



GENERAL REPORT ON THE THEME “SUPPORT SYSTEM FOR PIM SUSTAINABILITY”

A. Hafied A. Gany¹

INTRODUCTORY BACKGROUND

Out of about 315 abstracts that had been submitted, 95 papers that have been accepted for the “4th Asian Regional Conference” and “the 10th International Seminar on Participatory Irrigation Management, and about 50 papers for History Seminar for presentation, or about 135 papers altogether. There are 44 papers belong to Theme 1 (A Review on Participatory Measures in Irrigation); 23 papers belong to Theme 2 (Required Grounds and Facilities for PIM Formation); and 28 papers belong to Theme 3 (Support System for PIM Sustainability).

On top on these figures, there are nine key speakers to give highlights of the underlying issues on PIM. Among others: (1) Problems and perspectives of PIM under the Small Land Holding Condition (INPIM-INA); (2) Irrigation Management Transfer (IRAN); (3) Irrigation Management Reform; (4) Success and sustainability of PIM (INPIM); (5) Performance PIM (FAO); (6) The Impacts of Management Transfer; (7) Experience on Management Transfer (The World bank); (8) Water Users, Participatory Management and Sectoral Reform (IWMI); (9) International Networks on Participatory Irrigation Management (The World Bank).

The present general report has been abstracted from Theme 3 giving special scrutiny on “Support system for sustainability of Participatory Irrigation Management”. Out of which, 21 papers are acceptor for oral presentation and seven papers for poster presentation.

Based on overall review of the 28 papers on Theme three, the issues have been grouped into sin major sub themes, which are highly relevant with the theme, despite that some particular aspects are unavoidably “overlapped” to some extent with other themes. This report, therefore, fucuses a special scrutiny on these six sub-themes (sections) with some interrelated context with the other two themes. The issues are highlighted in Section 7.

1- A. Hafied A. Gany, Ph.D., P.Eng., is a Board of Director of International Network on Participatory Irrigation Management (INPIM); Pesident of the Indonesian Chapter of INPIM (INPIM-INA); Vice President of the Indonesian National Committee of ICID; and the member of History Working Group of Irrigation and Drainage of International Commission on Irrigation and Drainage –ICID.
(General Reporter) - gany@hafied.org; hafiedgany@gmail.com

The general outline of the report based of grouping in somewhat random order, are highlight as the following groups: (1) Institutional Aspects, Constraints, and Opportunity; (2) Concepts and Analysis of Public Participation; (3) Sustainability of Participatory Irrigation Management; (4) Evaluation of Irrigation Project Performance; (5) Impacts of Socio-economic development; (6) Capacity Building; and (7) Salient highlights of the papers on the theme “Support System for PIM Sustainable”.

I. INSTITUTIONAL ASPECTS, CONSTRAINTS, AND OPPORTUNITIES

1.1. GENERAL REVIEW

Under the variety of modes, participatory irrigation management has been implemented in many parts of the world over the last few decades. The implementations have been reportedly been indicating positive results. These particularly true for the newly completed projects including among others: (1) irrigated agricultural performance; (2) resource mobilization; (3) quality of irrigation services; (4) maintenance of irrigation infrastructures; and (5) farmers’ institutional development, and other such implementation achievement.

However, there are a number of evidences suggest that sustenance of such gains over a long run is often debate-able especially under the poor institutional conditions with the short-lived project activities. In fact, the continuation of external support should be continuously provided for a period of time before the capability of the community to manage the project on self sustainable basis. These external supports among others are: (1) supporting policies and strategies; (2) capacity building, training, and extension; and (3) monitoring and evaluation.

1.2. INSTITUTIONAL ARRANGEMENT

From the perspective of institutional arrangement, there are at least three significant and complementing actors: national/provincial governments, irrigation agencies and/or water users associations, and the irrigators. The institutional linkages among the three governance levels of responsible actors are evident.

In Nepal for example, the experiences so far indicate that the transferring management to farmers has been a huge experiment. Overall, the process has been positive, but more needs to be done to achieve the desired objectives.

In the past several attempts have been made to introduce a system to collect water fees from the farmers but without much success or long lasting. Therefore, whether gains in irrigated agricultural performance in PIM/IMT sites can be sustained is questionable. In the past, due to insufficient resource allocation for regular maintenance, irrigation systems fell into disrepair soon after rehabilitation and needed to be rehabilitated within a few years.

With regard to effective functioning of the WUAs, one difficulty is to locate strong leadership in the community and create an enabling environment for its emergence by creating favorable linkages with contributing actors. This is particularly relevant to the

cases in which various supports are extended in the name of supporting PIM/ IMT initiatives through short-lived donor-supported projects.

Despite that the refine Goals and Objectives of PIM/IMT foresees improvement in agricultural performance and reduction in government expenditure. However, for last several years, clear and measurable objectives are not yet laid out. In fact, transferring the irrigation system over to WUAs in itself is perceived as one of the objectives in contrast to defining the impacts and results that are expected from the management transfer. For example, experience in Nepal suggest that greater farmer participation in water supply and system management; increased contribution of farmers' resources to operate and maintain the systems; higher agricultural production; and a more positive farmer perception towards water delivery services. The main threat, however, is the lack of sustainability.

1.3. SUSTAINING THE POSITIVE ACHIEVEMENTS

To ensure a sustainable positive impact, the state needs to give much more attention towards issues such as: (1) Sufficient resource allocation for O&M (be it from farmer contributions or government subsidies); (2) Ways to locate good leadership in the community and create an enabling environment for its emergence; (3) Focus on institutional development of WUA before rehabilitation, as preconditions before starting technical works; (4) Post transfer support: DOI should broaden its role of 'irrigation system manager' towards 'support service provider'; and More (human and financial) resources allocated to ensure a functional monitoring and evaluation (M&E) system to monitor impacts of PIM/IMT.

1.4. OPPORTUNITY FOR EFFECTIVE INSTITUTIONAL ENHANCEMENT

An important area which is sometimes overlooked in the design of IMT programs is the support system for WUAs and irrigated agriculture during and after management transfer.

Planners need to consult with water users about what support services are most needed by the farming community in order to assume the new responsibilities and tasks as well to overcome constraints.

Support services during and after management transfer may include advisory services about institutional arrangements, establishment of organizational and financial procedures and skills, credit facilities, legal advice, marketing and construction procedures.

Training and extension are amongst the most important tool to develop the knowledge and skills of farmers and enable WUA officials to undertake management responsibilities and to ensure more profitable irrigated agriculture.

1.5. FARMERS NETWORK FOR WATER SECTOR REFORMS IN SOUTH INDIA

This paper deals with practical experiences of one of the fundamentals of PIM i.e. Farmers Network for Water Sector Reforms (FNWSR) in South India undertaken by JalaSpandana.

The main objective of FNWSR is to facilitate farmers – the major stakeholders in irrigation to participate effectively in the political process of policy formulation and implementation. INPIM supported JalaSpandana to carry out FNWSR in 2004 and 2005.

The results in terms of regular interaction with the concerned Ministry and Bureaucracy, pressure group to lobby for PIM, motivate fellow farmers to function efficiently at various levels of WUAs, seem alarming. In Andhra Pradesh, FNWSR succeeded in building pressure on the government and ensuring the continuity of WUAs. In Karnataka, the members of FNWSR succeeded in effective formation and functioning of project level WUAs institutions in four major irrigation projects.

The analysis concludes that the farmers network is the pre requisite for the success of PIM that warrants devolution of power from department to water users. In this context the FNWSR not only enables negotiate and contest with the government agency but also facilitate building consensus and cooperation from fellow farmers. It is evident from the evaluation that the FNWSR has created considerable impact on PIM through creating awareness among farmers, direct interaction with the policy makers, facilitating implementation process, with limited financial resources.

1.6. FORMULATION OF COMMUNITY DEVELOPMENT PLAN IN SEMI-ARID ZONE

This paper presents agricultural and rural development policy of the Government of Morocco in the arid region located at the southeast of the Atlas Mountains.

Given the severely lacks rainfall, with only 50 to 200 mm per annum and agricultural activities are fully dependent on torrential water and groundwater through subsurface tunnel structures, referred to as the “khattara” (system resembles tertiary canal of a large irrigation system in end water distribution system) in Morocco.

The khettara system has been well operated for several hundreds years because community itself was established on the basis of khettara water. Since the khettara flow is indispensable to maintain communities in arid region, it is desirable to improve present situation through efforts of local people with assistance of local governments considering the major significance of the khettara rehabilitation, i.e., (1) less cost and safer water sources; (2) sole water source for stable agricultural production; (3) source to preserve social system; and (4) heritage for the future.

In the light of these facts, it is expected that the Government will continuously support communities and unify them into more large organization such as "communal society" to stabilize and increase farm income of the rural communities under their initiatives.

II. CONCEPTS AND ANALYSIS OF PUBLIC PARTICIPATION

2.1. COOPERATIVE MODE OF PUBLIC PARTICIPATION

Based on experiences, the locals' participation in water resources utilization is not differed from other forms of public interactions. For public project, however, financial

support by the governments plays a great role in the completion of this kind of project, and the absence of the public in these projects can be a remarkable weak point.

One of the effective ways in water resource development is through public participation such as on public in scheduling, construction, completion and maintaining the projects. In East Azerbaijan, for instance, the participation of the public in completion and maintenance has been initiated through cooperative approach referred to as Water Supplying Cooperative Companies (WSCC).

Through the WSCC, public participation has been implemented by means of socio-economic and management to benefit from the water resource projects. Through the close interaction with the authorities within the framework of the WSCC, the effective life of the projects has been increased and a better use of soil and water resources. The case of East Azerbaijan is considered as a successful model for public participation.

2.2. PERFORMANCE STUDY OF PARTICIPATORY IRRIGATION MANAGEMENT

A performance study has been conducted in Orissa State, India to examine the functioning and otherwise of Water User Association (WUA) or Pani Panchayat in India promoted by the State and the local traditional irrigation institutions. The study objectives are; (1) to contrast the formal and informal institutions in terms of their formation, performance and success, (2) to examine about the peoples participation and their liveliness, and (3) to recommend policy interventions to make the formal institutions more successful.

The study observation concludes that the Pani Panchayat as regulatory institutions in charge of water distribution on equitable basis, their performance has been reasonably weak and unsuccessful. Even though Pani Panchayat has been initiated and endorsed in the State for more than a couple of years, the acceptance of the model have been lethargic and scattered. However, the study showed that co-operation increases with increase in farm size.

Researchers have drawn up a strategy for policy makers to ensure IMT programs become more pro-poor stressing the need to clearly define the rights of farmers, raise awareness of these rights, reform the election process, and monitor participation in water user authorities.

As a whole WUA an unexecutable and unacceptable, and is not in the interest of the people. There are so many constraints like selfishness, illiteracy, no interest due to big landowners, which hinder for the improvement of WUA.

A detailed action plan should be prepared in consultation with the water users through Participatory Rural Appraisal method. It is necessary to apply bottom-up approach instead of top-down for sustainability. Simpler procedures are needed that still provide the WUA organisations with sufficient legal standing to deal with government agencies, contract with private firms, contractors, and control resources within the group.

2.3. PERFORMANCE EVALUATION OF NEW IRRIGATION PROJECTS IN ZANJAN PROVINCE, IRAN

Increasing water efficiency in agriculture part is the most important solution to reduce the negative impacts of water crisis. The most important aspect to put into effect is that the new irrigation project has to be based on appropriate programming as well as performing of irrigation designs and projects implementation.

An evaluation study has been conducted in Zanjan Province, Iran concludes that the performance of new irrigation projects have been ranked into four levels including excellent, good, moderate and weak. The overall evaluation of projects in zanjan indicates that the weakness from the qualitative analyses, while the evaluation indicate the good performance from qualitative. From these projects, three successful contribution projects have been identified, however, the performance evaluations from pressured irrigation in third program in Zanjan Province, the study concluded that these projects aren't conformities in contribution degree from quality point.

From this evaluation, some recommendation for future implementations are as follows: (1) The projects have to be equipped with data base networks from national water sources with appropriate quantity and quality as well as time accuracy; (2) Water measurement networks must be effective to support appropriate water resources allocation; (3) Improvement of irrigation efficiency and water utilization is most important aspect to consider; (4) Implementation of artificial feeding projects by groundwater during the non culture seasons; (5) consistent assistance to water users association for improving operation and maintenance; (6) The result from studies about comparing evaluation of pressured irrigation and difference in irrigation efficiency, it is potential in pressure way to use more lands from irrigated farms.

2.4. FARMERS' PARTICIPATION IN IRRIGATION WATER MANAGEMENT IN NORTHEAST IRAN

A study has been implemented in Northeast Iran to investigate the farmers' participation in irrigation networks management with an approach to compare two groups of farmers in the irrigation networks with Water Users' Cooperative (WUC) and without. The methodological approach was a descriptive-correlational and causal-comparative study of the survey type.

The reliability analysis and the t-test with independent samples showed that there were significant differences in relation to the averages of the variables of status of farmers' participation in irrigation management, annual income, farmers' perception of rural irrigation status, social solidarity with some parameters.

According to the study findings, it was found that WUCs as the considerable social capital can improve the level of farmers' participation in irrigation water management.

Significant differences was statistically found between two groups of WUs, those who involved in irrigation network with WUC and those in non-WUA networks in relation to the individual variables of age, education level, and experience in agriculture.

Among the economic characteristics, there was a significant difference between two groups of respondents in relation to their annual incomes. Significant differences were

found between two groups of respondents from the stand point of all their cultural and social characteristics, namely extension contacts, communication channels, social confidence, social solidarity, social participation, farmers' attitude toward the WUC, and farmers' participation status concerning irrigation networks management.

In addition, the analysis results indicated that among technical factors, there was a significant difference between farmers' behavior regarding farm water management and farmers' perception of rural irrigation status in two groups of respondents. Hence, agricultural policies in Iran must aim at raising the potential of water management technologies through the development of multi-functional WUCs to enhance agricultural water productivity, promote equitable access to water and to conserve the natural resource.

2.5. PARTICIPATORY MANAGEMENT OF MODERN IRRIGATION SCHEMES IN IRAN

A study of stakeholder views on the modern Dez and Moghan irrigation schemes has suggested farmers and extension staffs that the existing canal management is not sufficiently responsive to the new challenges of agriculture in the post-reform era, and that a more participatory management structure could help resolve the problems in water delivery.

Iran already has a long-standing and successful model for participatory farmer management in the millennia-old Miraab system (*Shaarebin*) used for managing the Karezes and Qanats in the arid and semi-arid regions of Iran. The survey responses indicated that all three stakeholder groups (farmers, extension staffs and water agency staff) would support the implementation of a management structure based on the Miraab system.

The research confirmed the importance of consulting different stakeholder groups, who might have different attitudes and perceptions of the problems and potential solutions. All the stakeholder groups surveyed indicated they would support its introduction, though some doubts were expressed in interviews about senior water agency staff.

It is suggested that farmer organizations should take the government's interest in irrigation management transfer as a window of opportunity to take up the stewardship of, initially, the tertiary water distribution system. They should use their indigenous knowledge to achieve the flexible demand management required for viable modern farming.

The commitment of farmers and support of other stakeholders are both crucial for success of the Miraab systems in the new working context. Successful management of the tertiary canals would be a good start for the ultimate establishment of the full farmers' stewardship of the main and secondary canals in the future.

2.6. PIM OPTION FOR GROUNDWATER

Given the fact that a large sector of the irrigated area is totally or partly dependent upon groundwater, in Iran, groundwater has also become a cornerstone of many regional economies and societies.

A study has been conducted to study analyzes the situation of groundwater resource use in the Abshar irrigation system in the Zayandeh Rud Basin, Iran and establishes the question if participatory management of groundwater and conjunctive use is a viable option for irrigation management in the present context.

This paper intends to trigger the thought on whether through participatory groundwater (or conjunctive water) management it is possible to establish control measures for groundwater management in a case such as the Abshar Irrigation System or any other area where groundwater exploitation levels form a threat for the sustainable use of groundwater.

The remaining questions to be established among others: "Is participatory groundwater management within and outside of surface water irrigation systems a feasible solution?"

If so, what knowledge is needed? What social structures are needed and at what scale? How should responsibilities be established and who should be responsible for what? What role should be delegated to the state? What role should be delegated to the water management agencies? What responsibilities should go to user organizations and how do you organize these? Is there a need for institutional engineering? The subsequent answers to these questions would provide feasible options for PIM on Groundwater.

2.7. PARTICIPATORY IRRIGATION MANAGEMENT IN IRRIGATION NETWORKS OF TEHRAN PROVINCE

Participatory Irrigation Management in the section of irrigation and agriculture in the wide land of Iran with water scarcity has a long history. After the victory of Islamic revolution of Iran government provided a fast development in water industry in the demand of work in a way that the resource dams which are under operation and use are more than 170 national dams in provinces and about 83 national resource dams are being built.

The process of participatory management shift has been done either by voluntarily establishment of people or it has been done by the application of government, so they have been able to use this design through actual field performance.

As far as the previous experiences in Teheran Province, there are a number of problems and constraints associated with PIM implementation. These are among-others: (1) limitation of authorities and legal instrument as well as support system; (2) Unclear water right (3) Diversified water policies causing problems on the management shift in the cities of Tehran Province; (4) Lack of successful PIM model the purpose of attracting people participation; (5) Lack of sense of ownership and responsibility in PIM implementation; (6) Lack of inter-sectoral coordination; (7) Highly dependence on the government on the water services; (8) Problem of land conversion from irrigated agricultural lands to industrial, housing and other non agricultural purposes; (9) Lack of initiative for proper maintenance of irrigation infrastructures; (10) Lack of public

awareness on the appropriate use of safety facilities provided for irrigation infrastructures.

2.8. APPLICATION OF PROPORTIONAL PLUS RESET (P+PR) AUTOMATIC CONTROL SYSTEM FOR PARTICIPATION OF WATER USERS IN DELIVERY MANAGEMENT

Facing water shortage and increasing water demand, it is necessary to consume limited water resource in an optimal fashion. Due to low performance of irrigation networks improvement, water delivery systems and its performance with participation of water users and applying improved control system become a must.

For this purpose in recent decades several automatic control Systems including P+PR system, for flow management in irrigation networks have been introduced. Applications of these techniques provide situation that, water users play a direct role in water delivery with high flexibility.

To test the performance control in this study, the ICSS hydrodynamic model has been applied on ASCE standard canal number two to test the global performance of P+PR downstream automatic control system.

The results show that average depth deviations are in the range of 0.001 to 0.014 % and maximum depth deviations are in the range of 0.111 to 0.211 %. The response time of control system shows that the depth is stabilized in the allowable range at the first time step. Performance indicators and depth variations demonstrate appropriate functioning of the control system.

Relying on the results of this study, application of this control system in irrigation canal which provide higher flexibility and direct participation of water users in management of water delivery could be suggested.

The study concludes that the performance of developed P+PR automatic downstream control system for simultaneous and significant diversion variations of outlets is quite suitable and it could be used as an effective instrument for direct participation of water users in management of water delivery.

2.9. PARTICIPATORY IRRIGATION MANAGEMENT IN MAHARASHTRA STATE, INDIA

Maharashtra has long tradition of farmers' participation in irrigation management in the form of Phad systems and Malgajari tanks. In the nineties, the first Co-operative Water Users Association (WUA) was established in the Mula Irrigation Project. With its success, Government of Maharashtra (GoM) has been promoting PIM in the State. Over the last 10-15 years, there was appreciable growth in WUAs. There are number of success stories, underlining the importance of WUAs. On the other hand, there are also some instances of no appreciable improvement in performance of irrigation projects with WUAs.

The study was concluded to evaluate the actual performance of WUAs a study was conducted with some conclusion as to provide insight into hindrances in functioning of

WUAs and measures to improve its effectiveness, which in turns improves the performance of irrigation projects.

It reveals the reasons behind the slow progress and also highlights important learning and challenges to upscale PIM in the State. GoM has initiated series of reforms to strengthen PIM. A stand-alone act (MMISF Act - 2005) has been enacted to provide legal backing to WUAs. The water for irrigation to be supplied volumetrically through WUAs only and there will be legal agreement between WUA and competent authority. The State has gone further in providing water use entitlement to individual farmers and establishment of independent water resources regulatory authority to ensure judicious, equitable and sustainable management of water resources of the State.

It is observed that Irrigation management transfer improves the service delivery as well as financial performance of the Project. There is need to have committed support from WRD and timely efforts to build WUAs to shoulder the responsibility. The Maharashtra case study provides insight into important aspects of PIM and possible measures to strengthen WUAs movement. Though Maharashtra approach to PIM is gradual, but with reforms in place and changed mindset of officers of WRD and farmers, PIM could lead to sustainable irrigation management.

2.10. PARTICIPATION OF THE FARMERS ON O&M OF IRRIGATION NETWORKS IN CENTRAL JAVA AND WEST NUSA TENGGARA PROVINCES, INDONESIA

Under the new law on Water Resources No. 7/2004 and the Government Regulation on irrigation No. 20/2006 in Indonesia, the central and local governments recognize the role of the water user associations (WUAs) to carry out the irrigation networks system management based on farmers' participation approach.

This paper elaborates several researches for analysis and evaluation of the farmers' participation on operation and maintenance of the irrigation networks system in two provinces in Indonesia: Central Java and West Nusa Tenggara.

This research gives general responses of the farmers' participation at the planning and performing processes respectively as indicating the scores of 2.77 and 2.80 and classifying the moderate categories as well as at the evaluating process as indicating the score of 3.2 and classifying the high category. The farmers' response on operation and maintenance of the irrigation networks system management in two provinces summarizes that 42% of farmers is categorized as high participation, 16% as moderate participation, 32% as low participation and 10% as very low participation.

Several other researches have been carried out for different locations in Indonesia for evaluation the farmers' participation on O&M of the irrigation networks system by different analysis methods and clearly concluding the positive impact. This synthetic research was carry out at six water districts in two provinces i.e Central Java and West Nusa tenggara, the results also showing that a good correlation between the farmers' participation and the performance of O&M of the irrigation networks system in Indonesia.

2.11. FORMATION AND DEVELOPMENT PROCESS OF PIM IN QAZVIN AREA

Since the last fifty years, gradual progression in management style of irrigation and drainage systems supported by promotion of people's participation in management trend has faced the government-oriented or hindering mechanisms to critical challenges at global scale. Genesis of this mind-set could largely facilitate evolution of change management through the four-stage process including: diagnosis, denial, cooperation and participation.

The network imitates a telescopic model in operation with hydro-mechanical diversion and checks (Amil) installed at its upstream. The Irrigation Management system in Qazvin (QIM) also follows full public governance as being experienced everywhere across the country. This traditional management, parallel to over-dated structures has left nothing but a depreciated and inefficient network in Qazvin.

A holistic plan for capacity building and empowerment of local farmers was founded in the province to develop a participatory management and promote due changes towards optimum utilization and maintenance of the network. The initiative is reliant on a tree-shaped model and consists of: farming groups, water users associations, unions and their apex Federation at provincial level. Upon direct election of farmers' representatives and formulation of legal instruments, managerial and maintenance affairs in main and lateral canals were gradually transferred to the local clients.

Presently, many commitments encompassing structural rehabilitation and water distribution have been shifted to the farmers in Qazvin, followed by logistic and administrative works handled by private sectors. Dynamic involvement of the young generation (men and women) at managerial and technical levels scattered at WUAs branches or Federation posts remarks for outstanding aspects of the PIM system in Qazvin.

To date, the mode applied for creation of CBOs (community-based organizations) and legislation of NGOs in terms of Water Users Association (WUAs) in Qazvin, generates a national pattern over the state.

2.12. RESEARCH PROJECT FOR IMPROVEMENT OF PIM (THE TAFILALET AREA, SOUTH-EAST OF MOROCCO)

The research project for improvement of PIM is a concrete follow-up of the Rural Development Project in the Tafilalet (PDRT). The Tafilalet is located South-east of Morocco, in the pre Saharan, south-of the Atlas mountains zone and extends over an acreage of 77 250 km², of which 60 000 ha are under irrigation.

During a mission carried out in the area by experts from the International Fund for Agricultural Development (IFAD), it was deemed necessary to undertake actions to upgrade users' capacities to deal with management of irrigation infrastructures. Based on the results of the mission, plans of the research project for the improvement of PIM were developed and implemented. The project, financed through donations from IFAD (\$US 490, 000), aims to set up prerequisites to make it possible for users to upgrade their intrinsic capacities through: (i) organizing themselves within Water Users

Associations (WUAs) where water resources are available; and (ii) meeting O&M costs incurred by irrigation systems.

A pilot action plan has been implemented in two small-scale irrigation systems falling within the scope of action of the Tafilalet Rural Development Project (PDRT). The project has targeted two localities Jorf and Tinjdad where the problem of water scarcity is most acute. The plan is based on the following three basic actions: (i) promoting adoption of partnership schemes involving various departments of the Ministry for Agriculture and users of water resources and rehabilitation of irrigation infrastructure; (ii) increasingly involve the Regional Office of Agricultural Development of the Tafilalet (ORMVATf) in providing supervision and technical backstopping to the WUAs and (iii) encouraging use of water-saving irrigation strategies.

During the four years of project implementation and while aiming at introducing new methodology and a new approach to prompt farmers to contribute to ensuring durability of irrigation infrastructure, the project has been able to reach almost all of the goals set down: (i) organizing and training farmers within the context of their WUAs; (ii) enhancing awareness by means of training courses and field trips; (iii) promoting water-saving irrigation strategies through practical demonstration plots and acquisition of logistics support; and (iv) setting up a database for follow-up evaluation of the WUAs' performance.

2.13. PRDA: A PARTICIPATORY METHODOLOGY FOR ANALYZING AND IMPROVING IRRIGATION PERFORMANCE – CONCEPTUALIZATION AND EXAMPLE OF APPLICATION IN KENYA

In Sub-Saharan Africa, agriculture is the backbone of the economy and employs approx 70% of the active work force. Rain-fed agriculture is largely dominant and agricultural production is increasingly vulnerable to erratic rainfalls and recurrent droughts. Although irrigation development is still in its infant stage in most countries and its performance remains largely below expectations of policy planners, it is believed it has a strong potential for rural development and economic growth.

The APPIA (is a French acronym for “Improving Irrigation Performance in Africa”) project is implemented in several countries in Sub-Saharan Africa. One of the major activities of the project was to develop and test in the field a participatory methodology for analysing and improving the performance of farmer-managed irrigation scheme. This methodology has been named PRDA for “Participatory Rapid Analysis and Action Planning of Irrigated Agricultural Systems”. A manual published by IWMI and the FAO presents the details of the methodology.

This paper describes briefly the situation of smallholder irrigation in Kenya and the numerous questions regarding the performance of such schemes. PRDA is then presented and a case study of its application in one Kenyan scheme is given. In conclusion this paper suggests a set of recommendations for effective use of PRDA based on the lessons learnt in the African countries where it was tested. Based on the results obtained during the course of the APPIA project, the present document suggest that PRDA may be one tool to achieve successful participatory irrigation management that can be used by multi-disciplinary/multi purpose organization such as National Irrigation and Drainage Committees.

Technicians and policy makers realized that there was no organization in country that can address all issues related to irrigation management. Hence the Ministry of Water and Irrigation decided the formation of a professional association to enhance networking amongst irrigation players, implement multi-disciplinary approaches and develop further Research & Development programs. In countries where they exist this could be one role of the National Irrigation & Drainage Committees.

III. SUSTAINABILITY OF PIM

3.1. MEASURING OF SUSTAINABILITY

Many resources have been spent on analyzing and standardizing an approach to introducing PIM. However few resources have been allocated to developing indicators for monitoring and evaluation (M&E) of the performance of WUAs. The sustainability of WUAs within the specific socio-cultural context of the countries in which they have been introduced/developed requires more consideration.

Given special scrutiny of the themes on international experience with measuring performance of WUAs; common pitfalls for sustainability of WUAs; and main technical and institutional indicators for measuring WUA performance, it has been concluded that the institutional arrangements for M&E of WUA performance, such as Federations of WUAs, the role of national, regional and local authorities in measuring WUA performance and the maturing of PIM as a process of development.

This conclusion puts forward a hands-on approach for policy makers, implementation experts, academics and consultants for ensuring and improving the sustainability of PIM.

3.2. STRATEGY FOR PIM SUSTAINABILITY

Participatory management in irrigation is among the burning issues for discussion in recent decade for exploiting the irrigation and drainage networks of different countries irrespective of their involving infrastructural facilities.

Considering the competition in consumption of agricultural water and optimum use of accessible water resources, a study has been conducted based on the assumption that the governmental management faces serious challenges in meeting the needs of users, while the private sector looks at it doubtfully because of high risk in investment on agricultural water. The study for creating participative irrigation management has been conducted in Foumanat Irrigation Network (Gilan Province) and Soufichai Irrigation Network (East Azerbaijan Province).

The Foumanat Irrigation Network is a network with an age of more than 30 years and covers an area approximately 50,000 hectares. The main crop of the area is rice. Soufichai Irrigation Network is about eight years old and covers an area about 12,000 hectares. The main crops of the area are cereals and fruits.

The study concludes that the strategy for PIM sustainability must be perceived that operation and maintenance of irrigation networks is not independent from ways of participation in rural and urban societies.

The ways and degree of participation in irrigation networks have to be seen from two major considerations: The first that the degree of willingness of the mother exploiting company to assigning part of its responsibilities and the second is the users who are going to accept the responsibility.

For explanation of common issues especially the ways of allocation and distribution of water in irrigation networks, both these aspects must be equipped with analysis instruments, which has to be able to demonstrate water allocation to each system that would resolve the competitive use of water amongst the users.

3.3. MICRO-PLANNING IN PIM, AN ENTRY POINT FOR SUSTAINABILITY

The necessity of devolution of certain management responsibility of irrigation system to the farmers' organization is now widely accepted as an effective tool for sustainable irrigated agriculture.

In India during 1990s systematic institutional and organizational changes have been undertaken to increase farmers' participation in irrigation management through formation of Water Users' Association (WUA) or Pani Panchayats under different externally assisted economic restructuring and irrigation infrastructure development programmes of World Bank, European Commission, Japan Bank for International Cooperation.

Today, Participatory Irrigation Management (PIM) at various levels is being implemented in different types of irrigation systems. For this program, appropriate institutional arrangements and mechanisms to bring about efficient utilization, equitable distribution and sustainable irrigation service are framed by different states of India.

From a number of experiences learned in Orissa, the poorest state in the dominion of republic of India, concludes that the strategic micro level planning along with identified entry point implementation program that are undertaken for sustainable irrigated agriculture simultaneously.

The study concludes that the objective of poverty reduction by way of promoting schemes for agricultural productivity improvement through irrigation can be achieved by adopting community based participatory approaches that support agricultural development like improving irrigation performance. These could be achieved by employing new production technologies, enhancing access to markets, promoting environmentally sustainable production activities, having gender perspective, measures to improve income and livelihood through micro-finance, rural infrastructure up-gradation, and participatory processes to empower the rural poor.

3.4. THE NECESSITY OF FARMERS PARTICIPATION IN PRESSURIZED IRRIGATION SYSTEMS FOR PIM SUSTAINABILITY IN IRAN

As a developing country, Iran has several large-scale irrigation and drainage networks under study and operation. These networks are often constructed in small-scale farmlands, and because of water deficit, inappropriate topography and incentive policies, they are equipped with pressurized irrigation systems in which operation is more complicated, comparing with surface irrigation method.

On the other hand, government policy is to develop private sector and therefore transferring operation of the networks to farmers' organizations is highly considered. Most importantly is the availability considerable costs of project execution which is provided by public credits also bank facilities by farmers' commitment establishing a sustainable PIM is highly important.

Nowadays, national policy is often accelerating construction in large-scale pressurized irrigation projects, as a result all components of pressurized irrigation systems being performed by government, so farmers do not play such an important role in this process. This theorem would cause some problems in transferring the irrigation system management to farmers' organization.

The study results obtained from performing under pressurized irrigation systems by government is compared with the one constructed by farmers organization, also offers some suggestions with regard to changing the present procedures and participating farmers organizations in project execution.

The study observation conclude that the pressurized irrigation projects in large areas which are constructed in small scale farmlands, all of the project execution are done by government and after accomplishment of project execution, will be transferred to farmers organizations. Nevertheless this approach will result in farmers' irresponsibility, and it will, in turn cause their dissociation during project operation so that after transferring the system to farmers' organizations, farmers will ascribe the organizations' managers to be responsible for all the system's problems.

3.5. SUSTAINABLE PARTICIPATORY IRRIGATION MANAGEMENT

To make proper decision on irrigation management transposition, "sustainability in irrigation management" and specifically PIM, which is the result of transposition program should be taken into consideration.

In irrigation management transposition process, as the management transposition mechanism and the assured responsibility delegation method are important, the sustainability and persistence of activities are the main issue. Specially, since the stakeholders as the future caretakers for operation and maintenance of irrigation installations do not have enough experience for the acceptance and performance of the given responsibilities. Therefore, the persistence of these activities in the form of new operational system, which is the subject of sustainable management, is focal point of the transposition program.

The main elements in the sustainable participatory irrigation management are: (1) Strategies; (2) Training and Extension; (3) Monitoring and valuation.

In all the three abovementioned main elements, it is recommended that the rational advisory models to be substituted for the common governmental trends, which requires: (1) In policymaking, new guidelines with no consideration for administrative caution, but correspond to requirements of local developing society to be submitted; (2) In training and extension, in addition to formal education in agricultural and irrigation activities, the issues relevant to reconciliation of technical specifications of the network with social requirements of an operation unit to be clarified for the stakeholders; (3) By the assistance of a specialized support system (e.g. in form of a non-governmental specialized/advisory organization) a diligent plan for monitoring and valuation of the performance of modern management to be designed to overcome the conditions resulted from establishment of the participatory operational policy instead of the past one.

IV. EVALUATION OF IRRIGATION PERFORMANCE

4.1. PERFORMANCE EVALUATION OF NEW IRRIGATION PROJECTS (ZANJAN PROVINCE, IRAN)

In an attempt to evaluate the water efficiency in agriculture it's necessary to focus our best tries on programming and performing irrigation designs and projects. From evaluation in irrigation new projects in five years third program in Zanjan Province the results of effect amount have been ranked in four levels including excellent, good, moderate and weak. Nevertheless, projects have been evaluated in as weak in quantitative term but good in qualitative term, and from these projects, three successful contribution projects have been elected and introduced in this article.

The general suggestion noted that in order to motivate in investors, it's necessary to use encourage policies for using new irrigation approaches.

Regarding to performed evaluations from pressured irrigation in third program in Zanjan Province, it was realized that these projects aren't conformities in contribution degree from quality point.

Learning from experience of the project implementation, the following aspects are recommended: (1) Water resources data base must be provided accurately from quantity and quality aspects; (2) Water measurement networks installation must be improved to ensure better irrigation management; (3) The increase of irrigation efficiency could be achieved by appropriate irrigation water operation; (5) On pressured irrigation it's necessary in pressure way to use more lands from irrigated farms.

V. IMPACTS OF SOCIO-ECONOMIC DEVELOPMENT

5.1. IMPLEMENTING PIM MANAGEMENT IN THE LITERATE STATE OF INDIA

Kerala, elongated coastal state of India, lags behind many states in the country in participating farmers in the management of irrigation, and implementing PIM.

Government manages the irrigation projects and distribution of water to its 0.3 mha irrigated area, which includes wetland crops like rice, and garden land crops like coconut.

Fragmentation and subdivision of land and resultant small size of holdings (average 0.3 ha); part-time cultivation of farmers who are literate (literacy rate 91%); lack of sufficient labour availability and high labour cost; and lack of coordination among various departments are the major threats to irrigated agriculture in Kerala.

PIM pilot projects being implemented at Neyyar and Malampuzha Irrigation Projects of the State have shown that, in spite of all the above issues, farmers are highly motivated and are ready to share responsibilities of PIM. Since spouses of farmers are also inducted as members of WUAs, enthusiasm shown by women in managing irrigation is encouraging.

The pilot project experiences are also encouraging. But the hesitation of officials to depart from the existing system, the reluctance of operational staff to involve users in management, and lack of legislative backing, are the main blocks noted.

The observation concludes that there are several problems that may hinder the implementation of PIM in Kerala, as mentioned above. But prospects are not too bad, as there are several contributing factors. If the irrigation agency supports and nourishes, PIM will flourish in Kerala also.

Almost at all levels, it is accepted that there needs a change. But their apprehensions regarding job security and loss of mandate compel them to opt for maintaining the status quo or keep away from the efforts to initiate change. It is expected that the lessons learnt from the pilot projects on PIM may help to gear up the political and administrative will to counter this.

5.2. PARTICIPATORY EXPERIENCES FOR ENHANCING LAND AND WATER PRODUCTIVITY

This paper shares the experiences of a project having measures to facilitate the formation of land and water management strategies and institutions that are socially acceptable and broadly replicable.

The paper describes the participatory process developed and adopted for exploring options for better use of water with focus on a single distributary RPC-V (Right Parallel Channel – V) of Patna Main Canal system through cost effective participatory mechanism, involving poor farmers, landless and share croppers.

A key difference in the present approach has been the identification and elaboration of possibilities of bringing improvement through dialogue with poor and marginal stakeholders empowered in relation to the larger-scale farmers who traditionally dominate the on-farm water management (OFWM) through self-help groups (SHGs). Dialogues were initiated between experts, local communities, and other key stakeholders such as the Irrigation Department.

The paper concludes that peoples' participation has been identified as one of the major principles for sustainable development of water resources. This reflects to believe that

people who inhabit an environment over time are more competent to make decisions. Dynamic nature of land and water invites wide range of stakeholders having multiple interests leading to complex integration amongst them. Establishing dialogue amongst these stakeholders needs identification of appropriate processes and means through which they can be brought together for a common goal.

The experiences in collaborative project and wide range of project partnership reflects that participation with community members on land and water related issues is mainly focused on two general types of situations: (a) set of issues focusing immediate and critical concerns leading to short-term emergencies or gains such as; irrigation needs, eradication of seasonal water logging and falling crop yields and (b) concerns that provide opportunities to different stakeholders to come together for longer-term, precautionary issues.

To achieve these goals the perspective should be broader which may accommodate members from wider constituency.

5.3. IMPACTS OF FARMERS' NGOS ON SOCIO-ECONOMIC DEVELOPMENT OF QAZVIN AREA, IRAN

Connoisseurs believe that inefficient management in O&M of irrigation system is assumed as a key element in weakening irrigation performance. Based on experiences, removal of existing inconsistencies and challenges will not realize without people's participation.

The analysis in this article have been made to formulate and implement a strategic plan for establishment and operation of NGOs (Non-Governmental Organizations) in Qazvin plain mobilized by face to face communication towards further involvement of his staff (Qazvin Irrigation Management, QIM) and target farmers in the process.

Based on a timing schedule, an action plan became operational to gradually shift exploitation and maintenance of existing irrigation-drainage network to the local community. Various commitments e.g., selling, inspection, registration, distribution and delivering water quotas are to be implemented by corporate Water Users Associations. They are also obligated for maintenance, dredging, and fixing hydro-mechanical segments (Amil) and turn-out structures.

The local leaders, apart from foregoing services and continued inspection of structures and operational processes, are responsible for fulfilling the demands, settling the problems on the spot and preparing daily reports on possible offending in the network.

Implementing IMT (Irrigation Management transfer) initiative in Qazvin, has resulted in numerous cultural, social and economic impacts especially in the area of improvement of irrigation management and has created structural changes towards the great objective i.e. "Equitable distribution of water" in the network.

5.4. PIM, POVERTY AND MODERNIZATION OF FARMER'S ORGANIZATION (FO) MANAGED IRRIGATION CHANNELS IN SINDH, PAKISTAN

The concern of this paper is to assess the role of FOs in managing and implementing the investment and modernization schemes of their own managed channels under PIM in Sindh province of Pakistan. The paper seeks the contribution of PIM modernization intervention in reducing the poverty, equity in delivery of water service and sustainability of FOs. The paper then focuses on the current PIM concepts, reform, and its process. The paper also address the issues of rehabilitation works, contract management.

At present at least 180 irrigation channels have been transferred to FOs for management and operation followed by assessment and collection of water service charges. The FOs have also been given an opportunity to implement and undertake the rehabilitation and modernization schemes for improving channels maintenance and operation.

The overall analyses concluded that PIM has evolved and become generally accepted as a necessary aspect of productive and sustainable irrigation. The schemes of modernization of irrigation channels are an excellent opportunity to address the issues of sustainability of FOs, sustainable water resource management. The FO managed investment schemes have not only addressed the local employment issues of landless agriculture and rural worker but also has addressed the water equity and efficiency as well.

The increased farm productivity and income has reduced poverty from the rural poor. In Sindh PIM has proved to be successful model. But it is long way to go and government still needs to support and create support services for sustainability of reforms in Sindh. An empowerment model has to be followed and enabling environment for these new institutions has to be created.

There is a need to maintain the transparency and create support service for institutions created under reforms, particularly FOs and water management agency.

5.5. VOLUMETRIC PRICING OF IRRIGATION WATER IN INDIA: EXPERIENCES AND LESSONS LEARNED

Volumetric method of pricing irrigation water has always been advocated as the better approach to induce water savings by farmers. However, owing to seemingly technical and administrative complexities in adoption of the volumetric method - especially in large public canal irrigation systems, the area based pricing method is widespread in most countries.

In India, during the last decade, there has been significant development in adoption of the volumetric supply and pricing through PIM. Present paper provides a brief overview of international practices and the present status of irrigation water pricing and PIM in India. A case study of volumetric allocation, supply and pricing adopted by a Water User Association (WUA) in the State of Maharashtra has been presented.

The experiences and lessons learned from the case study and similar other WUAs have clearly demonstrated that a combination of volumetric supply and pricing at the entry point of a WUA command area and subsequent distribution and recovery on crop-area-

season basis by the WUA can become successful. Although, the much perceived objective of achieving water savings due to the volumetric pricing was not directly realized, there prevails a win-win situation both to the government department staff and WUAs /farmers. For irrigation staff, this approach has minimized the efforts in area measurement and vigilance on the area irrigated by farmers, and billing of irrigation charges has become simpler.

From farmers' side, as there is a full freedom of cropping pattern and the volumetric water charging system being transparent, they are willing to pay higher rates and use the available water efficiently by irrigating more area with same amount of water. Nevertheless, there is a vast scope to refine /upgrade the present system, especially in respect of increasing the accuracy and reliability of flow measurement.

The concept of volumetric supply can gradually be introduced at individual farmer's level by roping in available technology and farmers' involvement. There is a particular need to strengthen the role of WUAs to equip them for the enhanced responsibilities which calls for a major capacity building exercise.

The Way Forward: Volumetric supply and pricing of irrigation water in India is still at experimental stage and has to go a long way before it becomes a widely accepted and an integral component of WUA's operation.

The case study has amply demonstrated that farmers are willing to pay higher water charges provided the supplies are reliable, flexible, equitable and there is a transparency in the billing system. In the Waghad project, a few WUAs have gone one step ahead by practicing internal distribution of water on hourly basis instead of crop-area basis (proxy volumetric approach).

Nevertheless, the political will, quality of service, and leadership are the *buzzwords* to make it happen. There is a need to make the flow measurements more accurate, reliable and the structures more robust. The flow measuring device may be equipped with an automatic water level recorder /totalizer to account for fluctuating flow rates and convert those into volumes.

Deficiencies in the construction and maintenance of the measuring structures need to be removed. Some innovative flow measuring devices may be tried. There is a need to provide water level regulating structures in the canal network to maintain stable flows at the measuring points. Capacity building and training of all concerned – Department personnel and farmers should continue. With the given scenario, one can hope of using volumetric water pricing as a tool to bring about water savings in reality.

VI. CAPACITY BUILDING

6.1. PARTICIPATORY TRAINING PROGRAM, IN ANDHRA PRADESH, INDIA

This paper deals on the field activity of participatory training program (PTP)/capacity building of various stakeholders undertaken by Jala Spandana in large canal irrigation projects in Andhra Pradesh, India.

Given the objectives as to strengthen PIM, sustain WUAs, enhance water use efficiency and livelihoods, the JalaSpandana Designed Participatory Training Programme (PTP), which build the confidence of farmers and other stake holders and produced good results in taking over the responsibility of collecting water tax/rates/charges, exploring alternates for efficient main system management, sustainable WUAs, tail end deprivation.

The trainings were carried out in an integrated approach to Integrated Water Resources Management (IWRM) with unlimited time bound program that is easy to encompass all the complexities of the irrigation system, which again could be registered by the participants.

Under the support of the Government of Andhra Pradesh. PTP has been extended to irrigation projects that are undergoing modernization program with huge expenditure. The representatives who were initially discussing only on physical works started exploring alternatives for efficient water management. Establishment of dummy/informal project level committees is yet another technique adopted in PTP.

Lessons Learnt: PTP is the right way of training program as different stake holders realize their roles and responsibilities and in three years period, the project committee of WUAs or Department officials show the sign of taking over the training as part of water management. The department officials and WUAs prove great potential to resolve majority of the issues including tail enders and operation and maintenance issue.

The **time** frame for PTP in these large irrigation projects given the magnanimity of the issues and work in large irrigation project **is inadequate**, the field experience shows that at least three years is necessary for NGOs to prepare the ground fully and **exit**.

The intensified PTP in large irrigation projects compounded with policy reforms certainly make PIM success in AP, particularly in the wake of policy making WUAs continuous body with every two years election to one third of the members.

INPIM may commission study on PIM in Andhra Pradesh both from policy perspective and field situations for the benefit of larger interest of PIM. Further, it would be appropriate for INPIM to support activities like Farmers Network for Water Sector Reforms and Develop PTP.

6.2. BUILDING CAPACITY FOR PIM - EXPERIENCES AND EMERGING ISSUES

This paper builds on established concepts of capacity-building to look in turn at the key dimensions of the policy environment, institutional strengthening and individual development. The importance of a consistent and supportive policy environment for building capacity for PIM is emphasized. A range of approaches to institutional strengthening are put forward, and their focus on the strengthening and development of Water Users Associations for PIM is discussed. Individual development is normally undertaken through training, but there is a clear need for innovatory and non-formal approaches to training, particularly to support PIM.

The paper then goes on to discuss water governance and social learning, as two key emerging issues of particular relevance to capacity-building for PIM. Water governance provides a framework for viewing PIM within the wider perspective of the water sector

as a whole, while the current emphasis on social learning is particularly relevant to concepts of participation and PIM, and provides an entry point for capacity-building through individual development.

Recent experiences collated through ICID workshops and elsewhere are reviewed for insights into capacity-building for PIM. These include experiences from India, China, Peru, and transition economies such as Ukraine and Albania, with reflective case studies from Pakistan, Bangladesh, Nigeria and Tanzania.

The paper draws on these experiences to develop some general conclusions in the light of the theory and concepts of capacity-building, in particular highlighting the need to take an integrated view of all the resources needed for capacity-building for effective PIM and the importance of better understanding of participatory processes and of learning at the local level.

This paper also analyzed the need for capacity building for PIM at the level of the policy environment, institutional strengthening and individual development. It discussed the importance and relevance of the emerging concepts of water governance and social learning to capacity-building for PIM. Finally it reviewed the experience of ICID and others in the field.

The general calculation is that the Institutional strengthening provides the most significant issues in capacity-building, and there is no blueprint for success. The outlined approaches to institutional strengthening which build on a set of design questions. The appropriate responses to these questions will vary from location to location.

The emerging concepts of water governance and social learning suggest further key challenges for capacity-building.

Whilst much has already been learnt from field experiences, there will always be a need for further learning as the needs for capacity-building change in the constantly evolving context of PIM.

VII. SALIENT HIGHLIGHTS OF THE PAPERS ON THE THEME “SUPPORT SYSTEM FOR SUSTAINABLE PIM”

INSTITUTIONAL ASPECTS, CONSTRAINTS, AND OPPORTUNITIES

GENERAL REVIEW

7.1. There are a number of evidences suggest that sustenance of institutional gains over a long run is often debate-able especially under the poor institutional conditions with the short-lived project activities.

7.2. In fact, the continuation of external support should be continuously provided for a period of time before the capability of the community to manage the project on self sustainable basis – among others are: (1) supporting policies and strategies; (2) capacity building, training, and extension; and (3) monitoring and evaluation.

INSTITUTIONAL ARRANGEMENT

7.3. From the perspective of institutional arrangement, there are at least three significant and complementing actors: national/provincial governments, irrigation agencies and/or water users associations, and the irrigators. The institutional linkages among the three governance levels of responsible actors are evident.

7.4. Despite that the refine Goals and Objectives of PIM, however, for last several years, clear and measurable objectives are not yet laid out. In Nepal for instance, transferring the irrigation system over to WUAs in itself is perceived as one of the objectives in contrast to defining the impacts and results that are expected from the management transfer. For example, experience in Nepal greater farmer participation in water supply and system management; increased contribution of farmers' resources to operate and maintain the systems; higher production; and a more positive farmer perception towards water delivery services. The main threat, however, is the lack of sustainability.

SUSTAINING THE POSITIVE ACHIEVEMENTS

7.5. To ensure a sustainable positive impact, the state needs to give much more attention towards issues such as: (1) Sufficient resource allocation for O&M (be it from farmer contributions or government subsidies); (2) Ways to locate good leadership in the community and create an enabling environment for its emergence; (3) Focus on institutional development of WUA before rehabilitation, as preconditions before starting technical works; (4) Post transfer support: DOI should broaden its role of 'irrigation system manager' towards 'support service provider'; and More (human and financial) resources allocated to ensure a functional monitoring and evaluation (M&E) system to monitor impacts of PIM/IMT.

OPPORTUNITY FOR EFFECTIVE INSTITUTIONAL ENHANCEMENT

7.6. Planners need to consult with water users about what support services are most needed by the farming community in order to assume the new responsibilities and tasks as well to overcome constraints.

7.7. Support services during and after management transfer may include advisory services about institutional arrangements, establishment of organizational and financial procedures and skills, credit facilities, legal advice, marketing and construction procedures.

7.8. Training and extension are amongst the most important tool to develop the knowledge and skills of farmers and enable WUA officials to undertake management responsibilities and to ensure more profitable irrigated agriculture.

FARMERS NETWORK FOR WATER SECTOR REFORMS IN SOUTH INDIA

7.9. The farmer's network is the pre requisite for the success of PIM that warrants devolution of power from department to water users. In this context the FNWSR in India not only enables negotiate and contest with the government agency but also facilitate building consensus and cooperation from fellow farmers.

7.10. It is evident from the evaluation that the FNWSR has created considerable impact on PIM through creating awareness among farmers, direct interaction with the policy makers, facilitating implementation process, with limited financial resources.

FORMULATION OF COMMUNITY DEVELOPMENT PLAN IN SEMI-ARID ZONE

7.11. The *khettara* (system resembles tertiary canal of a large irrigation system in end water distribution system in Morocco) system has been well operated for several hundreds years because community itself was established on the basis of *khettara* water.

7.12. With assistance of local governments considering the major significance of the *khettara* rehabilitation, i.e., (1) less cost and safer water sources; (2) sole water source for stable agricultural production; (3) source to preserve social system; and (4) heritage for the future.

7.13. In the light of these facts, it is expected in Morocco that the Government will continuously support communities and unify them into more large organization such as "communal society" to stabilize and increase farm income of the rural communities under their initiatives.

CONCEPTS AND ANALYSIS OF PUBLIC PARTICIPATION

COOPERATIVE MODE OF PUBLIC PARTICIPATION

7.14. One of the effective ways in water resource development is through public participation such as on public in scheduling, construction, completion and maintaining the projects. In East Azerbaijan, for instance, the participation of the public in completion and maintenance has been initiated through cooperative approach referred to as Water Supplying Cooperative Companies (WSCC).

7.15. Through the WSCC, public participation has been implemented by means of socio-economic and management to benefit from the water resource projects. Through the close interaction with the authorities within the framework of the WSCC, the effective life of the projects has been increased and a better use of soil and water resources. The case of East Azerbaijan is considered as a successful model for public participation.

PERFORMANCE STUDY OF PARTICIPATORY IRRIGATION MANAGEMENT

7.16. A study observation in Orissa State, India concludes that the Pani Panchayat as regulatory institutions in charge of water distribution on equitable basis, their performance has been reasonably weak and unsuccessful. Even though Pani Panchayat has been initiated and endorsed in the State for more than a couple of years, the acceptance of the model have been lethargic and scattered. However, the study showed that co-operation increases with increase in farm size.

7.17. Researchers have drawn up a strategy for policy makers to ensure IMT programs become more pro-poor stressing the need to clearly define the rights of farmers, raise

awareness of these rights, reform the election process, and monitor participation in water user authorities.

7.18. A detailed action plan should be prepared in consultation with the water users through Participatory Rural Appraisal (PRA) method. It is necessary to apply bottom-up approach instead of top-down for sustainability. Simpler procedures are needed that still provide the WUA organisations with sufficient legal standing to deal with government agencies, contract with private firms, contractors, and control resources within the group.

PERFORMANCE EVALUATION OF NEW IRRIGATION PROJECTS IN ZANJAN PROVINCE, IRAN

7.19. For new irrigation project, the most important aspect to put into effect is that the implementation has to be based on appropriate programming as well as performing of irrigation designs and projects implementation.

7.20. An evaluation study has been conducted in Zanjan Province, Iran concludes that the performance of new irrigation projects have been ranked into four levels including excellent, good, moderate and weak. The overall evaluation of projects in zanjan indicates that the weakness from the qualitative analyses, while the evaluation indicate the good performance from qualitative.

7.21. From these projects, three successful contribution projects have been identified, however, the performance evaluations from pressured irrigation in third program in Zanjan Province, the study concluded that these projects aren't conformities in contribution degree from quality point.

7.22. From performance evaluation, some recommendation for future implementations are as follows: (1) The projects have to be equipped with data base networks from national water sources with appropriate quantity and quality as well as time accuracy; (2) Water measurement networks must be effective to support appropriate water resources allocation; (3) Improvement of irrigation efficiency and water utilization is most important aspect to consider; (4) Implementation of artificial feeding projects by groundwater during the non culture seasons; (5) consistent assistance to water users association for improving operation and maintenance; (6) The result from studies about comparing evaluation of pressured irrigation and difference in irrigation efficiency, it is potential in pressure way to use more lands from irrigated farms.

FARMERS' PARTICIPATION IN IRRIGATION WATER MANAGEMENT IN NORTHEAST IRAN

7.23. A study has been implemented in Northeast Iran to investigate the farmers' participation in irrigation networks found that Water User's Community (WUCs) as the considerable social capital can improve the level of farmers' participation in irrigation water management.;

7.24. Significant differences was statistically found between two groups of WUs, those who involved in irrigation network with WUC and those in non-WUA networks in relation to the individual variables of age, education level, and experience in agriculture.

7.25. Significant differences were found between two groups of respondents from the stand point of all their cultural and social characteristics, namely extension contacts, communication channels, social confidence, social solidarity, social participation, farmers' attitude toward the WUC, and farmers' participation status concerning irrigation networks management.

7.26. The analysis results indicated that among technical factors, there was a significant difference between farmers' behavior regarding farm water management and farmers' perception of rural irrigation status in two groups of respondents. Hence, agricultural policies in Iran must aim at raising the potential of water management technologies through the development of multi-functional WUCs to enhance agricultural water productivity, promote equitable access to water and to conserve the natural resource.

PARTICIPATORY MANAGEMENT OF MODERN IRRIGATION SCHEMES IN IRAN

7.27. A study of stakeholder views on the modern Dez and Moghan irrigation schemes has suggested farmers and extension staffs that the existing canal management is not sufficiently responsive to the new challenges of agriculture in the post-reform era, and that a more participatory approach could help resolve the problems in water delivery.

7.28. Iran already has a long-standing and successful model for participatory farmer management in the millennia-old Miraab system (*Shaarebin*) used for managing the Karezes and Qanats in the arid and semi-arid regions of Iran. The survey responses indicated that all three stakeholder groups (farmers, extension staffs and water agency staff) would support the implementation of a management structure based on the Miraab system.

7.29. It is suggested that farmer organizations should take the government's interest in irrigation management transfer as a window of opportunity to take up the stewardship of, initially, the tertiary water distribution system. They should use their indigenous knowledge to achieve the flexible demand management required for viable modern farming.

7.30. The commitment of farmers and support of other stakeholders are both crucial for success of the Miraab systems in the new working context. Successful management of the tertiary canals would be a good start for the ultimate establishment of the full farmers' stewardship of the main and secondary canals in the future.

PIM OPTION FOR GROUNDWATER

7.31. A study has been conducted to study analyzes the situation of groundwater resource use in the Abshar irrigation system in the Zayandeh Rud Basin, Iran and establishes the question if participatory management of groundwater and conjunctive use is a viable option for irrigation management in the present context.

7.32. The remaining questions to be established among others: "Is participatory groundwater management within and outside of surface water irrigation systems a feasible solution?" If so, what knowledge is needed? What social structures are needed and at what scale? How should responsibilities be established and who should be responsible for what? What role should be delegated to the state? What role should be

delegated to the water management agencies? What responsibilities should go to user organizations and how do you organize these? Is there a need for institutional engineering?

PARTICIPATORY IRRIGATION MANAGEMENT IN IRRIGATION NETWORKS OF TEHRAN PROVINCE

7.33. The PIM concept in the section of irrigation and agriculture in the wide land of Iran with water scarcity has a long history. After the victory of Islamic revolution of Iran government provided a fast development in water industry in the demand of work.

7.34. The process of participatory management shift has been done either by voluntarily establishment of people or it has been done by the application of government, so they have been able to use this design through actual field performance.

7.35. Learning from experiences in Teheran Province, there are a number of problems and constraints associated with PIM implementation. These are among-others: (1) limitation of authorities and legal instrument as well as support system; (2) Unclear water right (3) Diversified water policies causing problems on the management shift in the cities of Tehran Province; (4) Lack of successful PIM model the purpose of attracting people participation; (5) Lack of sense of ownership and responsibility in PIM implementation; (6) Lack of inter-sectoral coordination; (7) Highly dependence on the government on the water services; (8) Problem of land conversion from irrigated agricultural lands to industrial, housing and other non agricultural purposes; (9) Lack of initiative for proper maintenance of irrigation infrastructures; (10) Lack of public awareness on the appropriate use of safety facilities provided for irrigation infrastructures.

APPLICATION OF PROPORTIONAL PLUS RESET (P+PR) AUTOMATIC CONTROL SYSTEM FOR PARTICIPATION OF WATER USERS IN DELIVERY MANAGEMENT

7.36. Due to low performance of irrigation networks improvement, water delivery systems and its performance, within in recent decades several automatic control Systems including P+PR system, for flow management in irrigation networks have been introduced. Applications of these techniques provide situation that, water users play a direct role in water delivery with high flexibility.

7.37. To test the performance control in this study, the ICSS hydrodynamic model has been applied on ASCE standard canal number two to test the global performance of P+PR downstream automatic control system, having a conclusion that application of this control system in irrigation canal which provide higher flexibility and direct participation of water users in management of water delivery could be suggested.

7.38. The study concludes that the performance of developed P+PR automatic downstream control system for simultaneous and significant diversion variations of outlets is quite suitable and it could be used as an effective instrument for direct participation of water users in management of water delivery.

PARTICIPATORY IRRIGATION MANAGEMENT IN MAHARASHTRA STATE, INDIA

7.39. Over the last 10-15 years, there was appreciable growth in WUAs by the Government of Maharashtra (GoM), India. There are number of success stories, underlining the importance of WUAs. On the other hand, there are also some instances of no appreciable improvement in performance of irrigation projects with WUAs.

7.40. The study observes that Irrigation management transfer improves the service delivery as well as financial performance of the Project. There is need to have committed support from WRD and timely efforts to build WUAs to shoulder the responsibility. The Maharashtra case study provides insight into important aspects of PIM and possible measures to strengthen WUAs movement.

7.41. Though Maharashtra approach to PIM is gradual, but with reforms in place and changed mindset of officers of WRD and farmers, PIM could lead to sustainable irrigation management.

PARTICIPATION OF THE FARMERS ON O&M OF IRRIGATION NETWORKS IN CENTRAL JAVA AND WEST NUSA TENGGARA PROVINCES, INDONESIA

7.42. Under the new law on Water Resources No. 7/2004 and the Government Regulation on irrigation No. 20/2006 in Indonesia, the central and local governments recognize the role of the water user associations (WUAs) to carry out the irrigation networks system management based on farmers' participation approach.

7.43. This research gives general responses of the farmers' participation at the planning and performing processes respectively as indicating the scores of 2.77 and 2.80 and classifying the moderate categories as well as at the evaluating process as indicating the score of 3.2 and classifying the high category.

7.44. The farmers' responses on operation and maintenance of the irrigation networks system management in two provinces summarizes that 42% of farmers is categorized as high participation, 16% as moderate participation, 32% as low participation and 10% as very low participation.

7.45. Several other researches have been carried out for different locations in Indonesia suggested that there is a positive correlation between the farmers' participation and the performance of O&M of the irrigation networks system in Indonesia.

FORMATION AND DEVELOPMENT PROCESS OF PIM IN QAZVIN AREA, IRAN

7.46. Since the last fifty years, gradual progression in management style of irrigation and drainage systems supported by promotion of people's participation in management trend has faced the government-oriented or hindering mechanisms to critical challenges at global scale.

7.47. A holistic plan for capacity building and empowerment of local farmers was founded in the province to develop a participatory management and promote due changes towards optimum utilization and maintenance of the network. The initiative is reliant on a tree-shaped model and consists of: farming groups, water users associations, unions and their apex Federation at provincial level.

7.48. Presently, many commitments encompassing structural rehabilitation and water distribution have been shifted to the farmers in Qazvin, followed by logistic and administrative works handled by private sectors. Dynamic involvement of the young generation (men and women) at managerial and technical levels scattered at WUAs branches or Federation posts remarks for outstanding aspects of the PIM system in Qazvin.

7.49. To date, the mode applied for creation of CBOs (community-based organizations) and legislation of NGOs in terms of Water Users Association (WUAs) in Qazvin, generates a national pattern over the state.

RESEARCH PROJECT FOR IMPROVEMENT OF PIM (THE TAFILALET AREA, SOUTH-EAST OF MOROCCO)

7.50. The research project for improvement of PIM is a concrete follow-up of the Rural Development Project in the Tafilalet (PDRT). The Tafilalet is located South-east of Morocco, in the pre Saharan, south-of the Atlas mountains zone to make it possible for users to upgrade their intrinsic capacities through: (i) organizing themselves within Water Users Associations (WUAs) where water resources are available; and (ii) meeting O&M costs incurred by irrigation systems.

7.51. During the four years of project implementation by introducing new methodology and a new approach to prompt farmers to contribute to ensuring durability of irrigation infrastructure, the project has been able to reach almost all of the goals set down: (i) organizing and training farmers within the context of their WUAs; (ii) enhancing awareness by means of training courses and field trips; (iii) promoting water-saving irrigation strategies through practical demonstration plots and acquisition of logistics support; and (iv) setting up a database for follow-up evaluation of the WUAs' performance.

PRDA: A PARTICIPATORY METHODOLOGY FOR ANALYZING AND IMPROVING IRRIGATION PERFORMANCE – CONCEPTUALIZATION AND EXAMPLE OF APPLICATION IN KENYA

7.52. The APPIA (is a French acronym for “Improving Irrigation Performance in Africa”) project is implemented in several countries in Sub-Saharan Africa. One of the major activities of the project was to develop and test in the field a participatory methodology for analysing and improving the performance of farmer-managed irrigation scheme. This methodology has been named PRDA for “Participatory Rapid Analysis and Action Planning of Irrigated Agricultural Systems”. A manual published by IWMI and the FAO presents the details of the methodology.

7.53. Based on the results obtained during the course of the APPIA project in Kenya, it is suggested that PRDA may be one tool to achieve successful participatory irrigation management that can be used by multi-disciplinary/multi purpose organization such as National Irrigation and Drainage Committees.

7.54. Technicians and policy makers realized that there was no organization in country that can address all issues related to irrigation management. Hence the Ministry of Water and Irrigation decided the formation of a professional association to enhance

networking amongst irrigation players, implement multi-disciplinary approaches and develop further Research & Development programs.

SUSTAINABILITY OF PIM

MEASURING OF SUSTAINABILITY

7.55. Given special scrutiny of the themes on international experience with measuring performance of WUAs; common pitfalls for sustainability of WUAs; and main technical and institutional indicators for measuring WUA performance, it has been concluded that the institutional arrangements for M&E of WUA performance, such as Federations of WUAs, the role of national, regional and local authorities in measuring WUA performance and the maturing of PIM as a process of development.

7.56. This conclusion puts forward a hands-on approach for policy makers, implementation experts, academics and consultants for ensuring and improving the sustainability of PIM.

STRATEGY FOR PIM SUSTAINABILITY

7.57. Considering the competition in consumption of agricultural water and optimum use of accessible water resources, a study for creating participative irrigation management has been conducted in Foumanat Irrigation Network (Gilan Province) and Soufichai Irrigation Network (East Azerbaijan Province).

7.58. The study concludes that the strategy for PIM sustainability must be perceived that operation and maintenance of irrigation networks is not independent from ways of participation in rural and urban societies.

7.59. The ways and degree of participation in irrigation networks have to be seen from two major considerations: The first that the degree of willingness of the mother exploiting company to assigning part of its responsibilities and the second is the users who are going to accept the responsibility.

7.60. For enable the effective allocation and distribution of water in irrigation networks, the operator must be equipped with analysis instruments, which has to be able to demonstrate water allocation to each system that would resolve the competitive use of water amongst the users.

MICRO-PLANNING IN PIM, AN ENTRY POINT FOR SUSTAINABILITY

7.61. In India during 1990s systematic institutional and organizational changes have been undertaken to increase farmers' participation in irrigation management through formation of Water Users' Association (WUA) or Pani Panchayats under different externally assisted economic restructuring and irrigation infrastructure development programmes of World Bank, European Commission, Japan Bank for International Cooperation.

7.62. Today, Participatory Irrigation Management (PIM) at various levels is being implemented in different types of irrigation systems. For this program, appropriate institutional arrangements and mechanisms to bring about efficient utilization, equitable distribution and sustainable irrigation service are framed by different states of India.

7.63. From a number of experiences learned in Orissa, the poorest state in the dominion of republic of India, concludes that the strategic micro level planning along with identified entry point implementation program that are undertaken for sustainable irrigated agriculture simultaneously.

7.64. The study concludes that the objective of poverty reduction by way of promoting schemes for agricultural productivity can be achieved by adopting community based participatory approaches that support agricultural development like improving irrigation performance. These could be achieved by employing new production technologies, enhancing access to markets, promoting environmentally sustainable production activities, having gender perspective, measures to improve income and livelihood through micro-finance, rural infrastructure up-gradation, and participatory processes to empower the rural poor.

THE NECESSITY OF FARMERS PARTICIPATION IN PRESSURIZED IRRIGATION SYSTEMS FOR PIM SUSTAINABILITY IN IRAN

7.65. As a developing country, Iran has several large-scale irrigation and drainage networks under study and operation. These networks are often constructed in small-scale farmlands, and because of water deficit, inappropriate topography and incentive policies, they are equipped with pressurized irrigation systems in which operation is more complicated, comparing with surface irrigation method.

7.66. Based on a study results obtained from performing under pressurized irrigation systems by government is compared with the one constructed by farmers organization, offers some suggestions with regard to changing the present procedures and participating farmers organizations in project execution.

7.67. The study observation conclude that the pressurized irrigation projects in large areas which are constructed in small scale farmlands, all of the project execution are done by government and after accomplishment of project execution, will be transferred to farmers organizations.

7.68. However, this approach will result in farmers' irresponsibility, and it will, in turn cause their dissociation during project operation so that after transferring the system to farmers' organizations, farmers will ascribe the organizations' managers to be responsible for all the system's problems.

SUSTAINABLE PARTICIPATORY IRRIGATION MANAGEMENT

7.69. To make proper decision on irrigation management transposition, "sustainability in irrigation management" and specifically PIM, which is the result of transposition program should be taken into consideration.

7.70. In irrigation management transposition process, the persistence of activities in the form of new operational system, which is the subject of sustainable management, is focal point of the transposition program.

7.71. The main elements in the sustainable participatory irrigation management are: (1) Strategies; (2) Training and Extension; (3) Monitoring and valuation.

7.72. In all the three abovementioned main elements, it is recommended that the rational advisory models to be substituted for the common governmental trends, which requires: (1) In policymaking, new guidelines with no consideration for administrative caution, but correspond to requirements of local developing society to be submitted; (2) In training and extension, in addition to formal education in agricultural and irrigation activities, the issues relevant to reconciliation of technical specifications of the network with social requirements of an operation unit to be clarified for the stakeholders; (3) By the assistance of a specialized support system.

EVALUATION OF IRRIGATION PERFORMANCE

PERFORMANCE EVALUATION OF NEW IRRIGATION PROJECTS (ZANJAN PROVINCE, IRAN)

7.73. In an attempt to evaluate the water efficiency in agriculture it's necessary to focus our best tries on programming and performing irrigation designs and projects.

7.74. Regarding to performed evaluations from pressured irrigation in third program in Zanjan Province, Iran, it was realized that these projects aren't conformities in contribution degree from quality point.

7.75. Learning from experience of the project implementation, the following aspects are recommended: (1) Water resources data base must be provided accurately from quantity and quality aspects; (2) Water measurement networks installation must be improved to ensure better irrigation management; (3) The increase of irrigation efficiency could be achieved by appropriate irrigation water operation; (5) On pressured irrigation it's necessary in pressure way to use more lands from irrigated farms.

IMPACTS OF SOCIO-ECONOMIC DEVELOPMENT

IMPLEMENTING PIM MANAGEMENT IN THE LITERATE STATE OF INDIA

7.76. Kerala, elongated coastal state of India, lags behind many states in the country in participating farmers in the management of irrigation, and implementing PIM.

7.77. Fragmentation and subdivision of land and resultant small size of holdings (average 0.3 ha); part-time cultivation of farmers who are literate (literacy rate 91%); lack of sufficient labor availability and high labor cost; and lack of coordination among various departments are the major threats to irrigated agriculture in Kerala.

7.78. PIM pilot projects being implemented at Neyyar and Malampuzha Irrigation Projects of the State have shown that, farmers are highly motivated and are ready to

share responsibilities of PIM. Since spouses of farmers are also inducted as members of WUAs, enthusiasm shown by women in managing irrigation is encouraging.

7.79. The pilot project experiences are also encouraging. But the hesitation of officials to depart from the existing system, the reluctance of operational staff to involve users in management, and lack of legislative backing, are the main blocks noted.

7.80. The observation concludes that there are several problems that may hinder the implementation of PIM in Kerala, as mentioned above. But prospects are not too bad, as there are several contributing factors. If the irrigation agency supports and nourishes, PIM will flourish in Kerala also.

7.81. It is expected that the lessons learnt from the pilot projects on PIM may help to gear up the political and administrative will to counter this.

PARTICIPATORY EXPERIENCES FOR ENHANCING LAND AND WATER PRODUCTIVITY

7.82. This paper shares the experiences of a project having measures to facilitate the formation of land and water management strategies and institutions that are socially acceptable and broadly replicable. The paper describes the participatory process developed and adopted for exploring options for better use of water with focus on a single distributary of Patna Main Canal system through cost effective participatory mechanism, involving poor farmers, landless and share croppers.

7.83. The observation concludes that peoples' participation has been identified as one of the major principles for sustainable development of water resources. This reflects to believe that people who inhabit an environment over time are more competent to make decisions. Establishing dialogue amongst these stakeholders needs identification of appropriate processes and means through which they can be brought together for a common goal.

7.84. The experiences in collaborative project and wide range of project partnership reflects that participation with community members on land and water related issues is mainly focused on two general types of situations: (a) set of issues focusing immediate and critical concerns leading to short-term emergencies or gains such as; irrigation needs, eradication of seasonal water logging and falling crop yields and (b) concerns that provide opportunities to different stakeholders to come together for longer-term, precautionary issues. To achieve these goals the perspective should be broader which may accommodate members from wider constituency.

IMPACTS OF FARMERS' NGOS ON SOCIO-ECONOMIC DEVELOPMENT OF QAZVIN AREA, IRAN

7.85. It is commonly understood that inefficient management in O&M of irrigation system is assumed as a key element in weakening irrigation performance. Based on experiences, removal of existing inconsistencies and challenges will not realize without people's participation.

7.86. The analysis in this article have been made to formulate and implement a strategic plan for establishment and operation of NGOs (Non-Governmental Organizations) in

Qazvin plain mobilized by face to face communication towards further involvement of his staff (Qazvin Irrigation Management, QIM) and target farmers in the process.

7.87. Based on a timing schedule, an action plan became operational to gradually shift exploitation and maintenance of existing irrigation-drainage network to the local community. Various commitments e.g., selling, inspection, registration, distribution and delivering water quotas are to be implemented by corporate WUAs.

7.88. Implementation of IMT (Irrigation Management transfer) initiative in Qazvin, Iran has resulted in numerous cultural, social and economic impacts especially in the area of improvement of irrigation management and has created structural changes towards the great objective i.e. "Equitable distribution of water" in the network.

PIM, POVERTY AND MODERNIZATION OF FARMER'S ORGANIZATION (FO) MANAGED IRRIGATION CHANNELS IN SINDH, PAKISTAN

7.89. The concern of this paper is to assess the role of FOs in managing and implementing the investment and modernization schemes of their own managed channels under PIM in Sindh province of Pakistan. The paper seeks the contribution of PIM modernization intervention in reducing the poverty, equity in delivery of water service and sustainability of FOs. The paper then focuses on the current PIM concepts, reform, and its process. The paper also address the issues of rehabilitation works, contract management.

7.90. The overall analyses concluded that PIM has evolved and become generally accepted as a necessary aspect of productive and sustainable irrigation. The schemes of modernization of irrigation channels are an excellent opportunity to address the issues of sustainability of FOs, sustainable water resource management. The FO managed investment schemes have not only addressed the local employment issues of landless agriculture and rural worker but also has addressed the water equity and efficiency.

7.91. The increased farm productivity and income has reduced poverty from the rural poor. In Sindh PIM has proved to be successful model. But it is long way to go and government still needs to support and create support services for sustainability of reforms in Sindh. An empowerment model has to be followed and enabling environment for these new institutions has to be created.

7.92. There is a need to maintain the transparency and create support service for institutions created under reforms, particularly FOs and water management agency.

VOLUMETRIC PRICING OF IRRIGATION WATER IN INDIA: EXPERIENCES AND LESSONS LEARNED

7.86. Volumetric method of pricing irrigation water has always been advocated as the better approach to induce water savings by farmers. However, owing to seemingly technical and administrative complexities in adoption of the volumetric method, the area based pricing method is widespread in most countries.

7.93. In India, during the last decade, there has been significant development in adoption of the volumetric supply and pricing through PIM. A case study of volumetric

allocation, supply and pricing adopted by a WUA in the State of Maharashtra has been presented.

7.94. The experiences and lessons learned from the case study and similar other WUAs have clearly demonstrated that a combination of volumetric supply and pricing at the entry point of a WUA command area and subsequent distribution and recovery on crop-area-season basis by the WUA can become successful.

7.95. The concept of volumetric supply can gradually be introduced at individual farmer's level by roping in available technology and farmers' involvement. There is a particular need to strengthen the role of WUAs to equip them for the enhanced responsibilities which calls for a major capacity building exercise.

7.96. The Way Forward: (a) Volumetric supply and pricing of irrigation water in India is still at experimental stage and has to go a long way before it becomes a widely accepted and an integral component of WUA's operation; (b) The case study has amply demonstrated that farmers are willing to pay higher water charges provided the supplies are reliable, flexible, equitable and there is a transparency in the billing system; (c) There is a need to make the flow measurements more accurate, reliable and the structures more robust. The flow measuring device may be equipped with an automatic water level recorder to account for fluctuating flow rates and convert those into volumes; (d) Deficiencies in the construction and maintenance of the measuring structures need to be removed. Some innovative flow measuring devices may be tried. There is a need to provide water level regulating structures in the canal network to maintain stable flows at the measuring points.

CAPACITY BUILDING

PARTICIPATORY TRAINING PROGRAM, IN ANDHRA PRADESH, INDIA

7.97. This paper deals on the field activity of participatory training program (PTP)/capacity building of various stakeholders undertaken by Jala Spandana in large canal irrigation projects in Andhra Pradesh, India. Given the objectives as to strengthen PIM, sustain WUAs, enhance water use efficiency and livelihoods, the JalaSpandana Designed Participatory Training Programme (PTP), exploring alternates for efficient main system management, sustainable WUAs, tail end deprivation.

7.98. The trainings were carried out in an integrated approach to Integrated Water Resources Management (IWRM) with unlimited time bound program that is easy to encompass all the complexities of the irrigation system, which again could be registered by the participants.

7.99. Under the support of the Government of Andhra Pradesh. PTP has been extended to irrigation projects that are undergoing modernization program with huge expenditure. The representatives who were initially discussing only on physical works started exploring alternatives for efficient water management.

7.100. Lessons Learnt: PTP is the right way of training program as different stake holders realize their roles and responsibilities and in three years period, the project committee of WUAs or Department officials show the sign of taking over the training as

part of water management. The department officials and WUAs prove great potential to resolve majority of the issues including tail enders and operation and maintenance issue.

7.101. The **time** frame for PTP in these large irrigation projects given the magnanimity of the issues and work in large irrigation project **is inadequate**, the field experience shows that at least three years is necessary for NGOs to prepare the ground fully and **exit**.

7.102. The intensified PTP in large irrigation projects compounded with policy reforms certainly make PIM success in AP, particularly in the wake of policy making WUAs continuous body with every two years election to one third of the members. It would be appropriate for INPIM to support activities like Farmers Network for Water Sector Reforms and Develop PTP.

BUILDING CAPACITY FOR PIM - EXPERIENCES AND EMERGING ISSUES

7.103. This paper builds on established concepts of capacity-building to look in turn at the key dimensions of the policy environment, institutional strengthening and individual development. A range of approaches to institutional strengthening are put forward.

7.104. The paper then goes on to discuss water governance and social learning, as two key emerging issues of particular relevance to capacity-building for PIM. Water governance provides a framework for viewing PIM within the wider perspective of the water sector as a whole, while the current emphasis on social learning is particular relevant to concepts of participation and PIM, and provides an entry point for capacity-building through individual development.

7.105. Recent experiences collated through ICID workshops and elsewhere are reviewed for insights into capacity-building for PIM. These include experiences from India, China, Peru, and transition economies such as Ukraine and Albania, with reflective case studies from Pakistan, Bangladesh, Nigeria and Tanzania. The paper draws on these experiences to develop some general conclusions in the light of the theory and concepts of capacity-building.

7.106. The general conclusion is that the Institutional strengthening provides the most significant issues in capacity-building, and there is no blueprint for success. The emerging concepts of water governance and social learning suggest further key challenges for capacity-building. Whilst much has already been learnt from field experiences, there will always be a need for further learning as the needs for capacity-building change in the constantly evolving context of PIM.