram	14	18	1
Groundnut	1100	772	888
Total	**1360**	**1019**	**1165**

Incorporation of green manure crop in paddy fields

Demo on Neemseed kernel extract

Demo on Chilli garlic extract

BOTANICAL EXTRACTS

Vitex leaves

Datura leaves

4. Reduction in cropped area leading to reduction of inorganic fertilizers equivalent to 1442 tonnes

Year	Rice (ha.)	Ground nut (ha.)	Tomato (ha.)	Reduction of inorganic fertilizers (Tonnes)			
				Urea	SSP	MOP	DAP
2005-06			154	15.4	15.4	30.8	15.4
2006-07	1171	189	143	377	295	202	131
2007-08	278	161	195	113	115	89	47
Grand Total	**1449**	**350**	**492**	**505.4**	**425.4**	**321.8**	**193.4**

More crops per drop

Intercrops

- *Groundnut + Red gram (7:1)*
- *Cotton + Red gram (4:1)*
- *Sweet orange + groundnut (In between)*
- *Redgram+Blackgram (9:1)*
- *Tomato + Maize / Marigold*
- *Redgram+ greengram (9:1)*
- *Redgram+Okra(6:1)*
- *Cotton +Greengram(8:1)*

Blackgram intercropped with Redgram and Maize

THANK YOU

Note on Crop Water Efficiency

Date: 12th December 2008, 07.30 to 08.00 hrs

Lead faculty/coordinators: Mr.Ravi shankar

Place: Muthyalapadu Farm, Chagalamarri Mandal, Kurnool district.

1.0 Introduction

Bharathi Integrated Rural Development Society (BIRDS) is the nodal Non-Governmental Organization (NGO) for the Andhra Pradesh Farmer Managed Groundwater Systems (APFaMGS) Project implementation, and bears overall administrative responsibility for the project. The Project is implemented through a network of 9 Partner NGOs (PNGOs), each one implementing the project activities in its area/district of operation. The Project Leader and Technical Support Team (TST) of APFAMGS Project carry out the day-to-day management and coordination tasks on behalf of the nodal NGO. The project is located in seven drought-prone districts of Andhra Pradesh. Parts of these districts were identified based on the socio-technical criteria and delineated into number of Hydrological Units. The HU encompass 633 habitations. Men and women of these 633 habitations are equal stakeholders in the project activities, irrespective of economic status, caste, creed and religion. Concerted efforts are made to involve vulnerable sections of the society since the inception of the project (2003) till date.

In our country, around 88% of water is being used in agriculture sector, 23% for industry and 8% for domestic purpose. The water demand is shooting up with the growth of Agriculture, Industries and population and within a decade or so water crisis may lead similar to oil crisis of 1973. Today, the country is facing acute water scarcity in many states and the availability of water per person per annum has come down from 6000 cubic meter per person to 2500 cubic meter per person.

2.0 Need to save groundwater

Owing to various reasons, not only available water for irrigation purpose has been declining rapidly but also the demand for irrigation water has been growing at a faster rate. Hence, efficient use of irrigation water & also adopting water saving techniques are the important means for increasing the productivity. The surface irrigation methods, which are widely practiced in India lead to enormous losses of water due to seepage and evaporation. The losses also result poor distribution of water in farm due to inadequate land preparation and lack of farmer's knowledge in the application of water, which leads to excess application and deep percolation. The unscientific use of water has resulted not only wastage of water but also caused soil erosion, salinization and water logging which ultimately degraded the quality of two basic natural resources viz., soil and water.

This report explains the quantity of water saved with the project intervention (2003 to 2007) in APFAMGS Project as a whole.

Crop water efficiency can be achieved by the following techniques

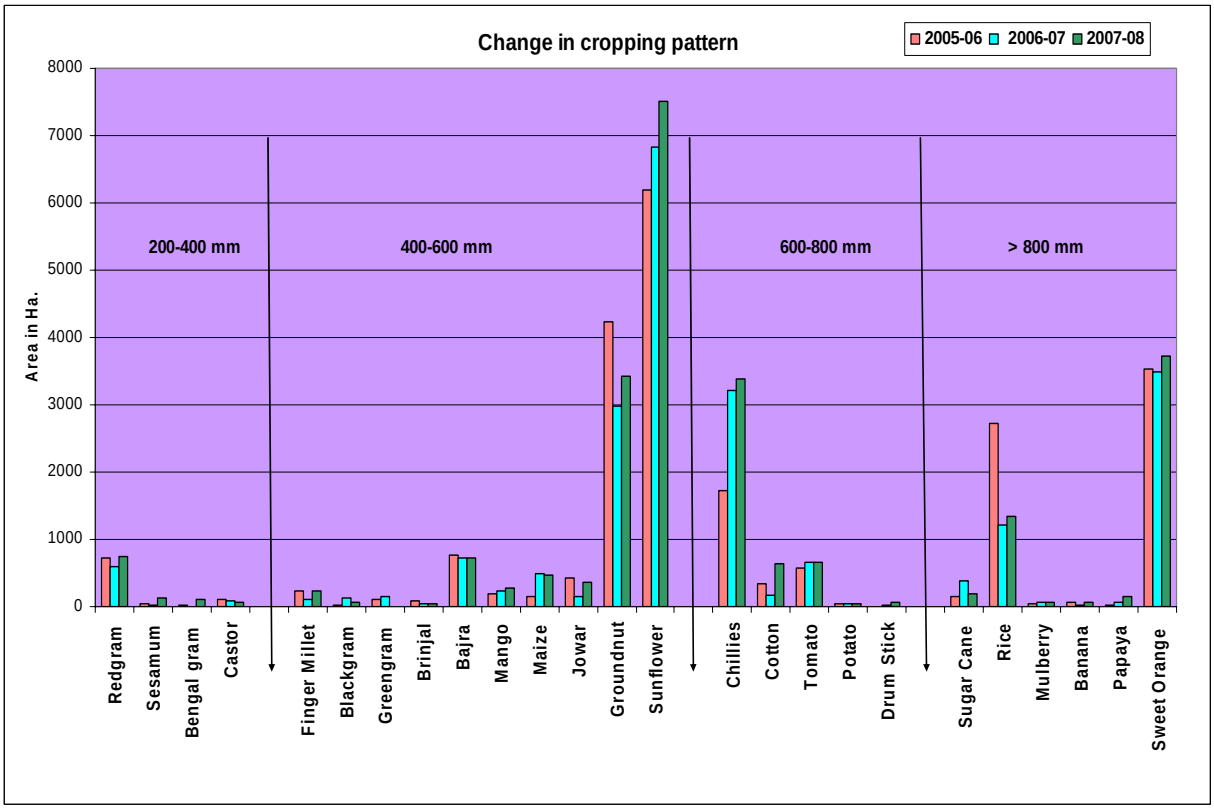
- Crop diversification (from high water use crops to low water use crops)
- Changes in cropping pattern
- Improved water use efficiency techniques

Crop Diversification (for 38 HUs in 3 years)

S.No.	Crop	2005-06	2006-07	2007-08
200 - 400 mm	Redgram	723.8	585.9	739.2
	Sesamum	37.6	20.56	128.88
	Bengal gram	11.6	8.3	116
	Castor	107.2	88.92	61.1
400 -600 mm	Finger Millet	239.26	104.224	233.3
	Blackgram	29.2	134.18	72.4
	Greengram	112.8	140.34	9.2
	Brinjal	78.08	32.48	35.1
	Bajra	772.04	713.52	728.42
	Mango	189.1	232.92	273
	Maize	144.4	489.06	460.3
	Jowar	435.86	145.72	366.78
	Groundnut	4231.444	2968.132	3415.36
	Sunflower	6182.72	6826.62	7502.58
600 - 800 mm	Chillies	1718.45	3221.396	3379.2
	Cotton	332.8	180.6	629.18
	Tomato	574.22	657.78	655.12
	Potato	51.08	44.16	39.40
	Drum Stick	2.08	22.70	56.70
Above 800 mm	Sugar Cane	138.74	385.12	185.02
	Rice	2715.252	1219.624	1347.58
	Mulberry	49.2	68.98	65.36
	Banana	55.7	19.5	72.56
	Papaya	20.8	70.92	145.34
	Sweet Orange	3522	3491.6	3714.8
	Total	**22475.43**	**21873.26**	**24432**

The crops were categorized into 4 groups based on their water requirements as indicated above. There was increase in the area in 2007-08 compared to 2005-06 of upto 8.7%. The analysis is carried out in 38 HUs out of 63 HUs of the project area since 3 years data is available.

Changes in cropping pattern



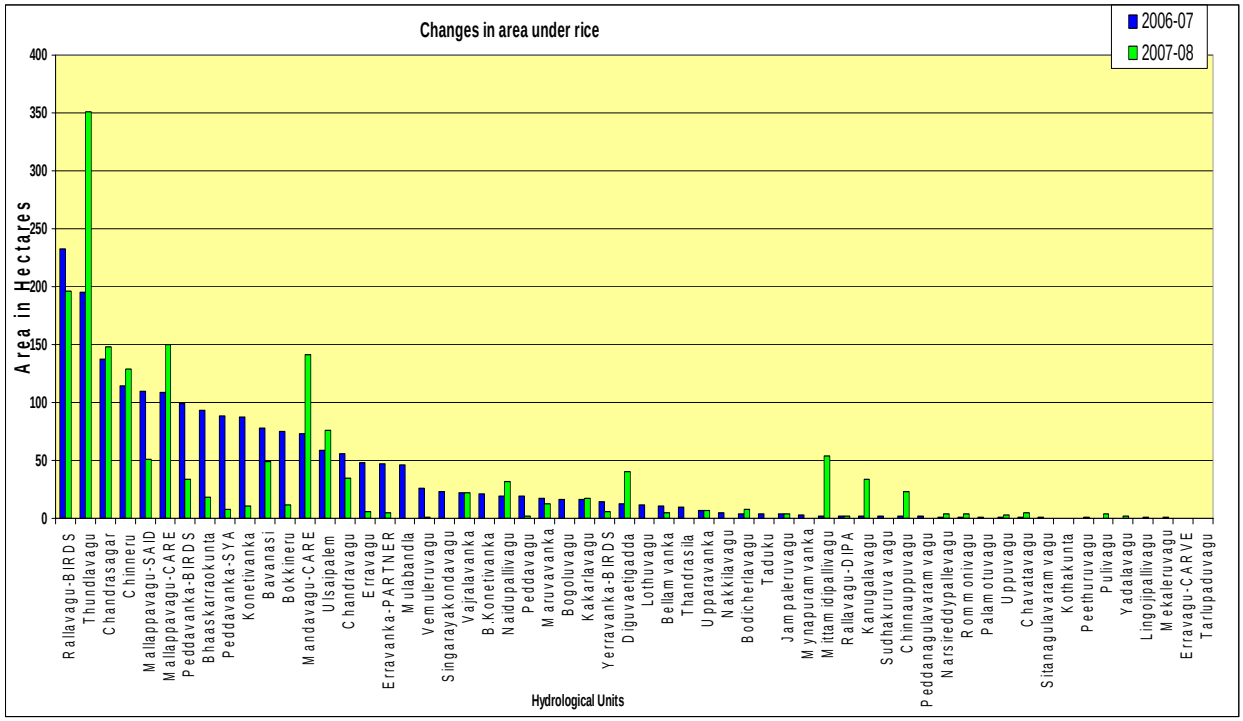
The inference that can be drawn from the above graph was that there was continuous increase in irrigated dry crops like sunflower, tomato, maize & chillies with changes in cropping pattern in irrigated crops like sugarcane & rice. The area under food crops like redgram. Bengalgram, blackgram, greengram, ragi & Bajra remained almost similar denoting food security.

In special interest towards cultivation of rice, as rice is water loving crop, it was observed that

31 HUs showed reduction in rice cultivation in rabi whereas 25 HUs showed increase in area and nearly about 14 HUs completely abstained rice cultivation in rabi. But there was simultaneous increase in area under rice in kharif by nearly 20%. The results are as shown below:

Reduction in rice area

HU	Paddy area (ha)		Difference	HU	Paddy area (ha)		Difference
	2006-07	2007-08			2006-07	2007-08	
Area reduced Under Paddy (Ha.)				**Area increased under Paddy (Ha.)**			
Vajralavanka	22.4	22	-0.4	Thundlavagu	195.2	350.5	155.3
Kothakunta	0.4	0	-0.4	Mandavagu-CARE	73.5	141.6	68.1
Sitanagulavaramvagu	1	0	-1	Mittamidipallivagu	2.4	53.6	51.2
Palamotuvagu	1.2	0	-1.2	Mallappavagu-CARE	108.32	149.7	41.38
Peddanagulavaramvagu	1.6	0	-1.6	Kanugalavagu	2	33.6	31.6
Sudhakuruva vagu	1.8	0	-1.8	Diguvaetigadda	12.5	40.2	27.7
Mynapuramvanka	3.2	0	-3.2	Chinnauppuvagu	1.7	22.8	21.1
Taduku	4	0	-4	Ulsaipalem	58.8	75.5	16.7
Maruvavanka	17.2	12.8	-4.4	Chinneru	114.72	129	14.28
Nakkilavagu	5	0	-5	Naidupallivagu	19.4	32	12.6
Bellamvanka	10.8	4.6	-6.2	Chandrasagar	137.82	148.28	10.46
Yerravanka-BIRDS	14	5.64	-8.36	Bodicherlavagu	4	8	4
Thandrasila	10	0	-10	Pulivagu	0	3.8	3.8
Lothuvagu	11.4	0	-11.4	Chavatavagu	1	4.4	3.4
Peddavagu	18.8	2.2	-16.6	Rommonivagu	1.4	3.8	2.4
Bogoluvagu	16.6	0	-16.6	Narsireddypallevagu	1.4	3.4	2
B.Konetivanka	20.8	0	-20.8	Uppuvagu	1.2	3.2	2
Chandravagu	56	34.4	-21.6	Yadalavagu	0	2	2
Singarayakondavagu	22.8	0	-22.8	Peethuruvagu	0	1.4	1.4
Vemuleruvagu	25.64	1.4	-24.24	Kakarlavagu	16.4	17.7	1.3
Bavanasi	78	49.4	-28.6	Lingojipallivagu	0	0.6	0.6
Rallavagu-BIRDS	232.8	196	-36.8	Mekaleruvagu	0	0.6	0.6
Erravanka-PARTNER	46.8	5	-41.8	Upparavanka	6.8	7.2	0.4
Erravagu	48	5.4	-42.6	Rallavagu-DIPA	2.2	2.4	0.2
Mulabandla	46	0	-46	Jampaleruvagu	3.8	3.92	0.12
Mallappavagu-SAID	109.2	50.94	-58.26				
Bokkineru	74.6	11.6	-63				
Peddavanka-BIRDS	99.4	33.8	-65.6				
Bhaaskarraokunta	93.62	18.5	-75.12				
Konetivanka	87.8	10.8	-77				
Peddavanka-SYA	88.4	8	-80.4				



Improved water use efficiency techniques

After Crop Water Budgeting (CWB) workshop, the GMCs & HUNs carry over the message of deficit/surplus of groundwater availability to groundwater users and take collective decisions to overcome deficit situations. The farmers were given options to follow improved water use efficiency techniques rather than change in cropping pattern keeping in view the market intelligence. The techniques adopted by the farmers over 3 years are depicted as follows:

1. Reduction in water use equivalent to 24.37 MCM

a. Water Use Efficiency methods (22.63 Million Cubic Metres)

Year	SRI (Cu.m.)	Sprinkler (cu.m.)	Check basin (cu.m.)	Alternate furrow (cu.m.)	Drip (cu.m.)	Drip & Mulching (cu.m.)	Alternate wetting & drying (cu.m.)	Rain gun (cu.m.)	Ridges and furrow (cu.m.)	PVC Pipes (cu.m.)	Total Reduction in water use by Water Use Efficiency Methods (cu.m.)
2005 -06	139376	3046440	55770	87720	1533834			9625			**4872765**
2006 -07	81344	2208870	145830	511680	2055669		5952	5390			**5014735**
2007 -08		3293682	802530	344210	4104334	92400	18720		1014642	3072848	**12743366**
										Grand Total	**22630866**

b. Water Conservation measures (Mulching):1.74 Million Cubic Meters

Year	VermiCompost (cu.m.)	Paddy straw /husk mulching (cu.m.)	Double Ring alongwith sunflower residues (cu.m.)	Total Reduction in water use by Water Conservation Measures (cu.m.)
2005-06	343968	14280	27600	**385848**
2006-07	411788	2750	15720	**430258**
2007-08	565402	97538	264090	**927030**
			Grand Total	**1743136**

From the above tables, it denotes that

- The areas under water saving techniques are collected from the farmers and water use per acre is calibrated to compare with water use in conventional methods.
- The application of vermi-compost has increased continuously in various crops like sweet orange, chillies, tomato, papaya etc., Drip in sweet orange, citrus, papaya, mulberry, chillies etc., & check basin in groundnut.
- The farmers even increased the use of PVC pipes which reduce conveyance losses through evaporation from field channels in the order of 15 to 30%.
- About 12.57 million cubic metres of water was saved over 3 years in various crops existing in the project area.
- The area under water use efficient techniques had increased with 6444 ha, 6555 ha & 20,956 ha. in 2005-06, 2006-07 & 2007-08 respectively.

The following norms are adopted by the project

Water conservation Method	% of water Reduced	Crops
SRI Paddy	40	Paddy
Sprinkler	30-50	Groundnut, Chillies, Vegetables, Bengal Gram
Drip	60-80	Sugar Cane, Sweet Orange, Banana, Papaya, Mango
Alternate Furrow Irrigation	25-30	Chillies, Sun Flower, vegetables
Check Basin for ground nut	15	Groundnut
Application of Mulch (Farm Yard manure, vermicompost, paddy straw, Paddy Husk, Crops stubbles)	10	Sweet orange, G.Nut, Chillies

Introduction

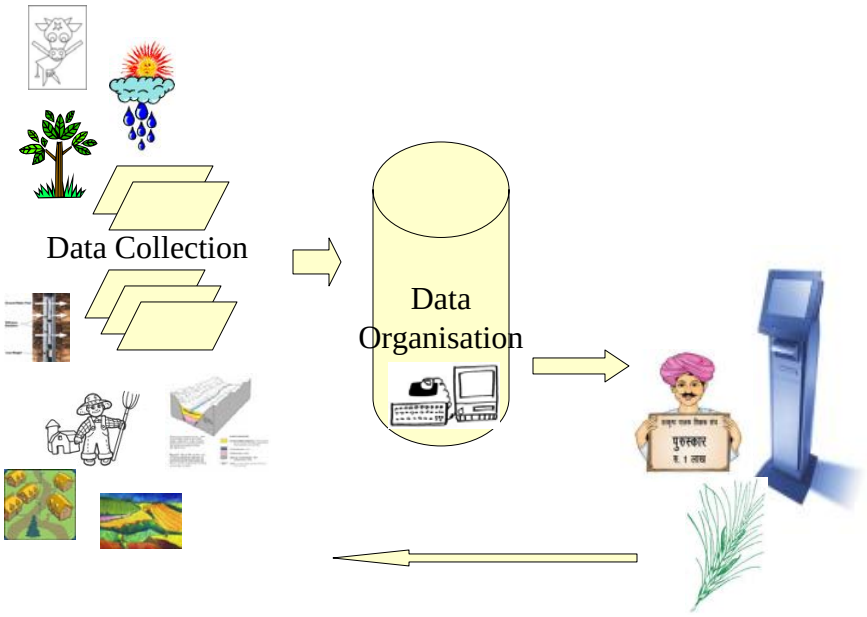
Andhra Pradesh Farmer Managed Groundwater Systems (APFAMGS) Project

HRIS+
Habitation Resource Information System
Crop Water Balance

12 December, 2008

vision

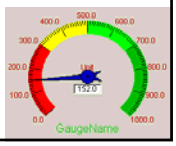
Vision



Design

Design

- Platform
  - Windows, MS-Access, Visual Basic
  - GIS enabled
  - Interactive charting tool
  - Stand-alone and networked (MSA, SQL Server, Oracle)
- Data transfer
  - Centralized database
  - Protocol governed transfer
  - Direct connectivity
- Modular
  - Independent modules
  - Interlinking and integration
- Reports
  - Crystal Reports
- Charts
  - Tee Charts



nuts & bolts

HRIS+

- Hydrological Unit Information
  - Basic Information
  - Artificial Re-charge structures
  - Wells
  - Rainfall
  - Training
- Habitation Information
  - Water Resources
  - Agriculture & Crop Management
  - Infrastructure
  - Employment
  - Power
  - Industries
  - Economic Services
  - Demography
  - Gender
  - Institutions
- Outputs & facilities
  - Crop Water Balance
  - Crop Plan
  - Crop Adoption
  - Hydrographs
  - Contours
  - Trends & Statistics
  - Thematic maps

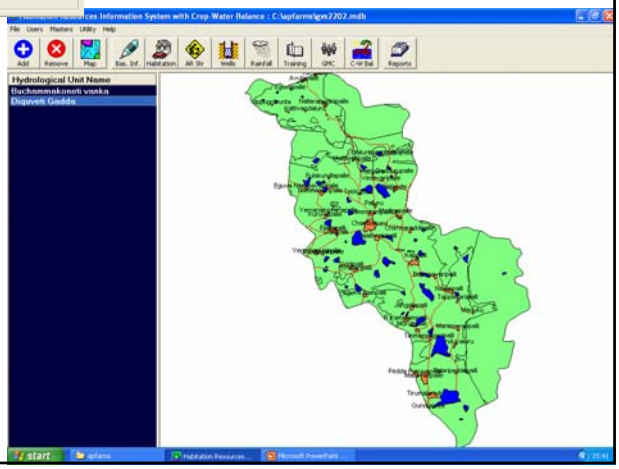
Graphs
GIS
Reports

User Authentication……..

Authentication

HRIS Consists of

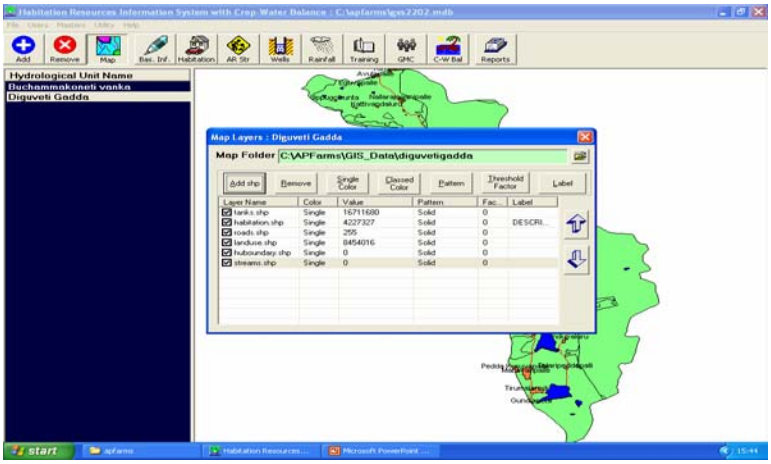
52 Forms ,
44 Tables,
Crystal reports,
Tee charts



Thematic Maps……..

GIS

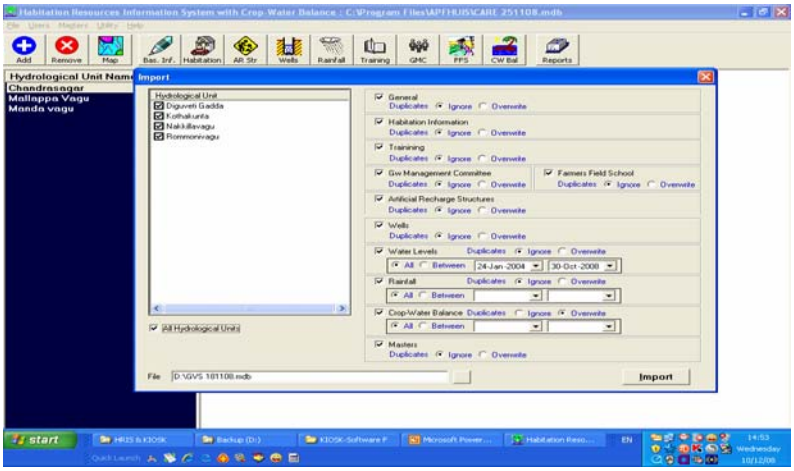
Generated Thematic Layers like Hydrological unit boundary, Road Network, Drainage Network with Canals ,Tanks and Rivers, Habitations , etc …based on 1:50000 Survey of India toposheets and also plotted all Observation well Locations and Rain gauge station locations by using GPS.



Import & Export……..

Consolidation

- Consolidation the data of All modules of Hydrological unit into one database.
- Consolidation the data of different Hydrological units of same PNGO.
- Consolidation of all Hydrological units of all PNGO's.



Maintenance……..

Databases….

Maintenance of Databases

- All PNGO's maintain their own database at PNGO level
- Every Month they enter the Water levels and Rainfall data
- Month wise database backups maintained by PNGO.
- Data Integration at Hyderabad using online means/offline (CD's)
- Hyderabad office maintains Project Level Database

Movie

Movie.....

Movie of HRIS

ThanQ.....

THANK YOU

Habitation Resource Information System (HRIS)

Introduction

Habitation Resource Information System (HRIS) is a store house of habitation level data that can be consolidated at a hydrological unit level. The data can be organised at individual farmer level. Development of the HRIS software commenced in September 2005, and the first prototype was ready in November of the same year.

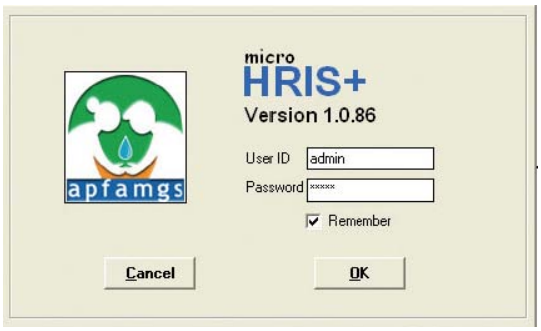
The system was refined over time, and provided comprehensive information on Hydrological units (with GIS maps and inbuilt GIS controls for spatial visualisation) as well as habitations.

HRIS can capture all varieties of data including static information pertaining to habitation, land use, soil, geology as well as dynamic information related to meteorology, hydrology, agriculture and cropping in an organized and efficient manner. To provide maximum value to the user, the software is GIS enabled; however, it can work without maps also in case they are not available.

This system facilitates data storage which can be easily accessed for carrying various types of analysis, generation of maps, graphs and reports.

The software has two important modules: HRI Module and CWB Module

Authorized User Access



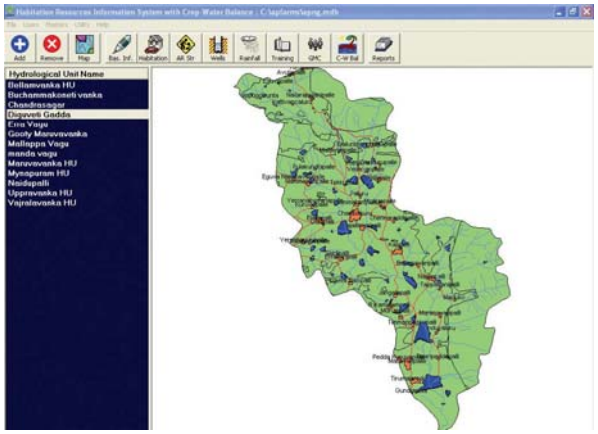
The software provides entry to authorized users on entering the User ID and Password. Different versions of the password have been released in order to cater to the new tools and data organization, reporting facilities sought by users from the PNGO's. Currently, the version 2.0.12 is operationalised in 9 PNGO offices.

HRI module

HRI module stores all the data of a hydrological unit, including the general information, infrastructure, demographic, water details, gender and institutions (including GMC), well information (including SWL, PWL, Discharge), Artificial Groundwater Recharge structures and daily rainfall details and training details, among others.

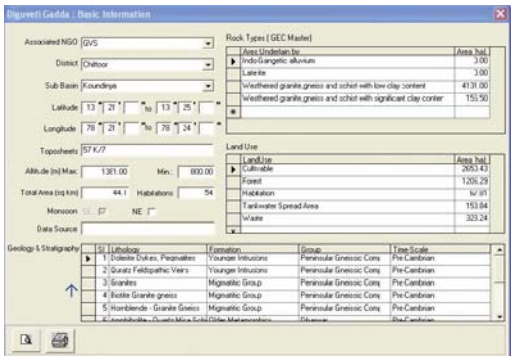
Number of screens has been designed to organise the data in HRIS module. The opening screen of HRI module displays the GIS map wherever available.

The GIS map is usually a multi theme integrated map boundary of which is defined by the Hydrological unit (HU). Various themes include the habitation, drainage, surface water bodies, roads and communication. All the screens display the buttons for opening the different screens. The software allows simple navigation between various screens.



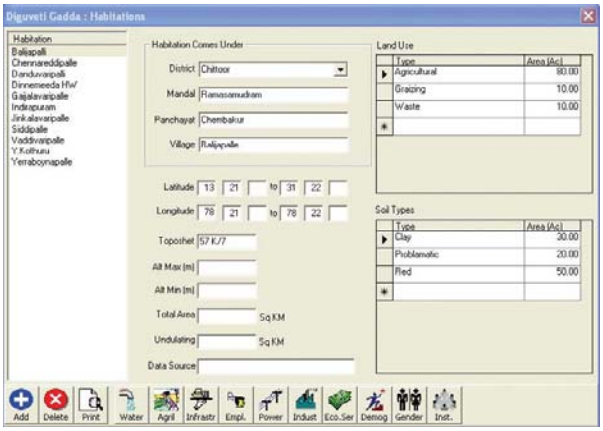
a. Basic Information

Basic Information relates to the Hydrological Unit (HU). Physical location, administrative details, geographical coordinates, elevation, geology, land use can be entered in this screen. New HU's can be created using the add button or deleted using remove button.



b. Habitation Information

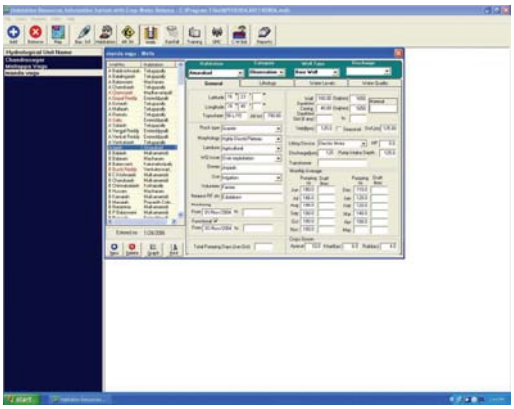
Habitation information accepts entry of habitation level information on the various infrastructure, demography, gender, socio-economic data, cropping data (at the level of individual farmers), seasonal crop production and yields; irrigation practices, power availability and use of pesticides etc.



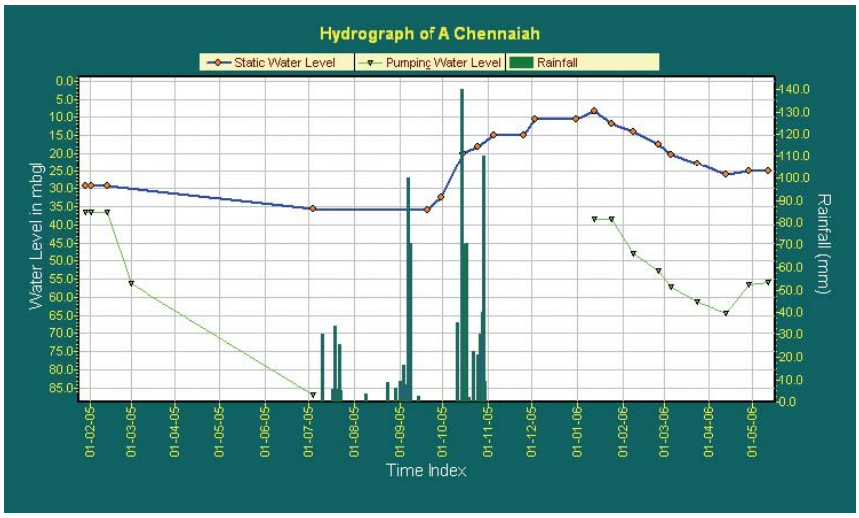
Details of crops, season wise giving details of irrigation, water saving techniques, fertilizers, pesticides etc can be stored.

c. Well Details

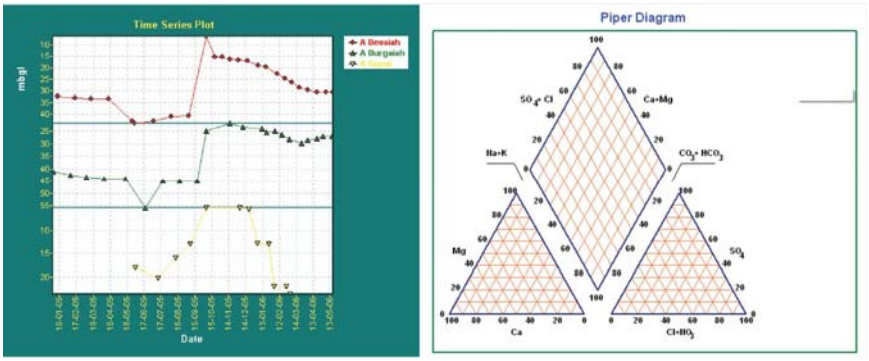
Well data screen stores static and semi-static data. Details on the well location, geological and Hydro-geological environment, well design, pumping devices, lithology, water level and water quality can be entered. All the different wells in the HU can be seen. Navigation between wells in the HU is made simple. Water level data can be entered for every 15 days along with discharge information. Water quality screen provides option for entry of various water quality parameters for different dates. All the static and dynamic data can be generated as data reports and analysed graphs. The software provides tools for generation of time series data on water level and quality. Contour maps can be generated from water quality and water levels. Various water quality diagrams can be generated that enhance the appreciation of the data.



The software provides generation of standard hydrograph of water level in conjunction with rainfall data.

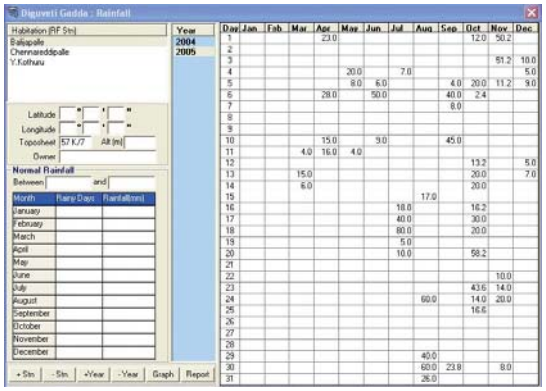


The graphical tools provide scope for advanced graphics including generation of multiple hydrographs, generation of 3D, changing symbols, colours etc.



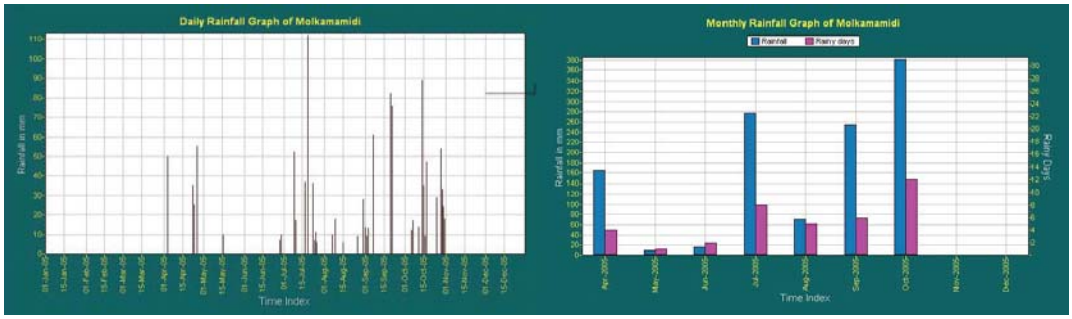
d. Rainfall Data

HRIS provides scope for entry of daily rainfall data from multiple rain gauge stations. With provision of entry of location details of rain gauge stations, the scope for generating iso hytal maps as well as Theissen Polygon is also provided. For each rain gauge station, the annual average as well as monthly average can also be recorded.



The graphical tools provide scope for generating hydrograph of daily rainfall data, monthly

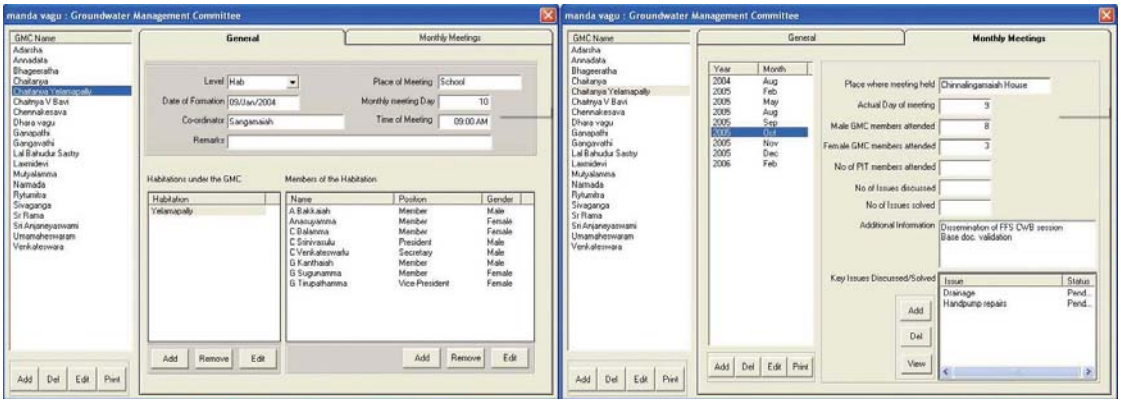
hydrographs as well as season wise distribution.



Report can be generated for individual rain gauge stations as well as all stations within the HU.

e. Groundwater Monitoring Committee (GMC) Details

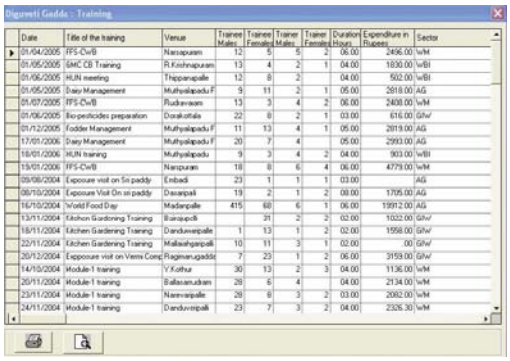
The software has been so designed as to capture all the details on the GMC's including membership, formation details, and monthly schedules of meeting as well as store all the recordings of the minutes. It is hoped that the software over a period of time can relate the impact of various parameters (even those believed to be unrelated) on the overall strengthening and capacity building of GMC's. Key indicators of growth can also be flagged.



Information on the Groundwater Monitoring Committees (GMC's), the composition, the meetings, the issues and the resolutions are also tracked.

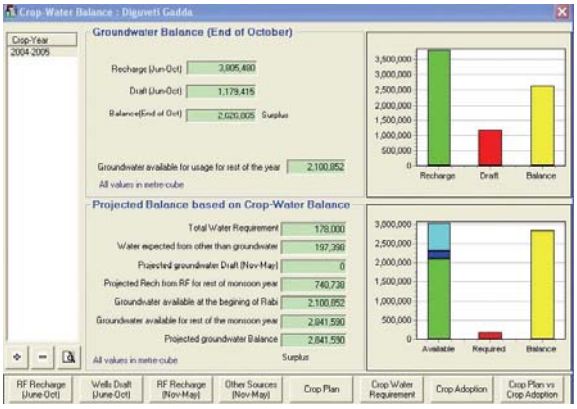
f. Trainings

Capacity building of the GMC's is critical to the project goals and all the training details can be stored in the data base.



Crop Water Balance Module

HRIS links directly to the crop water balance (CWB). All the different inputs given in the various forms of the HRI module is called for and used in the CWB module for computing the Crop Water Budget estimates. CWB being the major output under the project, the software has captured all the field level data and used the various parameters to Quantify total rainfall in the HU, potential rainfall recharge based on certain thumb rules as defined for various Hydro-geological situations. The programme can calculate the total groundwater withdrawals from the HU from all the different types of wells; and also calculate the contributions to recharge from various surface water bodies. Based on the cropping plan, it can project the total groundwater demand in the HU. Based on this, it can project the Crop Water Balance as numbers as well as graph.



HRIS provides screen for entry of crop adoption to compare the crop plan with the crop adoption.

This software generates both tabular and graphical reports. Thematic maps are also supported. The reports can be generated at Habitation level as well as at Hydrological unit level. The graphs generated can be exported to MS word or Excel sheets for further use.

HRIS currently uses Access database for storing information. This is an RDBMS Database that allows the user immense data export functionality.

Large amounts of information can thus be stored in a standardized and reliable manner which helps in generating different reports that are required from time to time consistently. The platform is MS Windows and allows for integration of data.

The system can grow in both time and space, and is immensely scalable. The database can be changed to a larger system like Oracle or SQL Server. The data will be used in the information kiosk, which will have a stupendously easy user interface for direct use by the farmer in local language.

The database files can be compressed and transferred on electronic media. The size, except for the maps, will be small and files could even be sent through e-mail.

The software comes with export and import feature so that when new data is created, only incremental portion of the database that has been modified can be mailed. In case of a new version, the export feature in the software takes care of up gradation which will ensure that all data is secure.

Introduction

Andhra Pradesh Farmer Managed
Groundwater Systems (APFAMGS) Project

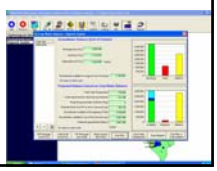
Phase II –
Establishing of Information Kiosk

12,December 2008

The Phased Approach

Approach……

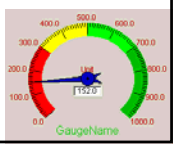
- HRIS+ was started to capture good data – Demographic, natural resource, social, economic, rainfall, groundwater, cropping budget, GMC …..
- GIS digitisation and GPS were used to provide the HU layers – Drainage, road, tanks, rivers, contours, spot heights, settlements……



Design

Design

- Platform
  - Windows, MS-Access
  - GIS enabled
  - Interactive charting tool
- Data transfer
  - Centralized database
  - Protocol governed transfer
  - Direct connectivity
- Modular
  - Independent modules
  - Interlinking and integration
- Front end
  - Dot net Programming Language
- Charts
  - Tee Charts
- Translator
  - Unicode



Features.....

Features of Kiosk

- **Large screen at eye level**
- **Touch screen enabled**
- **On-screen keyboard**

- **Large fonts**
- **Graphics used extensively**
- **Animation utilized**

- **Extremely limited input**
- **Intuitive navigation**
- **Login by pressing by name**

- **Local language (Unicode enabled)**
- **Graphical communication**

Modules……

Modules of KIOSK

- Hydrological Unit Information
  - HU Basic Information
  - Water Resources
  - Gender
  - Institutions
  - Farmers
- Habitation Information
  - Habitation Basic Information
  - Water Resources
  - Gender
  - Agriculture & Crop Management
  - Institutions
  - Farmers
- GIS Maps
  - Location Map
  - Resources Map
  - Drainage Network Map
  - Satellite Map
  - Geology Map
  - etc…
- Main Moduels
  - Crop Water Balance
  - Rainfall
  - Wells & Water Levels

μω

On to the Kiosk

- On to the kiosk ….

μω

ThanQ.....

THANK YOU

μω

A tool towards

Empowerment of Farmer's knowledge

INFORMATION KIOSK

Background

Rapid development of information technology has made increased the awareness levels. Access to information has never been this easy, especially for urban areas. However, this awareness levels have been largely limited to commercial information promoted by enterprises that are vying with one another in promoting their products. Demand based knowledge is still a distant reality in rural areas. Agriculture related information available in the rural areas is still restricted to information on seeds, fertilizers, pesticides, agriculture tools, implements, motors, pumps and pipes.

Knowledge related quality information related to management and conservation of natural resources are still not accessible in rural areas. APFAMGS has made an entry in this area, making available information to the farmers on groundwater resource availability at individual farmer level in a simple way using GIS, graphics and animation.

Information Kiosk makes available the project data base, GIS maps and satellite imageries through use of touch screen facilities. Thus it optimizes the advancements in software and hardware and customizes it for use by rural non-computer literate farmers.

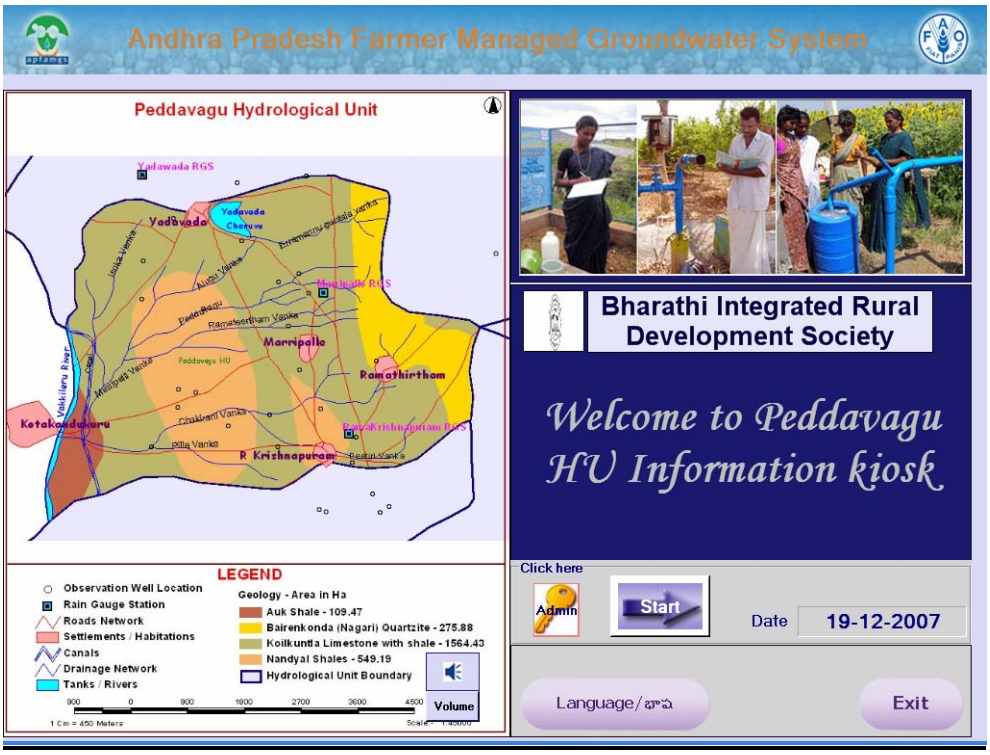
Information Kiosk makes it possible for APFAMGS to disseminate field data as well as information to farmers in an inexpensive way. APFAMGS has used Information Technology (IT) as a tool for knowledge up gradation. The project has successfully optimized traditional communication tools (Non-Formal Education) in combination with IT in the design of Farmers Information kiosk. IT tools including computerized data base, GIS, Internet, communication tools have been integrated with Non-Formal Education led outputs like art and physical models in combination with audio files, media files, graphics and animations to promote the concept of Information Kiosk.

Kiosk have been optimized for empowering the community with knowledge on issues related to water availability, cropping systems matching with the available water, water saving techniques, organic agriculture practices etc. The project has taken great care to ensure that the Kiosk can be used by farmers directly without assistance of any facilitator.

The kiosk comes with a number of features including basic modeling tools. Kiosk provides a feature for farmers to raise questions related to the impact of different cropping system on groundwater resource availability. Kiosk adopts an innovative approach in presenting the most complicated technical details in a simple fashion using animations, graphs, photographs, videos and sound files.

The kiosk is bi-lingual and has a touch screen facility with simple buttons for navigation.

Kiosk was especially made for farmers and it is designed with full of pictorial images, pictures and graphs. By this, farmers can easily know about their Hydrological Unit (HU) Details, Habitation Details and Crop Water Budget (CWB) issues. Farmer can easily interact with this because this kiosk was made in Local Language. We can switch from one Language to another. At present, English & Telugu are optional languages.



Welcome Screen of Kiosk along with HU Map and related photos

Major Modules of Kiosk:

1. HU Basic Information
2. Habitation Information
3. Crop Water Balance

1. HU Basic Information Module:

In this module showing details about Hydrological Unit that are

a) General Information of HU

Information about District, NGO & Latitude, Longitude of Particular HU with related maps.

b) Geology, Rocks, Land use details of HU

About HU Geology information, Rock information, Land details information about that particular HU with related photos.

c) Water Resources, Gender Information, Farmers details, Institutions of HU.

Consolidation figures of Water Resources, Gender Information, Farmers, and Institutions available in particular HU with related images & Photos.

d) GIS Maps – showing all related GIS Maps of the concerned HU.

In this GIS Module, eight thematic maps are provided. All maps are also available in Local Language.

List of thematic maps :-

- **Location Map :-**

  Andhra Pradesh, District, Operational Area.

- **Hydrological Monitoring Stations :-**

  Observation Well Locations, Rain Gauge Stations, Roads Network, Habitations.

- **Drainage Network :-**

  Drainage Pattern with Tanks and Canals

- **Elevation**

  20 Meter Interval Contours with Spot Heights

- **Geology**

  Geological Formations with Areas

- **Resource Map**

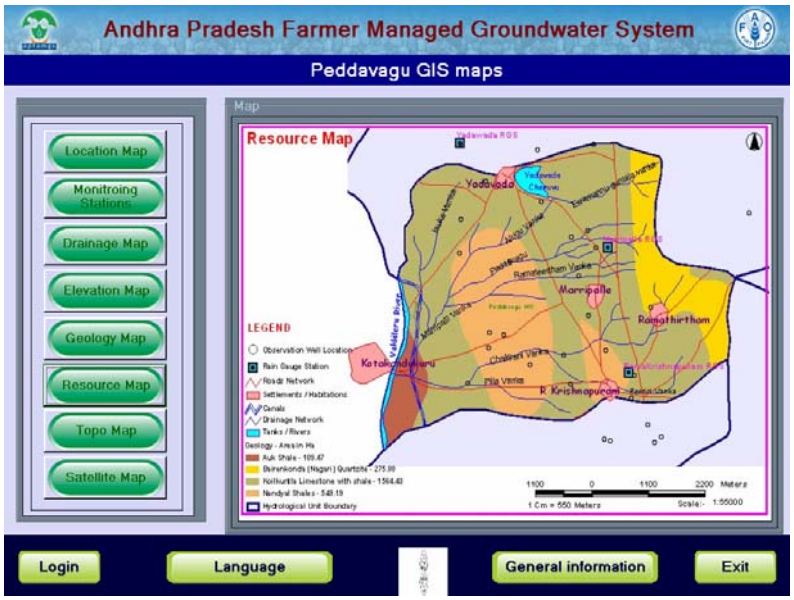
  Observation Well Locations, Rain Gauge Stations, Roads Network, Habitations, Drainage Pattern with Tanks and Canals overlaid on Geological Formations.

- **SOI Topo Map**

  1:50000 Survey of India Topo Map

- **Satellite Map**

  IRS – P6 Liss4 Mx Satellite Data Acquired on January 2006

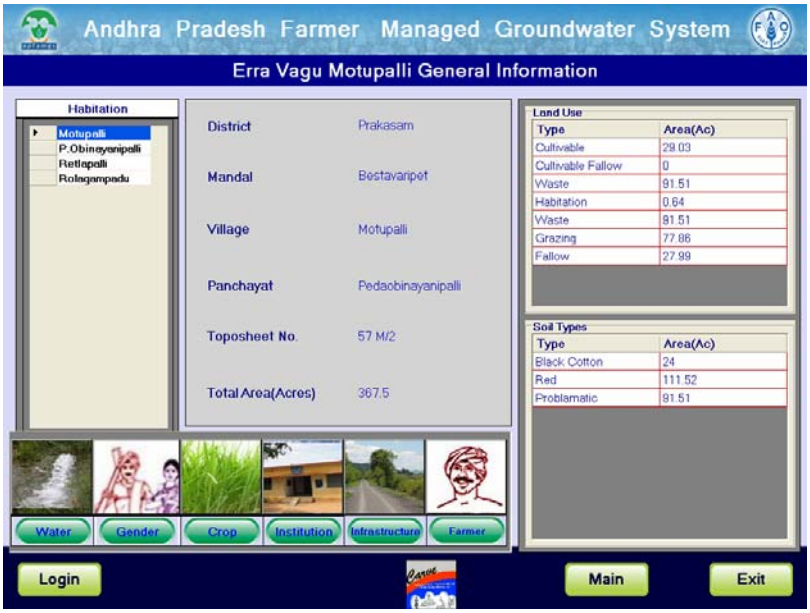


GIS Maps Integration in Kiosk

2. Habitation Information:

This module shows details about Habitations of related HU.

1. General Information of particular Habitation.
   Shows the details of Village, Mandal, Panchayat, Area of Particular Habitation
2. Soil types & Land Use details of Habitation.



Habitation Soil types, Land details in that area in acres

3. Water Resources, Gender Information, Farmer details, Institutions of Habitation. Habitation wise Water resources information, Gender, Farmer & Institutions details of every Habitation.

4. Year wise Crop details of particular Habitation.
   Habitation wise, Year wise & Season wise nothing but Kharif / Rabi wise Crop details like Crop name, Acres, Investment per Acre, Yield Per Acre, Water source for particular crop. These all details come under into this form.
5. Infrastructure of Habitation
   In this, Education, Health, Drinking water details, Transportation & Communication details are available that to Habitation wise.

3. Crop Water Balance:

This is the Major module of Kiosk. In this, year wise CWB details are incorporated.

In this we have three parts.

i) Crop Water Balance
ii) Rainfall Details
iii) Well Details

i) Crop Water Balance:-

Kharif & Rabi seasons are two parts in Crop Water Balance Module. In Kharif, June to October Water Calculations are displayed. And in Rabi, November to May Water Calculations are displayed.

That is

a) Kharif --- Recharge, Draft ,Balance
b) Rabi --- Estimated Recharge, Draft, Balance, Other sources recharge, Crop Plan, Crop Water Requirement and Crop Adoption

a) **Kharif:-**

Recharge: Rainfall received during June to October in particular year, it will display the related pictures of rainfall. Based on the HU, rock type and rainfall received during June to October it will calculate the Recharge and it will give the result.

Draft: HU draft will be calculated based on the parameters like all functioning wells, No. of Pumping days, No. of Pumping hours, Average discharge and finally calculation of Total Draft displayed.

Draft Calculation in Kharif along with balance image & values

Balance: Based on Recharge & Draft, balance will be displayed up to June to October in particular year of respective HU.

b) **Rabi :-**

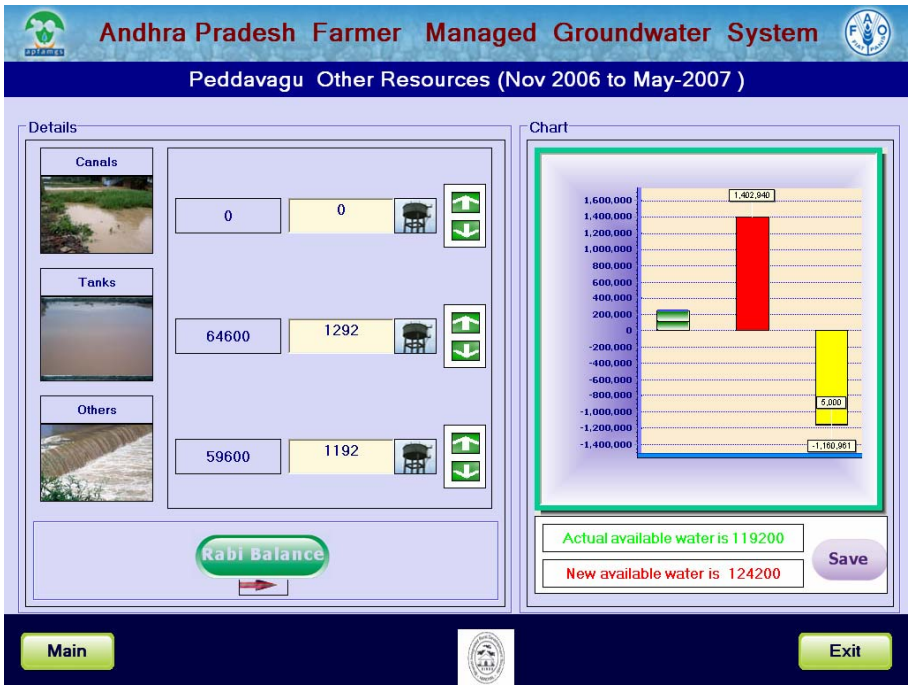
Recharge: Rainfall received during November to May in particular year of respective HU and it will display the related pictures of rainfall. Based on the HU rock type and rainfall received during November to May, it will calculate the Recharge and it will give the result.

Crop Plan: This form displays the Crop Plans of all farmers Habitation wise within that HU.

Crop Water Requirement: This form will display the information about Crop Water Requirement of particular HU. Mainly it covers all crops and their water requirements that too in different units and after that each & every crop water requirement will be calculated based on the Indian Council of Agricultural Research (ICAR) norms. After that, final value of Crop Water requirement will come in the end of the form.

Crop Adoption: This form displays the Crop Adoptions of all farmers Habitation wise within that HU to know the changes in cropping pattern by the end of May.

Other Sources: Recharge from Other sources like Canals, Tanks, any other water resources related to HU will calculate in this particular form. Because, this recharge from other sources also plays major role in Rabi water balance calculations.



Calculation of Recharge from Other Sources along with Tee chart

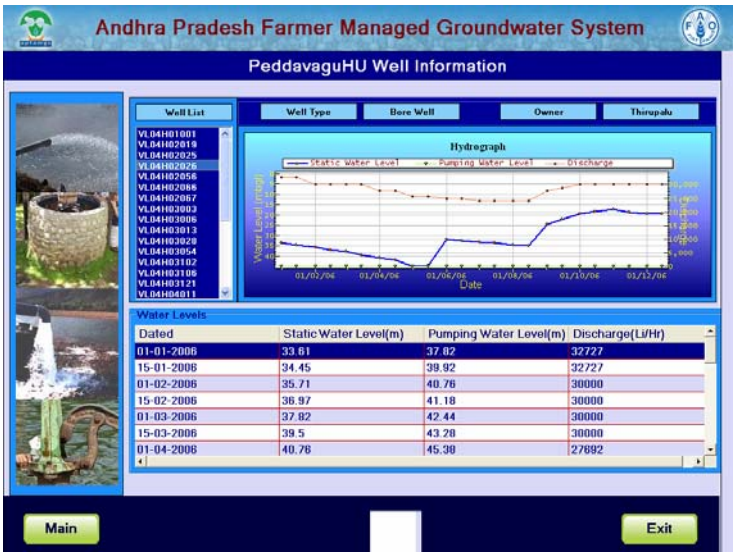
Rabi Balance: This is the final stage of water balance calculation in Rabi season. Here we will take all results from different forms what we have seen above. In this Rabi Balance, major components are Balance of Kharif, Rabi Recharge, Crop Water Requirement, Other Sources recharge.

This is the final result. Farmer will directly see the result so that he can analyze the water balance for Rabi and he can have a chance to change the crop depending on his balance.

2) Rainfall Details: This module displays the Rainfall details of all Rain gauge stations that exist in respective HU. Daily Rainfall, Monthly Rainfall of all Rain gauge stations details are displayed in this form and year wise data is also available.

3) Well Details:

In this particular module, all well details belonging to that particular HU are displayed taking into consideration Static Water Level (SWL), Pumping Water Level (PWL), Date of Water levels and Discharge of particular well. All these details are displayed for every well. Along with this, one chart is also displayed for easy understanding.



Water Levels Graph of Particular Well along with details

Finally we have Thank You Form.

Thank You Form

Summary of the progress

The first version of Farmer Information Kiosk has enabled GIS and IT tools to be made available to the farmer in the form of user friendly computer monitor. Kiosk has been received with great enthusiasm by all groups of farmers both the educated youth and old. While the young farmers see a lot of potential in the use of Kiosk as a decision making tool, the elderly farmers see it as a source for information. 9 Kiosks have been operationalised,

one for each NGO while the possibility of implementing one each for all the 63 HU's is a necessity.

The Kiosk's have been able to provide for the first time seamless access to electronic data that are generally not accessible to rural farmers. The GIS features have helped farmers to look at situation beyond their farm, habitation and get a view of the regional influences. The kiosks have helped them broaden their vision through maps, graphs and animations. They have been able to plan cropping systems matching with the availability of natural resources (water, land, soil) while completely avoiding all risks.

Future Developments in Kiosk

Based on the success gained in implementing 9 Kiosks over the entire project area, APFAMGS plans to design the next version of the Kiosk that will not only give a regional perspective but also help in better understanding of the future scenarios. APFAMGS sees a significant role for IT in all its future programmes. IT will play significant role in increasing its operational efficiency of disseminating knowledge while reducing the transaction costs. The other potential benefits envisaged is broad sharing of the knowledge simultaneously or sequentially with a large section of different socio economic groups spread over the project area and outside. The most significant benefit is the ability in the use of specialized software to forecast the potential future scenarios as a response to current development strategies. The project plans to make available modeling capabilities to the farmers through the Kiosk with a translator at the front end with the specialized modeling software working at the back end. The project also sees IT as an opportunity for rural farmers to share their data, skills, knowledge and agricultural products to different users. IT potential shall be tapped to dramatically increase the share ability of rural information as well as knowledge while providing economic value to rural data, information and services.

Information pages related to climate, market prices, technologies and other related sites would be the new features incorporated in the future. Metadata catalogs on the technical data collected by farmers and their prices shall be displayed.

The current version of the kiosk stores only local data in the computer, while in the future versions it would communicate with a server to get a full understanding of the entire project area. Current versions provide free information providing local contents, while the future version will provide global information at a small cost for the needy. Kiosk will also be promoted as a revenue earner to the youth managing the kiosk.

Information Kiosk to emerge as tool in Decision making

AFAMGS would like to play a pro active role in tapping huge untapped demand for IT in rural environments. Since the current IT solutions are either tailored for overseas market or

urban areas in India, there is an urgent need to develop contents for helping decision making by farmers in rural areas. The future activities in the improvement of Information Kiosk is making available knowledge to ensure sustainable use of available groundwater and other natural resources leading to appropriate Decision making. This would fully complement the current work going in the project related to demand side groundwater management, capacity building of farmers with knowledge and skills.

IT would be used as an enabler for accessing information on all natural resource such as Soil, Land, Water, vegetation not only as documents but also as daily weather report, on line maps, graphs, and animations as well as global reports. The kiosk hardware shall be upgraded with latest version of the computer with adequate memory supported by touch screen facility and customized software. The software will be so designed as to enable a non computer literate farmer to use it with ease. The software will be supported by audio and media files. The screen will function as an interactive notice board while preventing users from accessing system functions. The kiosk shall be supported by utilities for bill payments, accessing mails and other publishing needs.

The success in designing and implementing the kiosk provides the confidence to make it a as a decision making tool to help farmers appreciate the implications of current groundwater management practices on the future availability of groundwater quantity and quality. The Kiosk will open the opportunities for farmers to look at scenarios that are at a distant time and space and help take right decision that are environmentally sound and sustainable. The kiosk will provide a window of opportunity to foresee potential upcoming scenarios for different development practices of the present as well implications of climate change and future markets.

The Farmer information kiosk shall be designed as public terminals that can be access by farmers, managed by self employed youth. The Kiosk shall be located in a public place where all people have access with no gender discrimination. The hardware will essentially consist of Kiosk box visible as a large touch screen, mounted camera, computer CPU that is housed in the box. The key pad, mouse, track ball, printer, scanner are additional devices available. The Kiosk comes with provision for internet connectivity. The connectivity will be using commercial network available locally. Given the power failures and fluctuations, it is necessary to have battery that can provide 4 hr back up and an UPS.

The future work will replicate the initial success to large areas covering 63 HU's. New information shall be made available in the form of

- Market Prices
- Access to e-newspaper
- update Village profile
- generate birth/death certificates,
- pay bills (electricity, land tax, house tax etc.,)
- provide income generating opportunities to youth especially women.
- serve as a library source.
- provide Email service
- Question & Answer service
- real time weather forecast
- Information on Health, Education and utilities
- provide hard copy print outs

Profile of Mudurallapalli

Location

Mudurallapalli habitation of Chagalamarri Mandal is located in the south-southeast of the district Kurnool, about 139 km from district headquarters Kurnool. The habitation lies between the longitudes 78° 37' 55" and latitudes 14° 59' 10". As such it falls in the Survey of India toposheet no. 57 J/9 (1:50,000). It is a revenue habitation comes under Yerravanka Hydrological unit. It is 4 km from Chagalamarri covered with reserved forest, at a distance of 4 km approximately. This habitation comes under Yerravanka Hydrological Unit (HU).

Population

The total population of the habitation is 327, 182 men and 145 women, which gives a sex ratio of 796 females for 1000 men.

Item	Particulars	Units
Population	Total population	327
	Male	182
	Female	145
	Households	58
Community (Households)	Scheduled Caste	1
	Scheduled Tribe	0
	Backward Class	4
	Open Competition	53
Occupational Status	Agricultural labor	2
	Rural artisans	2
	Agriculture	53

Institutions and facilities in the habitation

In this habitation there are 5 Self Help Groups (SHGs), 2 Rythu Mitras. Members have awareness on group concept. Savings are collected by group leaders / convener. Regular meetings with all the members of SHGs to discuss on related issues & no dues from their side. Only village organization leaders attend meeting at Velugu office located at Chagalamarri.

The available infrastructure in the habitation consists of an elementary school and a government borewell for drinking water purpose. Municipal water is supplied through taps for 6 houses from the established borewell. There are two dairy cooperative societies (supply milk to private milk factory, Chagalamarri) in the habitation of which 35-40 farmers are members. It supplies 60 liters of milk per day.

Proper guidance and trainings is extended by Velugu project for SHGs by the Government. There are proper linkages with Non Governmental Organization (BIRDS) & less linkage with Governmental organizations (Dept. of agriculture for seeds).

In this habitation, there is a NGO, BIRDS working for the people in improving their awareness on groundwater utilization, adoption of water saving methods or crop choice, also doing some developmental activities along with bringing social awareness among the community through project named Andhra Pradesh Farmers Managed Groundwater Systems Project (APFAMGS Project).

Agriculture

The villagers mainly depend upon agriculture and agricultural labour is brought from neighboring villages. They are very much dependent on agriculture laborers. A sizable number of agriculturists depend on groundwater for their livelihood. Most of the farmers are practicing modern methods using tractor for ploughing the fields & land preparation. For sowing seeds, bullocks are used. Very few farmers use tractors (4) but uses them for other farmers for rent. Manual labor is engaged for weeding and for the application of pesticides. Sprayers are operated manually (hand sprayers). The most common method of irrigation is flooding in rice & ridge and furrow for other crops like turmeric, sugarcane. The major extent of area is covered with Rice, Pigeon pea, Turmeric and Jowar in Kharif season. Groundnut, Chick pea & sunflower are grown in rabi season.

Surface water bodies

The main purpose is to provide adequate infiltration opportunity for rainwater for recharging the ground water table to hold some of the floodwater during peak periods so that there is no damage at the downstream of the gully. Surface water bodies in Mudurallapalli were built as part of watershed development programme. The water harvesting structures (2 Check dams) were constructed by District Water Management Agency (DWMA) and Panchayat Raj in this habitation.

Time line of Groundwater structures

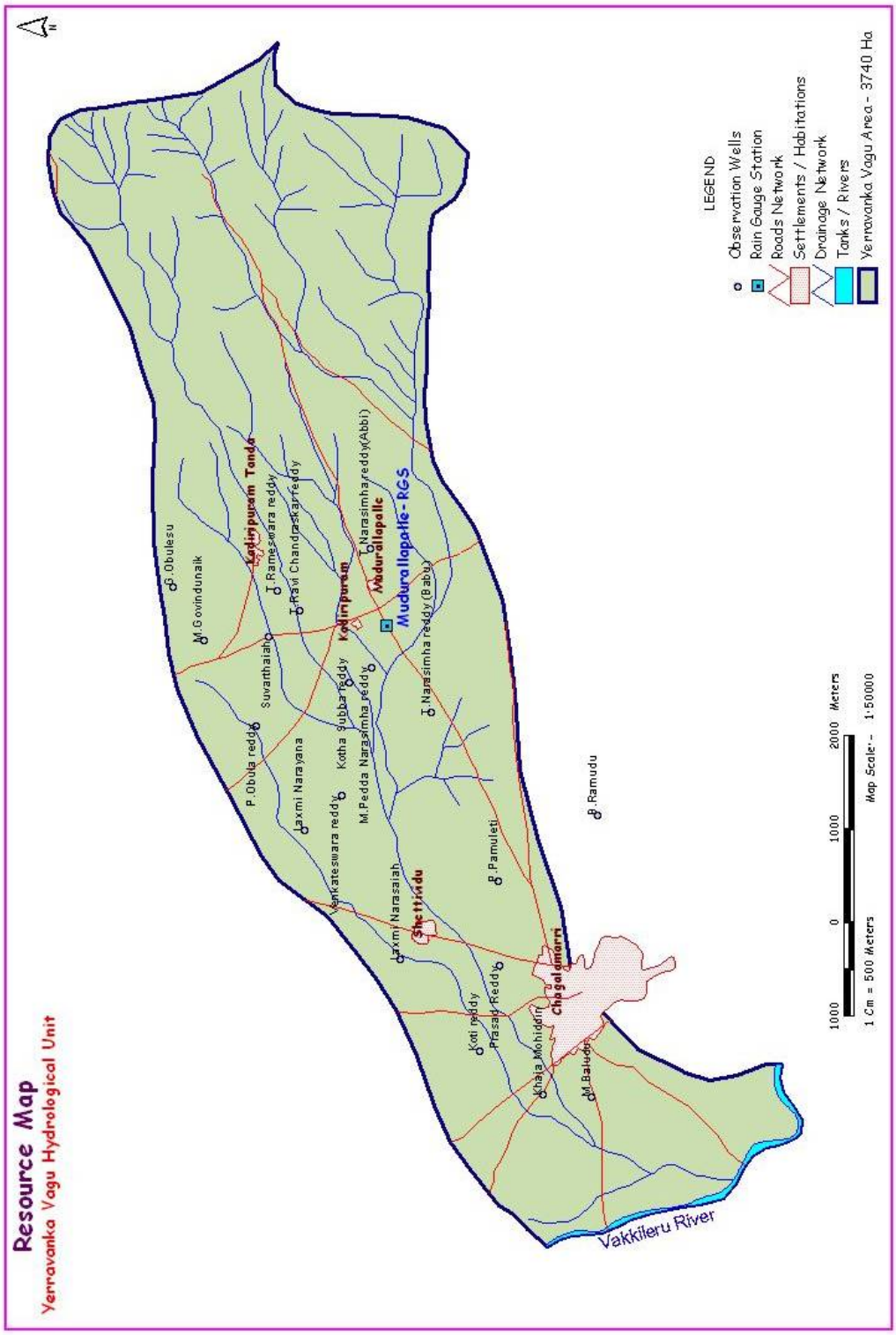
The source of irrigation has shifted from ponds, springs, open wells, dug cum bore wells to bore wells over a period i.e., from 1950 to 2004.

Out of the 50 (Perennial bore wells only) functional groundwater sources, 4 are one year old, 14 two-year old, 13 three to six years old, 11 seven to ten year old and the remaining more than ten years old. Main user of groundwater in the habitation is Agriculture (90%), while the remaining is consumed by domestic (10%).

Groundwater

Groundwater in the habitation is tapped mainly in the form of Bore wells. The area is underlain by shales and limestones, belonging to Nallamalai Stage of Kadapa Formations. From groundwater point of view, the area can be simply classified under the Hard Rock Province of Peninsular India. Groundwater occurs mainly under unconfined to semi-confined conditions. While shales are poor aquifers (high porosity and very low permeability), limestones form good aquifers where cavernization has taken place.

In this habitation at present functioning dug and dug cum bore wells are nil, due to the depletion of ground water levels. Total number of bore wells in this habitation is 58, out of this,8 are dried, 11 bore wells are seasonal and remaining 39 bore wells are functioning through out the year (perennial). Bore well depths are ranging from majority 150 ft to 380 fts. Due to the over exploitation and poor recharge of the aquifers in this habitation, nearly 14% of the bore wells are dried.


Resource Map
Yerravanka Vagu Hydrological Unit
LEGEND
Observation Wells
Rain Gauge Station
Roads Network
Settlements / Habitations
Drainage Network
Tanks / Rivers
Yerravanka Vagu Area - 3740 Ha
1000 0 1000 2000 Meters
1 Cm = 500 Meters
Map Scale:- 1:50000
Kodiripuram Tanda
Kodiripuram
Madurallapalle
Madurallapalle- RGS
Shettivaidu
Chagalamarri
Vakkileru River
G.Obulesu
M.Govindunaik
T.Rameswara reddy
T.Ravi Chandrashekarreddy
T.Narasimhareddy(Abbi)
Suvarthaiah
P.Obula reddy
Laxmi Narayana
Kotha Subba reddy
M.Pedda Narasimha reddy
T.Narasimha reddy (Babu)
Venkateswara reddy
Laxmi Narasaiah
G.Pamuleti
G.Ramudu
Koti reddy
Prasad Reddy
Khaja Mohiddin
M.Baludu

BIRDS-APFAMGS PROJECT
2-5-97, Satram street, ALLAGADDA – 518 543
Kurnool (Dist.), Andhra Pradesh, India.
Ph : +91-8519-222339, email : apfamgs_alg1@yahoo.co.in

Field visit to Mudurallapalle Habitation

Date: 12th December 2008, 09.30 to 11.30 hrs

Lead faculty/coordinators: Mr.Ravi shankar & Mr.Nagaraju

Place: Mudurallapalle, Chagalamarri mandal, Kurnool dt.

Interaction with farmers in the field

1. Sri M.P.Narasimha Reddy

Total Extent: 7 Acres

Area under Rabi 2006 - 2 acres Rice + 1.5 acres Groundnut + 3.5 acres redgram

Area under Rabi 2007 - 1 acre Redgram + 6 acres Groundnut

Area under Rabi 2008 - 2 acres Redgram + 2 acres sunflower + 5 acres turmeric

Extent under Water saving methods (2008): 2 acres of sunflower under ridge & furrow
3 acres of turmeric under ridge & furrow

2. Sri Maddileti

Total Extent: 7 Acres

Area under Rabi 2005 - 7 acres of sugarcane

Area under Rabi 2006 - 7 acres of sugarcane

Area under Rabi 2007 - 5 acres of sunflower + 2 acres of Groundnut

Area under Rabi 2008 - 2 acres of Groundnut + 5 acres of sunflower

Extent under Water saving methods (2008): 5 acres of sunflower under alternate furrow

3. Sri Jaya Prasada Reddy

Total Extent: 7 Acres

Area under Rabi 2006 - 2 acres of groundnut

Area under Rabi 2007 - 2 acres of Groundnut

Area under Rabi 2008 - 2 acres of sunflower

Extent under Water saving methods (2008): 2 acres of sunflower under ridge & furrow

4. Mr.Narayana Reddy

Total Extent: 10 Acres

Area under Rabi 2005 - 10 acres of sugarcane (Kharif extended)

Area under Rabi 2006 - 10 acres of sugarcane (Ratoon extended)

Area under Rabi 2007 - 10 acres of Banana (Kharif extended)

Area under Rabi 2008 - 10 acres of groundnut

Extent under Water saving methods (2008): 10 acres of groundnut under check basin

Summary

From the above data of individual farmers, it clearly denotes that the farmers shifted cropping pattern from water loving crops to water saving crops alongwith adoption of water saving techniques to save groundwater as much as possible leading towards demand side groundwater management.

The farmers are practicing ridge & furrow method of irrigation for sugarcane & turmeric. Some of the farmers are motivated to practice System of Rice Intensification (SRI) method of cultivation in Rice in Kharif 2005-06 (due to participation in FFS-CWB sessions conducted by APFAMGS Project, Allagadda) that saves about 40% of groundwater compared to conventional method of cultivation of rice. Even the farmers changed their cropping pattern from Rice to Pigeon pea last year and this season also, the acreage of Pigeon pea is increasing than rice. The farmers irrigate rice by flooding method & groundnut by border strip method. The farmers participated in CWB exercise & learnt about sprinkler in groundnut alongwith mulching practices during FFS-FMGS 2006-07.

Lessons from APFAMGS-experience

K.A.S.Mani
APFAMGS
WWW.apfamgs.org

Project Achievements

APFAMGS project made possible behavioral change leading to voluntary self regulation

Improved community knowledge and understanding of the links between water-land-soil-crop-society -economy

Demonstrated that farmers can make difficult choices without Offering any incentives

Farmers collect technical data using community assets without compromising on technology

Farmers share Data and critical Information freely

Women's participation in decision making provides new dimension in groundwater management

People's institutions implement local governance to curb overexploitation

Pro-active partnerships between up-stream and downstream water users with in a drainage unit helped improve groundwater situation

Farmer Water School approach provided skills to individual farmers to improve water use efficiency

Minimising wastage from agriculture-crop production and reuse of nutrients contributing to improve water use efficiency.

Farmer's as Data Generators

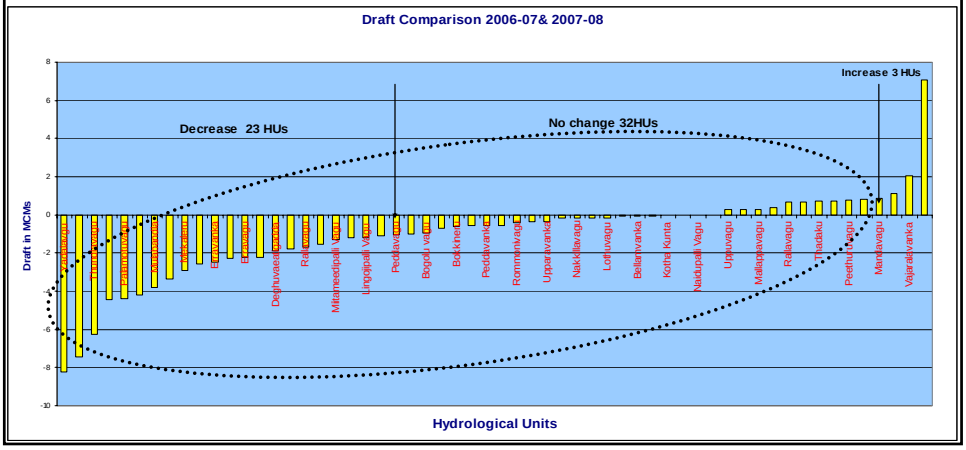
- **GMC are currently involved in technical data collection in 638 habitations and sharing it with close to a million farmers.**
  - *3584 farmer volunteers (men and women) involved in collecting technical data*
  - *Daily rainfall measurement is collected from 190 rain gauge stations*
  - *Daily groundwater levels are monitored from 90 monitoring wells*
  - *Fortnightly groundwater levels are monitored from 2019 monitoring wells*
  - *Fortnightly well discharge measurement are carried out from 969 monitoring wells*
  - *Surface water outflows from the Hydrological unit is measured at 65 microbasins*
  - *Seasonal groundwater quality measurements are carried out from 300 drinking water wells*
  - *10,000 farmers graduates attend year round Farmer Water School every year.*
  - *15000graduates as farmer facilitators have been trained.*

Nutrition Survey 2005, 2006

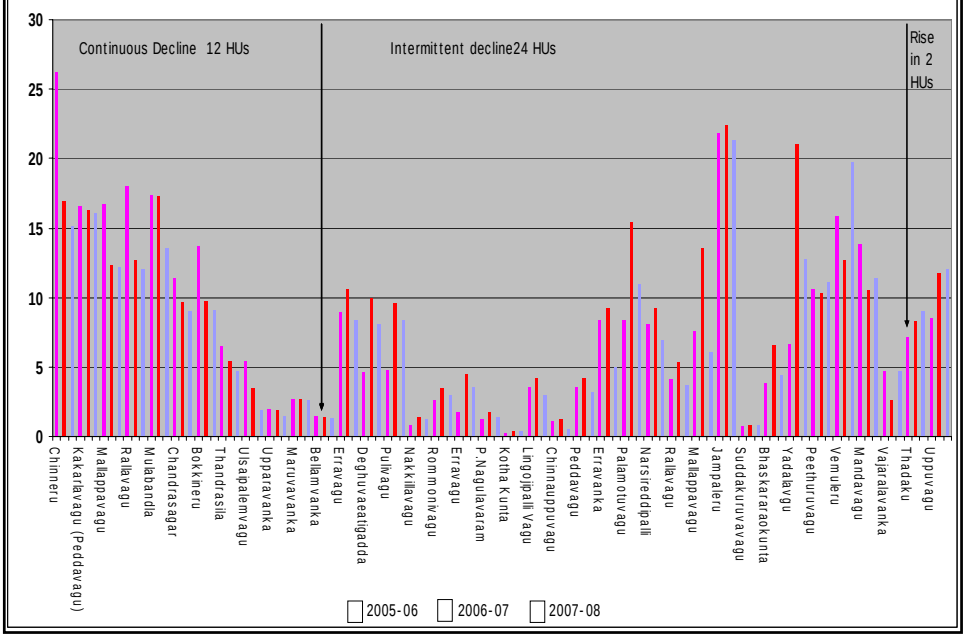
- ***Nutrition survey have been carried out periodically to assess the food and nutrition status especially in children, elders and women. This helps guide crop planning.***
- ***Bio-diversity getting limited in different parts of the project area.***
- ***Proportion of calorie output from coarse grains like Millets is going down drastically.***
- ***Limited pulses varieties are affecting the intake of different nutrients especially protein.***
- ***Consumption of adequate quantities of vegetables, especially green leafy ones, essential for meeting the micronutrient requirement is getting altered.***
- ***Cropping diversification to commercial crops is at the cost of essential edible pulses and oilseeds.***

Reduced groundwater pumping

Groundwater pumping for agricultural use has been significantly reduced in number of hydrological units over the four years



Groundwater pumping status of 38 HUs over three years



Dissemination of Project Learning's to Global audience

- International Learning Workshop on Demand Side Management of Groundwater was organized from 30th July to 10th August 2007.
- Sixteen participants from Iran, Yemen, Thailand, Myanmar, Bhutan, Philippines, Kenya, Nigeria, Tanzania, Democratic Republic of Congo (DRC) and Brazil attended the workshop.
- World Bank has shown interest in taking the APFAMGS concept fo Demand Side approach to Morocco, Tunisia and few other countries.

Financial support mobilized from Government programmes

Government of AP has partnered with APFAMGS in supporting Demand Side Concept by extending government schemes to 28,505 farmers towards water conservation and crop management has been to the tune of 138 million rupees.

17,765 Farmers could access water saving and crop related support from different government schemes

10,740 farmers could access water conservation and land development schemes

Local Groundwater Governance

- *Stakeholders for first time brought into operation new groundwater governance that transgressed beyond individual holdings and habitations, without being coercive.*
- *The invisibility of the groundwater resource did not deter them from having full access to understanding the resource availability and dynamics.*
- *The ability of the stakeholders to articulate and share the information across the hydrological unit helped them to evolve to evolve local plans and rules for sharing water equitably limiting the damage to aquifer while safeguarding individual interest.*
- *Local governance on groundwater is largely concerned with sustainability and see the need to come together to take painful decisions on their own without expecting the governments to do.*

Documentation

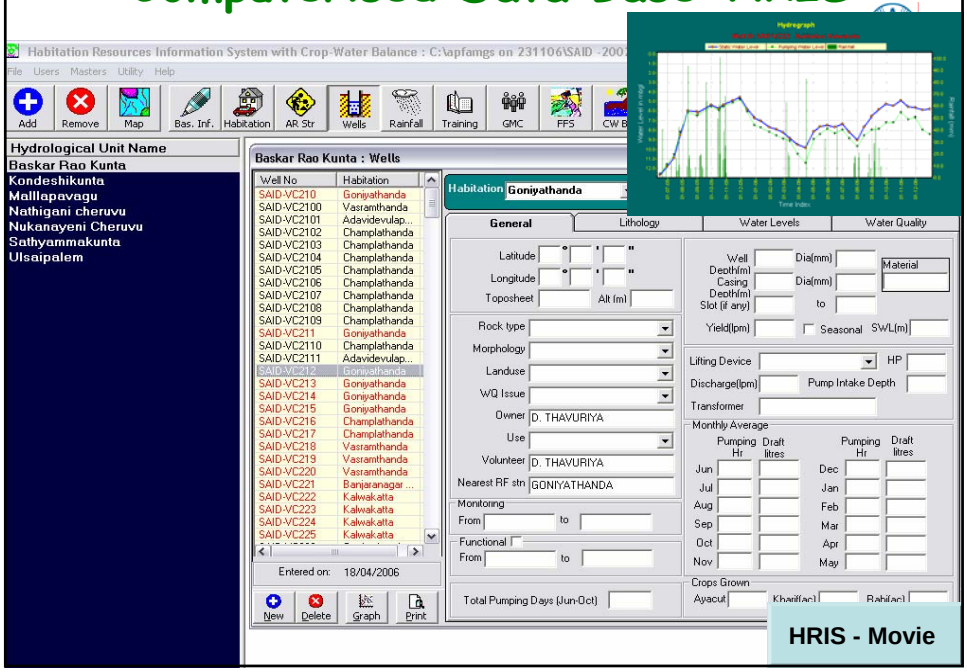
2008 (Under Preparation)
Demand Side Groundwater Management Tool kit
Farmer Water School Tool kit (updated version)
2007
Cross Cultural Perspectives on Groundwater Based Institutions
Neella Muchatta - 9th Issue
Orissa Farmer Managed Water Resouce System (OFAMWRS) Project Proposal
Vermi Compost
Srorage of Food Grains
Mulching
Oranic Farming -1
Oranic Farming - 2
Soil Reclamation
Soil Sampling
Botanical Pesticide
Water requirement & sensitive stages
Integrated Water Management-1
Integrated Water Management - 2
Farmer Water School Tool kit (Telugu & English)
Neella Muchatta - 8th Issue

2006
Causes and Control of Root Rot Diseases in Sweet Orange in APFAMGS Project (Markapur Project Area)
Neella Muchatta - 7th Issue
Nourishing Traditions – Local greens
Half Yearly Report Jan - June 2007
Half Yearly Report July - December 2006
Note on Geographical Information System (GIS)
Note on APFAMGS Project Website www.apfamgs.org
Note on Habitation Resource Information Systems (HRIS)
Monitoring & Evaluation of Capacity Development Programme as part of APFAMGS project, India
Social Perspective towards ensuring Groundwater sustainability – MAR Approach
Technology and knowledge for gender equity and justice
Practices that can combat Poverty and Distress in India
The Trail of Change (English, Telugu)
The Trail of Change (English)
Andhra Pradesh Groundwater Users Association (AGUA)
Groundwater Management Committee (GMC) Process Document

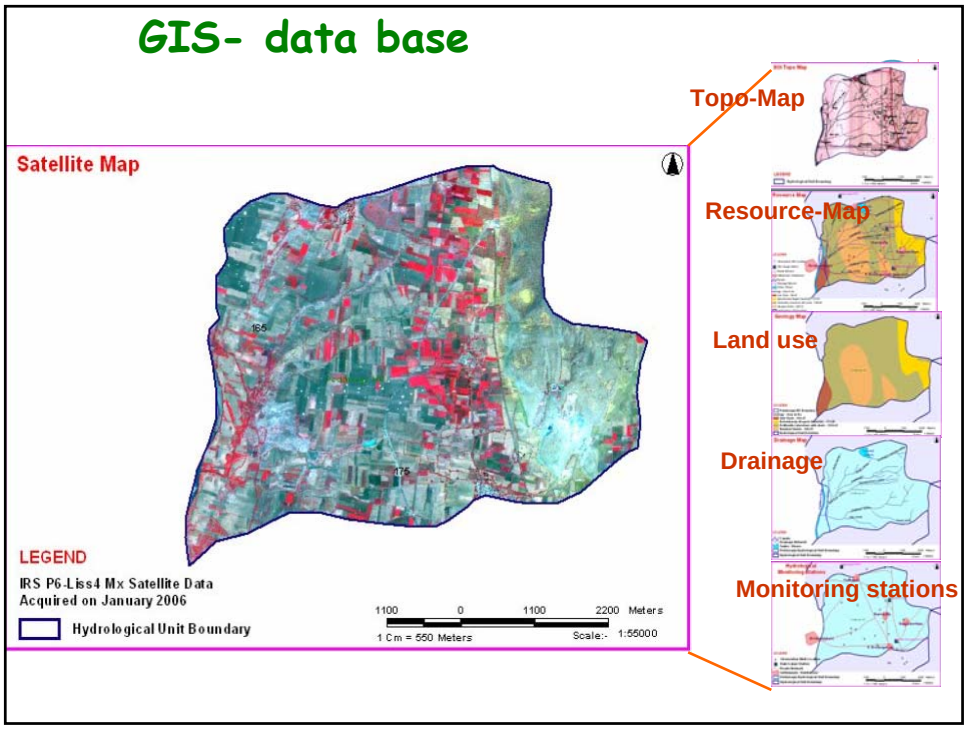
Nellamuchata (Newsletter) – Vol.6
Managed Aquifer Recharge (MAR) Report
News room FAO (Telugu)
Nellamuchata (Newsletter) – Vol.5
News room FAO (English)
Project Brochure (in German language)

2005
Nellamuchata (Newsletter) – Vol.4
TOT – FFS newsletter – 2005 – I - xiii
Project Brochure – 2005
Training Manual on GIS - 2005
Model Base Document (Chinneru) - 2005

Computerised Data Base-HRIS



GIS- data base



Project Web Site www.apfamgs.org

Farmer Information Kiosk


Thank U
For further details, visit http://www.apfamgs.org


THANK YOU

Training on Demand Side Groundwater Management (DSGM)
10-12 December 2008, BIRDS International Learning Centre,
Muthyalapadu village, Kurnool district, AP

Participant's Back at Office Action Plan

Dr. K.A.S Mani
Project Leader
Technical Support Team (TST), AFPAMGS Project
http://apfamgs.org

Issues of Concern for State

- Groundwater development in AP is 3.2 M.ha (07-08) while surface water irrigation 3.1 M.ha (GW-Directorate)
- 4000 villages already in over exploited category
- Large increase in the number of failed wells
- Groundwater development for meeting drinking water needs increasing and is beyond APWALTA purview
- Indebtedness because of failure of groundwater wells a major cause for concern
- Large Funds provided by banks for drilling wells locked up as unproductive assets
- Deterioration in groundwater quality spreading across the state
- Water logging problem in canal commands
- ----------
- ----------
- ----------

Issues of Concern to GW Department

- Multiple roles for the department officers
- More reporting to be done as compared to field studies
- Absence of research projects
- GWD under staffed- not a promising future
- No recruitments since 1991
- Limited scope for up-gradation of skills
- Limited or no programme to address the issues of people's concern as compared to populist programmes

Issues of Concern to groundwater users

- Limited/no access to the wealth of knowledge available in the department
- Real time data not accessible
- Data not contextual to the need/location
- Total package of solutions not made available
- No warning on the potential threats (reactive not proactive)

Need for common meeting ground

- All issues need to be addressed together
- Capital expenditure should not be high
- No Large induction of staff
- Capacity building limited to the essentials
- Leave a visible impact at the groundlevel
- Reach as many users as possible

Food for thought

- Partnership with community
- Download certain responsibilities
- Enable community to address the problem locally
- Invest time and energy to high end intellectual inputs
- Contribute to overall policy based on direct feed back from community
- Improve water use efficiency rather than increasing over all water use

Thoughts on individual action back at office

- Sharing of GIS based data with farmers
- Change the mandate of the department
- Water quality issues
- Command Area problems to be addressed
- Non Command Areas: curb over-exploitation with community partnership
- Recruitment of additional staff
- Better usage of skills available with present staff

Thoughts on individual action back at office

- Budget allocation for departmental inputs for other agencies
- Data collection: participation of farmers can bring down the workload and enable Officers to involve in scientific work
- Research to address farmers problems
- Farmers education in rain water harvesting needed
- Isostacy studies for saturated aquifers

Thoughts on individual action back at office

- Exploration to management
- Start thinking about future
- Updating skills and knowledge of staff
- To become a full-fledged scientific department
- Top level Advisory Group
- Training should be followed by practicing the learning in the work

Thoughts on individual action back at office

- Innovations in low-cost technology as alternative to electricity (battery run bore-wells can be tried)
- Departmental advice is necessary for other departments (irrigation) – Integrated surveys
- Groundwater awareness program for farmers to be made main mandate of Dpt
- Awareness on PHM in Over-exploited villages

Thoughts on individual action back at office

- Partnership with other departments?
- Refine reports and documentation
- GWD should be legal authority for all issues related to groundwater
- Forecasting/projection: is more relevant than analyzing what already happened

5. EVALUATION FORM

Name :

Designation : **Duty Station:**

1. What were the strong and weak points of the methodology used? How can it be improved?

a. Strong points

b. Weak points

c. Suggestions for improvement

2. Please comment on the accommodation and food.

General comments

a. Accommodation

b. Food and Mess

3. Please give your comments and suggestions regarding the sessions, contents and presentations.

General Comments

a. Course Content

b. Course Duration

c. Lecture Sessions

d. Field visits

4. **Were you able to meet and have substantial discussions with the farmers and get and idea on new knowledge and understandings based on Participatory Hydrologic Monitoring?**

5. **Were you able to have substantial discussions with other participants and exchange thoughts on adopting the workshop learning's in your work?**

6. **Do you feel you have a better understanding of demand side management of groundwater after this workshop? Please elaborate.**

7. **Do you feel that you have strengthened your skills to enable you to adopt concepts of Demand Side Groundwater Management in your work? Please explain.**

8. **Any specific commitment as a follow-up to the Workshop**

Date: Signature:

Will you have any objection if this form is shared with your Senior Officers: Yes / No.

6. EVALUATION FEED BACK

1. What were the strong and weak points of the methodology used? How can it be improved?

a. Strong points:

- Methodology
- Farmer orientation and data dissemination
- Participation of farmers in the estimation of groundwater availability is a very good approach
- Evaluation on socio-economic factors is good
- Igniting the stake holders to plan their cultivation and allied activities with the aid of data collected.
- It is building confidence in the science and technology leading to take decisions at their level itself.
- Arrangement of interactive session with farmers, demos by farmers themselves
- The awareness created in farmers by your field staff on groundwater is exemplary
- Involvement of the farm community in the groundwater management is unique.
- Appreciable for building awareness among farmers through informal education in monitoring water levels, Discharge, groundwater estimation & crop water budget.
- Village meetings, technical communications, modeling, pictorial depiction, preparation of Groundwater and crop budget and future planning.
- Authenticity over the delivered lectures.
- Accepting the lectures and including the proposals of high experienced officers
- Kalajatha
- Commitments
- Educated the HU beneficiaries satisfactorily. Hydrological data collection, storage is good. Book keeping is good. The gender involvement is appreciable.
- Field staff commitment towards the APFAMGS is good and their relation with farmers is very nice.
- Act of the organization in supplying the scientific and technical approach to the farmers and made them to exchange their views, capabilities acquired with the educated departmental officers etc.
- These methods have created good awareness among the farmers about groundwater resource, usage, with less quantity more acreage – legal entity to be adopted/included in the methodology.

b. Weak points:

- Exposing groundwater department to government is not relevant in the training program
- For all the practical gains and formulations, data should be properly correlated with standard and fundamental concepts.
- Need to include/modify some sessions based on the background of the trainees.
- Lack of scientific evaluation methodology
- Deviating from scientific way of data collection & utilization & management
- As we are doing most of the work being done by your organization, would like to have more practical evaluation of work done by the farmers rather than sitting in lecture halls.
- The complexity involved in computation is difficult for the people to understand and requires lot of time.
- The methodology should be corrected with established procedures.
- The minimum needs (may be mandatory in some villages) like storage of harvest etc is to be taken care.
- Class room teaching is not quite interesting.
- Only water levels cannot decide extent to be irrigated.
- The methodologies adopted are primarily unable to assure a standard unit for scaling or grading. (according to the availability of groundwater resource based on the water level data obtained from the monitoring of PHM in the assessment unit).

c. Suggestions for improvement:

- Extend your services to all over the state.
- Please continue this methodology with proper satisfaction and correlations with innovative concepts of science and technology.
- Training period of 3 days is not sufficient. It requires at least one week as it involves both field visits and class room lectures.
- Coordinate with the research organizations for evaluation study like Groundwater Depts., CGWD etc.,
- Reputed Groundwater organizations involvement should be there in the implementation of collected data.
- Presenters should have sufficient background data before presentation.
- The farmers need to be imparted up on at least the basics of the aquifer parameters to assess the aquifer (well) specific capacity etc.
- Regular monitoring and imparting the techniques / suggestions as per demand

- Suggest farmers not to use more than 60% of available groundwater resource.
- The practice of PHM and analysis should be continued for a long time to get fruitful results.
- Educate the beneficiaries for community storage devices.
- More emphasis should be given on how you motivated the farmers to enlighten them.
- Count the draft from domestic wells (PWS + CPWS) during water budget and allocation of GW resource for future use of drinking /domestic is needed.
- It is advised to estimate the dynamic groundwater resource and correlate, the old 10 years data with present year. If the draft is more than dynamic resource, then declare “Rabi crop Holiday” in every alternate year based on monsoons.
- Training period should be 5 days and lectures should be elaborative in the concerned subjects.

2. Please comment on the accommodation and food.

General comments:

- Good accommodation and food
- Ambience is excellent
- Hospitality is appreciable
- Satisfactory
- Excellent
- Local pulses and cereal food will be an added attraction.
- The place is pleasant
- Drinking water is not supplied to the rooms in water bottles- drinking water arranged in water cans in general vessels.

a. Accommodation:

- Very good
- Excellent
- Satisfactory
- Daily room cleaning is to be attended
- Homely

b. Food and Mess:

- Very good
- Satisfactory
- Excellent
- Good, needs to be less spicy and oily

3. Please give your comments and suggestions regarding the sessions, contents and presentations.

General Comments :

- Overall training programme is good
- Useful for Hydrogeologist
- Contents and presentations are good in all the sessions
- Topic oriented literature should be supplied as much as you can
- Success story and / or reasons adopted to over come the failure if any is not dealt
- Good for non technical candidates
- To exchange the views among the resource persons and officers may help for future planning in different domains.
- Distinguish the différence between groundwater management and the Demand Side Groundwater management.

a. Course Content :

- Sufficient
- Very good
- All contents in the course is more essential to groundwater / water users group in the village level
- Adequate
- Relevent
- Good. But, better supply of more literature on topic
- Satisfactory
- Demand Side Groundwater Management, in this regard, the farmers are trying to leave the old irrigation system practices i.e. the traditional crops, diversifying the crops and crop water use effciency ; but not following the reduction of draft from high yield borewells and most of the borewells are highly the closed spacing – not implementing more artificial recharge structures to increase groundwater resource. The farmers are trying to irrigate less area when in deficit based on crop water budget.
- Innovative

b. Course Duration :

- Sufficient
- Very good
- Satisfactory

- Cut short to 2 days only
- More than enough
- Required atleast 5 days with more lectures regarding related to groundwater management with models
- Not sufficient
- Adequate
- Training period 3 days is not sufficient to cover all the course contents.

c. Lecture Sessions:

- Some lectures are good and thoughtful.
- Some lectures are not up to the mark.
- Farmers expression on the groundwater is remarkable.
- Very good
- Satisfactory
- Needs improvement
- Good lectures. Delivered their thoughts regarding GW management.
- Feels repetitive
- Presentations and lectures are more detailed and very good.
- Created good idea about methodology

d. Field visits:

- Sufficient
- Farmers responded well
- The fields for visits were selected nearer to the training centre and the members of GMC & HUN are only gathered. The farmers are well aware about the new methods for adopting in agricultural practices as suggested by the NGO organization and technical experts
- More field exposure to cover more area
- Satisfied
- Fields are very nearer to the training centre. It is good for trainers. Farmers are giving their experiences in the field what they are adopting through new methodology, who were given new guidance by the BIRDS – scientist.
- Useful in observing the effectiveness of farmers, after creation of awareness among farmers.
- Field programs are well arranged and interacted well with farmers.
- Needs to have some more visits and extra time
- Good. Real field knowledge is received.
- Extremely useful

- Excellent
- More informative
- Good. Some more time to be allotted for field visits, rather than lecture session.
- Essential and satisfactory
- Exciting

4. Were you able to meet and have substantial discussions with the farmers and get and idea on new knowledge and understandings based on Participatory Hydrologic Monitoring?

- Farmers got very good knowledge in change of cropping pattern as well as changes in crop plans based on participatory Hydrologic Monitoring. They could reduce the losses in agriculture production.
- To the extent possible, interaction with the farmers was under taken.
- It is understood from the discussion with the farmers that your organization has earned the confidence of the farmers and are well convinced of your advices.
- Yes, satisfied regarding managing of groundwater systems by farmers themselves.

- Yes, interacting with villagers, sharing and learning from farmer community the best practices in farming. Budgeting of Groundwater resources and crop budgeting and using past 10 years data for Rabi cropping is excellent and helpful to many of the officers also.
- We have observed that farmers are able to explain with complete understanding the complex groundwater and hydrologic cycle and crops planning etc.
- Insufficient time to discuss and meet the individual farmers. Knowledge sharing time may have to be increased.
- Discussed in detail with some farmers in the field. Gone through the methodology adopted by the farmers, their understanding levels etc… Regarding the awareness of farmers, it is highly appreciable that the farmers really understand the importance of water, its availability, draft, balance, crop water budgeting etc..
- Farmers got very good knowledge in change of cropping pattern as well as changes in crop plans based on Participatory Hydrological Monitoring. They could reduce the losses in agriculture production.
- Enough discussions are held and shared knowledge
- Yes, get impressed with the involvement of farmers for this new techniques
- During field visit at R. K Puram, We discussed with farmers. They explained their new adoptions like sprinklers irrigation in bhendi, bittergourd etc., SRI paddy with low water using with high yields.

- We could able to discuss with only selected farmers, that too only with committee members.
- More number of farmers not participated for discussions from the village. But the members (committee) of GMC and HUN are well aware about the rise and depletion of water levels in PHM wells and water balance in the assessment unit. It is observed that the farmers are following the advices and suggestions voluntarily for their individual benefit but not community benefits. Management of Demand Side Groundwater is treated as individual problem. But, for community development as a whole based on equity principle, usage of groundwater resources and management should be thought of.
- Yes, farmers are systematically participating in PHM activity.

5. Were you able to have substantial discussions with other participants and exchange thoughts on adopting the workshop learning's in your work?

- Yes, I have discussion with other participants and exchanged thoughts on adoption of the workshop learnings in my work.
- I had discussion with farmers and participants and exchanged the thoughts regarding command side groundwater management.
- Yes, created awareness in groundwater users to evaluate groundwater resource by adopting these methods based on the PHM water levels, Hybrid crops to be developed (commercial crops) which required only soil moisture / less water required crops / no water required crops with high yields.
- It's a very good platform to exchange views among us on groundwater systems.
- Water school approach is good.
- We had substantial discussions. Yes, learning can be adopted.
- Regarding marketing facility and encouragement from govt. officials
- This particular GMC / HU technical data can be used as a tool to implement in our concerned districts.

6. Do you feel you have a better understanding of demand side management of groundwater after this workshop? Please elaborate.

- Yes, particularly the demand side management of groundwater in the back of consumption and apply irrigation water in different methods.
- Agriculture production will be increased.
- Losses in agriculture will be reduced.

- Previously I had concept regarding demand side management of groundwater. However, after attending to this training program, I got the clear idea of the concept of DSGM.
- Yes. These types of studies must be extended to other areas and should be taken up in larger scales by government also.
- It is my personal opinion that the ruler of WALTA act in well construction is very much important to stop the interference with other wells and also in designing the pumps.
- Groundwater balance estimation techniques (GEC norm) should be adopted and the resource allocation for agriculture, Industrial and domestic purpose must be calculated separately and the domestic allocation is not dealt in the workshop, and regarding industries if any is not explained.
- Regarding the saturation and storation of co-existing basin is not at all dealt in this workshop and this need to be covered in future.
- In fact, DSGM concept is very good but for implementations in root level effects are also good if includes certain scientific way of approach in Groundwater management and estimation. As per Sri Hanumantha Rao's W/s methodology holds good for better results. Demand Side Groundwater Management training material should be more informative on the aspects like types of demand, categorization of demand based on result oriented farming sector by interpreting the self data with the other concerned line dept. Jalam badi must include Jala Niyantrana by way of some system, rhythms in KALAJATHA (Bavi bavi ki dooram, bidda bidda ki dooram etc..)
- I strongly believe in demand side management. But, I have some doubts in real adoption in the field. I felt that it is very difficult to convince the farmers in changing the mind set of farmers in crop changing, reduction in cropped area etc… After this training, I understood that demand side management is possible. But, it requires great commitment, skills, planning, patience, technology with social touch etc., as the BIRDS is doing.
- Based on the concept and understanding of the stake holders (farmers), we can achieve the goal which is for the overall development of farmers. Data collection should not be unilateral but it should be on the basis of the participatory approach. Decision and planning are to be done by the farmers, it should be supported by the technologists concerned.
- Yes, understood well about Demand Side Management of Groundwater. The farmers applied management techniques as to irrigate their entire area, by adopting different crops, which are less water consuming crops. But, all the

farmers are not following strictly the less usage of groundwater quantity available from their bore well-Groundwater resource.

- The data of GMC is useful for research orientation, which is useful to arrive some scientific assessments in usage of quantity of groundwater, within the limits of available groundwater resource and also useful to fix appropriate norms for the other areas for implementation.
- The training course is very good opportunity to give awareness on the DSGM such as to bring farmers / water groups in village level in each HUN by simple methods for understanding to reach our project concept.
- I had a better understanding of demand side groundwater management after this workshop. I understand that your esteemed organization has succeeded to inject the concept of command side groundwater management to farmers.
- Yes, management should be community oriented. Every farmer has to treat it as common problem.
- It is desirable to call the session as “Supply Side management, rather Demand side” as it dealt only distribution of available sources.
- It might be called as “workshop” instead of Training programme.
- Yes, the management of water, land utilization, crop changing, organic manure utilization, natural pesticides preparation, adopting micro irrigation techniques etc. are being explained by the farmers as well as lectures have made understand and the interaction is very helpful.
- I feel that we are doing and propagating the same during our surveys as a part of program of the nodal agency of land water – groundwater dept. I want to tell few things after visiting Muduralla palle.

1. Mudurallapalle village is part of command area of Telugu ganga project, as canal is passing though the village.
2. Village started enjoying canal water
3. This is the right time to shift over to water logging and conjunctive water studies in few command area villages from “Demand Side Management of Groundwater”
4. As per CWC IPP3 recommendations, conjunctive use of water is something to do with additional recharge through canals. As I observed that the recharge calculation is not including the recharge through irrigation return flow and canal.
5. conjunctive use of water and recharge treatment should be started from project planning itself.

- I feel the demand side groundwater management is optimum utilization of groundwater by selecting suitable crops depending up on the collected data, groundwater budget and crop water budget rather than going for the artificial recharge structures to promote the augmentation of rain fall in to groundwater though creating additional infiltration volume.

  It is understood that the farmers are making changes in the pattern of crop and extent of area irrigated depends up on the decisions resulted from the deliberation of groundwater community management showing the collective participation of the farmers of the hydrological unit.

  Live demonstration given by the farmers made know that they were to the maximum extent made aware of the groundwater phenomena's and basic things there of.

  I feel this is because of the continuous efforts of the BIRDS and its APFAMGS & its personnel & staff.

- Yes, good understanding on

  1. Water budget
  2. crop water budget
  3. institutional set up at micro level (village level)
  4. water conservation
  5. recharge methods
  6. more crops per drop techniques
  7. agricultural practices
  8. irrigation practices
  9. pesticide management

7. Do you feel that you have strengthened your skills to enable you to adopt concepts of Demand Side Groundwater Management in your work? Please explain.

- As far as possible, I will adopt the concepts of Demand Side Groundwater Management in my work.
- Absolutely the course will help to serve and give able guidance to farmers.
- Yes. The backdrop of no. of soil moisture methods, regarding the water saving methods and their management of groundwater.

- I feel that with some modifications we have to implement this program every where.
- We too have to increase our skills in communicating with the farmers and our finding should be shared with people and must be user friendly.
- Yes, monitoring of PHM wells equipment development of HU and rain gauge stations, etc. And much more interesting subject is that village level members / water users group had good awareness on DSGM by the simple methods observed in the village trip / in this workshop.
- Participation of farmers in collection of data, planning, adoption has been felt essential and steps of this nature feel to be publicized.
- New idea of community involvement is added to my knowledge of Hydro geological ideas.
- Supposed to use these skills in HPE awareness programs and Over Exploited (OE) villages.
- My opinion is – it appears the demand on Groundwater side is more than the available groundwater resource. Hence provide subsidies to the farmers who use less groundwater than the resource.
- I feel that I have strengthened the skills regarding the concept of demand side groundwater management.
- Yes, this may be adopted with minor modifications in our future projects. i.e. APCBMP, CAD projects with co ordination of farmers and departments of tanks
- Yes, I will make use of the experience in my normal course of work.
- Not applicable. It strengthened our skills for supply side management.

8. Any specific commitment as a follow-up to the Workshop

- Use of validated data that is generated by the farmers in field in getting scientific evaluation document as an evidence of successive stories.
- As BIRDS organization is dealing with groundwater, they should know the rules and regulation of APWALTA act.
- I hope to design it in near future and try to implement in my area of working.
- People must educate on Rain water harvesting methods by means of dugout farm ponds etc. by massive way in non-command area.
- Utilization of power to motors must regulate by means of optimum Horse power
- Cropping pattern must change in a large way.
- Given a chance with adequate material. I wish to share and impart my learning with beneficiaries of other virgin micro basins.

- Conduct awareness programs / workshops on Groundwater management side at village level. Create awareness to the farmers not to take up further exploitation as per APWALTA act in over exploited villages.
- Like to have exchange of knowledge between us and any specific help asked will be addressed.
- I will adopt methods what actually the organization is adopting in DSGM in our future projects on Ground water management like aquifer level Groundwater management to be started in Nalgonda district under AP water sector in the present project.
- More emphasis should be on demand types of GW management based on local needs.
- To improve the discharge of Borewell, still low cost technology can be used by Battery based bore well water lifting which can be run for 24 hrs.
- Field visits may be allotted one day.
- I will use this experience in due course of my job.
- Lectures need supporting information to their presentation. Many at times lack of supporting data and also rejected to the suggestion made by GW officers.
- It is observed that rising of water levels in Mudurallapalli village during field visit (due to telugu ganga canal flows), proper remedies measured to be taken.

  - The training on groundwater modeling and forecast of groundwater may be needed.
- I propose to explain the methods adopted on Demand Side Groundwater Management in awareness camps.
- PHM system can be implemented in OE villages at first instance.

Andhra Pradesh Farmer Managed Groundwater Systems (APFAMGS) Project

Certificate of Participation

This is to Certify that Mr. participated in the Training Programme on "Demand Side Groundwater Management (DSGM)" held in BIRDS International Learning Centre, Mutyalapadu, Kurnool District, Andhra Pradesh. from 10th December to 12th December, 2008.

The Training Programme was organized by Andhra Pradesh Farmer Managed Groundwater Systems (APFAMGS) Project in partnership with Bharati Integrated Rural Development Society (BIRDS) & Food and Agriculture Organization (FAO) of The United Nations.

Dr. K.A.S Mani
Project Leader
APFAMGS Project

Dr. P. S. Rao
National Programme Coordinator
FAO - INDIA, New Delhi

V. Paul Raja Rao
Executive Director
BIRDS