ASSESSMENT OF PARTICIPATORY IRRIGATION MANAGEMENT (PIM) IN SPATE AREAS WITHIN IWRM APPROACH

CASE STUDY: WADIZABID, TIHAMA PLAIN, YEMEN

Prepared

By

Eng. Fahd Mohsen Ali Al-Maghrbi
1. INTRODUCTION

1.1. General Description (Background)

Yemen Republic (YR) is located in the most south-western corner of the Arabian peninsula bordering the Arabian Sea, the Gulf of Aden and the Red Sea as in Figure 1.1 (IIP, 2004). Between Oman and Saudi Arabia. (Sharafaddin, 1997)

![Diagram of Yemen and Irrigation Improvement Projects](image)

**Figure 1.1** Location of the Yemen and Irrigation Improvement Projects

The Yemen's location is in the Arabian peninsula hers is influence upon water sources diversity where the there two main sources for water they (Ground Water, Rainfalls ). Also climate is Yemen's within the northern extension of the arid tropical climate, hers is influence upon the rainfalls where the rainfalls is irregular and amount of evapotranspiration exceeds the rainfall average in most situations. If Yemen is consider from of the poorest countries in water resources in the world (FAO, 1987).
1.2. Spate irrigation in Yemen

The Yemenis consider as a first state in the world in the irrigation practice with floods waters, where there are widespread remains of ancient irrigation installations still to be seen all over the Yemen (Lawrence, 2005).

Together with the ancient Sabaen engraving— which illustrate surprising agricultural prowess— they stand as evidence of the technical achievement of those days. In the first thousands of B.C. when the great Marib’s dams were constructed during the Sabian period, it is believed that construction of the Mar‘ib dam commenced around 3rd millennium BCE, and was completed in stages over the next 500 years. The structure had very well constructed stone abutments and irrigation off takes on both banks, which partly survive.

The dam itself was constructed from rock and soil and breached on five or six occasions between the 4th and 7th century BCE when the final catastrophic breach occurred, which is described in the Holy Koran (Lawrence, 2005).

The first Yemenis settled in fertile mountain terrain and near wadis, always near water. By about 2000 Bc, Rainfall in this corner of the arabian peninsula is irregular. (FAO, 1987).
1.3. Participatory Irrigation Management (PIM) in Yemen

In order to ensure the sustainability of spate irrigation scheme, the Government of Yemen has adopted the concept of Participatory Irrigation Management (PIM), whereby farmers taking a growing share of the responsibility for the operation and maintenance (O&M) of the spate irrigation schemes. with the aim of:

1. Rehabilitation and improve the physical infrastructure of spate irrigation schemes in order to improve water distribution within these schemes and to capture all spate flows.

2. To decentralize responsibility the management of spate irrigation schemes.

3. To promote user participation and create the conditions for ultimate financial self-sufficiency of spate irrigation schemes by progressively supporting the development

4. of Water Users’ Associations and their federations and the participation in O&M and financial management.

5. To support O&M costs of the spate irrigation schemes at an efficient level and to phase out public financing progressively as farmers contribute more.

By the late 1990s, the Government of Yemen through the Ministry of Agriculture and Irrigation undertook to prepare an Irrigation Improvement Project with assistance from the International Development Association(IDA) for developing
and demonstrating the participatory irrigation management (PIM) approach to decentralization and to transfer of irrigation scheme management responsibilities to appropriate local institutions from through formation and strengthening of Water Users' Groups (WUGs) at the level of tertiary canals, Water Users' Associations (WUAs) at the level of the primary canals.

The objective is of formation of Water Users' Groups (WUGs) and Water Users' Associations (WUAs) is the effective participation of farmers in the planning, design and execution of the rehabilitation and improvement of spate irrigation systems, and actualization of following benefits:

1. The rehabilitation and improvement works will reflect their preferences as much as possible as farmers will be actively involved in the planning and design.

2. Farmers will have control over the quality of the rehabilitation and improvement works, which are executed by contractors, as they will be involved in the supervision of these civil works and they undertake some civil works themselves.

3. Farmers have full control over the scope and quality of the maintenance works and they can decide which works will be undertaken on priority basis as their WUA will be fully responsible for the maintenance of the entire canal system.
4. Availability of spate water will be allocated and distributed equally among all water users as their WUA will be fully responsible for the operation of the entire irrigation system.

5. The farmers will not depend upon the provision of irrigation services by Government-employed staff as their WUA can employ and dismiss its own staff for the daily operation and maintenance of the scheme.

6. Farmers have full control over their financial resources as the irrigation service fee and any other service charges will be set and collected by the WUA.

7. Less conflicts regarding the distribution of spate flows due to improved communication between water users within their WUA and between the WUA and the operators of the diversion structures.

8. Any conflicts between water users could be easy resolved

2. **problem statement**

The crisis in the public budget to rehabilitate and improve the physical infrastructure of spate irrigation schemes and centralize responsibility the management of spate irrigation within the public sector caused in poor maintenance for the spate irrigation schemes and to address the problem of non-sustainability of the existing spate irrigation schemes management, the Government of Yemen has adopted the concept of Participatory Irrigation
Management (PIM), whereby farmers taking a growing share of the responsibility for the operation and maintenance (O&M) of the spate irrigation schemes. Therefore, the assessment is the becoming ever more important to assess the productivity and sustainability of irrigation systems, WUAs, and irrigated agriculture. This is due to the following trends:

1. Increasing competition and conflict over water between water users, irrigation systems and different sectors.
2. The need to produce more “crop per drop” due to increasing populations and the competition for water;
3. The declining availability of public sector funds for irrigation.
4. Increasing need to assess performance of irrigation systems after reforms.
5. Increasing need to assess and mitigate environmental problems.

The increasing reliance on service plans and agreements and local financing requires ever higher attention to transparency in decision making and accountability between stakeholders. The transfer of management responsibilities to WUAs and service agreements with third parties increase the need for integrated management audits (which include technical, financial and organizational aspects). Identification of good performance standards, relative to a region and type of irrigation system, can provide benchmarks to help drive improvements in other systems.
3. Study Area Description

Wadi Zabid is one of Tihama plain Wadis, and has the most floods Water flowed in tihama plain. It consider as second big Wadi in Tihama plain. The Wadi basin lies in western Yemen and drains into the Red Sea. The Wadi basin lies between longitude 43° 5’ and 44° 20’ East and latitude 13° 45’ and 14° 30’ North. Wadi Zabid is the second largest Wadi after Wadi Mawr in the area, with an area is about 4740 km². (swldan, 2004)

Wadi Zabid consists of many tributaries Wadis as AL-Udain and the Sahol Ibb area. It runs continuously, especially in the area nearest to the foothills and it irrigation the Zabid area and the excess flow runs into the sea at Al-faza. The a length of more than 250 km (Asmahan 1987). The Wadi basin has been divided into three physiographical zones from east to west, these zones are: The eastern zone (highlands), Central zone (midlands) Western zone (Tihama lowlands) As in Figure 3.

Figure. 3 . Study area
The irrigation system in the study area: In Wadi Zabid there is the oldest spate irrigation scheme and the first in Yemen. Which is consisting of Five diversions structures. Four of the five diversion structures have canal regulators on both sides and the other (Diversion #2) has a single head regulator. These five diversion structures are making nine canals off takes. Some of these nine canals divide to two or three canals along their courses, and the overall are 16 original canals, which are served from the irrigation system as shown in Figure 4.

In the beginning of the twenty one centuries the World Bank support the Improvement Irrigation Project (IIP) in Wadi Zabid Al-Hodiadah governorate in a purpose of transfer of competence of the administration and the maintenance and operation of Irrigation systems to farmers. The improvement irrigation project established 16 Water User Associations (WUA's) in Wadi Zabid as shown in Figure 4.
4. Research objectives

Several studies have been conducted on the issues of Water resources development and management. Policies and recommendations have been made at the regional and national level.

However, the Wadi Zabid basin (the study area) has not been studied separately the evaluation of WUA's in order to know if it is successful in operation and maintenance and management of the irrigation system or not.
5. The Research Objectives

1. Evaluate the technical capacity of the WUA.
2. Evaluate the managerial capacity of the WUA.
3. Evaluation financial capacity and sustainability
4. Identify a number of measures including tailored trainings that contribute to strengthening the technical, managerial and financial sustainability of the WUAs.

6. Research Methodology:

6.1. Study plan (Overview):

The study is based on the compilation and review of (available studies, relevant reports) and survey for decision makers in water sectors including irrigation engineers, agronomists, members of the general associations and members of management board of associations from through questionnaires and interviews.

6.2. Methods of data collect:

6.2.1. The Studies previous plural

Studies collect from different water sectors as NWRA, TDA, department of (O, M) in TDA, WEC library, Internet and others.

Documentary data collect the included, information about formation WUA, Membership Representation of farmers in WUA from the command Area of the
WUA in designs of water distribution and diversion structures, Water distribution schedules, Involvement of (TDA, WUA) in maintenance, gushes data in wadi and study area.

6.2.2. Questionnaire

Structured questionnaires use in collect data regarding associations performance and activity on the one hand the managerial capacity, the technical and financial capacity and sustainability to evaluate the most factors affect performance WUA. For this designed questionnaires for three groups it was as follows:

The survey of Management board members covered (48) members randomly selected by average (3) Management board members per association and while the survey of Farmer member of WUA covered (96) members randomly selected by average (6) members per association. Moreover, the samples of farmer’s member of WUA were randomly chosen in three levels from canal, where all association distributed between upstream, middle and downstream of the canal.

The survey questionnaire of decision makers in water sectors distributed by average (3) questionnaires per sector and covered total of (12) questionnaire.
6.2.3. Interviews

The interviews with decision makers, water resources agricultural researchers, and water sectors responsible especially in Spate irrigation systems related sectors, such TDA, NWRA.

The interviews use two techniques, the first technique is a personal discussion with water sectors managers the second technique is groups discussions from researchers in water resources and agriculture.

6.2.4. General field data

- Type of cropping pattern
- Type of irrigation system
- Area of Spate irrigation land (ha)
- The status quo for Spate irrigation system in wadi Zabid

7. Data analysis, associations assessment of water users (WUA)

The survey data analysed for decision makers in water sectors including irrigation engineers, agronomists, members of the general associations and members of management board of associations by use of computer program SPSS and Excel.
8. Conclusions

The results of the study confirm that there are differences between associations in the financial and the administrative and technical performance is where the differences clear points of weakness and strength at capacity of technical, managerial and financial for associations.

8.1. The conclusions of the technical evaluation for associations

The results of the analysis of assessment technical indicators confirmed that most of the associations she have weaknesses in the technical performance is represented in the following points:

1. Management board members knowledge weakness some associations by canals structures.
2. Weakness at understanding generality associations members of main functions of the associations.
3. Not all the areas been transferred to the WUAs in some associations.
4. Members Weak affiliation with some associations.
5. Representation of poor farmers marginal in some associations.
6. women's were not allowed to have any leadership or participation in associations management
7. Monitoring and evaluation of the distribution of Water, where most of the associations that are not available by the records of the Water delivery.
8. No documentation of rights and the rules of the Water.

9. Associations do not intervene to prevent the recurrence of irrigation and control is on flood at channels beginning.

10. The irrigation council staff is not adequately supported by the concerned authorities for arrest of senior land owners from opening the main gates without licenses.

11. The associations have not role in groundwater management.

12. Most associations suffer from technical weakness in maintenance from where Planning, application of maintenance process and Lack of understanding of the importance of maintenance of irrigation schemes and its risks by many associations actors.

13. Associations suffer technical difficulties because of the large size of irrigation schemes and high costs of operation and maintenance.

Performance indicators also of confirm that there are points powerful technique in some associations are as explained below:

1. Associations applied the base and schedules of Jabarti related to the distribution of water at the level of the valley.

2. Activity covers some associations the whole region irrigated by the canal of its own

3. Some associations are planning a state of emergency.
8.2. Results of the administrative assessment for associations

Confirm the results of the administrative assessment for associations that there are weaknesses in the performance of administrative, is represented in the following points:

1. The higher castes have dominated the management WUA and the social relationships as they continue to look down upon the lower castes.
2. Low democratic level (not repeat elections in most associations).
3. Board of Directors some associations do not hold a meetings and also the associations Board of Directors not hold any meetings with members of the association Mndhu 2008.
4. Performance weakness of Inspection and observation committees.
5. Absence of meetings records and lecturer in more the associations and the lack of arrangement and management of archives.
6. Most associations not discipline for internal regulation.
7. Appearance of conflicts external between some associations and internal conflicts among the members of some associations.
8. Weak capacity of associations in conflict resolution external.
9. Relationship weakness between leaders and members in some associations.
10. Relationship and communication weakness between WUA and the maintenance adjuration in TDA.
11. Nothing to do with external institutions and organizations.

Results confirm also that there are strengths in performance managerial for some associations she as follows:

1. Internal regulation availability in all associations.
2. Discipline of the some associations by tariffs is interior.
3. Availability of records and meetings lecturer in some associations.
4. Capability of more the associations to solve problems is interior.
5. Relationship between leaders and members good in of more the associations.

8.3. Results is the financial capacity and sustainability assessment for associations

The results of the financial assessment confirmed that there is incorporeal difference between some associations and this difference distinguish points of weakness and strength in financial capacity for associations and sustainability for associations as follows:

Points of The financial weakness in associations
1. Annual plans and financial records (income, cash, property, equipment, supplies, etc.) not availability in more the associations.
2. Not availability any plans for plural of fees is the irrigation in more is the associations.

3. Some associations members to not pay irrigation fees.

4. Members to not pay organic fees in all associations.

5. Irrigation Fees tariff are different between WUAs.

6. He existing laws/bye-laws also do not empower the WUAs to collect irrigation fee from the beneficiaries which can be used for the O&M of these structures nor they can impose any fines on the defaulting farmers.

7. Absence of the monitoring and annual audits for financial operations in more the associations.

8. The financial status quo too low and the associations no preparation plans to increase income.

9. Plans and financial records not review by the users (farmers).

Points of The financial capacity strength for associations

1. Most associations charge irrigation fees.

2. Most associations charge maintenance fees in case of need for maintenance.

3. Some associations of collect donations from farmers in emergencies.
9. Recommendations

9.1. Public Recommendations

1. Customs are still quite strong therefore, an understanding of the social hierarchy is important, to intervention facilitation in strengthening Water User's Associations.

2. An understanding of the socio-economic context in which farmers operate is essential to ensure effective and sustainable improvements.

9.2. Technical Recommendations

In terms of technical support, assistance is needed both in:

9.2.1. WUA Capacity Building in Water Management

The performance improvement is the associations in Water Management required to:

1. provide technical and consultations support to enable the associations from development of rules traditional, such as the traditional base Jabarti the concerning by Water rights to agree with modern irrigation system and the climate changes which helps to improve the distribution of Water on level the Wadi and the level of each channel and reduce the control of the Water at the beginning of the channels and upstream the Wadi.

2. The application for traditional rule that prohibits land from receiving spate water more than once in a 14-day period.
3. If water rights and rules in spate irrigation systems are to continue to deliver, they must necessarily adjust to new situations created by various factors - new land development, changes in crop pattern, structural modernization. Example: Added a phrase to the al aela fil aela rule in modern spate irrigation systems lead to fair Water distribution on canals level so as to reduce the control of the Water at the beginning of the channels.

4. Water users' consciousness by their role, rights and responsibilities, and the role and responsibility of the WUA and by-laws should be distributed and displayed in key areas (coffee shops, village meeting halls, etc.)

5. Management Board members the must represent all the areas been transferred to the WUAs of what to help in verbalizing associations activity in all the areas.

6. promotion for the effective participation of all farmers and affiliation in associations.

7. coordination with is the concerned authority for associations authorization in groundwater management from where the digging watcher and new irrigations techniques popularization.
8. The draft bylaws to the Water law should give the legal power of WUAs in the following:

   a) Authority to establish mandatory fees and contributions, for construction and maintenance.

   b) Authority to establish rules concerning proper distribution for flood water, with penalties for violations that may include fines and restrictions on Water use.

9. WUA decisions to establish or modify rules, fees, penalties, and other matters must be approved by majority in meeting general assembly or by referendum among beneficiaries.

9.2.2. WUA Capacity Building for development of maintenance operation

The technical performance improvement for the associations in maintenance operation required to:

1. Training associations on manners of Planning maintenance and maintenance process application.

2. For development of maintenance operation necessary from be between water rights and maintenance where can be for example the right to flood land by water is tantamount for farms contribution in the maintenance rule application of field loss for flood irrigation if one fails to contribute maintenance prohibiting flood access to a field its owner failed to contribute
3. The modern irrigation structures necessitate a different type of maintenance. 

They do not depend on labour and the collection of brushwood, but instead require bulldozers and trucks therefore associations need for support from different organizations, managerially, financially and technically.

4. Provide proper training to the WUAs in the O&M of modern structures to restore confidence in them and amend the draft bye-laws which would empower the WUAs to collect fees from the water users or impose fines on the defaulters for the O&M of water installations as envisaged under Article 10 of the Water Law.

5. That economic incentives have a key role for stimulating associations performance in maintenance process.

6. Promotion of the effective participation of all farmers in, rehabilitation and management of the spate irrigation systems.

9.2.3. **WUA capacity building in the agriculture**

The technical performance improvement for the associations in agricultural production operation required to:

1. Verbalizing the researches agricultural to improve irrigated agriculture with WUAs.

2. Determination of suitable cropping patterns based on water availability.
9.3. The Managerial Recommendations

1. Development of managerial skills within the WUAs the related to good management from where registers preparation, minutes of the meeting, the archive it and the irrigation schedule preparation

2. Training associations on measures calming conflicts or avoid them occurring include:
   a. WUA management meet to discuss possible conflict situations and prepare actions to help mitigate or avoid the identified potential areas of conflict.
   b. Development of trust between the WUA management and water users through good management, good communication, and open, transparent and fair procedures.
   c. Conflict management and resolution through source of conflict identified, the nature knowledge and because of the conflict, the conflict resolution procedures prescribe in the statutes or by-laws.

3. Training water user associations on How to Planning for future.

4. Have developed the communication and reciprocity of knowledges and expertises (Internal and external communication).

5. The help of the associations to amend the regulations with respect to:
a) law amendment elected of Management Board members so that not to allow members of the governing body of the election more than two sessions for restriction control the associations.

b) Support irrigation council and the authorities of the members of the general associations to replace any member of from management Board members if there is a weakness and laxity in the performance of his duties according to the rules and procedure of the associations.

6. Election of committee from Irrigation council to follow up associations tasks and performance and trained on how to evaluate the performance of the associations and raise a detailed reports for chairman of a Irrigation Council and TDA,

7. Have developed partnership of mutual accountability between WUAs, government.

8. Provide proper training to the WUAs in:

   a) Efficacy of meetings in associations continuation and success

   b) Preparation of annual work plan and annual report.

9. Effective activation is for local authorities to solve problems of Spate irrigation between farmers this limits the interference and monopoly of powerful people.
9.4. The Financial Recommendations

1. The financial income development from through associations support on:
   a) Tariff increase of Irrigation fees for hectare.
   b) Procuring Irrigation fees and the fines.
   c) The associations direct in new financial sources creation such as the work in producer marketing and import herbicide.... etc.

2. WUA Capacity Building in Financial Management through the training on:
   a) Financial bookkeeping.
   b) Preparation of annual budget and financing plan.
   c) Mobilisation of financial resources.
   d) Filing and maintenance of financial records.
   e) Importance of establishing Reserve Fund.
   f) Capacity Building of WUA in the internal inspection Procedure and audit of financial records and Preparation of audit report.
10. References


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