

**The Participatory Irrigation Management Program in Andhra Pradesh, India:
Current Issues and the Need for Monitoring and Evaluation**
Notes from a visit by Douglas L. Vermillion, December 9 – 22, 1999

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Andhra Pradesh, India.

This note identifies key issues related to the Andhra Pradesh Farmer Managed Irrigation Systems Act of 1997 (APFMIS) and makes suggestions for monitoring and evaluation of the reforms by the government. Comments are based on the author's observations from field visits, reports reviewed, and discussions held in the INPIM Seminar about the "participatory irrigation management" (PIM) program in Andhra Pradesh (AP).

The following sections are in this note:

1. Current status of reforms
 2. Apparent outcomes and impacts to date
 3. Key issues related to the reform program
 4. Needs for monitoring and evaluation
- Annex: Summary of field visits and list of reports reviewed.

1. Current status of reforms¹

By 1996, the irrigation sector in A.P. was in a state of crisis and major reform was called for. The GOAP "White Paper" of 1996 noted the following key problems (amongst others):

- Serious decline in net irrigated area. Only 2.3 M ha of the 4.8 M ha of potential irrigated area created was actually under irrigation (a gap of 52% between potential created and actual irrigated area);
- Under-financing of operations and maintenance;
- Poor irrigation system efficiencies and water distribution (including significant wastage of water diverted and inequitable distribution of water within schemes, especially between head and tail ends);
- Low cropping intensities and yields;
- Low farm income.

After several months of consultations involving the state legislature, various government agencies, political parties, farmer groups, and the media, the Andhra Pradesh Farmer managed Irrigation Systems Act, 1997 (APFMIS Act) was passed by the Legislative Assembly in April 1997. Water charges were more than tripled in the same month (from Rs. 60/acre to Rs. 200/acre). In June 1997, nearly² 10,292 water users associations (WUAs) were created through a state-wide election. In November 1997, 174 Distributory Committees (DCs) were created through

¹ The main point of this section is to expose the author's basic perceptions and assumptions to scrutiny.

² Elections were not held in June for 492 WUA due to court and government stay orders and other problems.

elections. Project Committees (PCs) at the scheme level are yet to be created. Numerous consultation, training and feedback meetings have been held throughout the state at different levels from June 1997 to the present.

Key features of the APFMIS Act are that it provides for:

- mandatory constitution of farmer organizations and automatic membership,
- hydraulic area of jurisdiction,
- powers to farmer organizations (FOs) to collect water charges and apply sanctions for rule violations,
- re-orientation of irrigation department (ID) staff as “competent authorities” (CA) to provide technical support to farmer organizations (FOs),
- federation of FOs up to the scheme level and creation of an apex body at the state level.

With assistance from the World Bank, Rs. 118.1 Crores (\$28.1 M) was provided in 1998 for minimum rehabilitation works (an investment of approximately Rs. 100/acre). Previously, the government allocated Rs. 40/acre for O&M, but approximately Rs. 35 of this was used for Irrigation and Command Area Development Department (I&CADD) staff salaries and fixed overhead costs, leaving barely Rs. 5/acre for actual maintenance work. The Rs. 100/acre allocation for minimum rehabilitation, from WB funds, was to be used only for actual maintenance works, exclusive of I&CADD salaries. From January 1998 to March 1999, 22,887 works were undertaken, of which 70% were implemented by WUAs or DCs.

Training in role reorientation was given to officials in the I&CADD in 1995 and to designated “competent authorities” in 1997. Training workshops were held for WUA presidents in September and October 1997 and for WUA and DC leaders in July and October 1999. In 1998 and 1999 conferences for WUA and DC leaders were held at the district, regional and state levels for additional information dissemination, training and obtaining of feedback from farmer organization leaders. Additionally, the training and information campaign activities under the state-wide Janmabhoomi program supported awareness about the principles of reform.

2. Structure for M&E process

As will be seen below, there are numerous issues concerning the reforms in A.P. which require M&E data, analysis by stakeholders and further consensus building and decision making. Representatives of all relevant stakeholders should be involved in working groups or consultative committees at the state, regional, district and scheme levels. The reform program should involve in consultative committees representatives of all important stakeholder groups. This may include, amongst others, the following: farmer leaders from canal, tank and lift irrigation schemes; officials of the state government; officials from the I&CADD, Revenue Dept., Agriculture Dept., and Finance Dept.; NGO's; Panchayat Raj and other local government officials; and possibly local law enforcement officials.

The APFMIS working groups or consultative committees should meet regularly to review M&E data and request collection of additional information, as needed and as new issues arise. There should be an apex committee at the state level which guides policy and overall strategy. Soon, farmer-elected representatives will sit on scheme-level project

committees and committees at higher administrative levels right up to the state level. The reforms continue to evolve and new issues are on the horizon for which M&E data will be needed. Reliable, objective information is an important resource to facilitate the process of problem solving and consensus building.

It is recommended that working groups consisting of multiple stakeholders be formed at scheme, district, regional and state levels to review and facilitate the process of reform. The working group at the state level should adopt a core set of indicators for which it needs to aggregate data up to the state level and should disseminate this set to lower levels of government, with the request that the lower levels collect and aggregate the same data. Lower levels should be encouraged to adopt their own additional indicators as local circumstances require.

For more critical and complex issues (such as mal-distribution of water and local resource mobilization for O&M), it may be helpful to establish special issue groups to focus on generating ideas, information and support for how to address these issues.

The government and farmer organizations should link M&E indicators to certain desired performance criteria. These should then be linked to certain rewards, such as bonuses, awards or study tours.

3. Current needs for M&E indicators

Performance assessment can be divided into three components of reform: 1) assessment of the process of implementation, 2) assessment of immediate outcomes of implementation, and 3) assessment of ultimate impacts. The author's perception of key issues for the APFMIS reform program and related needs for M&E are listed below according to these components.

3.1 Process issues

Process issues are about the dynamics of change, procedures and achievement of specific targets. An assessment of process asks, "Are we doing things in the right way?" They tend to require more qualitative indicators than do outcome and impact assessments. In many cases multiple indicators for the same issue may be necessary to get a balanced view. The following are what appear to be the most important current process issues for the APFMIS reform program, with suggestions for related M&E indicators. Issues are presented as questions to be answered through M&E.

For many of these issues, simple indicators will not be able to tell the full story about local dynamics and perceptions. More qualitative and exploratory methods will be needed to enable understanding of more subtle or sensitive issues. These may include participatory rural appraisal methods and key informant and group interviews.

- 1. Were the elections for Territorial Constituency (TC), WUA and DC leaders done in a democratic way? Did they result in selection of popular leaders who represent the interests of common farmers, including tail enders, small holders and landless cultivators?*

Possible indicators to measure this are:

- a) % of elections which were contested versus unanimous,
- b) WUA Social Awareness Index = % of WUA members who know names of TC and WUA leaders, % of members who know level of water charge, % of members who know what are their membership requirements (O&M obligations),
- c) WUA Social Support Index = % of WUA members who support WUA leaders and their policies,
- d) Socio-economic background of WUA leadership = Total size of landholding of WUA leader, caste of WUA leader, type of off-farm business of WUA leader (including whether they have been construction contractors),
- e) % of WUA presidents and TC leaders which are literate.

Data collection for these indicators should be compared, or if necessary, stratified by head/tail end and by land tenure categories.

2. *To what extent do WUA members participate in the WUA (including women)? For farms cultivated by tenants, how do landowners versus tenants participate in the WUA? Also, do WUA members have the ability to inspect WUA records when they like?*

This is about both the breadth of participation of WUA members, social viability of WUA's, and transparency about WUA business. Possible indicators to measure this are:

- a) % of WUA members (by gender and tenure status) who participated in the election of WUA leaders (or selection by unanimous consent),
- b) % of WUA members (by gender and tenure status) who attended key general assembly meetings for establishment of WUA and approval of by-laws, basic policies and level of water charge,
- c) % of WUA members (by gender and tenure status) who participate in mandatory maintenance works done by communal labor? (if applicable),
- d) % of WUA members who are aware of basic WUA policies and decisions (such as level of water charge, water distribution rule, timing of general assembly meetings),
- e) WUA Social Stability Index = % of WUA members who own or have long-term rights to irrigated land,
- f) Number of times WUA records have been examined by WUA members.

3. *To what extent do TC leaders participate in WUA decisions and activities?*

Some observers question whether the reform process is too much focused on the WUA president, to the exclusion of TC leaders and regular WUA members. The following indicators might be used to obtain information about this issue:

- a) % of TC leaders present in meeting when a key WUA decision was made (such as final selection of maintenance works, determination of new water distribution method, approval of water charges, recruitment of ditch tenders or gate keepers, etc.)
 - b) % of TC leaders who feel adequately involved in key WUA decisions,
 - c) % of TC leaders who participated in walk throughs for maintenance works.
4. *What is the quality of the working relationship between WUA and DC levels (and later, the PC level)? Are there any conflicts or communication problems between levels?*

Suggested indicators are:

- a) % of WUA presidents who attend DC meetings, % of DC leaders who attend PC meetings (after PC's are formed),
 - b) Frequency of disputes between any WUA and the DC over water distribution,
 - c) Frequency of disputes between any WUA and the DC over selection of maintenance works,
 - d) % of WUA presidents who are aware of the water distribution arrangement along the distributary canal during rabi and kharif seasons.
5. *What records are being kept by WUA leaders and how adequate are they? What records or data have been copied or shown to the WUA Presidents and/or TC leaders by Village Administrative Officers (VAO).*

Suggested indicators are % of WUA's which have:

- a full list of members,
- accounts records which are complete and up-to-date,
- a complete record of maintenance works,
- command area maps and
- a record of members who have paid or defaulted payments of water charges,
- attempted to obtain above information from the RD and have been unsuccessful.

6. *Are WUA leaders managing funds in an appropriate manner? To what extent are WUA Presidents benefiting personally from maintenance contracts?*

Suggested indicators are:

- a) % of WUA presidents which have been recalled due to financial improprieties,
- b) % of maintenance works handled completely by WUA presidents,

- c) % of WUA members or TC leaders which trust the WUA president in financial matters.

These simple indicators will not be sufficient. It will be necessary to have financial audits conducted by independent auditors not under the influence of WUA presidents. Results of the audits should be reported to DC's and PC's as well as to the I&CADD and Revenue Department.

7. *To what extent have disputes or problems arisen over the delineation of boundaries and powers for the WUA's and DC's? Is there any opposition to WUA's or DC's by Panchayat Raj governments or other local bodies?*

Suggested indicators are:

- a) Frequency of disputes over WUA boundaries,
- b) Frequency of disputes between WUA's,
- c) Frequency of disputes between WUA's and Panchayat Raj governments.

More incisive assessment of sensitive issues may be required through confidential key informant and small focus group interviews.³

8. *What kinds of farmers tend to pay the water charge and what kinds of farmers tend not to pay the water charge? To what extent do TC leaders or WUA presidents collaborate with the VAO in the collection of water charges? Are WUA's applying sanctions against water charge defaulters?*

Suggested indicators are:

- a) % of head versus tail enders who are in default of water charge payments,
- b) % of large landholders versus small holders or tenants who are in default of water charge payments,
- c) % of TC leaders who assisted VAO's with collection of water charges,
- d) % of WUA's which have applied sanctions against members who default on payment of water charges,
- e) Type of sanctions applied by WUA's against water charge defaulters.

More qualitative analysis, through semi-structured interviews with key informants and small focus groups, may be required to elicit information about motivations of farmers to pay or not pay water charges and about the relationship between TC's and VAO and between WUA presidents and other RD officials concerning water charges.

³ A focus group is a group of individuals which all belong to a same category, such as tail enders, laskars, competent authorities, TC leaders, etc. They are used to discuss sensitive matters.

9. *To what extent did WUA members participate in the selection of maintenance works done in the minimal rehabilitation program? To what extent are WUA members satisfied with the works done?*

Suggested indicators are:

- a) % of TC leaders participating in scheme walk-throughs for maintenance planning,
- b) Number of non office-holding WUA members which participated in scheme walk-throughs for maintenance planning,
- c) % of WUA members who are satisfied with the selection of maintenance works,
- d) % of WUA members who are satisfied with the quality of maintenance works done.

10. *Did WUA's and DC's contribute the required 15% matching investment for the minimal rehabilitation program? Are WUA's making plans for mobilizing resources for routine maintenance activities and for capital reserves?*

This is about the issue of financial sustainability, not just current solvency. It is of critical importance for assessing the viability of management transfer programs. Suggested indicators are:

- a) % of WUA's and DC's which contributed their required 15% matching investment under the minimal rehabilitation program,
- b) Average % matching contribution made by WUA's and DC's,
- c) Frequency of different types of contributions made by WUA's and DC's (in labor, materials and cash),
- d) O&M Financial Viability Index = Revenue available for O&M / cost of O&M,
- e) WUA Financial Self Reliance Index = Amount of funds and other contributions for irrigation from WUA members / total resource requirement for O&M.
- f) % of WUA's which have formulated plans for mobilizing resources for routine maintenance and for a capital reserve fund,
- g) % of WUA's which have implemented routine maintenance activities with their own resources,
- h) % of WUA's which have started developing a capital reserve or long-term savings fund.

11. *What new procedures have WUA's and DC's adopted for water distribution and regulation? How satisfied are WUA members (especially tail enders) with any changes made in water distribution?*

This is another very important issue. Unless water distribution is improved, it is unlikely that WUA's will be able to raise the level of water charges and increase the collection rate. Unless

more funds are raised locally for irrigation O&M than at present, the schemes will continue to deteriorate after minimal rehabilitation and the gap between potential and actual irrigated area will again widen.

Suggested indicators are:

- a) % of WUA's and DC's which have adopted new methods for water distribution,
- b) % of WUA's and DC's which have adopted new arrangements for implementing and regulating water distribution,
- c) % of WUA members (tail versus head enders) which are satisfied with the reliability and equity of water distribution within the hydraulic unit of the WUA,
- d) % of WUA members which believe that water distribution within the hydraulic unit of the WUA has improved after creation of the WUAs.

12. To what extent do designated "competent authorities" understand and accept their new roles? To what extent are the laskar's willing and able to work with the WUA's? To what extent is the I&CADD taking on the role of facilitator versus director? Is any additional training needed for I&CADD staff?

It is not a simple matter for a large bureaucracy to reorient itself from the role of director to the role of facilitator and service provider. Officials could perceive the reforms to be a threat to their position of influence, budgets, nature of work, and job security. There are subtle ways whereby lower-level agency officials could resist, try to sabotage, or spread negative propaganda about the reforms. More sensitive methods for assessing staff perceptions, behavior and support for the reforms may be required, such as through participatory appraisal and key informant and small focus group interviewing.

The following are some suggested simple indicators:

- a) Skill Capacity Index = % of competent authorities, Works Inspectors, and laskars with required respective skills,
- b) Functional Responsiveness Index = % of competent authorities, Works Inspectors, and laskars which have performed all of their required functions,
- c) % of WUA presidents and TC leaders who are satisfied with attitudes, responsiveness and services provided by competent authorities, Works Inspectors and laskars,
- d) Organizational Responsiveness Index = Number of requests for assistance by WUA which have been responded to adequately by competent authority.

13. How adequate are the skills of WUA and DC leaders? What further training may be required?

This includes the type of skills available and required, as perceived by the competent authorities and farmer organization leaders. A training needs assessment would be required to identify specific training requirements. But some simple indicators can be used to detect whether additional training may be needed. Some suggested simple indicators are:

- a) Skill Capacity Index = % of WUA and DC leaders with required skills,
- b) Number of WUA's with leaders who are deficient in certain skills (such as, bookkeeping, conducting meetings, preparing O&M plans, dispute resolution, scheme walk-throughs, water distribution methods, measuring water flows, etc.),
- c) Frequency of different skill areas requiring additional training, as identified by WUA and DC leaders,
- d) Preference for certain types of training methods (classroom, theory, in-field, on-job, etc).

3.2 Outcome issues

Outcome issues are about the immediate, direct effects of a program, or the achievement of essential objectives. An assessment of outcomes asks, "Are we accomplishing our objectives?" The following are what appear to be the most important program outcome issues for the APFMIS reform program, with suggestions for related M&E indicators. Issues are presented as questions to be answered through M&E.

1. *To what extent are WUA's and DC's performing necessary functions?*

Different WUA's and DC's will have different requirements for management activities and levels of intensity. This is especially true between canal, tank and lift irrigation schemes. It is important that not all organizations be evaluated according to the same standard. Hence, ratio-type indicators are recommended which incorporate local management requirements. Such indicators will have to be "situationalized" according to specific local conditions. Such indicators could be structured as follows:

- a) Service Delivery Responsiveness = No. of services delivered / No. of services required locally,
- b) Organizational Responsiveness = No. of functions performed / No. of functions required locally,
- c) Member Satisfaction Index = % of WUA members satisfied with WUA performance

Rapid or participatory appraisals may be required to obtain more in-depth understanding of farmer perceptions about WUA and DC performance.

2. *To what extent has there been an increase in actual irrigated area after the reform? To what extent can we attribute this to institutional reform versus the rehabilitation program?*

There are three problematic aspects of this outcome measure. The first problem is the inaccuracy of data about irrigated area before the reform program. It is widely known that the Revenue Dept. under-estimates irrigated area by 20 to 30%, while the I&CADD has a tendency to over-estimate area figures. Widely reported findings of an increase in area irrigated after reforms may largely be only the result of correction of previous misinformation about actual area irrigated. There needs to be a reconciliation between RD, I&CADD and Agriculture Department (AD) data, perhaps done through the coordination of the TC's and WUA's. As part of the reconciliation process, a close estimate of irrigated area before the APFMIS could be made.

The second problem is the difficulty of attributing increases in irrigated area to the APFMIS reform versus the rehabilitation. It is likely that most of immediate increases in area have been caused by the rehabilitation program. Increases due to the institutional reforms will only become apparent, at the regional or state levels, after a few years after rehabilitation, or in comparison with schemes which did not have rehabilitation (if there are any which are comparable to the others).

The third problem is the definition of area irrigated. One senses that there are different definitions and some are not clearly defined and some may be misleading. One definition is the area which has been "touched" at least once during the season (or year) by irrigation water. (And this could include only canal water or could also include lift irrigation). This can be a misleading definition because a single release of water to a field may not be enough to produce a crop. Another more meaningful definition might be area irrigated and harvested. Another problem is that the potential area created may have been exaggerated originally or may no longer be at all functional due to land filling of canals or other deterioration. Failure to irrigate the original design area may be due more to past errors than present O&M performance. Whatever definition is used, it should be a clear and standard one which enables assessment of current performance of O&M.

After the above problems have been addressed, the following simple indicators could be used:

- a) Irrigation Potential Achievement Index = Actual area irrigated / potential area created,
- b) Irrigated Area Utilization Efficiency = Actual area irrigated / current functional service area.

By current functional service area, we mean the area which could physically be served by irrigation because irrigation structures exist and are functional to deliver water to the designated area. In schemes where there is a shortage of water to serve the entire functional service area, a multiplier can be used to discount functional service area in accordance with water availability.

3. *Has there been an improvement in efficiency, equity, or reliability of water distribution after implementation of the reform program?*

Careful measurement of water delivery or distribution performance can require measuring devices and measurement capacity which do not exist locally. More simple indicators include perceptions of farmers, occurrence or frequency of water reaching tail end of canals, etc. As with the measure of area irrigated, it may be difficult in the short-term to determine that changes are due to rehabilitation versus institutional reforms. Additional qualitative assessment about new procedures implemented may be needed to strengthen evidence about effects of institutional reforms.

Some possible indicators are:

- a) Delivery Performance Ratio (DPR) = Actual delivery / Target deliver (at different locations),
- b) Relative Water Supply = Irrigation + rainfall / ET + seepage & percolation,

- c) Water Volume Performance = Actual water volume / Target water volume (for a given area),
- d) Irrigation Scheme Efficiency = Crop water requirement / Total inflow to scheme,
- e) Irrigation Distribution Efficiency = Amount delivered to turnouts / Total inflow to scheme,
- f) Field Application Efficiency = Crop water requirement / Amount of water delivery to field, (in some areas a surrogate measure for the same concept could be the total time taken for land preparation, as determined by water availabilities),
- g) Head/tail Equity Ratio = Average DPR of upper-end turnouts / Average DPR of lower-end turnouts
- h) Delivery Reliability Index = Total number of irrigations / Target number of irrigations (for selected head and tail areas).

4. *Has there been an improvement in the quality of maintenance and functional condition of irrigation scheme structures after the reform program?*

It is important to measure this over time so that trends can be detected. Physical sustainability of irrigation schemes is an important objective of management transfer programs. It is important to have early warning information available so that corrective actions can be taken if needed before schemes deteriorate as before the reforms. Suggested indicators are:

- a) Structural Functionality = Number of functional structures / Total number of structures,
- b) Maintenance Resource Utilization Index = Volume of work / Funds expended,
- c) Canal Flow Capacity = Actual canal flow capacity / Design canal flow capacity.

5. *Has there been an improvement in cropping intensity or a shift toward crop diversification after implementation of the reforms?*

Measures for this are well known. Annual cropping intensity is conventionally measured according to assumption of three seasons of a standard length of time. The maximum value is 300% (being 100% per season). Where cropping is diversified this may not work well and it may be more informative to base a cropping intensity index upon number of months (out of 12) crops are in the ground. Cropping intensity is not a suitable indicator for long-growing crops like sugarcane or tree crops.

It may be more important to measure extent to which farmers shift to higher value or non-rice crops after reforms.

Suggested indicators are:

- a) Annual Cropping Intensity = Area cultivated (adding each season or month) / Irrigable, cultivable area (adding each season or month),
- b) % of cultivated area planted in rice,
- c) % of cultivated area planted in non-rice commercial crops.

6. *Have crop yields per unit of land or per unit of water increased after implementation of the reforms?*

The standard indicator of crop production is yield per hectare or acre. Where water is a more constraining or scarce factor than land, yield per unit of water may be a more important indicator. This would require more attention to measurement of irrigation water diverted and delivered. So many factors effect crop yields that it is difficult to attribute changes in yields to an institutional reform program. Analysis of long-term changes in yield trend lines, weather and agricultural input application rates can help control for other factors which effect yields. Suggested indicators are:

- a) Crop yield per unit of land = Metric tons or kgs / hectare,
- b) Crop yield per unit of water delivered = Metric tons or kgs / 100 m³ or mm delivered to field turnout.

7. *What has happened to water charge collection rates after the reforms? How adequate are financial resources raised by the WUA for irrigation O&M requirements?*

Water charge collection rates are a useful, widely-used indicator of financial viability. But they do not tell us about the extent to which funds collected are sufficient to ensure physical sustainability of irrigation infrastructure. For this, additional measures are needed. Suggested indicators are:

- a) Water Charge Collection Rate = Amount of funds collected / Amount of funds assessed,
- b) Water User Payment Rate = Number of water users who paid water charge in full / Total number of water users required to pay,
- c) Maintenance Resource Sufficiency Index = Amount of funds allocated for maintenance / Funds required for routine preventive maintenance + funds required to repair backlog of deferred maintenance.

8. *How prevalent are irrigation-related disputes among farmers after the APFMIS Act, compared with before and to what extent can these be settled within the farmer organizations? How frequent are farmers taking irrigation-related complaints to the I&CADD?*

Suggested indicators are:

- a) Frequency of irrigation-related disputes before and after the reform,

- b) % of irrigation-related disputes arising which are settled within the WUA or DC,
- c) Frequency of farmer complaints about irrigation which are taken to the I&CADD, before and after reforms.

9. *What impacts is the APFMIS having on I&CADD staff and budgets?*

Suggested indicators are:

- a) Number of I&CADD staff at scheme and district levels, before and after reforms,
- b) Number of I&CADD staff reassigned as competent authorities,
- c) Number of I&CADD staff reassigned to WUA's and DC's,
- d) Size of I&CADD budget for establishment and operational budgets at scheme and district levels, before and after reforms (not including rehabilitation program funds).

3.3 Impact issues

Impact issues are about the ultimate, indirect effects of a program, or the realization of the basic goals and purposes of the program. An assessment of impacts asks, "Have we done the right thing?" If reforms are implemented as intended, it is important to then know whether they are having the intended ultimate effects on people and the environment. Normally, this takes longer to assess than outcomes. Impact assessment is more closely associated with evaluation than monitoring. The following are what appear to be the most important program impact issues for the APFMIS reform program, with suggestions for related M&E indicators. Issues are presented as questions to be answered through M&E.

1. *What has been the effect of the reform program on farm income and economic returns to irrigation water? What has been the impact on land values within irrigation commands?*

It can be expected that irrigation management transfer can lead to higher agricultural productivity and, through improved yields and crop diversification, to more profitable and labor-intensive agriculture. Some suggested indicators for economic productivity of irrigated agriculture are:

- a) Economic return to irrigated land = Gross or net value of output / hectare,
- b) Economic return to irrigation water = Gross or net value of output / 100 m³ or mm water delivered,
- c) Season or annual farm income (gross or net) per irrigated hectare (by location and farm size),
- d) Land sale values per hectare in upper and tail end areas.

The above indicators should be measured in head and tail areas and for different farm size categories.

2. *What has been the effect of the reforms on agricultural wages, employment and poverty?*

Suggested indicators are:

- a) Irrigation Wage Generation = Annual average income in irrigated area before and after reform,
- b) Irrigation Employment Generation = Annual person days of labor per hectare in scheme before and after reform,
- c) Relative Poverty Indicator = % of population below poverty line in scheme before and after reforms,
- d) Regional Relative Poverty Index = % of population below poverty line in scheme / % of population below poverty line in the region.

3. *What has been the effect of the reforms on the environment?*

It is possible that reforms could have some effect on the environment. One example of a possible effect is what farmers in the Godavari Delta reported to this consultant. They said that levels of salinity in the soil and water had declined after the reform program due to improvements in water distribution. More water has been reaching the tail-end areas and was used for flushing salts from soils. Also, due to more canal water being available, farmers in tail ends had stopped or decreased their use of bore well water (which has high levels of salinity). Such findings, if they could be documented and attributed to the reform, could be information of potential important global significance. Assessment of environmental impacts of reform should include analysis of causal linkages between institutional reforms and observed impacts.

Two possible indicators are:

- a) Irrigated Area Sustainability Index = Current irrigable area / Initial irrigable area,
- b) Resource Degradation Index = % of potential irrigation service area lost due to environmental problems (including waterlogging, salinity, sodicity, erosion, depletion of soil fertility, siltation of canals, etc.).

4. Important emerging issues

The following are this consultant's perceptions about what are the five most important topics emerging in the APFMIS reform program that deserve top priority attention. Working groups or consultative committees should address these topics through extensive discussions with stakeholders, participatory appraisals, M&E and action research where needed.

4.1 Shift to member-oriented WUA's

Some observers and participants in the reform process have expressed concerns that until the present, the process of developing WUA's has been mainly top-down and too focused on the WUA president. This may be partly justified and partly exaggerated. In the next phase of reform consolidating trust among members in the WUA will be crucial. There should be an emphasis on involving the membership in WUA activities in more meaningful ways and in ensuring that WUA policies and decisions are primarily oriented toward the interests of common members.

The following are some ways whereby membership participation in WUA's could be enhanced.

1. A general formalized azamoish, or joint inter-departmental reassessment of irrigated area, should be held state wide, following a standard procedure. This should involve WUA presidents and TC leaders. Before this is done, all parties concerned should be aware that in the future, the amount of funds available for irrigation O&M will be dependent upon the number of members and amount of funds raised. This will help provide an incentive to WUA leaders to ensure that the long-standing under-estimation of area is overcome.
2. Formalize the rights of share-croppers as full members with the right to vote. This may require legislation which permits landowners to delegate WUA "acting member" status to tenants without landowners losing their land ownership status.
3. Formalize co-membership status of married women, which allows them to vote in WUA meetings when the husband is not present and to be elected to WUA positions.
4. Requirements for members to contribute labor (or pay for it) for seasonal or annual maintenance activities (such as canal cleaning and de-silting).
5. Requirements that WUA records and accounts be regularly open for inspection by all members at a certain place and time.
6. Establishment of internal and external audit committees for technical, financial and social audits. Members would serve on audit committees for auditing their own WUA and some would participate in auditing of other WUA's.
7. Formalize a process for recalling WUA presidents and TC leaders which is not too onerous to be done quickly when needed.
8. Encourage creation of sideline businesses related to irrigated agriculture which could be taken up by WUA members, but organized under a separate unit. Leaders of the business units should not be related to WUA office bearers.

4.2 "Moral equivalent of war" against mal-distribution of water

The single most important thing the WUA's, DC's and PC's could do to establish trust among members and to create necessary incentives for members to raise sufficient resources to pay for O&M is to overcome the longstanding mal-distribution of water within irrigation schemes. This should be THE CRITICAL NEXT STEP in the reform process. If this problem is not solved effectively, the reform process will fail. Consultative committees at all levels and special issue

groups should begin to focus on solving this problem. Competent authorities, NGO's and law enforcement agencies should be involved in tackling this problem.

WUA's and DC's should hold consultations with their competent authorities and others from the I&CADD to identify new water distribution policies, rules and sanctions. The I&CADD should provide the necessary technical support to ensure that the proposed new water distribution arrangements are technically sound. Then the WUA's and DC's should hold general assembly meetings to obtain the approval of members. Meetings should then be held between WUA leaders, officials of district government, Panchayat Raj, I&CADD, RD and the law enforcement agency to inform them about the new water distribution rules and request the agencies to prepare a jointly-signed letter to support and legitimize the new policies, rules and sanctions. Technical audit committees should be concerned with water distribution as well as maintenance. They should include not only members of WUA's but also representatives from relevant government agencies. Findings of the technical audit committee should be made public and should influence allocation of government subsidies and perhaps other sanctions which government agencies could apply in a supportive manner.

While strong enforceable sanctions need to be established and enforced, with back-up from the government, mechanisms for consultation and persuasion with offenders and applying social pressure should always be the first line of response. It may be helpful for letters to be issued by the state and district governments and law enforcement agencies to WUA's and DC's which clearly acknowledge the rules for water distribution adopted by WUA's and DC's and state the extent of powers of WUA's and DC's to settle disputes and apply sanctions against errant members and others who may break WUA and DC rules regarding water distribution and damage to structures.

4.3 Getting the incentives right for local resource mobilization

After the necessary improvements have been made in water distribution, farmers will be in a far better position to support increasing water charges and making other contributions toward the local financial sustainability of their irrigation systems. The following issues will then need to be dealt with.

What is the basic structure of incentives which will be required to motivate farmers to invest in routine O&M and long-term infrastructure improvement at adequate levels to ensure the physical sustainability and productivity of their irrigation systems? The following are examples of what some of these incentives might be:

1. WUA's take over some or all of the functions of collecting and transmitting water charges. It may be preferable for the VAO to continue to receive the moneys and keep the accounts while the WUA presidents and TC leaders serve to mobilize members to pay the fee. It is vital that VAO open their books to the WUA's. They should be instructed to do so by the Revenue Dept. hierarchy;
2. Project Committees should be allowed to set their own water charge rates above the level of the state recommended level (which should be considered only as a minimum);
3. WUA's retain their share of the water charge collected for routine O&M and the VAO transmits the government's share to the government. Short-falls in collection could be borne

by both the WUA and the government, but short-falls would reduce the amount of funds available to WUA's, DC's and PC's;

4. The amount of revenue for O&M or rehabilitation allocated by the government to a WUA (or DC or PC) is strictly linked to and based on the amount of funds and other resources (including labor) which are mobilized by the WUA. This will create an incentive for WUA's to expand their service areas so as to expand their revenue base (this has happened in a number of cases of IMT in other countries);
5. Government subsidies should not be considered as a form of government welfare or largess, but as a kind of government investment to stimulate local investment and self reliance. The returns to the government's investment are greater local financial self reliance, economic development and a gradual decline in the amount of subsidies required. Subsidies should always be contingent upon local investments and certain performance criteria (which could be assessed by M&E or audit committees). Also, funds should not be disbursed to WUA's until after the WUA has made its share of the investment;
6. Government funds would be disbursed to WUA's only after approval is also given by the Project Committee, so that the PC can provide a review, check and balance function;
7. WUA's should be required to raise capital reserve funds. These would be required as collateral for WUA's to obtain loans and a pre-requisite for WUA's to obtain government subsidies.
8. Different levels of subsidies and terms and conditions for local contributions should be developed for tank and lift irrigation schemes, suitable to their special constraints and needs.

4.4 Reorienting the I&CADD

It is not enough to simply have policy statements which declare that the I&CADD will take on the role of facilitator and provider of technical services to the farmer organizations. Certain additional structural changes are needed to support this. Some of these might be as listed below.

1. Bonuses, promotions and favorable postings could be given to staff who are effective in the role of facilitating development of strong and well-performing WUA's, DC's and PC's.
2. The current dispute with laskars being transferred to WUA's needs to be resolved as soon as possible. Compromise may be necessary, but they should still be under the supervision of TC leaders and WUA presidents. Perhaps an appeal process (to I&CADD) or a joint supervision arrangement between the WUA and I&CADD could be set up. Laskars who adamantly reject the change could be replaced by traditional neeradi or others recruited by the WUA's.
3. Federating WUA's up to scheme level will probably require transfer of many I&CADD Works Inspectors to the farmer organizations. Eventually farmer organizations may need to recruit their own Works Inspectors. Young graduates with Industrial Training Institute Certificates, Draftsman Civil Course are becoming widely available in rural areas.
4. The I&CADD may need to conduct some strategic planning, in collaboration with other government bodies, to revise its mandate. This may involve some withdrawal from its former

role in irrigation O&M and adoption of new tasks in water basin management, environmental monitoring and regulation, water rights registration, higher-level water dispute resolution, etc.

5. The I&CADD (and perhaps RD) should participate in technical, financial and social audits of WUA's, DC's and PC's, at least for the next several years. This would provide a necessary check and balance and legitimizing function and would help "give teeth" to the audit committees.

4.5 Empowering and enhancing the relevance of WUA's through scaling up

Scaling up farmer organizations from the WUA level to scheme level and higher can open up new opportunities to empower and enhance the value of the farmer organizations to farmers. Actions need to be taken to protect the integrity of the federation process and to exploit the new opportunities for farmers. Some suggestions follow.

1. Social audit committees, which consist of both farmers and government officials (and possibly NGO staff), could be established prior to elections at the PC level to monitor elections and report any irregularities observed.
2. Technical and financial audit committees, which consist of both farmers and government officials (and possibly NGO staff), should be established at each level of federation.
3. Important government communications, regulations and subsidies should go through the Project Committee first, and then trickle down to the DC and WUA levels, so as to strengthen the PC and support the principle of "one scheme, one system of management."
4. Pilot or demonstration schemes should be selected in each region where full management transfer is implemented right up to the scheme level. This will provide a learning experience and a location where others can visit for training purposes. This will encourage farmer-to-farmer training.
5. The training program should identify training modules based on requests from farmer leaders. More emphasis is needed on practical, task-oriented, field-based training (as reported by farmers).
6. More emphasis is needed on agricultural extension, especially on crop diversification for high value, non-rice crops. This will serve the need to reduce water consumption and increase the economic value of output per unit of water. Federation to DC and PC levels will create a sufficiently large scale of organization for farmer organizations to begin hiring their own agricultural extension agents. Alternatively, they could hire existing extension agents from the Agriculture Department on a contract basis—not having to pay their full cost of salaries, but more their operational costs. Extension agents could be charge not only with the task of extending information, but also searching out and setting up marketing opportunities, conducting soil analyses, and obtaining information about new crops and best cultivation and irrigation practices.
7. Farmer organization federations above the PC level could create information networks with newsletters about crop price information, marketing channels, political issues requiring lobbying from farmers, etc.
8. Farmer organization federations will need to be linked up to water basin management bodies and be given a role in coordinating water use and environmental management at this level. The rising inter-sectoral competition for water requires that farmer irrigation organizations be involved in these coordinating functions.

Annex 1 Summary of field visits

Dr. Douglas Vermillion and Dr. Denise Beaulieu visited the Vamshadhara and Narayanapuram schemes in Srikakulam District on December 9 and 10 and the Central and East Godavari Delta on the 11th and 12th. We met with WUA presidents, TC leaders, regular WUA members, DC presidents, competent authorities and other engineers from the I&CADD, officials of the Revenue Dept. and the press. We tended to split into two groups, one of us would interview farmer representatives and the other would interview government officials.

In the Vamshadhara scheme, Srikakulam district, farmers reported that after the reforms they had handled making repairs by themselves and that water distribution had become more reliable and equitable and yields had increase (from about 20 bags/acre to 25 bags/acre, 1 bag = 80 kgs.). They said after the Act, farmers got united an persuaded farmers not to steal or take extra water. We saw WUA minute and account books. Farmer leaders interviewed said that the WUA's can handle repairs up to Rs. 50/acre, but above that level they expect the government to pay. They said that if the government would fully rehabilitate their scheme that the farmers would then be willing to take over the cost of maintenance thereafter.

WUA members want to grow fruit trees along canals and have fisheries to raise extra money to put into their bank accounts for a reserve fund to be used for emergency repairs or special maintenance. A key concern of farmers is that they need more agricultural extension, in order to reap the benefits of improved water management.

They reported that the government has an arrangement to provide assistance to WUA's in the form of matching grants, usually on a 50/50 or 30/70 share basis, subject to negotiation. This is allocated among WUA's at the district level.

A WUA president suggested that the recall provision in the Act should be changed from requiring a simple majority to requiring a 2/3 vote, so things can be more stable. (I wondered whether this could not be done by the WUA changing its own by-laws.) WUA leaders complained that training was more about what the government thought they needed to know and do, than their own practical needs. They said every training just adds to their responsibilities. They recommended that judicial power be given to the I&CADD to enable them to prosecute those who damage irrigation structures. Farmers said that the election process was ok but some factions try to promote their candidates. In general, farmers do not know what the water charge collection rates are. Farmers want to have more water control structures to exploit benefits of improved water supply. Head-end farmers in large schemes still seem indifferent to water problems of tail enders.

In the Narayanapuram Anicut System I interviewed a Competent Authority and Works Inspector and discussed the minimal rehabilitation program. Before the Act the I&CADD would get Rs. 60/acre per year for O&M. Of this, Rs. 20 was used for staff costs. They identified annual works according to two criteria: what works haven't been done for three or more years and any special problems arising during the previous season. The tendering

and contract process was discussed and compared with the new process of maintenance under the minimum rehabilitation program.

Now, the competent authority, WUA president, TC members and interested farmers walk through all canals in the WUA area (walking about 5 kms per day). The WUA leaders present the list of proposed works to the general body of members, wherein the list is shortened and prioritized. Then the Competent Authority and his staff prepare cost estimates and obtain necessary technical approvals from superiors and the WUA president signs an agreement for the maintenance program. The government disburses 40% of the funds required in advance. No outside contractors are used. Virtually all labor is provided by WUA members. It was reported that final disbursements of funds for maintenance works had been delayed for unknown reasons.

This process is better than before because farmers prioritize the works, use their own labor, avoid using outside contractors and the quality and volume of work is much better. After the Act the Assistant Engineers and staff have more work (with meetings, supervision, walk-throughs, etc.) but “actually we are doing it the way it is supposed to be done.” The Assistant Engineer interviewed suggested that the reform should be decentralized more so that the Competent Authority has the authority to disburse funds without having to have the Pay and Accounts officer involved.

We also interviewed farmers and I&CADD staff at a tank scheme in the district. (I have lost the name of it). We were told that the first priority for maintenance works in tanks is tank sluices and surplus weirs, then division dams and canal regulators, and then branch canals (desilting and repairing breaches). In 1998-99 they received Rs. 90/acre for maintenance works, of which Rs. 60/acre was used for headworks. WUA contributes a 15% matching amount in labor, bullocks and materials. Farmers reported that with less rainfall than same seasons before the Act, the water is still enough to reach the entire area.

We also met with a Revenue Department official. He explained the revenue collection process for the land tax and water charge. He said that the Revenue Recovery Act empowers the RD to “attach property” of defaulters, but so far his superiors had instructed him not to enforce this. His collection rate is about 80% and those who don't pay tend to be the more wealthy and powerful.

He estimated that the actual cost of irrigation is about Rs. 1,200/acre so even with the recent increases in the water charge to Rs. 200/acre the government is still subsidizing most of the cost of irrigation. A betterment levy is needed to rehabilitate tanks.

He is against having the WUA take over collection of water charges and against direct allocation of funds collected to WUA's. He said there are so many checks and balances and inspections to protect appropriate collection and use of funds and these would be eliminated by the proposed reform. However, he said the WUA could assist the VAO to raise the collection rate. He felt that it would require a new legislative Act to change water charge collection to the WUA's. The government often lets water charge collection

be dropped in an election year. He said politicians should not interfere with revenue collection.

On December 11, we met with farmer leaders in the Central Godavari Delta. A WUA president said that they could collect the water charge if given staff and property attachment powers. They could better persuade farmers to pay, even powerful ones. They would say, "If you don't pay, we will all refuse to pay and will ensure that you get no water." They would not allow politicians to interfere with water charge collection. WUA presidents do not want to get paid for their services. WUA and DC leaders expressed willingness to collaborate with the RD to collect water charges, but weren't so inclined to do it by themselves. They expect to keep the WUA share and pass on only the government's share. This would enable them to obtain the funds in advance and use them as needed.

We were told that if a landholder is absent, a registered tenant cultivator may vote. The government provided an incentive of Rs. 20,000 per WUA if the elections were done uncontested. Open meetings were held to discuss potential candidates and reach unanimous decisions about WUA president and TC members. Pamphlets about the APFMIS Act and duties of WUA presidents and TC members were given to all farmers. TC members are supervising laskars and reported no difficulties working with them.

Some WUA's are already raising funds from fruit trees and sale of grass on canal embankments. All reported that funds used for minimal rehabilitation were well used with no wastage. After the Act water is delivered simultaneously to tail and head ends. Transplanting time had been reduced from 25 days to 15-20 days. Rice crop yields had increased from 20-25 bags/acre before to 30-40 bags/acre after the Act. Farmers want agricultural extension help to do land classification and soil testing to determine what non-rice crops can be grown in different places. They need support to diversify into commercial crops and want help to develop a marketing strategy to export crops, especially bananas.

Farmers reported that in tail areas near the sea farmers are using less fertilizer now because they don't need to use the infertile bore well water. Canal water conveys more soil nutrients. Also, there is less salinity in the soil because more water going to tail ends is flushing the salt. [If true, this consultant believes that this is an important environmental impact which deserves international attention. This deserves a research study to document this.]

In the East Godavari Delta farmer leaders told us that in addition to laskars, WUA's also needed to have Works Inspectors be transferred to the WUA's (at least one inspector for two WUA's). Out of 15 WUA's in the DC, 4 had uncontested elections and 11 had contested elections. They were sure that in the next election all elections would be contested. They said 1 Competent Authority and 1 Works Inspector is needed for each 5 WUAs. They noted that the so-called Social audit is really only a WUA general body meeting where farmer members inquire about WUA activities. [This does not seem to be adequate, as noted above.]

Annex 2 List of reports reviewed

1. Oblitas, Keith and Raymond Peter, in association with Gautam Pingle, Halla M. Qaddumi, and Jayantha Perera. 1999. *Transferring Irrigation Management to Farmers in Andhra Pradesh, India*. World Bank Technical Paper No. 449. Washington, D.C.: The World Bank.
2. K. V. Raju. 1999. Participatory Irrigation Management in Andhra Pradesh: A Way Forward. Draft report commissioned by the Indian Network for Participatory Irrigation Management. Bangalore: Institute for Social and Economic Change.
3. Davuluri Venkateswarlu. 1999. Politics of Irrigation Management Reforms in Andhra Pradesh. Paper commissioned by the Indian Network on Participatory Irrigation Management and presented at the International Researcher's Conference on Participatory Irrigation Management, 11-14 December, Hyderabad, India.
4. B. Guru Prem. 1999. Capacity Building for PIM in Andhra Pradesh (India). Paper presented at the Fifth International Seminar on Participatory Irrigation Management, 14-21 December, Hyderabad, India.
5. Jasveen Jairath. No date. Participatory Irrigation Management (PIM) in Andhra Pradesh: Contradictions of a Supply Side Approach. Draft manuscript.
6. M.K. Rahaman. No date. Farmers Participation – Successful Stories in Andhra Pradesh. Draft manuscript.