

Evaluation of FAO cooperation with India

**Andhra Pradesh Farmer Managed Groundwater Systems
(APFAMGS - GCP/IND/175/NET)**

Evaluation Report

November 2008

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Acronyms

AFF	FAO Finance Division
AMEF	Agriculture-Man-Ecology Foundation
AOS	Administrative and Operational Support
AP	Andhra Pradesh
APFAMGS	Andhra Pradesh Farmers Ground Water Management System
APWELL	Andhra Pradesh Groundwater Borewell Irrigation Schemes
BH	Budget Holder
BIRDS	Bharathi Integrated Rural Development Society
CWB	Crop Water Budgeting
DFID	UK Department for International Development
EOD	Entry on Duty
ESWD	FAO Gender, Equity and Rural Employment Division
FAO	Food and Agriculture Organization of the United Nations
FAOR	FAO Representation
FAS	Field Accounting System
FF	Farmer Facilitators
FFS	Farmer Field School
FWS	Farmer Water School
FPMIS	Field Programme Management Information System
GCP	Government Cooperative Programme
GEF	Global Environment Facility
GMC	Groundwater Management Committees
GoAP	Government of Andhra Pradesh
GoI	Government of India
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
HQ	Headquarters
HU	Hydrological Unit
HUN	Hydrological Unit Network
IPM	Integrated Pest Management
LEIA	Low External Inputs Agriculture
LTE	Long Term Experiment
LTU	Leading Technical Unit
MoEF	Ministry of Environment and Forests
NABARD	National Agricultural Bank for Rural Development
NEX	National Execution modality
NFE	Non Formal Education
NGO	Non Governmental Organization
NMTPF	National Medium-Term Priority Framework
NRLW	FAO Service for Land and Water (previously AGLW)
NTE	Not to Be Exceeded
PBEE	FAO Evaluation Service
PHM	Participatory Hydrological Monitoring
PNGO	Partner NGO
PRI	Panchayat Raj Institutions
ProDoc	Project Document
RAP	FAO Regional Office for Asia and the Pacific
RNE	Embassy of the Kingdom of the Netherlands in India
RP	FAO Regular Programme
RPB	FAO Regular Programme Budget
SC	Steering Committee

SHG	Self-Help Groups
SRI	System of Rice Intensification
STE	Short Term Experiment
TCAP	FAO Field Programme Development Service
TCAS	FAO Agricultural Policy Support Service
TCP	FAO Technical Cooperation Programme
ToR	Terms of Reference
ToT	Training of Trainers
TST	Technical Support Team
UNDAF	UN Development Assistance Framework
UNDP	United Nations Development Programme
VB	Delivery versus Budget
VE	Delivery versus Expenditure
WB	World Bank

Executive Summary

1. The external final evaluation of the project Andhra Pradesh Farmers Ground Water Management System (APFAMGS) was foreseen by the Project Document and was mandatory according to FAO evaluation policy. A gender-balanced team composed of national and international consultants conducted the exercise from 1 to 12 September 2008. The evaluation adopted a consultative approach with stakeholders and triangulation as a key method for validation of information and evidence. As part of the process, interviews were conducted with project staff at all levels, with men and women participants to Project's activities supported by different NGOs and with partner institutions.
2. The Project evolved from the previous Netherlands' funded intervention Andhra Pradesh Groundwater Bore-well Irrigation Schemes (APWELL), which had been conducted between 1996 and 2003. FAO took over the role of donor in mid-2004 from the Embassy of the Kingdom of the Netherlands in India, with a budget ceiling of USD 6,784,539 for 51 months of implementation.
3. The institutional design was rather complex: one Nodal NGO, BIRDS, signed the agreement as executing/implementing agency; eight Partner NGOs participated in implementation, with the continuous technical support of a Technical Support Team, World Education and others. The set-up was very efficient: delivery at the time of the Evaluation mission was 94%, indicating very high efficiency.
4. The NEX modality of implementation was very effective: it allowed flexibility of execution with FAO playing a guidance and financial oversight role. Contributing factors were, among others, the choice of well grounded and credible NGOs as executing agency and partners, the high professional level of consultants supporting the NGOs on technical and methodological issues and the commitment of all partners, including FAO. More in detail, project implementation was characterized by:
 - effective strategic management;
 - rigour in following project core principles, purpose and expected outcomes, using the Logical Framework as guidance;
 - flexibility in learning from participants and progress at community level through detailed annual work plans;
 - constant interaction among partners, including good relationship and effective consultation with FAO-India;
 - intensive monitoring of implementation and financial execution;
 - strong staff time inputs volunteered from the Nodal NGO and the Partner NGOs;
 - clear and timely reporting to FAO on activities and achievements.
5. The Project has been successful in meeting its challenges and expected results were largely achieved. Farmers understand the seasonal occurrence and distribution of groundwater in their habitations and in Hydrological Units as a whole and are able to estimate seasonal recharge, draft and balance. Farmers are capable of collecting and recording rainfall and associated groundwater data. They master the concept of groundwater as a common property resource and are willing to manage it for the collective benefit. This was achieved through strong focus and investment on capacity building and through the process of demystification of science, without compromising on the basic scientific principles of sustainable management. This had a strong empowering effect on participants.
6. The Project work on the supply side of the groundwater resource through Artificial Groundwater Recharge structures was a successful action to improve groundwater availability. The model can be usefully replicated in similar environmental conditions under any type of intervention.

7. Farmer Water Schools are a platform for groundwater farmers, men and women, that facilitates experiential learning of different cultivation techniques and cropping patterns linked to the use of the groundwater resource. This was achieved through intensive capacity building and progressive development of the Farmer Field School (FFS) concept into the Farmer Water School (FWS), building on the principles of Non Formal Education.
8. A key element in the FWS is the Crop Water Budget session at the start of the Rabi season, particularly as a decision-making tool for farm families to adopt alternative agricultural practices, suiting the availability of groundwater. This innovation to the FFS approach is a key decision-making tool also at community level and can be considered an important element towards increased social and natural capital. It is also important in light of future expansion and up-scaling of the FWS approach.
9. In addition, training on Low External Input Agriculture, inputs from the Bio-agents production centre, documentation of best agricultural practices and Farmer Training Teams, all led to reduction of external inputs, with beneficial consequences on the environment and the health of the rural population.
10. Gender mainstreaming and women empowerment were effective and the Project proved that it is a possible achievement even in conservative cultural conditions. The systematic and numerically significant involvement of women in Project's activities brought into the learning process different perspectives, needs and knowledge and was a key element for the Project's success.
11. The local institutions and platforms set up for common decision making at the level of the hydrological unit are thriving bodies that can prove very beneficial for their members and the wider population. There is good evidence that social capital was created and developed at the different levels.
12. Prospects for environmental, social, institutional and technical sustainability of the Projects' achievements and results are high. Economic sustainability of the innovations proposed will depend to a good extent on national and international food and energy price policies; nevertheless, farmers should be equipped with knowledge and decision making tools that allow them to cope with external threats to a good extent.
13. The Evaluation formulated recommendations for the short and the long term, addressed to the different key stakeholders.

Recommendations for the short term

Recommendation 1 To FAO

The Evaluation recommends that the project duration be extended to March-April 2009, within current budget availability.

Recommendation 2 To APFAMGS

The Project should develop a formal and crystallized APFAMGS model of intervention, to make it available for replication elsewhere as a complete approach and for informing national policy for the sector. Attention should be focused on the key elements required for the approach to be effective. The model could foresee a phased approach and/or modular form, if appropriate.

Recommendation 3 To APFAMGS

The exercise of Crop Planning should be based on sufficiently precise groundwater monitoring so that farmers can plan irrigation withdrawals between recharge events and should be introduced for the Kharif season as well, to increase awareness about groundwater cycle over the long term and contribute to the sustainable management of the commonly shared water resource and to the decision making process available to men and women farmers for coping better with climate changes.

Recommendation 4 To APFAMGS

The Project should ensure that information about groundwater availability and water-saving cropping patterns are shared as widely as possible with rain-fed farmers, landless, labourers and other marginal groups in the habitations.

Recommendation 5 To APFAMGS

Advocacy work should be conducted at the Government level, to emphasize the need for continuous technical support (from PNGOs and, if funds permit, TST) to the pool of 1000 farmer facilitators.

Recommendation 6 To APFAMGS

Increased training to HUNs should be provided on request in the following areas: marketing, market linkages, post-harvest management and processing. Wherever required, refreshment of leadership skills, management skills and financial management skills should also be envisaged.

Recommendation 7 To APFAMGS

The Project should facilitate HUNs' access to other key programmes such as WWF/ICRISAT SRI and Organic Cotton Marketing Programme (Chetna Organic/ETC India) and other GoAP programmes, for technical innovations, marketing and equipment and linkages to existing and new emerging markets for farmers, e.g. "water-saving" products.

Recommendation 8 To APFAMGS

Further uptake of good agricultural practices and reduction of spraying for management of pest and diseases should be ensured, through refresher training and monitoring of farmer facilitators/FWS, especially on AESA on pests/diseases and Long Term Experiments.

Recommendation 9 To APFAMGS

The Food and Nutrition survey should be re-run, revised also following the technical suggestions formulated in the report (see 5.1.5).

Recommendation 10 To APFAMGS

Awareness should be raised at GMC and HUN level on the possibility for rainfall and groundwater data collection to become a source of income: focus should be on the need for high reliability and precision of data collected and on the realistic marketing potential of this activity.

Recommendation 11 To APFAMGS

Within the framework of its exit strategy, the Project should formalize a light methodology for PNGOs to monitor the quality of FWS, GMCs and HUN's performance after the project ends. It should include tools and indicators for the monitoring process and a mechanism for taking remedial action insofar as possible.

Recommendation 12 To Partner NGOs and key stakeholders

BIRDS, Partner NGOs and their close associates should develop a vision, strategy and methodology for the work they intend to carry on in future as a network, to become a fully-fledged partner for funding organizations.

Recommended intervention model for the long term

Recommendation 13 To the Government of India, FAO and other development partners

The Evaluation recommends that efforts be undertaken to ensure availability of budget for an intervention on a similar geographical scale to be run until 2011 by BIRDS and its partners; FAO should provide high-level technical assistance and guidance in it. The overall goal of the intervention is described in Figure 4.

Recommendation 14 To Indian State and Central Governments

APFAMGS experience is a breakthrough in the management of groundwater and in securing livelihoods of poor farmers in India: since both are key concerns of the central Government of India and of many State Governments, the approach should be adopted and mainstreamed in the Government's policy and development work.

Recommendation 15 To Indian State and Central Governments

The participation and close involvement of locally well grounded and respected NGOs should be a common feature of government programmes aimed at capacity and institution building in rural areas.

Recommendation 16 To FAO India

FAO-India should commit to advocacy work on behalf of APFAMGS, to facilitate mainstreaming of the Project's experience in policy work at national level and in supporting the diffusion of the model to other States in India; the model could typically be diffused and up-scaled through FAO's collaboration within the UNDAF framework.

Recommendation 17 To FAO

FAO HQ should mainstream the APFAMGS model and experience on Farmer Water Schools in its normative programme, to facilitate diffusion and adoption of the approach and method in other countries. This might include the preparation of FWS manual.

Recommendation 18 To APFAMGS

The membership and community ownership of GMCs and HUNs should be extended to include adequate representation of rain-fed farmers, landless, labourers and other marginal social groups, through sensitisation and visioning workshops, to facilitate the sustainable use of all natural resources.

Recommendation 19 To APFAMGS

Agricultural bio-diversity, soil/land, drought, watershed and conflict management sessions, as well as attention for Payments for Environmental Services (PES), should be added to the Farmer Water School, to provide all users, men and women, with an experiential learning platform for managing sustainably their commonly shared natural resource and coping better with climate changes and other external threats.

1 Introduction

1.1 Evaluation background

14. In 2004, following a decision by the Indian Government (GoI) to restrict the number of bilateral donors, the Netherlands withdrew completely from any project type of Official Development Aid (ODA) engagement in the country. The Embassy of the Kingdom of the Netherlands in India (RNE), responsible for managing a number of projects at the time, reached an agreement with FAO, whereby the Organization would accept RNE funds for three projects and would run them in the role of donor. A key element of the agreement was that FAO would maintain the institutional set-up of each project with the same organizations already involved in project execution through the so-called National Execution (NEX) modality. Through it, FAO had no direct implementation responsibility, but rather assisted national implementing institutions in making appropriate choices. A fourth project was created to fund all FAO's backstopping services (GCP/IND/177/NET), which represented a non-quantifiable additional input.
15. The Andhra Pradesh Farmers Ground Water Management System (APFAMGS) was one of the three projects: it started for FAO in August 2004 with the code GCP/IND/175/NET, and was planned to be implemented within 51 months. The closing date at the time of the Evaluation was end October 2008. The Project had a budget of USD 6.7 millions.
16. The national implementing organization was the Bharathi Integrated Rural Development Society (BIRDS), a national Non Governmental Organization (NGO) heading a consortium of other eight Andhra Pradesh-based NGOs and supported by a range of consultants. FAO played the role of donor, with the Budget Holder (BH) responsibility given to the FAO Representative in India; the Leading Technical Unit (LTU) was FAO Service for Land and Water (NRLW at the time of report writing). A National Programme Coordinator, Land and Water was recruited and based in the FAO Representation (FAOR) in New Delhi, to backstop the three projects.
17. The Project Document (ProDoc) foresaw an external final evaluation, as for the other two NEX projects. The three projects had similar starting and ending dates and the final evaluations were planned for mid-2008. In consideration of the significance of the three projects to the overall FAO portfolio in India, at the end of 2007 it was agreed that the three project evaluations would be part of an overall evaluation of FAO cooperation with India over the past five years. The reports of the three project evaluations will be part of the final report of the FAO-India country evaluation.
18. The aim of the Evaluation, as stated in its Terms of Reference¹ (ToR) was informing the Government of India, BIRDS and its partners, FAO and other stakeholders about the achievements of the Project and the efficiency and effectiveness of the methodologies used, the technologies diffused and the NEX implementation modality. The Evaluation should also formulate recommendations and draw lessons for possible up-scaling of the approach for the future development of farmers' groundwater management in India.
19. A team of four experts was organized, that provided all expertise and competence required for the assessment of all project components. Team members were:
 - Ms Tullia Aiazzi, evaluation, gender and rural development expert, team leader, FAO Evaluation Service;
 - Dr Mihir Maitra, groundwater expert;
 - Mr Arnoud Braun, Farmer Field School and agricultural development expert;
 - Mr Franco Franchini, administration and finance expert.
20. The team conducted the Evaluation during the period 1-12 September 2008², with the full support of the implementing organizations. The Evaluation team wishes to thank all those who

¹ See Annex 1

² See Annex 2 for the Evaluation's itinerary and organizations met

contributed to its work with their time and endless patience in answering all questions and requests for documents and information.

1.2 Methodology of the evaluation

21. As stated above, the Evaluation of APFAMGS was part of the wider exercise of the evaluation of all FAO cooperation with India over the past five years. This process started with the inception phase: PBEE carried out in depth discussions about the project at FAO HQ and RAP (FAO Regional Office for Asia and the Pacific) with officers working in India, followed by a mission to India in April 2008, to meet with key stakeholders in country and identify the main issues to be assessed during the evaluation. On this occasion, meetings were also organized in Hyderabad with APFAMGS implementing organizations and a field visit to a participating community, to gather information and documentation about the project and initiate planning the evaluation.
22. In August 2008, draft ToR prepared by PBEE were circulated to all key stakeholders for comments and suggestions. The final version was distributed to all stakeholders before the start-up of the evaluation.
23. A gender-balanced team composed of national and international consultants, was selected and recruited. Team members had access to all documentation made available by the Project in due time; the team gathered in Hyderabad where an internal briefing was organized before starting the meetings with the Project.
24. The evaluation adopted a consultative approach with stakeholders and triangulation as a key method for validation of information and evidence. Analytical tools included: review of existing reports and of the Project data-base; extensive meetings and group interviews with project staff at all levels; meetings with men and women participants to Project's activities supported by different NGOs; meetings with partner institutions; direct observation of field and training sessions, infrastructure works and fields; and attending one Steering Committee Meeting.
25. The Sustainable Livelihoods Framework was used as the reference for assessing contributions to poverty alleviation, gender mainstreaming, social, economic and environmental sustainability. The Strengths, Weaknesses, Opportunities and Threats (SWOT) framework was also used for assessment of the Project performance.
26. Particular attention was devoted to gender and social inclusion issues. In this respect, the Evaluation contributed also to the piloting exercise by the Task Force on the Guide to Evaluation from a Human Rights and Gender Equality Perspective of the United Nations Evaluation Group (UNEG). This included briefing and debriefing with the Task Force and feedback on the Guide.
27. Time availability did not allow the Evaluation to discuss the project results with non-participating farmers; however, diffusion and adoption of the Project's results was assessed through data analysis about changes over time of numbers of farmers participating in milestone events.
28. In the methodology of FAO country evaluation, an impact evaluation is usually carried out to assess the changes in livelihoods and food security of beneficiaries of a consistent body of work by the Organization. The World Bank-India Office had already launched with the Project's and FAOR's permission, an impact evaluation of APFAMGS. Therefore, FAO resources were used for the impact evaluation of the AMEF Project. Unfortunately the report of the World Bank study was not available by the time of the APFAMGS evaluation; insofar as possible they will be taken into account in the FAO-India country evaluation report.

2 Context of intervention

2.1 National context

29. India has 16% of world's population but only 4% of the total available fresh water. The country faces a serious challenge in meeting the water requirement of all its users. About 86% of present water use in the country (645.84 billion cubic metres) goes into the irrigation of an estimated area of about 87.23 million hectares³. Presently, more than 50% of the irrigation water requirement in the country is met from groundwater resources and approximately 20% of Indian farmers depend on it for their livelihoods. Further, 85% of rural drinking water comes from groundwater resources.
30. The Indian Constitution has laid down water as a state subject and the Central Government's role is of "advisor" to the States. While surface water is a public (state) property, groundwater underneath a person's land is fully under his/her control. The owner of the land has the legal ownership and right to extract and use groundwater in any manner deemed fit and tenancy laws govern its disposition. The practice has its origin in the Transfer of Property Act IV of 1882 and Land Acquisition Act of 1894.
31. The Environment Protection Act (EPA) formalized in 1986, was adopted by all the States by 1990. In 1997, the Ministry of Environment and Forests (MoEF) constituted a Ground Water Authority to regulate and control groundwater extraction under the EPA, following directions by the Supreme Court of India. This directive mandates that any person drilling a new bore well would require technical clearance from the State authorized Groundwater Department. However, effective mechanisms to implement the provisions of the Act are yet to be developed. Also, at different points in time with the most recent version in 2005, the Government of India (GoI) circulated a "Ground Water Model Bill" among State Governments, for comments and adoption and a number of States have indeed implemented ground water legislations.
32. The National Water Policy in 2002 recognised over-exploitation of groundwater in the country and suggested broad measures like assessment, regulation, recharge, conjunctive use, etc. It laid down priority of drinking water over irrigation and suggested private sector participation and community management of water resources.
33. In this legal context, development of groundwater has remained primarily in the private sector. In the past, national objectives of increased food production and food self sufficiency led State Governments to provide subsidies to farmers for dug and deep bore-well construction, pump sets and even free electricity at times although the Government of India made attempts to regulate groundwater exploitation through the National Agricultural Bank for Rural Development (NABARD), by restricting loans for bore-wells to farmers in over-exploited areas since 1991.
34. In practice, legislation on its own has been ineffective in preventing farmers from constructing new bore-wells. Eventually, over exploitation of groundwater particularly in hard rock areas, caused steady decline in its level and millions of dug wells and high numbers of deep bore wells have gone dry, affecting large numbers of small and marginal farmers. It is being increasingly realized widely that unless some effective steps are taken to conserve and manage groundwater, the very livelihood of numerous farmers would be jeopardized in the near future.

2.2 Origins of the Project

35. Contributions from bilateral projects for sustainable management of groundwater for irrigation in India have been limited, although several bilateral projects dealt with drinking water supply and watershed management.

³ Although the total irrigation potential created so far in the country is about 102.77 million hectares, the actual utilization is estimated to be considerably less, in the order of 60 - 70%.

36. An exception has been the Government of The Netherlands, whose support to water and groundwater management in India and in Andhra Pradesh in particular has a long history. The two most recent interventions were the Andhra Pradesh Groundwater Bore-well Irrigation Schemes (APWELL) Project and Andhra Pradesh Water Vision.
37. Through the initiative Water Vision, The Netherlands supported the Government of Andhra Pradesh to position the water sector, the first exercise of this type in India, by pledging and re-asserting the Government's commitment to provide a secure water future for all by 2020. This was in addition to the Andhra Pradesh Water Land and Trees Act (APWALTA) elaborated in 2002, to promote water conservation and tree cover and to regulate the exploitation of surface and groundwater, including prevention of construction of new wells in over-exploited areas.
38. APWELL aimed at improving the living conditions of small and marginal farmers by providing bore-well schemes in seven districts⁴. The main aim of the project was fulfilled to a large extent with visible impact on living conditions of small and marginal farmers, increased agriculture production and existence of strong local institutions (Borewell Users Associations). The project started in 1995; in 1999, in response to signs of lowering water table and increasing risks of groundwater uses, it initiated testing a new approach through which farmers would be involved in Participatory Hydrological Monitoring (PHM).
39. In 2003 APWELL came to an end: the implementing organizations and core staff ensured continuity throughout the transition period until RNE launched the new initiative APFAMGS, which became a FAO- implemented project in mid-2004.
40. APFAMGS is a logical extension of APWELL: while the latter was centred around the creation of water facilities for poor and marginal farmers in seven districts in Andhra Pradesh, APFAMGS focus was on developing capacity of groundwater users in managing their resource in a commonly sustainable way for crop production. The experience of groundwater management and PHM gained through APWELL fully informed the conceptual design and implementation set-up of APFAMGS, and was the basis upon which the new project could build at full steam from the beginning.

2.3 *FAO's comparative advantage*

41. Although FAO in India did not have specific country level experience in groundwater management projects, this is one of the areas of expertise of the Organization, in the context of irrigated agriculture and food security. FAO publishes AQUASTAT, a world-wide database on water; it is a member of UN-Water and other networks on water issues; it issued numbers of publications on different related aspects, and the like.
42. FAO was thus in an excellent position to provide technical know-how from the international experience to the Project, while supporting it with international and national visibility and credibility. This would have the additional aim of contributing to the identification of new potential partners, again at both national and international level.
43. Although some of the international visibility could also have been achieved through the RNE, the stage offered by FAO in this sense was one of its widely recognized added values as an international knowledge organization and the Evaluation considers that it was quite effective in the case of APFAMGS.

⁴ Anantapur, Chittoor, Cuddapah, Kurnool, Mahbubnagar, Nalgonda and Prakasam

3 Assessment of project concept and relevance

3.1 *Project theory*

44. Groundwater is a natural resource whose occurrence and distribution are more easily identified within the boundaries of a Hydrological Unit. Although in India decisions about its use are in the hands of individuals who own the land where it occurs, it is a typical common property resource and as such, its sustainable management requires cooperative management and shared benefits. In technical terms, sustainable management of groundwater means extracting only the water received by an aquifer through natural annual rainfall recharge and other artificial recharge structures, if any. Over-exploitation occurs when extraction exceeds recharge. Collection of rainfall data and measurement of well discharge and water levels are necessary for the assessment of the quantities that can be extracted on an annual basis.
45. The core concept of APFAMGS was that sustainable management of groundwater is feasible only and if users understand its occurrence, cycle and limited availability, and they accept that groundwater conservation through collective decisions is ultimately a safeguard of their own interest. The corollary was that once concepts of hydrogeology and groundwater management which had hitherto remained in the domain of scientific communities were translated for and mastered by poorly literate farmers through what was called the “demystifying science” approach, groundwater users would agree to take appropriate action for its sustainable management. It is clear that the implementation of such a complex concept implied a strong “piloting and testing” element.
46. Most commonly, groundwater management acts on the supply side, wherein attempts are made to drill more bore wells and/or construct more recharge structures to augment recharge. Demand-side management is also considered feasible, but external control and regulatory measures are over-costly and ineffective. APFAMGS on the contrary adopted a demand side approach, wherein farmers are made to understand their groundwater system adequately so that they could make informed decisions about their water use. Thus, the burden of control of extraction would be transferred to individuals in communities who know the “why and how” and act based on sound information, rather than being enforced by external agents through imposed rules and regulations.
47. The concept underpinning the project proved to be correct, as this report shows, but it may not have been enough: the Evaluation considers that some key additional conditions were necessary in making the project a success, namely the institutional set-up, quantity and quality of inputs and time among others. Further, the increasing scarcity of the resource due to years of successive droughts raised strongly farmers’ awareness and willingness about the need to act collectively for the sustainable management of groundwater: this also played in favour of Project’s acceptance. In circumstances of plenty, the willingness to cooperate towards a consensual reduced use of common property resources for the common good may be very limited.

3.2 *Project objectives and logical framework*

48. The project development objective or goal was: “Stage is set for enabling the farmers to manage their groundwater systems in about 650 villages in seven drought-prone districts of Andhra Pradesh by the year 2008”.
49. Major objectives were:
 - I. About 3,000 Men and Women farmers are in a position to understand groundwater systems within which they are operating at about 650 habitations in Andhra Pradesh, in a scientific manner, by the year 2008.
 - II. Hydrological database, using GIS platform, is developed for usage of Groundwater Management Committees, covering 650 habitations, by the year 2006.

- III. About 6,500 farm families enabled for adoption of alternative agricultural practices suiting the availability of groundwater, by the year 2008.
 - IV. Community based institutions established for alternative management of groundwater resources with equal representation/ participation of men and women, covering about 650 habitations, by the year 2008.
50. Each “objective” was articulated in a number of outputs and activities in the Project Logical Framework (LF). Overall, the logic links in the LF are acceptable and coherent, proceeding from Objective 1 towards Objective 4, with some mismatch in the sequence outputs-“objectives”.
 51. Other, more striking inaccuracies in the LF were the absence of one level of the structure and the wording used, which was a “results” statement for all levels. Results were missing as such, although the “objectives” were in fact “outcomes”. In practice, there was no development goal, which could have helped in setting a higher, more ambitious target for the Project. It is difficult to say whether this was done on purpose, i.e. to “play on safe ground”, or otherwise. Last, most Objective Verifiable Indicators were expressed at the level of outputs, thus being in fact simple targets (e.g. number of participants in training activities), rather than being indicators of outcomes or impact.
 52. Fortunately, the low level of accuracy of the LF did not affect project implementation or the use of the LF as a useful tool during implementation. The ProDoc with its LF was printed in hard copy and widely distributed among Project staff at different levels, who clearly knew it and mastered it well⁵. The LF was a living reference for the Project, which provided guidance in steering changes in the methodological approach at mid-way of the Project life.
 53. The Evaluation could assess that the LF was also useful in monitoring project progress in quantifiable terms and some targets were revised to higher values during the Project’s life, which was praiseworthy.

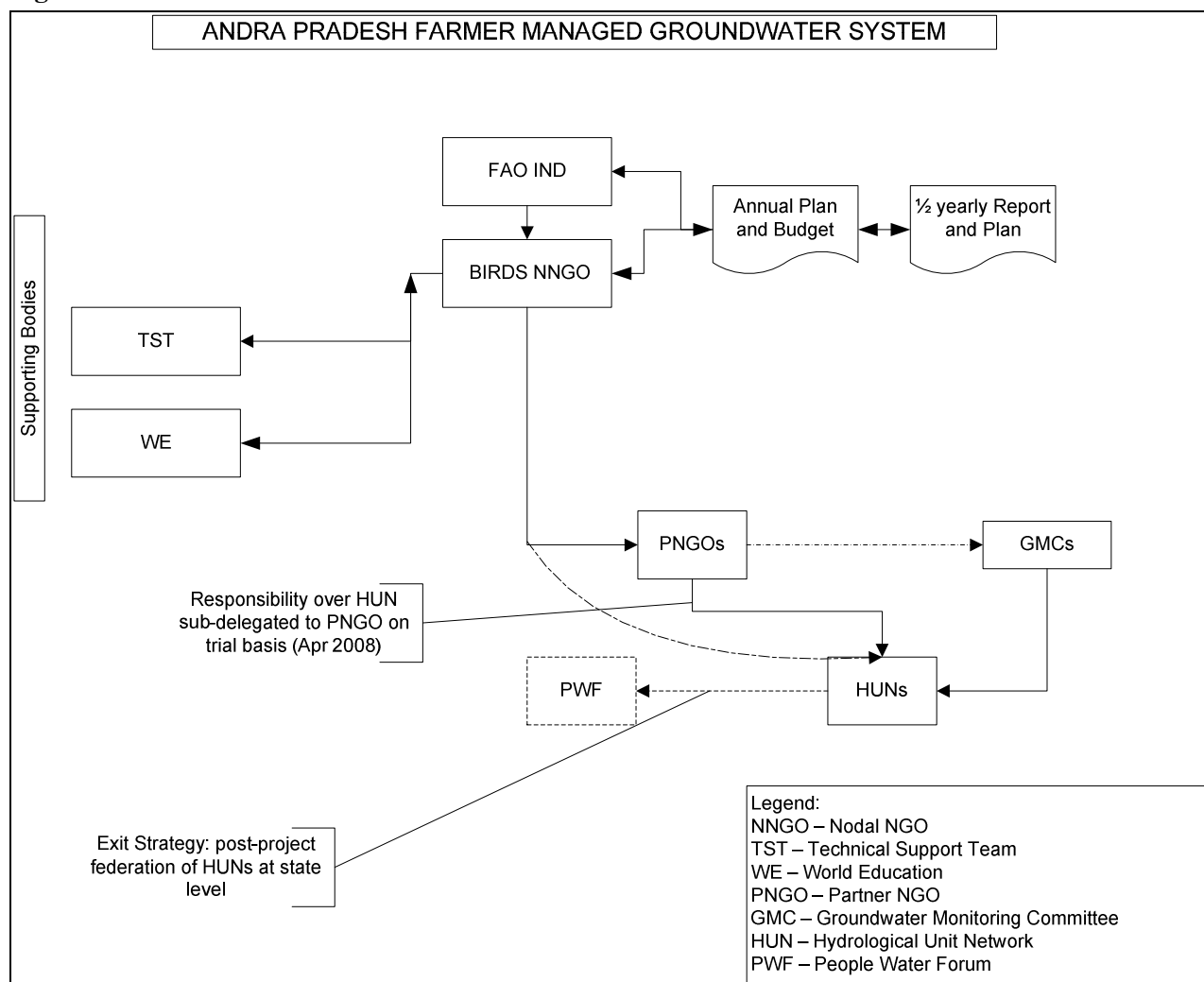
3.3 Project design

54. The Project inherited the implementing organizations of APWELL and RNE-APFAMGS, with some key changes in the relations between them and the donor. The institutional set-up was rather complex, as illustrated here:
 - a. FAO had role of donor, intended as the ultimate decision-making entity in the Project. At the same time, because of its nature of technical and not financing-only organization, FAO also had a role as executing agency. The choice of the National Execution as implementation modality defined such role as provision of “*technical assistance and operational, financial and project management support services*”⁶, in addition to national and international visibility. The role was to be played by the Lead Technical Unit (LTU) in HQ, FAO Land and Water Service (AGLW, now NRLW) for technical backstopping, and by the FAO Representation in India, with Budget Holder and monitoring responsibility.
 - b. The National Executing/Implementing Organisation was the Nodal NGO BIRDS. It was the signatory of the Project Agreement with FAO, was responsible for Project execution and implementation and for coordination of all implementing partners and consultants. BIRDS was a competent organization, with more than 20 years of experience in its area of intervention, well grounded at community level and credible at state and national level.
 - c. The Implementing Organizations were nine Partner NGOs (PNGOs): BIRDS, CARE, CARVE, DIPA, GVS, PARTNER, SAFE, SAID and SYA. All of them were experienced organizations, competent, committed and credible at community level in their respective areas of intervention.
 - d. Consultants were to provide key technical and methodological inputs:

⁵ The Evaluation confirms a similar finding of an internal mid-term review carried out by the Project in 2006.

⁶ Article III para 1 of the FAO-BIRDS Agreement

- the Technical Support Team (TST) was created by the consulting firm PRIYUM, and was responsible for all technical inputs in the areas of water management, agriculture, institutional development, gender issues and monitoring;
 - World Education (WE) was to provide support on the methodology of Non-Formal Education (NFE);
 - Sumadhura was to provide support on GIS; a cheaper solution was found by recruiting an IT consultant through TST in 2007;
 - Practica Foundation provided expertise on pumping systems until 2007;
 - Individual consultants and universities were to provide different more targeted expertise, on a variety of issues.
- e. Last, the Steering Committee was to include representatives of all direct project stakeholders and of external institutions, to provide advice on crucial policy matters as well as in building up linkages at higher levels.
55. Implementation arrangements foresaw the elaboration of annual work-plans and budgets, through a process coordinated by BIRDS with PNGOs, TST and WE. Plans were to be presented to FAO which would approve them after consultation with the LTU. Funds disbursement was authorized upon approval of the six-month work-plan. The second half-year payment was authorized after approval of the previous six-month report of activities. The chart below illustrates the structure and functional links among Project stakeholders.

Figure 1. *APFAMGS structure*

56. The Project was approved for 51 months' duration with adequate financial resources. The Evaluation considers that both budget and time frame were reasonable to achieve intended objectives considering that the Project set-up was to a large extent "inherited" from a previous intervention, and that the "piloting and testing" element of the Project still required a number of cropping seasons to prove its validity.
57. The Project was informed by a strong participatory, capacity building and gender equity approach⁷. NFE and experiential learning were to be the key methods through Farmer Field Schools to develop farmers' capacities on water management and sustainable agriculture and to "demystify science". Local institutions like the Groundwater Management Committees (GMCs) and the Hydrological Unit Networks (HUNs) were to be set up to allow wide-spread participation and representation at the community and Hydrological Unit levels.
58. Technological support to these processes was to come through the introduction of GIS and the set-up of large databases and by making them available directly or one-step away from farmers. Last, the development of links between farmers and service-providing and political institutions like the District Agriculture Officers and the Panchayat Raj Institutions (PRI) was to contribute to the long-term sustainability of the capacity building efforts.

⁷ Gender issues are discussed in detail in a later chapter.

59. The ProDoc identified as primary beneficiaries all small groundwater users, men and women, in seven drought-prone districts in Andhra Pradesh, in about 560 habitations⁸ located in 58 Hydrological Units (HU). Although groundwater users are not the majority of farmers, the Project had a strong concern with social equity, by stating “All the inhabitants, both men and women will be targeted for project benefits, irrespective of economic status, caste, creed and religion. Vulnerable sections of the society are also included along with the people who control the groundwater resource on account of land ownership.”
60. Secondary beneficiaries were identified in the Government departments who would benefit of the data collection work at community level, although this could be debatable. NNGO and PNGOs staff were also important beneficiaries of the Project through the huge investment in their capacity building along the process.

3.4 Project relevance

61. Andhra Pradesh is the fourth largest State in India with 23 districts. The seven project districts - Nalgonda, Prakasam, Karnool, Kadapa, Chittoor, Annantpur and Mehboobnagar - are among the most drought prone districts in the State. At the time of Project preparation, the total number of dark blocks (over exploited areas) in India had increased by 66% in 7-8 years; in Andhra Pradesh (AP) dark blocks had gone from 0 to 30 in the same period: at the same rate, by the year 2017/18, 36% of the blocks will be dark or critical⁹. Groundwater users in the seven districts represent approximately 21% of the total number of families.
62. A direct consequence of over-exploitation and decline of the water table is an increased threat to agricultural production and food security, with the compounded problem of increased debts for farming families that led to high suicide rates and increased social instability.
63. In the absence of viable and effective alternatives to irrigated agriculture and groundwater control mechanisms, a project like APFAMGS that aimed at working on the demand side of groundwater management and at building capacities of users to adopt a more environmentally and economically sustainable agriculture, assumed great relevance to the contemporary national priority in the context of management of its common natural resources and poverty alleviation.

4 Project implementation

4.1 Project Budget and Expenditure

64. The Project was approved with a budget ceiling of USD 6,784,539. Total expenditure at 1 September 2008 was USD 6,360,531; funds transfer for the second half of 2008 was still pending at the time of the Evaluation. This left a residual unspent budget of USD 424,008: at the rate of expenditure of 2007, this amount could finance Project activities for six to seven months. Overall, delivery rate against Project budget was 94%, indicating very high efficiency.
65. More in detail, the analysis of delivery versus budget (VB) and versus total expenditure (VE)¹⁰ shows a very similar trend, indicating that resources available were used judiciously throughout project life:

⁸ The term “habitation”, which is used exclusively in the project documents, indicates what is generally known as village.

⁹ The answer by GoI to a Parliament interrogation in October 2008 was as follows: : ...in the year 2004, out of 1231 mandals of the State, 219 mandals are categorized as “Over-exploited”, 77 as ‘Critical’ and 175 as ‘Semi-critical’.

¹⁰ Delivery versus Budget (VB) indicates the Project’s expenditure as percentage of the Project budget: it provides the overall rate of expenditure. Delivery versus Expenditure (VE) indicates the percentage of each year’s expenditure against the total Project’s expenditure: it gives the annual pace of implementation and has to equal 100%.

- 2004: 20% VB and 22% VE show that the NNGO and the PNGOS were well structured and organized NNGO and could start operations at full speed;
 - 2005 and 2006: 30% and 26% VB and 31% and 28% VE respectively confirm the above observation;
 - 2007: 12% in both VB and VE are typical rates for the consolidation stage;
 - 2008: 6% VB and 7% VE correspond to a final phase and exit strategy context, with reduction in Project staff and the like.
66. The Project utilised the Indian software TALLY for financial management and monitoring. The programme runs on a fully-fledged cash-based environment, is used to enter transactions, reconcile accounts and reports; it is simple, practical, user friendly and fully responding to users' requirements after minimal training, and it has rapid system response to standard transactions and report compilation. The NNGO ran an articulated training programme in the BIRDS training centre followed by on-the-job training in the user's sites for all PNGOs. Also, after-training support was provided if required.
67. The quality of the financial reports was excellent throughout; in particular HUNs' reports (prepared by HUNs and laid out in pdf format by PNGOs) show excellent understanding of the principles underpinning the system. This will be a key factor in ensuring sustainability after the Project comes to an end.
68. The Evaluation could verify that management of funds by the FAO Representation was financially correct. Nevertheless, likewise for the other NEX projects, a few weaknesses were noted:
- there were unjustified delays in fund transfer to APFAMGS in 2006 (three months) and in 2007 (six months); in 2008, the second allotment due in July had not been transferred yet by mid-October;
 - less than adequate information and communication on financial matters with the executing agencies.
69. Both events seem to have influenced the decision by the Project to adopt an exit strategy in 2007, as discussed below.

4.2 Government support

70. At the time of preparation of the three NEX project agreements, the Government of India provided a general endorsement of the three initiatives, without defining any role for itself apart from asking FAO to report on them in the context of usual procedures between them. Nor did the ProDoc foresee any specific role for or commitment by GoAP, apart from considering Government organizations as secondary beneficiaries of the data collection work by farmers.
71. In practice, relations between the project and AP Department of Groundwater and of Rural Development are very good, with a clear flow of exchange of information from the Project about its progress and achievement and interest by the Government. Indeed, staff from Andhra Pradesh State Groundwater Department (APGWD) were exposed and trained on Project's sites on Farmer Water Schools (FWS) and on the Project approach and methodology. Also, a number of APFAMGS facilitators were recruited by the AP Department of Agriculture to implement Field Schools based on the APFAMGS model.
72. Thus, although no direct support in Project implementation was foreseen, there is evidence of appreciation of and indirect support to APFAMGS achievements and results by key departments of GoAP, which are seriously interested and committed to adopt and upscale the approach.

4.3 *Project Management*

73. The Project's set-up, as mentioned above, had to perform complex operations working through NGOs with local communities and poorly literate farmers over a vast geographical area. The inclusion of the provisions for Technical Assistance in the contractual responsibilities of the Executing Agency BIRDS facilitated greatly the overall management of the project. In fact, the line of control and command was very clearly defined, with all consultants¹¹ depending both functionally and financially from the Executive Director. Clearly, managerial skills and competences of all organizations involved assume paramount importance in such scheme: once these were assured, everything worked smoothly and through a highly collaborative model.
74. An additional facilitating element was that the executing agency BIRDS was an NGO: it had a considerable leeway in organization and management and was in the best position to afford creation and use of effective and efficient management techniques. In this respect, the Evaluation considers that BIRDS was a particularly well managed, structured, motivated and pragmatic NGO, which were key factors in the overall Project implementation.
75. The Project developed and adopted effective training and monitoring tools across the whole structure, which integrated administration, management and technical areas. In each PNGO a multi-function team was set up based on the NNGO model and scaled to adapt to each context. An accurate system of periodic controls and reports allowed Project Management to have full knowledge of the implementation environment without interfering with on-going activities, thus facilitating decision-making. Also, the capacities of the implementing partners and their compliance with agreed plans of work were constantly evaluated: this allowed the prompt identification of ineffective partners and their separation when required.
76. Overall, the Evaluation considers that Project implementation was characterized by:
- effective strategic management;
 - rigour in following project core principles, purpose and expected outcomes, using the Logical Framework as guidance;
 - flexibility in learning from participants and progress at community level through detailed annual work plans;
 - constant interaction among partners, including good relationship and effective consultation with FAO-India;
 - intensive monitoring of implementation and financial execution;
 - strong staff time inputs volunteered from the Nodal NGO and the Partner NGOs;
 - clear and timely reporting to FAO on activities and achievements.
77. As agreed by all stakeholders, within this context the NEX modality of implementation proved to be very successful, since it allowed flexibility of execution with FAO playing a guidance and financial oversight role.
78. As mentioned above, some weaknesses at the level of the FAO Representation in financial management and flow of information seem to have contributed strongly to the decision by Project management to adopt an exit strategy in 2007, which can be considered as rather early. This facilitated the progress towards sustainability of local institutions such as HUNs and GMCs, to the point that it was possible in 2008 to delegate financial responsibility to community-based HUNs through a sub-delegation agreement. On the other hand, this deprived communities of one year of support to develop and strengthen capacities.
79. This decision also caused the loss of well trained staff. However, the turnover rate of staff at the different levels was in the order of 10% per year, which is not surprising in a dynamic employment market like India, with high upward mobility and where cultural pressure in favour of civil service employment is very strong.

¹¹ Consultants included TST, World Education, Sumadhura, etc.

80. There is evidence from Project records that recommendations formulated by the Project Steering Committee (SC) were given due notice and were acted upon. The focus of the SC was often on the scientific dimension of the Project, losing sight at times of the Project objectives on demystification of science to allow farmers' empowerment. Some of the recommendations were also development oriented and provided useful guidance to the Project.

4.4 Technical and Operational Backstopping by FAO

81. The LTU responsibility was assigned to NRLW/HQ, which carried out one mission per year to the Project. The LTU was involved also in the approval of annual Project work plans and half-yearly reports. Overall, this support was well received and appreciated by Project staff.
82. Project staff highly appreciated the contribution FAO gave to the international visibility of the Project, either by facilitating APFAMGS staff's participation in international events and projects, or by bringing international observers to visit the project and share experiences with it. Also, FAO's name and involvement provided the Project with visibility and credibility at the State and national level and links with new potential partners.
83. More in detail:
- FAO facilitated participation of APFAMGS in a number of international events, among which it is worth mentioning the 128th International Conference on Agrarian Reform and Rural Development in Porto Alegre, Brazil in 2006; the 4th World Water Forum in Mexico in 2006; the World Water Week in Stockholm in 2006; and the International Commission on Irrigation and Drainage Congress in Malaysia in 2006.
 - FAO also facilitated the organization of the International Learning workshop on demand Side Management of Groundwater, held by APFAMGS in Hyderabad in August 2007: 13 countries attended, presented their experiences and contributed to the exchange.
 - APFAMGS staff participated in the formulation of the Master Plan of the Social Forestry Division of the Department of Forestry, Ministry of Agriculture of Bhutan. Three missions were conducted, that included both stakeholder and Logical Framework Approach workshops, in addition to extensive information exchange and consultations. Funds were provided by the FAO-Netherlands Partnership Programme, Forestry Component (FNPP/Forest).
84. In addition to the technical backstopping from HQ, FAO also provided support by recruiting a National Programme Coordinator Land and Water, previously the RNE ground-water expert for coordination and monitoring purposes of the three NEX projects. The incumbent played an important guidance role for APFAMGS. Funds were provided from the umbrella support project GCP/IND/177/NET.
85. The FAO Representation also recruited an international expert in the last quarter of 2006, through GCP/IND/177/NET: her ToR foresaw a supporting role on Farmer Field School (FFS) methodology to the three NEX projects¹². Preliminary analysis of the FFS indicated some key areas for improvement, in particular on levels of farmers' participation in FFS; also, an interesting work was initiated on the analysis of minutes of GMCs meetings, to assess social capital and knowledge development. The collaboration did not continue, for unknown reasons.
86. FAO never provided any operational or administrative support to the Project and only one supervision mission was conducted, by the FAO Representation.

¹² Dr Francesca Mancini, an Italian expert on IPM with a wide experience in India.

5 Project contribution to the development objective

5.1 *Outputs and outcomes/results*¹³

87. The report discussed above how the hierarchy used in the Project Logical Framework was incorrect by FAO standard LF structure, by calling “objectives” what should have been called “outcomes/results”. In this chapter, terms have been used according to FAO terminology and targets set-out in the ProDoc were used as benchmark.
88. The complete list of outputs as provided by the Project is in Annex 3. The discussion in this chapter will focus on outcomes/results.

5.1.1 *Result 1: About 3,000 Men and Women farmers are in a position to understand groundwater systems within which they are operating at about 650 habitations in Andhra Pradesh, in a scientific manner, by the year 2008.*

89. Outputs under this result included delineation of Hydrological Units and preparation of relevant baseline documents, establishment of rainfall stations and observation wells, training of staff and farmers in PHM and installation of Artificial Groundwater Recharge (AGR) structures. Achievement of this result required that farmers understood the seasonal occurrence and distribution of groundwater in their habitations and in the HU as a whole.
90. Actual results were that about 7000 women and men in 661 habitations participated fully in the training process, more than twice the planned target. In fact, the first module of PHM attained about 21000 farmers, but only those who participated in the full training of FWS seem to be able to master the system. Even among the latter, the level of understanding of the process, of its implications and on how to carry out measurements and record data varied according to their roles, namely the Groundwater Management Committee (GMC) volunteers, HUN members and Farmer Facilitators (FF). Indeed, it is suggested that the Project reports provide quantitative information of achievements in training according to the diversified capacity building process and achievements.
91. GMC volunteers in 555 habitations were made capable of collecting and recording rainfall data from 203 rain-gauges. They also collected discharge and water level data from 2119 observation wells (Annex 3, Table 3.1). While rainfall data was collected daily, the pumping data were collected fortnightly. These data were maintained in a register kept at the GMC office and also entered in the village display boards for information. To this sense, the GMC volunteers have developed enough competence to collect scientific data necessary for understanding the status of groundwater in their locations.
92. Members of 63 HUNs were trained to understand the occurrence of groundwater at the HU level. While they are continuously upgrading their skills, not all HUN members are yet capable of undertaking recharge estimation and Crop Water Budgeting exercises (CWB) with equal ease and these are conducted by the FF, usually under the supervision of the PNGO but also independently in some cases. There are currently about 1000 FF who are HUNs or GMCs members.
93. In terms of adaptation of scientific knowledge, the groundwater recharge estimation is calculated through a percentage factor of rainfall over an area underlain by a particular rock type following the recommendations of the Groundwater Estimation Committee report (GEC, 1982). This is a simple method which could be easily adapted for use by the farmers without deviating much from the basic principles.
94. In this respect, the Evaluation noted that since farmers were collecting water levels throughout the year from the observation wells, groundwater recharge estimation using “fluctuation

¹³ See Annex 3, main Project’s outputs elaborated by the Project, numbered in Tables which are referenced throughout Chapter 5

method¹⁴ (Groundwater Estimation Committee, 1984) should also be introduced gradually. The method may first be mastered at the PNGO level before passing it over to the HUN members. Recharge estimation by two different methods would help to further calibrate the accuracy of each method.

95. Further, since GMC volunteers are collecting rainfall, water level and discharge data throughout the year, it is recommended that in future they should also conduct a pre-monsoon water balance study and correlate the results with rising/falling water level to conclusively ascertain whether the total water balance of the HU is actually positive or negative. For this, HUNs would be required to conduct one more water balance study at the end of the Rabi season based on actual Rabi rainfall, crops grown and cropped area. This would help farmers to further assess their Kharif recharge and draft vis-à-vis rainfall¹⁵.
96. It is worth noting that GMCs and HUNs are in the position to sell the data collected, and this happened already. Interestingly, they agreed differential fees for each category of potential clients, including a category of organizations to which they will not sell their data for fear of unfair utilization (e.g. soft-drink industry). The Evaluation noted that this income opportunity is possibly over-estimated by HUNs and GMCs. Supporting agencies will have to contribute to the identification of potential clients for the data and should ensure that data collected is reliable and of good quality, to improve its market potential.
97. As demand side management does not prevent augmentation of the supply side, site specific artificial groundwater recharge (AGR) structures were introduced (see Annex 3, Table 3.2): a total of 48 structures including induced recharge through open well (7), check dams and percolation tanks (14) and induced recharge through gravity and injection wells (27) were constructed in the Project area as pilot schemes to rejuvenate the nearby bore wells having no or poor yield. The gravity fed injection well structures comprising of a dug-out pit (chamber) filled with filter materials and a borehole extending from its bottom to a considerable depth are usually constructed in a stream bed that provides the source water for recharge. This particular design was found quite effective for accelerated recharge. The Project should monitor the effective area of influence of these structures through a pilot study before recommending large-scale replication. A similar perspective is actually foreseen by the Andhra Pradesh Groundwater Department: the Project, if and when consulted, should stress the need for adequate attention to the technical aspects of construction and maintenance, including the identification of the owner(s) of the beneficiary wells who should commit to this task and be trained adequately.

5.1.2 Result 2: Hydrological database, using GIS platform, is developed for usage of Groundwater Management Committees, covering 650 habitations, by the year 2006

98. Outputs under this result included the development of a Geographical Information System (GIS) platform, staff training on GIS and Global Positioning System (GPS), scanning and digitization of geo-referenced information for production of thematic maps. Achievement of this outcome required investment in Information Technology and adoption of software packages along with capacity building initiatives for Project staff.
99. TST and Sumadhura were responsible for developing a suitable GIS platform for the Project. The team had a GIS consultant and was equipped with software packages like ERDAS, HRIS+, ARCVIEW and ARCINFO, which enabled them to digitize scanned maps and also transfer satellite imagery data information in a map. The Project produced eight thematic maps for each of the 63 HUNs with features useful for PNGOs, along with additional base maps, charts, reports, technical papers, etc. (see Annex 3, Tables 3.3, 3.4 and 3.5)
100. Each PNGO was provided with ARCVIEW software so that they could update/edit these maps provided by the TST as per their need. The PNGOs also maintained the database of their respective HUNs which were originally processed centrally at TST and later forwarded to the

¹⁴ In this method, recharge quantity is estimated from the total seasonal water table fluctuation multiplied by the contributing area and water release capacity (specific yield) of the aquifer.

¹⁵ Kharif is the main rainy season and Rabi is the shorter one.

relevant PNGOs for their use. The Evaluation agrees that PNGOs did not need to develop their GIS skills beyond a certain level and that digitization of base maps should be done centrally by an external service agency like the TST and supplied to PNGOs for their use. The PNGOs in their part should be able to upgrade these maps from time to time using the GIS packages they already have. The database can be managed using both GIS and other database platforms.

101. The Project invested as well in 9 multi-lingual “Information kiosks” with touch screen technology where all the processed data and maps of the 63 HUNs have been uploaded. Nine GIS Kiosk were installed at each PNGO level, so that farmers could visualise directly information about their HUs, crops, groundwater balance and the like. The Evaluation team did not see any Kiosk installed in rural areas, thus it could not assess directly how farmers felt about it. Although the concept is attractive and it could be potentially a very powerful tool, the Evaluation had doubts about its appropriateness. It suggests that more careful testing and a proper cost/benefit assessment of its actual potential as decision-making tool would be necessary before any up-scaling be envisaged.

5.1.3 Result 3: About 6,500 farm families enabled for adoption of alternative agricultural practices suiting the availability of groundwater, by the year 2008.

102. Outputs under this result included the organization and running of CWB, staff and farmers training through Participatory Technology Development (PTD) and FFS and reduction of external inputs in agriculture. Achievement of the result required the development of appropriate FFS curricula, introduction and acceptance of CWB exercises, demonstration and adoption of Low External Inputs Agriculture (LEIA) technologies.
103. As mentioned above, in 2004-05, the Project worked with farmers through the Participatory Hydrological Monitoring developed during the previous RNE-funded phase. In 2005, 20 APFAMGS staff (15 men and 5 women) from all PNGOs were trained in FFS-IPM (Integrated Pest Management) in a season-long training organized by the FAO Representation for all NEX projects staff.
104. This first group of trainers launched a process of integration of PHM concepts in the FFS model. During 2005-06, under the close guidance of World Education, planning/preparatory sessions preceded each FFS-CWB session in the field: these were organized either at the PNGO office or in the farmers’ fields and farmer participants were also invited. The purpose was to discuss the content of the subsequent session, identify appropriate methods and materials (models/posters) and develop a session guide. The WE team travelled extensively to the field to assist the PNGOs. As a result, capacities of all the PNGO staff were adequately built by the end of that cycle. At this point in time, the process was still called Crop Water Budgeting FFS: FFS-CWB.
105. In 2006-07, the Project brainstormed ways to optimally utilize the staff capacity. A “multiple learning cycle” was identified as a good strategy to reach large number of farmers and increase farmers’ ownership of the process, which was called Farmer Managed Groundwater System (FFS-FMGS). As in the previous year and in the same type of locations, PNGO staff and farmer participants who were potential Farmer Facilitators participated in preparatory/planning meetings before each FFS-FMGS sessions, to discuss the existing session guides and explore ways to make content and methods more user friendly for the farmer facilitators. PNGO staff would then facilitate FFS-FMGS sessions at the hydrological unit level (first cycle). Farmer participants were drawn from each of the habitations in the HU. After each session, participating farmers organized a FFS-FMGS session in their respective habitations (second cycle), with the aid of the revised session guide, within 10 days of the last first-cycle session. PNGO staff participated in the second cycle as observers and mentors to the farmer facilitators and used the quality assurance checklist to give feedback to the farmer participants. The model was fine-tuned and systematized and became the FWS model in 2007-08, illustrated in detail in Figure 2¹⁶.

¹⁶ See Annex 4 for the sequential adaptation of the approach to FWS.

Figure 2. Characteristics of a typical Farmer Water School

▪ In a Farmer Water School, participants discuss groundwater concepts, availability and management, the impact on crop growth, roles of institutions on sustainability and gender equity. A major element of the FWS is the Hydro-Ecosystem Analysis (HESA), which is a decision-making tool for groundwater management. In HESA the process of decision-making is supported by observations of recharge factors (amount of rainfall, surface water, rock and soil formation) and discharge factors (number of bore-wells, pumping hours/days, average discharge), an analysis of the observations, presentation of the analysis and discussions, based on which decisions are made on crop plans and management of groundwater. This is the same sequence used for Agro-Ecosystem Analysis in the classical FFS approach.

Objectives

▪ The objectives of the FWS are to empower farmers with knowledge and skills to measure recharge and draft of groundwater, sensitize farmers on the need for collective action, sharpen farmers' ability to make critical and informed decisions on crop plans and sensitize farmers on new ways of thinking and resolving pertaining issues

A typical FWS

▪ A typical FWS follows the full hydrological cycle – in AP from June – May. The FWS comprises 25 to 30 participants who meet once every 15 days. The primary learning material is the Hydrological unit and the farmers' own field. The FWS is usually close to the farmers' own plots. Participants learn together in small groups of five to maximize participation. There are three activities that recur in the FWS – HESA, a special topic, an LTE or STE and a group dynamic activity. In the LTE/STE participants compare farmer and improved practices. A ballot box exercise is also part of a FWS, in which pre- and post-tests are conducted to test the increase in knowledge of participants. A Crop Water Budgeting workshop is a major session held at the start of the rabi season. Each FWS also holds a Field Day during one of the last sessions, to present to other farmers what they have learnt in the FWS.

Involvement of Institutions

▪ GMCs are involved in the FWS preparation meetings to determine the needs, select participants and discuss logistics. Farmer participants share their learning from each FWS session at GMC meetings. The HUNs normally organize the field day and have also started taking over the implementation of FWS.

Outcomes

▪ As a result of farmers' participation in FWS, farmers become experts in groundwater management. As a result of the received training, farmers become trainers in PHM. Through their involvement in building-up local institutions they as become organizers, planners and advocates.

106. As a result of the multiple cycle approach, the Project implemented 878 FFS and trained almost 1700 facilitators, 33% of whom were women (See Annex 3, Table 3.6). The Evaluation, after discussions with Project staff and facilitators themselves, considers that about 1000 facilitators will be capable of continuing FWS implementation. Through the same approach, the Project has reached an impressive number of farmers in the four FFS-FWS cycles that were implemented, in the order of 16,000 farmers, 38% of whom were women. The Evaluation has been unable to extensively observe analytical skills of FF in ongoing sessions, apart from one. It was observed that the original AESA tool could receive more attention to ensure farmers use it to make decision for IPM.
107. As part of the FWS curriculum the Project developed a range of Short-term (STE) and Long-term Experiments (LTE), all of which are elements of Low External Input and Sustainable Agriculture. LTEs included vermicompost, green manuring, bio-fertilizers, mulching, border crops, proper spacing, inter-cropping, use of botanical extracts, alternate furrows, ridges and furrows, System of Rice Intensification (SRI), and improved irrigation methods (drip, sprinkler, check basin). STEs included seed treatments, insect traps and zoos, preparation of botanical extracts, vermiwash method, water holding capacity and nutrients uptake.
108. It is also worth noting that through the LEIA FFS, farmers could maintain the same cropping patterns by modifying cultivation practices and reducing the cost of external inputs, i.e. by

- conservation of irrigation water through use of mulching, of Farm Yard Manure (FYM), introduction of sprinklers and drip irrigation, etc. There seemed to be good adoption rates of many practices, including of SRI and new irrigation methods. As a result of the groundwater focus of the Project, however, less focus was given to a more holistic approach to NRM, also looking at agro-biodiversity, land, drought, watershed and conflict management: these areas will require more attention in future up-scaling of the approach.
109. A key element of the FWS is the Crop Water Budgeting exercises: through these, farmers assess the groundwater balance at the end of Kharif season and water requirement for proposed cropping pattern of Rabi season at HU level. This ensures that the geographical scale of analysis is appropriate and that well-trained facilitators manage the exercise. CWB are strictly time-bound, as they have to be carried out in due time before the Rabi season starts: information about intended cropping patterns is collected at habitation level and the CWB results are then reported back at habitation level, with both GMC members and wider population. This helps in making individual decisions on which crops to grow and respective acreages based on the availability of groundwater, with beneficial impact on the sustainable use of a commonly shared resource.
 110. The Evaluation considers that the methodology for computing crop water requirements is appropriate: it uses the depth of water (volume) required for different crops per unit area, known as “delta of crops”, as recommended by ICAR for the given agro-climatic zone. The exercise could be further refined by developing a factor that relates pumping hour of a typical bore-well with the volume of water it supplies to their plots. This would help farmers understand the total number of pumping hours required to achieve application of the desired depth (volume) of water to a particular plot and crop. Also, it should be noted that the CWB exercise depends for its validity, on the range of variation of the actual Rabi rainfall from its ten years average. This and other type of information is produced by organizations like ICAR. It will be important that provisions be taken in future to ensure the continuous supply of useful inputs from ICAR and others to the HUNs.
 111. Data provided by the Project indicate that the number of participants in the CWB exercises increased substantially in the second year to stabilize in the third: approximately 7000 people in 2005 and 12000 in 2006 and in 2007, participated in the CWB, 33% of which were women. Participants in 2006 and 2007 represent about 50% of the total number of groundwater users in the Project districts. Out of the total participants, about 82% in 2005, 74% in 2006 and 70% in 2007, modified their cropping pattern as a follow-up to the CWB exercise. Consequent changes in area cropped are shown in Annex 3, Figure 3.7. However, a smaller but increasing percentage of participants (20%, 39% and 44% respectively) adopted specific water-saving techniques after the CWB. This level of participation and adoption are consistently higher than targets initially set in the ProDoc.
 112. The annual groundwater balance depends upon the rainfall and the water extraction during the year. It has to be reminded that a good rainfall year goes a long way in compensating groundwater levels, both because it allows larger infiltration and it reduces irrigation needs. At the time of Project start-up, most of the HUs registered negative groundwater balance, also due to a long sequence of drought years. Over the past three years, balances have stabilized and improved in all Project HUs. A groundwater balance comparison between 2006-07 and 2007-08 of 58 HUs showed decreasing, no change and increasing trends in 9%, 34% and 57% of HUs respectively (see Annex 3, Table 3.8 for data on four HUNs). Whenever interacting with the Evaluation, HUN and GMC members were eager and proud to show any positive groundwater balance in their HUNs. While farmers were encouraged to monitor groundwater levels on a two week basis as a minimum, in practice, particularly for localised aquifers, daily readings proved necessary to pick up recharge responses to rainfall events: this was important to establish the magnitude of the recharge response and the rate of recession so that farmers could judge available resources in their irrigation planning.
 113. An additional interesting feature of the CWB was the inclusion in the calculation of the expected local market price, which allowed taking into account the economic dimension. In this

respect, information produced through the CWB, is highly relevant also for non-groundwater users and particular attention should be paid to the poorer and marginal people, farmers and non-farmers, who could benefit directly or indirectly of some of the LEIA techniques. Although the Project did not produce detailed economic analysis yet at farm level, the Evaluation was told by several farmers in different locations that their income had increased as a result of the Project interventions, particularly because less inputs were used and by shifting to higher value crops. The Project could develop and incorporate tools that allow the FWS participants to assess the effects of their decisions in terms of farm economics.

114. The Project has calculated the reduction in the use of inputs through its work. The analysis was conducted on a number of inputs: on inorganic fertilizers, both directly and indirectly through the use of leguminous crops and vermicompost; on water consumption through reduced pumping and water-saving practices; and indirectly on decrease in inputs through changes in cropping patterns. Some of the information is rather striking; however the Evaluation raised doubts on the methodology used for these calculations, including indicators, assumptions, baseline data, which were not answered really satisfactorily. Also, legitimate doubts exist about the extent to which changes in cropping patterns can be attributed exclusively to APFAMGS work rather than other programmes or policies. More clarity on these aspects should be shed in the near future by the impact evaluation on APFAMGS that the World Bank-India was still finalizing at the time of the Evaluation.
115. Last, the costs of the FWS over time show dramatic decreases from approximately Rs. 1,500 per participant in 2006/7 to Rs. 122 per participant in 2008/9, as shown in Figure 3:

Figure 3. Changes over time of FWS costs

	2006-07: Jun-May	2007-08: Jun-May	2008-09: Jun-Dec
Costs	13,845,770	3,614,950	636,100
FFS	333	314	174
FFS Participants	8,916	9,460	5,220
Costs per FFS	41,579	11,513	3,656
Costs per FFS participant	1,553	382	122

116. Various strategies were put in place to attain this, including:
- Moving from individual FWS kits to group FWS kits;
 - In multi-level cycles, the FWS sessions were organized at the habitation level. In 2007-08 and 2008-09, efforts to increase HUNs ownership of FWS resulted in mobilization of local resources for organizing the sessions. This also reduced travel costs.
 - More prudent allocation of budgets for LTE and STE. FWS farmer participants saw the relevance of the experiments and contributed to the setting up of experiments.
 - Re-use of various NFE materials (posters, charts, models, etc.) from previous years.

5.1.4 Result 4: Community based institutions established for alternative management of groundwater resources with equal representation/ participation of men and women, covering about 650 habitations, by the year 2008

117. Outputs under this result included the set-up and strengthening of Community Based Institutions (CBIs), gender mainstreaming and the establishment of functional linkages among local and government institutions. The result would be achieved through the set-up of solid and sustainable CBIs well connected to external institutions and by women's active participation in them.
118. An interesting feature of the Project was the use of Kalajathas to enter new habitations. This is a traditional very powerful theatre show that illustrates the problems small and marginal farmers face in their everyday lives, such as drought, pests, failed crops and how the Project can help in providing solutions. The issue of farmer suicides was also part of the piece the Evaluation team

- attended. The use of these shows as an entry activity in the habitations, and its repetition on a yearly basis, can help substantially in diffusing information about the Project across all people in the habitations and open up the opportunity for bringing attentions also of farmers without access to groundwater, to improved techniques and cropping patterns.
119. The project has so far established 555 GMCs at habitation level and 63 HUNs at HU level. These Community-Based Institutions (CBIs) occupy a central position in APFAMGS approach, to collect data, make decisions and implement actions aimed at the sustainable management of groundwater in the project area. The Evaluation had evidence of the strength of a sample of GMCs and HUNs which were able, among others: to independently take decisions regarding the management of groundwater resources; to mobilize resources for their members from government programmes and to take up other activities of interest to their members such as marketing.
 120. In a number of cases, GMC members were members of Panchayat Raj Institutions (PRI) or were elected to these after joining the GMCs: these links allow access to funds and resource mobilization for community development work, which raises the potential role GMCs can play in local development. This will require as well more transparency and inclusiveness of GMC membership.
 121. The Evaluation also noted that while HUN members are at the forefront of developing activities thanks to links with external institutions, GMCs tend to remain in the background. Nevertheless, their role in data collection of all kinds, in reaching out at farmers of different levels, in triggering a demonstration effect for LEIA etc., is absolutely vital. Care should thus be taken to further strengthen the GMCs which are the building blocks of the demand side management concept. As they are informal institutions, they will need sustenance through capacity building on participatory and inclusive processes and on developing linkages with other village institutions such as Self-Help Groups (SHGs), PRIs, etc.
 122. The Project also supported the HUNs in the attainment of their legal status. A team of consultants assessed closely with stakeholders the needs of all HUNs and provided advice on the best legal status that meets their operational and strategic requirements. All 63 HUNs were legally registered by 2008. This was a key step in ensuring their sustainability. More remains to be done through innovative financial systems such as revolving funds¹⁷ for increased financial sustainability and training according to requests, also for GMCs, on topics such as Farming as a Business (FAAB)¹⁸, marketing, post-harvest management, value addition through processing and facilitating market linkages for HUNs. APFAMGS could explore these tools to assess their suitability to the local context and adopt or adapt the, if considered adequate.
 123. Development of local institutions is a long process. The Evaluation considers that a key element for the achievement of this result was the inclusion of Partner NGOs (PNGOs) with a long history of work in their districts and who had developed positive rapport, credibility reliability and reputation within the communities.

¹⁷ Revolving funds have been successfully used in other FFS programmes by local institutions (i.e. FFS apex organisations) to facilitate the expansion of FFS through a revolving system. The system works as follows: a loan to cover the learning sessions of one FFS is provided to a FFS; during the season the FFS develops commercial activities to pay back the loan at the end of the season or in the course of the next season. Once the loan has been repaid, another FFS can benefit from the same fund. This revolving system can also be used for enterprise development among FFS groups and even for individuals. In addition the system could be integrated in Payment for Environmental Services (PES) schemes. More about revolving funds in FFS can be found in the FFSnet database (<http://www.infobridge.org/ffsnet/>).

¹⁸ FAAB is a training that generates understanding among trainees about farming as an enterprise that can generate profits as well as feed the family. The training develops a framework to facilitate farmers' understanding of farming as a business, which considers input costs, labour costs and gross income from the sale of their production, as well as discussing supply and demand. This framework is then used to add marketing, saving & credit principles and the plant-to-meet-market concept. In addition it covers understanding of how collective actions contribute to increased efficiencies and profits, and that saving for future investments is more beneficial than borrowing at high interest rates.

124. Another key element of success was the Project determination to achieve gender equity in the CBIs and work for the empowerment of women in the communities (see below)

5.1.5 Other outputs

Publications and technical papers

125. Documentation and communication activities of the Project seem to have been highly effective. A number of attractive technical papers and publications were produced (See Annex 3, Table 3.9), on groundwater management, economic analysis of groundwater usage, nutritional value of indigenous vegetables, etc. Most were good quality, with some room for improvements. For example, misuse of the terms Objectively Verifiable Indicator (OVI), performance indicators and the like were noted in APFAMGS technical papers on Monitoring and Evaluation, clearly stemming from the same confusion that led to the incorrect set-up of the Logical Framework discussed above. The Evaluation could not assess their distribution and use, though their easy access through APFAMGS web-site facilitates undoubtedly their consultation by different types of users.
126. Almost all major issues were illustrated through very good power point presentations and the Project was able to make use of these communication materials in several workshops.
127. One interesting publication was the Data Products Catalogue published in 2006 and updated in 2008 that illustrates the type of water-related data collected by APFAGMS at community level, for the sake of universities, research projects and Government organizations. It could be improved by providing the geographical coordinates for the wells, to facilitate their identification in future.

Food and Nutrition Survey

128. Following a suggestion by FAO, the Project carried out in 2005/06 a preliminary Food and Nutrition survey at habitation level by PNGO staff. Although data have to be re-run to produce usable information¹⁹, the assessment was a first praiseworthy attempt at assessing who and how many are the food-insecure people at habitation level, including elderly, mentally and physically challenged persons, women-headed and landless families and the like. A brief analysis of the overall food production and security situation was also included. This exercise led to a Re-survey in 2006-07 conducted by GMC/HUN/farmer facilitators at family level. This collected information on crop, food purchased over the year and benefits received from Government's schemes. The analysis of data collected raised awareness on what were the crops and the themes that required more development and informed the curriculum of the following Farmers Water Schools.
129. The Evaluation considers that the tool is very valid and it is worth repeating the assessment three years later, to compare results. Weaknesses identified could be easily solved: the data in the current sheets have to be re-run and corrected, as already mentioned; the method for calculating the number of food insecure, should separate those unable always to procure their own food (aged people, visually, physically and mentally challenged) from those at risk of food insecurity (women-headed, landless, marginal farming families); a proper refreshment training should be conducted, to ensure the harmonisation of approaches to measure food insecurity and calculation skills; the questionnaire should include information on production, sales and purchase to provide the complete household food balance; the sampling framework could be stratified and reduced by using sample-size calculation at 95% of confidence with 10% interval. It might also be advisable to simplify the template used for describing the food-security state of habitations: it would be more effective with more livelihoods and food insecurity data and less generic descriptions.

¹⁹ A mistake in calculating percentages of food insecure out of total population produced wrong values of food insecure population.

5.2 *Gender issues*

130. Gender mainstreaming and equity in women's participation in Project activities featured strongly in the ProDoc, at results (specific objective) level. Also, mention was made in the Project's rationale of women's role in water management and related decision-making for family welfare; women were clearly included among participants for training and capacity building and targets of 50% of women's presence in GMC were clearly stated. Provisions were also made in the Project budget for recruitment of a Gender consultant among TST staff.
131. The Evaluation had clear and strong evidence that the commitment in the ProDoc to women and gender mainstreaming was acted upon systematically and with determination and that Project staff were very aware of the positive benefits of this approach. In their words: "working with women was the key element of Project's success" and "mainstreaming women allowed reaching out to larger population groups".
132. The project systematically recorded gender-disaggregated data: women were on average 39% of participants in training events excluding FFS, with upper peak of 49% for gender-sensitization trainings and minimum of 19% for Stream Flow Measurement training. In FFS and FWS, women were 38% of participants. Records also indicate that women were 43% of participants of events such as kalajathas. Women's presence in CWB, World Food Day and World Water day was in the range of 33%.
133. Figures above are telling and prove also that the Project managed to tackle both practical and strategic women's needs. The Evaluation could assess directly the level of enthusiasm, competence and empowerment of women facilitators and members of GMCs. These were moving and inspiring. Women of all ages were able and confident to illustrate complex concepts of water management and state how their profile in the communities and families had changed thanks to the Project's training efforts. In other words, the human capital of women participating in APFAMGS was strongly enhanced and developed through their involvement in training sessions, data collection, membership in GMCs and HUNs and for some, facilitators' work.
134. Also, women's greater influence at family level could be seen by the diversification of cropping patterns towards home consumption crops, including vegetables and pulses and cereals with higher nutritional value. Women are playing a key role with the Project support in maintaining agricultural bio-diversity, which should be an area for future work.
135. Among project staff, in spite of the clear commitment of the Project to gender equity, women were a minority²⁰, possibly in the order of 10-15%. Different reasons contributed to this, mainly related to cultural issues. In 2006, Project staff attended a two-day training by a FAO senior gender officer on gender issues in Bapatla, AP, with staff from the other NEX projects. The TST had a Gender consultant among its staff with some gaps in presence due to staff turn-over. The same applied to PNGOs: all had Gender Facilitators among their staff, with gaps in presence due to staff turn-over. Average participation of female staff in staff training events was also in the range of 31-32%, with upper peaks of 45% for Gender Assessment Studies and lowest being no participation at all in Market Linkage course and international training on Water Management.
136. The Project produced two long brochures, one on Gender and Water, and one on Gender and Technology and one booklet, illustrating local vegetable species with their local and Latin names and their use and preparation.

²⁰ Detailed figures were not provided to the Evaluation; though a rough estimate is that 10% at most of professional staff were women, with roles of gender specialist or field staff. No women were among NNGO, PNGO or TST directive staff.

5.3 Social inclusion and sustainability

137. The ProDoc mentioned “vulnerable sections of the society” and principles of participation “irrespective of economic status, caste, creed and religion” in the identification of the Project’s target population. In this respect, the strong tradition and commitment of all PNGOs to alleviate social exclusion was a relatively good guarantee that Project staff at community level would have paid attention to social exclusion mechanisms.
138. However, as mentioned above most participants were by default groundwater users, who usually are small but not marginal farmers, with bore-wells in their plots. Although they could be from Scheduled or Backward Castes, they would not be the most marginal farmers who depend only on rain for their cropping activities. On the other hand, most FAO projects, with the exclusion of emergency interventions, address farmers with a minimum of assets and resources and who are active in agricultural production.
139. Interestingly, the Project prepared a paper on “APFAMGS and Human Rights” where it developed the concept of Right to water, although its diffusion was not assessed. Another similar line of work was the addition of HIV/AIDS as a topic in the work with communities, after a request from these to get information and guidance.
140. The Project focus on groundwater users clearly influenced the social composition of the Community Based Institutions, although efforts were made to include representatives of less favoured groups. A detailed assessment of 555 GMCs and 63 HUNs membership would be necessary to answer clearly such a question, which was out of the Evaluation scope.
141. The GMCs met by the Evaluation looked strong and cohesive, which depended most probably on the homogeneity of members and bodes well for their own future sustainability, as long as they will have a common interest. The degree of HUNs social heterogeneity looked higher, which may be an added value at this level of aggregation in terms of capacity to capture different types of support and mobilize resources.
142. The Evaluation considers that to some extent, the intrinsic “weakness” of the Project working with a rather homogeneous group of producers with some resources, allowed it to develop successfully a complex methodology for the collaborative management of a common property resource. This might have been impossible with resource-less farmers and more diversified groups with different interests.
143. This raises two main challenges: first, it might be useful that PNGOs and BIRDS start assessing the unintended effects of the Project on marginal non-participants, e.g. men and women who would sell their labour to ground-water farmers and who have to look for alternative work opportunities as labour requirements seem to have decreased with LEIA technologies; second, how to adapt the APFAMGS approach and method to tackle other natural resources used also by poorer farmers and by different groups, in particular rain-fed and asset-poor farmers.

5.4 Environmental impact and sustainability

144. The rationale for the Project stemmed from a clear environmental and resource-scarcity problem: decreasing groundwater level due to excessive extraction and diminishing rainfall. The theory underpinning the Project was that action on demand-side management through demystification of science to allow users understand the groundwater cycle, was more effective than other types of interventions.
145. Environmental sustainability is articulated more in detail along the following elements:
 - reducing groundwater extraction through water-saving cultivation techniques can contribute to raise the water table sufficiently to restore water levels in dug wells for both irrigation and drinking water purposes, the latter with due attention to safety and hygiene concerns;
 - water table at a height that does not cause water logging but is conducive to improved conditions of soil and vegetative cover, both important elements of agricultural eco-systems;

- both reduced pumping head (higher water level) and pumping hours have a beneficial reduction effect on the consumption of electricity for water pumping with wider positive impact on national environmental and economic accounts;
- introduction and diffusion of environmental-friendly cultivation techniques: through the adoption of IPM and AESA concepts, farmers have taken to large scale use of Farm-Yard Manure and vermicompost as fertilizers and use of bio-extracts and inter-cropping for pest-control;
- enhancement of agricultural bio-diversity by enhancing the use of minor crops for home food-consumption and crop-based pest and weed control methods.

146. In conclusion, Project activities have contributed to improve the natural capital in the areas of intervention: increasing numbers of farmers adopt water-saving cropping patterns, thus decreasing extraction of groundwater, which in itself will be conducive to the improved state of the vegetative cover. Farmers interviewed all claimed strong reduction in the use of and expenditure for external inputs. This in addition should lead to improved environmental conditions by decreasing sources of pollution and to improved health conditions of farmers in general. The diffused awareness about positive effects of sustainable management of Common Property Resources should also be conducive to a wider diffusion of environmental-friendly attitudes.

5.5 Sustainability: economic, technical and institutional

147. The perspectives of sustainability of the project's results can be assessed in economic, technical and institutional terms. Economic sustainability at farmers' level is linked to the economic costs and benefits of the cropping patterns that were introduced, as well as by the reduction of financial risk that the lower use of external inputs should entail. Current evidence shows that farmers find a good economic return in adopting new crops and practices, thanks to a reduction of inputs costs, including hired labour, to somewhat improved yields and to better prices for newly introduced crops over those previously cultivated. Clearly, this will be heavily influenced by grain and food price policies, over which the Project has no control.
148. In terms of technical sustainability, there are few doubts that appropriate technical knowledge has been developed and diffused and it is widely owned by participants. The rates of adoption of water saving practices and of modification of cropping patterns as follow-up to CWB exercises are encouraging and very good respectively. Dependency on external inputs such as improved seeds will still be a challenge, but again, this is rather beyond the Project's scope of influence.
149. The perspectives of sustainability for Community Based Institutions are positive: GMCs and HUNs are young and thriving institutions and many have a good potential to develop into fully adult and solid organizations. The existing plans for a State level HUNs platform is good news for their future and for their access to resources from external sources. Both HUNs and GMCs have developed confidence to ask for services from the Government and are at the same time recognized as "easy to reach and to work with" interlocutors for Government service providers.
150. GMCs require more support, also in terms of using data collection and sale as a reliable source of income. Overall, strong social capital has been developed and should be a lasting asset for the participating communities. This was also facilitated by the involvement of well grounded NGOs as implementing agencies, which were already respected and will remain close to the communities for the foreseeable future.
151. In order to strengthen their sustainability, both GMCs and HUNs require expanding their membership, though possibly more at the level of HUNs, to ensure wider ownership and fully transparent management processes, in particular in relation to financial autonomy and sustainability. Also, their role as service demanders and providers in relation to the Government and to Panchayat Raj Institutions should be better defined.

152. A similar process developed at the level of the executing and implementing agencies: through the Project, the Nodal NGO and the PNGOs have created a formal partnership network that will give them more visibility and credibility, also as service providers for GoAP and other donors. Here again, a wealth of knowledge and experience has been brought together and has created synergies for all concerned.

5.6 Diffusion of results beyond project boundaries

153. The Evaluation found good evidence of how the APFAMGS model was diffused through international events and participation in programme formulation outside AP, as well as of the appreciation of the Project model as a reference example by external partners. Also, some concrete proposals were already formulated, although none had been approved yet at the time of the Evaluation. The most important examples of up-take of the APFAMGS model are briefly described below.
154. The Government of Andhra Pradesh is playing a key role in up-scaling the concept and experience of APFAMGS through different initiatives that are informed to different extent by the Project's methodology and experience. These are: the Farmers' Schools Programme and the AGR installation programme by the Department of Agriculture; the Community Based Tank Irrigation Project with World Bank funds by the Department of Irrigation; and the Watershed Development Programme by the Department of Rural Development.
155. The Project organized and hosted in August 2007 in Hyderabad, an International Learning Workshop on demand-side management of ground-water, entitled "Cross-cultural Perspectives on groundwater based institutions": seventeen countries attended, and some of these (Bhutan, Democratic Republic of Congo, Philippines, Tunisia and Yemen) have given some follow-up to the discussion and learning process triggered by the workshop. In Bhutan for example, the concept and experience of APFAMGS was integrated in the national Watershed Master Plan.
156. Other proposals have been formulated and submitted respectively to COOPERNIC, to the GEF²¹ and to the Indian State of Orissa. In these, the APFAMGS structure is used as a model for management and outreach to a high number of districts and communities, with objectives expanded to include dryland farming and coping strategies for climate changes.
157. ACIAR/CSIRO²² Land and Water and the University of Ballarat are planning to initiate by the end of 2008, a research programme aimed at how to address impacts of watershed development in AP and in North West Victoria State in Australia. Other Indian scientific institutions are also involved. The upcoming programme has developed already close collaboration with APFAMGS, which is considered a model for intervention. APFAMGS staff will contribute directly to programme implementation in the role of consultants. Exchanges also took place, facilitated by the World Bank, India and HQ, with the Tunisian Government to "export" the APFAMGS experience to this country.
158. In this respect, the Evaluation suggests that the Project should upload all published and grey FFS/FWS resource materials on the FFSnet database (<http://www.infobridge.org/ffsnet/>) for sharing these with the global FFS community, including
- adding BIRDS and partner NGOs as FFS organisations;
 - references and contacts of trainers, facilitators, resource persons, etc.;
 - outputs such as publications, videos, articles, etc.
159. FAO has been working to prepare a project proposal to be submitted for co-funding to the Global Environment Facility (GEF). The proposal was being channelled through the Ministry of Environment and Forests, with multiple partners including GoI, GoAP, WB and BIRDS. Its

²¹ COOPERNIC: the European Alliance of Independent Trading Companies; GEF: The Global Environment Facility.

²² ACIAR/CSIRO: Australian Centre for International Agricultural Research/Commonwealth Scientific and Industrial Research Organization

focus is “Climate Change GEF Focal Area; Strategic Program Climate Change Adaptation: India Sustainable Land and ecosystem management programme”, with a target of 650 habitations, with the aim of being a “knowledge based intervention for sustainable Natural Resources Management and adaptation to climate change”. The Evaluation considers that such a project should mainstream the experience developed in the past four years by the three NEX projects: its added value would be in widening the network of partners, in building upon solid experience with groundwater users, surface irrigation users and rain-fed farmers and would contribute to spread FAO’s experience more widely.

160. Last, the Evaluation considers that there is wide scope for mainstreaming the APFAMGS experience in FAO’s normative and operational work: a manual on FWS should be prepared, to facilitate up-scaling in other countries; potential project users are many, ranging from the Special Programme for Food Security to the Land Degradation Assessment in Drylands (LADA) project²³.
161. In relation to adoption and up-scaling of APFAMGS model, the Evaluation wishes to call for caution about the potential for adoption of any model: although many organizations including government may claim that they are implementing FWS or CWB or other key features of APFAMGS, in practice any programme will be implemented under different circumstances, possibly with different focus and for sure with different levels of commitment and capacity. This may entail very positive results, but also may lead to loss of focus and “adjustments” to the methodology such as short-cuts in staff training and the like, that would undermine its potential. Thus, it would be highly desirable that APFAMGS crystallized its own experience through the elaboration of a model of intervention based on PHM, FWS, CWB, GMCs and HUNs, etc. Emphasis should be on the key concepts and tools that are the foundation stones of APFAMGS success, including among others, locally well grounded NGOs, gender mainstreaming, adequate technical inputs and flexibility in project management.

5.7 Overall effectiveness of the intervention

162. The Project has been successful in meeting its challenges and achieving expected results. Farmers understand the seasonal occurrence and distribution of groundwater in their habitations and in Hydrological Units as a whole and are able to estimate seasonal recharge, draft and balance. Farmers are capable of collecting and recording rainfall and associated groundwater data. They master the concept of groundwater as a Common Property Resource and are willing to manage it for the collective benefit. This was achieved through strong focus and investment on capacity building and through the process of demystification of science. Both proved to have a strong empowering effect on participants.
163. The Project work on the supply side of the groundwater resource through AGRs was a successful action to improve groundwater availability. The model can be usefully replicated in similar environmental conditions under any type of intervention.
164. Farmer Water Schools are a platform for groundwater farmers, men and women, that facilitates experiential learning of different cultivation techniques and cropping patterns linked to the use of the groundwater resource. This was achieved through intensive capacity building and progressive development of the FFS concept into the FWS, building on the principles of Non Formal Education.
165. A key element in the FWS is the Crop Water Budget session at the start of the Rabi season, particularly as a decision-making tool for farm families to adopt alternative agricultural practices, suiting the availability of groundwater. This innovation to the FFS approach is also a key decision-making tool at community level and can be considered an important element

²³ LADA funded by GEF, implemented by the United Nations Environment Programmes (UNEP) and executed by FAO, could inform both its second third components with the APFAMGS experience of data collection at community level

- towards increased social and natural capital. It is also important in light of future expansion and up-scaling of the FWS approach.
166. In addition, training on LEIA, inputs from the Bio-agents production centre, documentation of best agricultural practices and Farmer Training Teams, all led to reduction of external inputs, with beneficial consequences on the environment and the health of the rural population.
 167. Gender mainstreaming and women empowerment were effective and the Project proved that it is a possible achievement even in conservative cultural conditions. The systematic and numerically significant involvement of women in Project's activities brought into the learning process different perspectives, needs and knowledge and was a key element for the Project's success.
 168. The local institutions and platforms set up for common decision making at the level of the hydrological units are thriving bodies that can prove very beneficial for their members and the wider population. There is good evidence that social capital was created and developed at the different levels.

5.8 Project current and potential impact

169. The project lacked a real development objective, as its Goal was in fact formulated at the level of specific objectives. The implicit development objective (Goal) should have been formulated as follows:

Groundwater users, men and women, and potentially also rain-fed farmers, have improved their livelihoods, are managing sustainably the commonly shared water resource and can cope better with climate changes and other external threats.

170. The Evaluation has shown that this objective was achieved: groundwater users, men and women, produce knowledge and master decision-making tools that allow them to make better informed decisions on their cropping patterns, while using groundwater more judiciously. Their incomes have improved, by reduction in the costs of input, some increase in yields and incipient improved marketing strategies. Through the learning process, men and women have been empowered socially and individually; through the newly created local institutions, livelihoods improvements can be expanded and consolidated. These achievements, in particular on knowledge and empowerment, are sustainable and will allow participants to cope better with external threats.
171. The Evaluation considers that the APFAMGS team has the potential to develop further its method and approach and widen its scope of intervention to include more marginal farmers practicing only rain-fed agriculture and tackle the sustainable management of other natural resources such as surface water, land, trees and forest.

6 Conclusions and Recommendations

6.1 Conclusions

172. APFAMGS was a very successful and innovative project that achieved all its targets and intended results. The Project aimed at tackling the scarcity of groundwater, which is both an environmental and livelihood problem, by demystification of the scientific approach and of the terminologies of crop and water management, thus empowering farmers through knowledge sharing, without compromising on the basic scientific principles of sustainable management.
173. The methodology of the intervention proved to be correct, including its focus on demand-side management of groundwater and the use of NFE and FFS as tools to develop capacities, build institutions and mainstream gender equity in its work and results.

174. Project management was strategic, rigorous and flexible. The adoption of the NEX model in this case was highly successful. Factors contributing to this were among others, the choice of well grounded and credible NGOs as executing agency and partners, the high professional level of consultants supporting the NGOs on technical and methodological issues, the commitment of all partners, including FAO.
175. Prospects for environmental, social, institutional and technical sustainability of the Projects' achievements and results are high. Economic sustainability of the innovations proposed will depend to a good extent on national and international food and energy price policies; nevertheless, farmers should be equipped with knowledge and decision making tools that allow them to cope with external threats to a good extent.
176. FAO has played a useful role in APFAMGS, by providing guidance on methods and techniques and in giving credibility and visibility to the Project. Its future role should be of advocacy for policy mainstreaming of the Project's approach, methodological and advocacy support for up-scaling and diffusion to other States in India and elsewhere. In addition, should there be a further expansion of the Project's scope of intervention as envisaged by the Evaluation, FAO's continuous involvement along the lines followed so far could prove equally beneficially and constructive.

6.2 Recommendations for the short term

177. Recommendation 1 is addressed to FAO: the Evaluation has shown the good results of APFAMGS and that it would be worth maintaining the same structure operational to fully utilize the current budget balance. It is estimated that available balance could last for about six months of Project operations.

Recommendation 1) To FAO

The Evaluation recommends that the project duration be extended to March-April 2009, within current budget availability.

178. The following recommendations for the short term are addressed to the Project. With basis on the analysis, the Evaluation considers that the immediate future period could be usefully employed to improve and or complete on-going activities, as well as for producing key outputs.

Recommendation 2) To APFAMGS

The Project should develop a formal and crystallized APFAMGS model of intervention, to make it available for replication elsewhere as a complete approach and for informing national policy for the sector. Attention should be focused on the key elements required for the approach to be effective. The model could foresee a phased approach and/or modular form, if appropriate.

Recommendation 3) To APFAMGS

The exercise of Crop Planning should be based on sufficiently precise groundwater monitoring so that farmers can plan irrigation withdrawals between recharge events and should be introduced for the Kharif season as well, to increase awareness about groundwater cycle over the long term and contribute to the sustainable management of the commonly shared water resource and to the decision making process available to men and women farmers for coping better with climate changes.

Recommendation 4) To APFAMGS

The Project should ensure that information about groundwater availability and water-saving cropping patterns are shared as widely as possible with rain-fed farmers, landless, labourers and other marginal groups in the habitations.

Recommendation 5) To APFAMGS

Advocacy work should be conducted at the Government level, to emphasize the need for continuous technical support (from PNGOs and, if funds permit, TST) to the pool of 1000 farmer facilitators.

Recommendation 6) To APFAMGS

Increased training to HUNs should be provided on request in the following areas: marketing, market linkages, post-harvest management and processing. Wherever required, refreshment of leadership skills, management skills and financial management skills should also be envisaged.

Recommendation 7) To APFAMGS

The Project should facilitate HUNs' access to other key programmes such as WWF/ICRISAT SRI and Organic Cotton Marketing Programme (Chetna Organic/ETC India) and other GoAP programmes, for technical innovations, marketing and equipment and linkages to existing and new emerging markets for farmers, e.g. "water-saving" products.

Recommendation 8) To APFAMGS

Further uptake of good agricultural practices and reduction of spraying for management of pest and diseases should be ensured, through refresher training and monitoring of farmer facilitators/FWS, especially on AESA on pests/diseases and Long Term Experiments.

Recommendation 9) To APFAMGS

The Food and Nutrition survey should be re-run, revised also following the technical suggestions formulated in the report (see 5.1.5)

Recommendation 10) To APFAMGS

Awareness should be raised at GMC and HUN level on the possibility for rainfall and groundwater data collection to become a source of income: focus should be on the need for high reliability and precision of data collected and on the realistic marketing potential of this activity.

Recommendation 11) To APFAMGS

Within the framework of its exit strategy, the Project should formalize a light methodology for PNGOs to monitor the quality of FWS, GMCs and HUN's performance after the project ends. It should include tools and indicators for the monitoring process and a mechanism for taking remedial action insofar as possible.

Recommendation 12) To Partner NGOs and key stakeholders

BIRDS, partner NGOs and their close associates should develop a vision, strategy and methodology for the work they intend to carry on in future as a network, to become a fully-fledged partner for funding organizations.

6.3 Recommended intervention model for the long term

179. There are good grounds to justify the capitalization of APFAMGS experience so far to expand its scope of work to more marginal groups of farmers and to other natural resources. Recommendation 13 is addressed to GoI, FAO and donors interested and committed to poverty alleviation through sustainable resources management.

Recommendation 13) To the Government of India, FAO and other development partners

The Evaluation recommends that efforts be undertaken to ensure availability of budget for an intervention on a similar geographical scale to be run until 2011 by BIRDS and its partners; FAO should provide high-level technical assistance and guidance in it. The overall goal of the intervention is described in Figure 4.

Figure 4. Intervention goal

- Through the understanding of key natural resources cycles (water, soil, forest) and of their common property nature (capacity building and demystification of science);
- through the experiential learning of old and new techniques and approaches for sustainable natural resources management (capacity building through NFE and FFS/FWS model);
- through the involvement of women and all social and economic groups to bring in the learning process different perspectives, needs and knowledge (mainstreaming gender and social equity);
- through the collection, analysis and visualization of scientific and social data through GIS maps (capacity building, demystification of science and empowerment); and
- through the set-up of local institutions and platforms for common decision making at the level of the hydrological unit, (capacity building for management and individual and group empowerment):

All users, men and women, improve their livelihoods, manage sustainably their commonly shared natural resource and can cope better with climate changes and other external threats.

6.4 Other recommendations for the long term

180. APFAMGS is a success story and major stakeholders, including the Government of India and FAO, should devote resources to up-scale and diffuse this experience at national and international level.

Recommendation 14) To Indian State and Central Governments

APFAMGS experience is a breakthrough in the management of groundwater and in securing livelihoods of poor farmers in India: since both are key concerns of the central Government of India and of many State Governments, the approach should be adopted and mainstreamed in the Government's policy and development work.

Recommendation 15) To Indian State and Central Governments

The participation and close involvement of locally well grounded and respected NGOs should be a common feature of government programmes aimed at capacity and institution building in rural areas.

Recommendation 16) To FAO India

FAO-India should commit to advocacy work on behalf of APFAMGS, to facilitate mainstreaming of the Project's experience in policy work at national level and in supporting the diffusion of the model to other States in India; the model could typically be diffused and up-scaled through FAO's collaboration within the UNDAF framework.

Recommendation 17) To FAO

FAO HQ should mainstream the APFAMGS model and experience on Farmer Water Schools as in its normative programme, to facilitate diffusion and adoption of the approach and method in other countries. This might include the preparation of FWS manual.

181. Likewise for the short term, the Evaluation identified and formulated a number of technical and methodological recommendations that could contribute to improve the effectiveness and impact of the recommended future Project phase.

Recommendation 18) To APFAMGS

The membership and community ownership of GMCs and HUNs should be extended to include adequate representation of rain-fed farmers, landless, labourers and other marginal social groups, through sensitisation and visioning workshops, to facilitate the sustainable use of all natural resources.

Recommendation 19) To APFAMGS

Agricultural bio-diversity, soil/land, drought, watershed and conflict management sessions, as well as attention for Payments for Environmental Services (PES), should be added to the Farmer Water School, to provide all users, men and women, with an experiential learning platform for managing sustainably their commonly shared natural resource and coping better with climate changes and other external threats.

7 Lessons Learned

182. Here below, a number of lessons learnt were formulated to bring to the attention of the wider development community, interesting issues and evidences stemming from the Evaluation. Some of these are not new lessons learnt at all, nevertheless the team decided to include them as well, since they do not seem to have been mainstreamed at all in today's development practice.

Lesson learnt 1.

APFAMGS has proved that demystification of science through “translation” of complex concepts in easy language and their transfer to users through a Non Formal Education approach, can be done effectively and is an empowering tool for users.

Lesson learnt 2.

Mainstreaming gender issues in a project since its inception, through a respectful but firm and committed push to ensure women's participation in all activities, contributes to the effectiveness and sustainability of the intervention itself.

Lesson learnt 3.

The Crop Water Budgeting session at the start of the Rabi season as a community decision making tool for adaptation of cropping plans is a powerful innovation for the FFS approach.

Lesson learnt 4.

The Multi-cycle Training of Farmer Facilitators developed by the Project is a successful and efficient adaptation of the FFS training model. Facilitators were better trained and a pool of farmer facilitators was rapidly built up

Lesson learnt 5.

The implementation and sustainability of a community development programme will be greatly enhanced whenever locally well grounded and respected NGOs are involved as implementing agencies.

Lesson learnt 6.

There is good evidence from Project's participants that under conditions of water scarcity, SRI is a sustainable technology for rice production: APFAMGS farmers adopt it as it allows saving water and inputs in general while also increasing yields.

Lesson learnt 7.

Last but not least and not new: time is necessary for an intervention to achieve complex objectives such as changing attitudes, empowerment, creation of new institutions; sustainable development requires investment and dedication.

Annex 1 Terms of Reference

1. Introduction

183. FAO's cooperation with India includes three large projects, which started at different points in time with funds from the Royal Embassy of The Netherlands in India. Following a decision by the Indian Government in 2004 to restrict the number of bilateral donors, the donor withdrew completely from this type of engagement. Funds allocated to the three projects were transferred to FAO on the basis of specific agreements to continue working under the National Execution modality (NEX) with the same cooperating organizations that had already been implementing the activities. The three projects and their implementing institutions are:
- GCP/IND/174/NET: Promoting Livelihood Improvements in Dryland Farming on the Deccan Plateau, implemented by the Agriculture, Man, Ecology Foundation (AMEF), Bangalore;
 - GCP/IND/175/NET: Andhra Pradesh Farmer-Managed Groundwater Systems (APFaMGS), implemented by Bharatiya Integrated Rural Development Society (BIRDS), Hyderabad;
 - GCP/IND/176/NET: Andhra Pradesh Water Management Project (APWaM), implemented by Acharya N.G. Ranga Agricultural University, Hyderabad.
184. With respective budgets all above US\$ 4 million, the NEX projects represent the largest financial undertaking by FAO in India in the last few years. Under FAO's corporate evaluation policy, projects of this size are always subject to an independent external evaluation. The fact that these projects were scheduled to be completed in 2008 led FAO Evaluation's Service and the then-FAO Representative in India to agree on the evaluation of FAO Cooperation with India, as part of the Service's programme of work on country evaluations. The project evaluation reports will be included in the overall country evaluation report.
185. These projects are the first application of the NEX modality, which was approved by the FAO Conference in 2003. Under NEX agreements, FAO has no direct implementation responsibility, but rather assists national implementing institutions in making appropriate choices. These three projects include only two budget lines: for contracts and FAO support costs. All technical support from FAO is funded through a fourth project: GCP/IND/177/NET: Programme Support to Nationally Executed (NEX) Land and Water Programme in India. This project provides funding *inter alia* for the national land and water officer based in the FAOR, Delhi and technical backstopping missions for the three projects from FAO HQ and RAP staff.
186. The evaluations of AMEF and APFaMGS projects will be part of a piloting exercise carried out by the Task Force on Human Rights and Gender Equality of the United Nations Evaluation group (UNEG), to test a Guide to Evaluation from a Human Rights and Gender Equality Perspective. The TF may comment on the Terms of Reference and the draft report.

2. Background of Project GCP/IND/175/NET

187. The Netherlands' support to water and groundwater management in India and in Andhra Pradesh in particular has a long history. The two most recent interventions were the Andhra Pradesh Groundwater Borewell Irrigation Schemes (APWELL) Project and Andhra Pradesh Water Vision. APWELL aimed at improving living conditions of small and marginal farmers by providing bore-well schemes, in seven districts viz., Anantapur, Chittoor, Cuddapah, Kurnool, Mahbubnagar, Nalgonda and Prakasam, of Andhra Pradesh and was completed in 2002. The main aim of the project is fulfilled to a large extent with visible impact on living conditions of small and marginal farmers, increased agriculture production and existence of strong people's

- institutions. Through Water Vision, the Government of Andhra Pradesh positioned the water sector in Andhra Pradesh, its first ever kind of exercise by any state in India.
188. Water is a State subject and so is its development, utilization and monitoring. The government of Andhra Pradesh is responsible for water resources planning, storage and use of its water resources. It also promotes Water User Associations (WUA), Watershed Associations (WA), Vana Samrakshana Samithi (VSS) and Water Conservation and Utilization Committees as people's institutions for management of canal irrigation, watersheds, water conservation and forest, respectively. However, groundwater development is largely a private initiative and several NGOs are involved in the sector.
189. The project development objective or goal is: "Stage is set for enabling the farmers to manage their groundwater systems in about 650 villages in seven drought-prone districts of Andhra Pradesh by the year 2008.
190. Major objectives are:
- About 3,000 Men and Women farmers are in a position to understand groundwater systems within which they are operating at about 650 habitations in Andhra Pradesh, in a scientific manner, by the year 2008.
 - Hydrological database, using GIS platform, is developed for usage of Groundwater Management Committees, covering 650 habitations, by the year 2006.
 - About 6,500 farm families enabled for adoption of alternative agricultural practices suiting the availability of groundwater, by the year 2008.
 - Community based institutions established for alternative management of groundwater resources with equal representation/ participation of men and women, covering about 650 habitations, by the year 2008.
191. The following key actions were to be implemented by BIRDS to achieve the project goal:
- Identify and formalise relations with NGOs in each district who can be part of the network
 - Set up Steering Committee involving various major non-project stakeholders including government agencies and independent experts
 - Ensure coordination with AME Foundation, Bangalore for mutual learning
192. FAO-India has started discussion with GEF for a follow-up project: Enabling Sustainable Land Management (SLM) among resource poor communities in Southern India (GCP/IND/181/GFF): FAO would be the implementing agency and should make available co-matching funds.

3. Purpose of the Evaluation

193. The evaluation aims at informing the Government of India, BIRDS and its partners, FAO and other stakeholders about the achievements of the Project and the efficiency and effectiveness of the methodologies used, of the technologies diffused and of the NEX implementation modality.
194. The evaluation will also formulate recommendations and draw lessons as relevant, in the perspective of up-scaling the approach for the future development of farmers' ground-water management in India.

4. Scope of the Evaluation

195. The evaluation will analyse among others that may emerge during the evaluation process, the following aspects:
- V. Relevance of the project to development priorities and needs;
 - VI. Assumptions and the theory of change underpinning the project idea and design;
 - VII. Quality, clarity and adequacy of initial project design and Annual Work Plans including:

- the links and causal relationships between inputs, activities, outputs, outcomes and impact (specific and development objectives);
 - relevance and appropriateness of indicators;
 - validity of assumptions and risks;
 - approach and methodology;
 - time frame and resources;
 - institutional set-up;
 - management arrangements; and
 - stakeholders and beneficiaries identification.
- VIII. Project management and implementation including:
- effectiveness and efficiency of operations management;
 - effectiveness of strategic management;
 - efficiency and effectiveness of projects' coordination and steering bodies and mechanisms at State level;
 - set-up, efficiency and effectiveness of monitoring and internal evaluation processes;
 - elaboration and implementation of an exit strategy;
 - quality and quantity of administrative and technical support by FAO, in particular technical and management assistance provided through GCP/IND/177/NET;
 - implementation gaps and delays if any, their causes and consequences, between planned and implemented outputs and outcomes; and assessment of any remedial measures taken.
- IX. Project budget and expenditure including
- efficiency and effectiveness of the NEX implementation mechanism: between FAO and the implementing agent and between the implementing agent and beneficiaries;
 - compliance with FAO's policy for national execution and with audit's recommendations;
 - relevance of budget allocations and expenditures to project objectives; and
 - rate of delivery and budget balance of the project at the time of the evaluation.
- X. Project results, including an assessment of a sample of outputs produced to date. A complete list of outputs prepared by the project team will be included in annex. The mission will especially review, the status, extent and quality of work on:
- introduction and diffusion of ground-water management systems among and beyond direct participants;
 - training of farmers in improved technologies;
 - capacity building of communities at large in ground-water management;
 - improvement in beneficiaries revenues, food security and nutrition;
 - participatory process throughout the intervention at community level.
- XI. Issues of gender and social equality, including:
- extent and quality of women's and minority caste members' participation in projects' activities, their access to projects' resources and benefits, capacity building and empowerment aspects;
 - social and economic profile of women participating in project's activities;
 - analysis of how gender relations, gender equity and processes of social inclusion were and will be affected by the project in the area/sector of intervention; and
 - extent to which gender and social equity was pursued in project management.
- XII. The prospects for sustaining the project's results by the beneficiaries and the host institutions after the termination of the project. The mission should examine in particular:
- Institutional, technical and economic sustainability of proposed technologies;

- Social sustainability of participatory processes initiated through the projects, including contribution to women's visibility and participation in local development processes;
- Institutional sustainability of BIRDS and of the network established with partner NGOs;
- Potential for up-scaling and replication of the methodology, including at policy level, taking into account the gender equality and human rights elements such as inclusion of women as decision makers, changes in gender relations, focus on and empowerment of the marginalized and overcoming caste barriers;
- Actual and potential contribution of project outputs and outcomes to FAO's normative work and function;

XIII. Environmental issues, including:

- environmental sustainability of technologies introduced and diffused;
- project contribution and/or impact on natural resources in terms of maintenance and/or regeneration of the natural resource base.

196. Based on the above analysis the mission will draw specific conclusions and make proposals for any necessary further action by Government and/or FAO to ensure sustainable development, including any required follow-up action; further supporting assistance through BIRDS and/or its partners will also be discussed. The Evaluation will draw attention to any lessons of general interest. Any proposal for further assistance should include specification of objectives and major suggested outputs and inputs required.

5. Methodology

5.1. Methods and approach

197. The evaluation will adopt a consultative approach with stakeholders and triangulation as a key method for validation of information and evidence. A range of tools will be used, including: consultation of existing reports, elaboration of check lists for semi-structured interviews with key informants and stakeholders, and direct observation during field visits.
198. The Sustainable Livelihoods Framework²⁴ will be used as the reference for assessing contributions to poverty alleviation, gender mainstreaming, social, economic and environmental sustainability, etc. The Strengths, Weaknesses, Opportunities and Threats (SWOT) framework will be one major analytical tool for assessment of the projects' results²⁵.
199. Particular attention will be devoted to gender and social inclusion issues, within the framework of the piloting exercise with UNEG's Task Force on the Guide to Evaluation from a Human Rights and Gender Equality Perspective. This will include initial briefing and review of the draft Guide, the piloting process, and completing the feedback form and debriefing. During the Evaluation, particular attention will be paid to accessing and canvassing the views of marginalized women and other marginalized groups.
200. Within time available, the Evaluation will try to compare the results perceived by participants on crop production and food security, with similar non-participating farmers.

²⁴ The Sustainable Livelihoods Framework identifies five different capitals (human, social, natural, financial, and physical), each including different assets. It helps in improving understanding of livelihoods, in particular of the poor. For more information, among others: http://www.livelihoods.org/info/guidance_sheets_pdfs/section2.pdf

²⁵ SWOT is a widely used strategic planning tool, useful also in analysis of projects and interventions, to assess their strengths and weaknesses and perspectives in the future. It is particularly used in focus group, but it can be adapted to individual interviews as well.

5.2. Consultations

201. The mission will maintain close liaison with the NGO consortium and FAO. Although the mission should feel free to discuss with the authorities concerned anything relevant to its assignment, it is not authorized to make any commitments on behalf of the Government or FAO.
202. The evaluation team will benefit of a briefing meeting with the NGOs consortium upon start-up of the evaluation exercise. The team will present its preliminary findings and conclusions in a debriefing meeting with the NGO consortium at the end of its mission.
203. The Terms of Reference of the evaluation and the final draft report will be circulated among key stakeholders before finalisation; comments and suggestions will be incorporated as appropriate.

5.3. Reporting

204. The mission is fully responsible for its independent report which may not necessarily reflect the views of the Government or of FAO.
205. The mission leader bears responsibility for submitting the final draft report to FAO within five weeks of mission. Within two additional weeks, FAO will submit to the team its comments and suggestions that the team will include whenever appropriate to finalize the report. A tentative outline for the report is to be found in Appendix 1 to these ToRs.
206. The final evaluation report will be a public document available on the website of FAO Evaluation Service. FAO will elaborate the Management Response to the report which will also be a public document and will submit it to the national government.

5.4. Composition of the Mission

207. The evaluation team will combine among its members the following fields of expertise:
 - Ground-water management issues;
 - Food Security
 - Farmers' Field Schools, adult education and capacity building
 - Gender issues
 - Social development, poverty reduction and processes of social inclusion
 - Project management and evaluation
 - FAO financial and management procedures and their applicability to NEX projects.
208. The team will be composed by four team members, who together will cover all the fields of expertise listed above. Three will be in the mission full time; the fourth team member will serve part-time to assess finance and management related to NEX for this and the other NEX projects being evaluated at the same time
209. All team members will have a University Degree and a minimum of 15 years of professional experience in their respective areas and in the field of development aid. All will be fluent in English. Mission members will have no previous direct involvement with the project either with regard to its formulation, implementation or backstopping. All will have signed the FAO Evaluation Service Declaration of Interest form.
210. The final selection will be the responsibility of FAO's Evaluation Service, according to the criteria set out above.

6. Timetable and Itinerary of the Mission

211. The evaluation mission is scheduled for the period 1-12 September 2008. The team will assemble in Hyderabad, where it will hold meetings with the NGO consortium and any other

stakeholder at government and non-government level. Field visits will be organized, for about 4 days after completing meetings in Hyderabad and will include a visit to BIRDS Headquarters. If required, upon return from the field visits, the team will have additional meetings while drafting its preliminary findings, conclusions and recommendations. The de-briefing meeting will be held on September 12.

Appendix 1: Tentative outline for the evaluation report

Acknowledgements

Acronyms

Executive Summary

- 1 Introduction
- 1.1 Background
- 1.2 Methodology
- 2 National context and background to the project
- 2.1 National context
- 2.2 Origins of the Project
- 3 Assessment of project concept and relevance
- 3.1 Project objectives and logic
- 3.2 Project design
- 3.3 Project theory
- 3.4 Project relevance
- 4 Project implementation
- 4.1 Project Budget and Expenditure
- 4.2 Government support
- 4.3 Project Management
- 4.4 Technical and Operational Backstopping
- 5 Project contribution to the development objective
- 5.1 Outputs and outcomes/results
- 5.2 Gender Issues
- 5.3 Environmental Issues
- 5.4 Sustainability: institutional, social, technical and economic
- 5.5 Overall effectiveness of intervention
- 5.6 Potential long term impact
- 6 Conclusions and Recommendations
- 7 Lessons Learned (optional)

Annexes

- I. Terms of Reference
- II. List of places visited and key persons met by the mission
- III. List of project activities/outputs: training events, meetings, reports/publications, initiatives supported/inspired by the project
- IV. List of consultancies and backstopping missions
- V. List of major equipment/supplies provided by the project

Annex 2

Itinerary of the evaluation mission and organizations met

Itinerary and time table

1-2 September	team assembled in Hyderabad, briefing meetings; travel to Kadapa
3 September	visit to BIRDS-Muthyalapadu farm; visit to Akkapally, NGO DIPA;
4 September	visit to Mudurallapalle and to Peddavanka HU, NGO BIRDS; FFS session and HUN meeting;
5 September	meetings with project participants and facilitators in Muthyalapadu; travel to Madanapalli;
6 September	visit to Tirumalareddypalle, NGO-GVS, visit to AGRs and meeting with stakeholders;
7-8 September	report writing and travel to Hyderabad;
9 September	meetings in Hyderabad with PNGOs and TST; data gathering;
10 September	report writing; participation in Steering Committee meeting;
11 September	report writing;
12 September	debriefing meeting;
27 October	circulation of the final draft report.
17 November	circulation of the final report

Organizations met

FAO Representative
FAO Representation, National Programme Coordinator, Land and Water
Nodal NGO BIRDS
Partner NGOs: CARE; CARVE; DIPA; GVS; SAID; SAFE; SYA; PARTNER
Technical Support Team
World Education
Indo-French Groundwater Project
Andhra Pradesh Department of Groundwater, Ministry of Water Resources;
Andhra Pradesh Department of Rural Development, Ministry of Rural Development
WWF Global Freshwater Programme
Australian Centre for International Agricultural Research
Participant farmers in project activities in visited locations
Project Farmer Facilitators

Annex 3 Project's outputs

Table 3.1: Physical works by APFAMGS

S No	Type of Physical Works	No of Units
1	No of Observation wells with provision for measuring SWL and PWL.	2119
2	No of Observation wells with provision for measuring SWL and PWL and Discharge.	1022
3	No. Rain Gauge stations.	203
4	No of Sign Boards erected.	671
5	No of Display Boards (water level type) erected.	661
6	No of Display Boards (Rainfall type) erected.	671
7	No of Display Boards (HU type) erected.	121
8	No of CWB results display board erected.	600
9	No of Crop Water Economics results display board erected.	510

Table 3.2: Artificial Groundwater Recharge works by APFAMGS

Name of the PNGO	Induced recharge through open wells	Tank desiltation	Gravity Recharge through Injection wells	Aquifer Recharge through Pressure Injection	Percolation tank construction	Check dams construction	Total
BIRDS	Nil	2	1	1			4
CARE	Nil			4	1		5
CARVE	Nil	2		6			8
DIPA	Nil	1	3				4
GVS	Nil	2	3			1	6
SAID	Nil			1			1
SAFE	Nil	1	3				4
SYA	Nil	1	2			1	4
PARTNER	7	2		3			12
Total	7	11	12	15	1	2	48

Table 3.3: Thematic Maps generated

Sno	PNGO	No of Hus	Maps Available		
			HU wise Maps	PNGO Wise Maps	A1 Maps PNGO Wise
1	BIRDS	11	88	9	3
2	CARE	3	24	9	3
3	CARVE	13	117	9	3
4	DIPA	9	45	9	3
5	GVS	4	32	9	3
6	PARTNER	6	54	9	2
7	SAFE	7	63	9	3
8	SAID	7	56	9	2
9	SYA	7	56	9	3
	Total HUs	67	535	81	25

Operational HUs: 63, plus 4 HUs in DIPA Total Forest

Table 3.4: Thematic Layers Digitized for the Project Operational area in 7 Districts

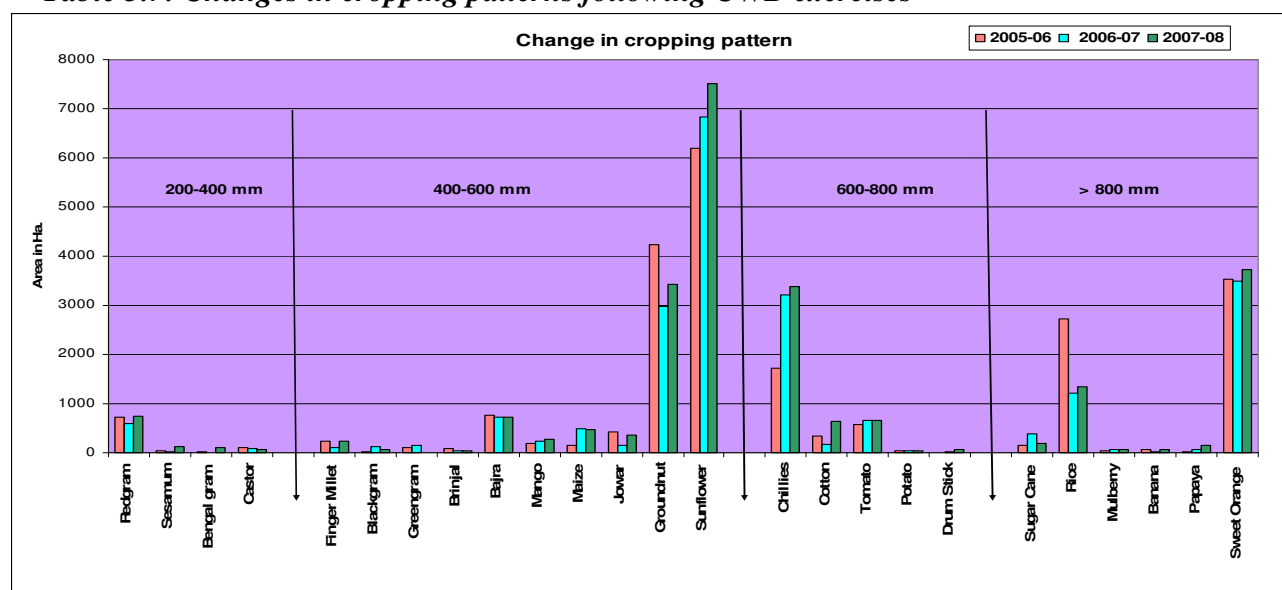
SNo	Description
1	Observation Well Locaitons
2	Rain Gauge Stations Location
3	Hydrological Unit Boundary
4	Drainage Network
5	Tanks and Rivers
6	Canals
7	Roads Network
8	Habitations or Settlements
9	Contours
10	Spot Heights
11	Geological Formations

Table 3.5: Types of Maps Prepared at TST Office by using the Thematic layers

Sno	Name of the Map
1	Location Map
2	Hydrological Units
3	Hydrological Monitoring Stations Map
4	Drainage Network Map
5	Geology Map
6	Resource Map
7	Elevation Map
8	SOI Topo Map
9	Satellite Image Map in A4 size
10	Resource Map in A1 size
11	Survey Of India Map in A1 size
12	Satellite Map - Acquired on Jan2006 in A1 size

Table 3.6: Number of Farmer Water Schools and Participants

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
Total	878	7754	12225	25199

Table 3.7: Changes in cropping patterns following CWB exercises**Table 3.8: Recharge, Draft and Groundwater Balance for Three Years in Four Hydrological Units**

Name of the PNGO	HU name	Hydrological year	Recharge(MCM*)			Draft (MCM)			Balance (MCM)		
			2005-06	2006-07	2007-08	2005-06	2006-07	2007-08	2005-06	2006-07	2007-08
GVS	Diguvayetigadda	2005-06	5.285	3.627	4.629	4.593	9.966	7.100	0.692	-6.338	-2.471
DIPA	Rallavagu	2005-06	1.927	0.790	1.814	4.698	4.719	3.701	-2.77	-3.929	-1.887
BIRDS	Peddavagu	2005-06	3.157	2.519	5.544	4.248	4.225	3.173	-1.091	-1.705	2.37
BIRDS	Erravanka	2005-06	3.051	2.531	3.628	9.291	8.651	4.976	-6.239	-6.119	-1.347

* MCM: Million Cubic Meter

Table 3.8: APFAMGS publications

S.No.	Ref. Code	Title	Date of Publication / Submission
1	APFM/PD/01/2003	RNE Project Document - 2003	2003
2	APFM/MN/02/2003	Financial and Administrative Guidelines - 2003	2003
3	APFM/RE/03/2003	Half-Yearly Progress Report: July-Dec 2003	2003
4	APFM/MN/04/2003	Participatory Hydrological Monitoring (PHM) Manual-2003	2003
5	APFM/BR/05/2003	Project Brochure (English) - 2003	2003
6	APFM/BR/06/2003	Project Brochure (Telugu) - 2003	2003
7	APFM/RE/07/2004	RNE Final Report - July 2003-April 2004	2004
8	APFM/PD/08/2004	FAO Project Document (English) - 2004	2004
9	APFM/PD/09/2004	FAO Project Document (Telugu) - 2004	2004
10	APFM/RE/10/2004	Project Launching Workshop Report - 2004	2004
11	APFM/RE/11/2004	Half-yearly Progress Report : May-Dec 2004	2004
12	APFM/BD/12/2005	Reference Material Water Management	2005
13	APFM/BD/13/2005	Annual Plan and Budget - 2005	2005
14	APFM/RE/14/2005	Half-Yearly Progress Report: Jan-June 2005	2005

15	APFM/BS/15/2005	Chinneru Base Document - 2005	2005
16	APFM/MN/16/2005	Training Manual on GIS - 2005	2005
17	APFM/BR/17/2005	Project Brochure - 2005	2005
18	APFM/NL/18/2005	TOT-FFS news letters - 2005 -I	May, 2005
19	APFM/NL/19/2005	TOT-FFS news letters - 2005 -II	May, 2005
20	APFM/NL/20/2005	TOT-FFS news letters - 2005 -III	May, 2005
21	APFM/NL/21/2005	TOT-FFS news letters - 2005 -IV	May, 2005
22	APFM/NL/22/2005	TOT-FFS news letters - 2005 -V	June, 2005
23	APFM/NL/23/2005	Neella Muchetta I news letter - 2005	February, 2005
24	APFM/NL/24/2005	Neella Muchetta II news letter - 2005	May, 2005
25	APFM/NL/25/2005	TOT-FFS news letters - 2005 -VI	June, 2005
26	APFM/NL/26/2005	TOT-FFS news letters - 2005 -VII	June, 2005
27	APFM/NL/27/2005	TOT-FFS news letters - 2005 -VIII	June, 2005
28	APFM/NL/28/2005	TOT-FFS news letters - 2005 -IX	July, 2005
29	APFM/NL/29/2005	TOT-FFS news letters - 2005 -X	July, 2005
30	APFM/NL/30/2005	Neella Muchetta III news letter- 2005	August, 2005
31	APFM/NL/31/2005	TOT-FFS news letters - 2005 -XI	July, 2005
32	APFM/NL/32/2005	TOT-FFS news letters - 2005 -XII	July, 2005
33	APFM/NL/33/2005	TOT-FFS news letters - 2005 -XIII	July, 2005
34	APFM/NL/34/2005	Neella Muchetta IV news letter - 2005	October, 2005
35	APFM/BR/35/2006	APFAMGS Brochure (German)	March, 2006
36	APFM/LP/36/2006	Concept paper Managed Aquifer Recharge (MAR)	March, 2006
37	APFM/LI/37/2006	Concept Papers - Groundwater Management	March, 2006
38	APFM/LI/38/2006	Concept Papers - Agriculture	March, 2006
39	APFM/LI/39/2006	Concept Papers - Gender in Water	March, 2006
40	APFM/LI/40/2006	Concept Papers - Water Based Institution	March, 2006
41	APFM/NEWS/41/2006	News room FAO web site (English)	May, 2006
42	APFM/NL/42/2006	Neella Muchetta - V News letters-2006	June, 2006
43	APFM/NEWS/43/2006	News room FAO web site (Telugu)	August, 2006
44	APFM/RE/44/2006	Managed Aquifer Recharge (MAR) Report	August, 2006
45	APFM/RE/45/2006	Plan and Budget 2006	February, 2006
46	APFM/NL/46/2006	Neella Muchetta -VI news letter - 2006	May, 2006
47	APFM/RE/47/2006	Revised Plan and Budget 2006	July, 2006
48	APFM/RE/48/2006	Process Document establishment of GMC	September, 2005
49	APFM/RE/49/2006	Data Products Catalogue "AGUA"	June, 2006
50	APFM/RE/50/2006	The Trail of Change (English) (villagers view point on APFAMGS intervention)	September, 2006
51	APFM/CP/51/2006	ICARRD Paper - Brazil (Practices that can combat Poverty and Distress in India)	March, 2006
52	APFM/CP/52/2006	(ICID Congress paper-Kuala Lumpur) Monitoring & Evaluation of Capacity Development Programme as part of APFAMGS Project, India	September, 2006
53	APFM/CP/53/2006	Technology and knowledge for gender equity and justice	September, 2006
54	APFM/CP/54/2006	Habitation Resource Information System (HRIS+)	September, 2006
55	APFM/CP/55/2006	Note on APFAMGS Project Website www.apfamgs.org	September, 2006
56	APFM/CP/56/2006	Geographical Information System - GIS	September, 2006
57	APFM/CP/57/2006	Impact study on AGR (Draft)	September, 2006
58	APFM/RE/58/2006	Half Yearly Report Jan -June 2006 (Draft)	September, 2006
59	APFM/RE/59/2006	Half Yearly Progress Report: Jan -June 2006	September, 2006
60	APFM/RE/60/2006	Nourishing Traditions (Local Greens)	October, 2006
61	APFM/RE/61/2006	The Trial of Change (Telugu)	September, 2006
62	APFM/NL/62/2006	Neella Muchetta - VII news letter-2006	November, 2006
63	APFM/PD/63/2007	Half Yearly Report: July - December 2006	January, 2007
64	APFM/PD/64/2007	Plan and Budget 2007	January, 2007

65	APFM/RE/65/2006	Causes and control of Root rot diseases in Sweet Orange in APFAMGS Project (Markapur project area)	May, 2007
66	APFM/NL/66/2007	Neella Muchatta - VIII news letter 2007	February, 2007
67	APFM/RE/67/2007	Useful implements and methods of use in conducting GW training sessions as part of field school methods - Toolkit (Telugu)	May, 2007
68	APFM/HO/68/2007	Integrated Water Management - 2 (pamphlet)	May, 2007
69	APFM/HO/69/2007	Vermi Compost (pamphlet)	May, 2007
70	APFM/HO/70/2007	Storage of Food Grains (pamphlet)	May, 2007
71	APFM/HO/71/2007	Water requirement & sensitive stages (pamphlet)	May, 2007
72	APFM/HO/72/2007	Mulching (pamphlet)	May, 2007
73	APFM/HO/73/2007	Organic Farming (pamphlet)	May, 2007
74	APFM/HO/74/2007	Organic Farming - 1 (pamphlet)	May, 2007
75	APFM/HO/75/2007	Soil Reclamation (pamphlet)	May, 2007
76	APFM/HO/76/2007	IWM (pamphlet)	May, 2007
77	APFM/HO/77/2007	Soil Sampling (pamphlet)	May, 2007
78	APFM/HO/78/2007	Botanical Pesticide (pamphlet)	May, 2007
79	APFM/RE/79/2007	Useful implements and methods of use in conducting GW training sessions as part of field school methods - Toolkit (English)	February, 2007
80	APFM/NL/80/2007	Neella Muchatta - IX news letter 2007	June, 2007
81	APFM/RE/81/2007	Half Yearly Progress Report: Jan-June 2007	July, 2007
82	APFM/RE/82/2007	Half Yearly Progress Report - Annexures	July, 2007
83	APFM/RE/83/2007	International Learning Workshop on Demand side Management GW Completion Report	September, 2007
84	APFM/RE/84/2007	Plan and Budget July-December 2007	January, 2007
85	APFM/BR/85/2007	Demand Side Management of Groundwater	September, 2007
86	APFM/RE/86/2007	Cross Cultural Perspectives on Groundwater Based Institutions	September, 2007
87	APFM/RE/87/2008	Plan and Budget 2008	March, 2008
88	APFM/RE/88/2008	Half Yearly Progress Report: Jan - Jun 2008	July, 2008
89	APFM/RE/89/2008	Work plan July-December 2008	July, 2008
90	APFM/RE/90/2008	Data Products Catalogue	August, 2008
91	APFM/MN/91/2008	Information Kiosk Manual	August, 2008
92	APFM/MN/92.2008	Farmer Water School (FWS) Manual	August, 2008

Annex 4

The Farmer Water School

A sequential adaptation of the FFS approach for understanding and management of groundwater resources

Since the inception of the Project, provisions were made for the integration of the FFS methodology into project activities. However, the Project perceived the methodology to be limited to crop development only. The season-long FFS ToT on Integrated Pest Management (IPM) in okra organized by FAO-India in May 2005 provided the Project an ideal opportunity for a sustained exposure to the FFS methodology, with more than 20 participants from the Project. The learning during the ToT, and the growing knowledge on successful application of the FFS methodology to non-agricultural sectors such as HIV-Aids and protection of wildlife provided staff the confidence and conviction to experiment the adaptation of the FFS methodology to Groundwater Management.

Earlier, though the PHM data (record of rainfall received, measurement of static, pumping and discharge of the bore wells) was collected by farmers for entire HU, data analysis and water balance estimation processes was done by staff and shared in the CWB workshop. The dissemination of this process to a larger audience was also minimal. Through the groundwater-adapted FFS approach, project staff were to enable the Groundwater Management Committee (GMC) members to i) analyze the PHM data (based on the data collected), ii) understand and discuss the subsurface strata, iii) calculate water balance estimation, iv) make collective decisions on managing scarce resources, v) share the learning of each session to larger audience in the community, present to larger audience or farmers of the hydrological unit (in the CWB workshop), and vi) disseminate key messages. Integration of FFS methodology with the PHM process would enable farmers (men and women) to i) identify problems in groundwater management, ii) search for local solutions, make collective decisions, iii) implement decisions, and iv) measure impact. The goal was to enable farmers to eventually manage their hydrological system, in a scientific way, with the participation of all stakeholders including community based institutions, government departments and other developmental agencies.

Factors favourable for the adaptation of FFS methodology to Groundwater Management were that:

- PHM infrastructure was established across the project,
- farmer volunteers had adequately been trained to measure and record PHM data;
- PHM training modules were available;
- no additional financial resources were required for the conduct of groundwater-adapted FFS;
- staff capacities and confidence were being adequately built through the Season-Long TOT that was in progress,
- periodical or sequential input of groundwater management concepts through experiential and discovery learning process would enhance the ownership of the learning process and effective management of groundwater resources;
- farmer friendly models could be developed with active input from farmers;
- indigenous water management practices can be explored;
- a higher degree of sustainability could be expected in participation and learning, and
- social harmony in joint management of scarce water resources would be feasible. Challenges were identified as limited field tests in case of ground water and results on water management are not immediately visible as in the case of agriculture.

Several strategies were listed keeping in mind the favourable factors and challenges in implementing adapted FFS, including i) one Hydrological Unit in each PNGO operational area would be targeted for field testing, ii) the duration of FFS would be one year concurring with the Hydrological year (sessions would be organized fortnightly and each session would last for four hours), iii) a workshop would be conducted to design a Training of Trainers (ToT) on groundwater-adapted FFS that would

also include a core message on content and sequencing of content, iv) pre-FFS session meetings would be conducted to select required number of farmers based on the criteria evolved, v) different problems on water related issues would be identified and the same would be prioritized, vi) the collected information would be analyzed and an action plan would be prepared involving all the stakeholders, vii) participants in the groundwater-adapted FFS would include farmer volunteers (both observation wells and rain gauge stations), owners of observation wells and rain gauge station sites, office-bearers of Groundwater Monitoring Committees, some progressive farmers, and landless poor, viii) the number of participants in a HU would be limited to 30 (efforts will be made to ensure equal representation of male and female farmers in all these participant groups), ix) there would be a focus on creating functional linkages with the existing governmental and nongovernmental institutional set up with the community based organizations formed for the specific purpose of sustainable groundwater management, x) process documentation would be undertaken in the form of proceedings of meetings, village reports, technical reports, photographs, audio tapes and videos.

Season 2005-06: FFS-CWB

For the first season each PNGO was encouraged to identify the Hydrological Units for implementing the FWS using the following selection criteria:

- all physical works should have been completed before June 2005;
- hydrological data collection should have started per June 2005;
- farmers motivated enough to generate a continuous hydrological data record between June-October 2005;
- farmers possess all the necessary skills to generate continuous hydrological data.

In each of the identified HUs, participants (in the range of 25-30) were selected based on the following criteria (with a minimum of 40%-50% women):

- should be a resident of the HU;
- must be a groundwater user farmer;
- in the age group of 20 to 45 years;
- should have been an active participant/volunteer in project activities;
- should have ability to articulate groundwater concepts;
- should be a team player with openness to share information; and
- should be nominated by the GMC.

TST and WE team visited each of the PNGO teams to assist in identifying the content to be delivered in FWS sessions, facilitate incorporation of Non-formal education and participatory approaches in the delivery of the content to the farmers, facilitate the preparation of session guide for groundwater-adapted FFS sessions, participate in the planning of the groundwater-adapted FFS sessions, assist the teams to reflect upon the process and fine tune the session plans for future groundwater-adapted FFS sessions and sensitize the teams to document the entire process for sharing learning and variations across PNGO teams at the project level. While facilitating the planning of the sessions with respective PNGO teams, TST and WE team did not influence the PNGO teams in identification of the content of specific sessions, as that would affect development of variant models. Focus was given on assisting the PNGO teams in visualizing and facilitating with the farmers the relevance of Farmer Field School approach to Crop-water Budgeting exercise. The importance was stressed of showing/demonstrating to the farmers 'how to observe' and the importance of 'observation and analysis' in decision making and the importance of making the farmer training sessions more an exercise in discovery learning for the farmers. Accordingly the venue for the FWS sessions was based on the kinds of geological formations and structures the farmers needed to observe in their respective hydrological units. The importance of recap at the start of each session to help farmers review the core learning of the previous session was also stressed.

As a result, PNGO teams reflected that farmers were showing keen interest in knowing more information about the factors that influence groundwater levels in their HUs. They were also pleased

with the efforts and innovations in presenting the data to the farmers. Sincere efforts were made to brainstorm and experiment with various farmer-friendly ways and methods to disseminate the FWS concepts. The PNGO teams felt that they have developed more sensitivity in the delivery of the training content, although more participatory methods needed to be explored to increase farmer ownership of the process and for effective dissemination of FWS session learning to co-farmers. They also believed that comprehensive session planning and preparatory work needs to be done prior to the actual conduct of FWS sessions and farmer trainings. Satisfaction was found with the level women participation and their involvement in the FWS workshop. They did indicate that they should be conscious not to influence the farmers during decision making and analysis.

Farmer participants of the first season FFS-CWB expressed satisfaction with the knowledge gained by participating in the FWS sessions and indicated that they understood concepts better if more pictures were used. Farmers also indicated that the presentation of data showing comparison between crop area and units of groundwater drawn would help farmers estimate crop productivity per unit of water used. Farmer expressed that FWS workshops should be organized in all hydrological units and all districts wherever water scarcity is present. They also express the need for PNGOs assistance in developing linkages with other government and non-government departments. Additional information on way of improving the soil fertility was indicated as a major need. Last but not least, they indicated that the CWB workshop had become a good forum, for all farmers in a particular hydrological unit, for collective decision making and analysis.

Season 2006-07: FFS-FMGS

As a result of the results of the reflections mentioned above the PNGO Teams developed a number of strategies to address some of the constraints in the 2005-06 season implementation:

- FWS sessions should start in the second week of July.
- The content should be spread over sixteen sessions.
- Two preparatory sessions should take place before the conduct of the FWS workshop
- Fifteen days time gap between each session will help farmers attend FWS sessions regularly
- Improved rapport with the farmers will help the PNGO teams to mobilize farmers for FWS sessions and workshop
- Sensitizing male farmers on women's role in water management would enhance women's participation in FWS sessions.
- Clarity on the learning objectives of each session will help in effective facilitation of the content
- Farmers need to be trained on the content and usage of various methods to facilitate the sessions and the CWB workshop.
- Involvement of the farmers in the preparation of banners, development of models, and arrangements is necessary.
- Various data collection methods need to be brainstormed and experimented with to identify farmer friendly methods.
- Technical information like 'infiltration rate' and 'recharge calculations' and tabular formats of data presentation need to be simplified.
- FWS sessions and workshops need to be carried out in all HUs.
- An Orientation workshop on FWS process for all the PNGO staff will help common understanding of the content and methods.

Highlights of the 2006-7 season included that complete session outline was designed and sixteen FWS sessions were planned to cover one full hydrological cycle. Session guides for each session were developed in Telugu and made available to farmer facilitators. In addition, visuals and physical models were developed for each FWS session for better understanding of concepts around groundwater science and training modules on HIV & AIDS were developed and discussed as special topics in FWS sessions. On problematic issues related to agriculture and groundwater, farmers were encouraged to conduct long-term (LTEs) and short-term experiments (STEs). Group dynamics were introduced for

group cohesiveness, leadership qualities, and institution strengthening, and centralized FWS field days were organized by each PNGO to share learning of FWS to larger community.

Season 2007-08: FWS

For the 2007-08 season the complete session outline was revised, and 16 sessions were conducted across all PNGOs. Session guides were revised and made more farmer friendly using local language. More innovative models were developed on groundwater recharge, crop water requirement, and crop water balance estimation, and Hydro-Ecosystem Analysis (HESA) was introduced as a key element in Farmer Water School as an analytical tool. HESA charts were developed and made available to farmer facilitators for better understanding on the concept. Session guides were further simplified to cater to the needs of farmer facilitators. In addition, HUNs and Farmer facilitators were encouraged to take lead to organize and conduct Farmer Water Schools in the respective hydrological units. HUNs were also encouraged to organize FWS field days on their own.

Season 2008-09: FWS

For the 2008-09 season FWS planning workshops were organized for HUN members and farmer facilitators to manage FWS on their own. Funds were transferred to HUNs directly for FWS management.