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## Assessment Indicators for Water Users' Associations in Egypt

### ABSTRACT

The sustainability of Water User's Associations (WUAs), as a first form of participatory management approach in irrigation sector, and their success with respect to the adequacy and quality of the service provided and financial control are ultimate goals that should be monitored and evaluated periodically. Monitoring, evaluation, and measuring the effect of WUAs is difficult. Measuring outcomes evolves adequate data before and after establishing associations, or direct observation of processes affected by the new institutional arrangement. The Ministry of Water Resources and Irrigation (MWRI) continues with monitoring and the evaluation of the operation and the maintenance performance of the transferred schemes. This effort aims to determine the physical conditions of irrigation schemes and facilities, highlighting problems of each scheme, giving recommendations for better management, and providing associations with technical assistance.

Although several studies in the review have been conducted for evaluating and monitoring different aspects of WUAs, and no one of them paid attention to develop indicators for the assessment process of these associations. Through the current study, integrated assessment indicators for evaluating the performance of WUAs, as well as their effects on environmental, socio-economic, managerial, institutional and technical issues were developed.

Intended for developing/selecting the assessment indicators, two questionnaires were designed. The objective of the first one was to represent a preliminary set of suggested indicators that were reviewed and discussed among the project work team, an expert from the Irrigation Advisory Service (IAS), and experts from MWRI during a one-day workshop. The objective of the second one was to decide on the final assessment indicators through a PRA survey. Statistical analyses for the collected data and information were performed. Finally, based on the different obtained results from the previous activities, other elaborated discussions among the project workteam have taken place for more refinement to set down the final version of assessment indicators.

**Keyword:** Water User Associations, performance indicators, Participatory Rural Appraisal (PRA) survey, irrigation management, stockholder's participation.

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## 1. INTRODUCTION

The aim of establishing Water Users' Associations (WUA) is to develop the participatory irrigation management concept for increasing water use efficiency, through the involvement of all stakeholders, as much as possible, in the various management activities. Water User's Association (WUA) is a group of farmers, all served by a common source of water, who join together to allocate, distribute, and manage water (Sallem et al., 1984). WUA allows farmers to perform activities that are more difficult or impossible to do individually.

Although several studies in the review [(2), (3), (5), (6), (8)] have been conducted to evaluate and to monitor different aspects of WUAs, none of them has paid attention to develop indicators for the assessment process of these associations. Through the current study, integrated assessment indicators for evaluating the performance of WUAs, as well as their effects on environmental, socio-economic, managerial, institutional, and technical issues were developed.

The assessment indicators of WUAs are considered a tool to evaluate the performance of these associations and to monitor their status over the time. Hence, it is a very helpful tool for the developing future action plans and on the application of suitable correcting mechanisms at the right time. The main functions of the indicators are simplification, quantification, communication, ordering and allowing for comparison of different regions and different aspects. Simplifying indicators make complex phenomena quantifiable in such a manner that communication is either enabled or promoted.

The development and implementation of assessment indicators should be based on the core elements in the management process of these associations, and give fair attention for all aspects to ensure their sustainability. Accordingly, indicators may have to be focused on the main issues concerned with the better management of various activities and their different related outcomes. Therefore, the main topics, e.g. legal and institutional issues, management and financial issues, socio-economic and environmental impacts, operation and maintenance of irrigation schemes and facilities, and irrigation performance and expenditures / benefit analysis have to be considered. Assessment indicators are to be evaluated through a good designed questionnaire. For example, questions concerned with their budget, the extent of their operation and maintenance work, the extent of the farmers participation (i.e. meetings, payment of fees, etc.), the number of complaints they receive, the mechanism for resolving conflicts, the impact of WUAs on the yield, farming activities, and relations with other farmers, their major problems, how they go about solving them, the fee payment method, may be asked.

Intended for developing/selecting the assessment indicators, two questionnaires were designed. The first one was to represent a preliminary set of suggested indicators that were reviewed and discussed among the project team work, an expert from the Irrigation Advisory Service (IAS), and experts from MWRI during a one-day workshop. The second one was to decide on the final assessment indicators through a Participatory Rural Appraisal (PRA) survey. Statistical analyses for the collected data and information were performed. Finally, based on the different results obtained from the previous activities, another elaborated discussions among the project teamwork has taken place for more refinement to set down the final version of assessment indicators.

## 2. CONCEPTUAL FRAMEWORK OF THE ASSOCIATIONS

In the following frame, a summarized analysis of the literature review will be focused on various aspects and activities of WUAs in order to constitute a holistic imagination of their picture and its finest features.

- Water User's Association (WUA) and Water User's Union (WUU) is a group of farmers, all served by a common source of water, who joined together to allocate, distribute, and manage water (Sallem et al., 1984). WUA is devoted to farmers' associations in old agricultural lands, while WUU is devoted to those associations in the new reclaimed lands.
- Water users' associations are legal entities governed by the Law 213 in 1994, as specialized associations performing functions related to water management on mesqa level. The ministerial decree No. 14900 in 1995, issued by the Minister of Water Resources and Irrigation, reflects their functions, rights and duties in water management activities.
- The creation of water users associations is justified by the participatory approach in water management to allow farmers to concentrate efficiently their efforts and means for joint actions aimed at the optimum utilization of water resources on irrigated and reclaimed lands. The board assembly, as well as the head of the mesqa is elected by the general meeting of the founders (i.e. members or farmers).
- Water users associations are empowered to act on behalf of their members in their relations with local water management districts and local administrative entities, to solve problems of water supply, to conclude contracts for construction, repair, and maintain the irrigation schemes and facilities, as well as other contracts and transactions allowed by the existing legislations.
- Water users associations have managerial, financial, and technical autonomy. They make their own budget and set the tariff for irrigation. They operate as independent legal entities, starting from the date of their registration. Consequent activities of the associations will be based on democratic principles, taking into account the interests of all members and of local administrative rules.
- In accordance with the objectives and tasks included in the present law and ministerial decree, WUAs are involved in a cooperation of their members to achieve the following:
  - Operation and maintenance of irrigation schemes and facilities, and other elements of infrastructure within their command area, which are linked to the water management system.
  - Water intake from the source and distribution of the water among the members of the association, in accordance with the most efficient use of water resources, taking into account the needs of all farms.
  - Construction, rehabilitation, maintenance, cleaning, and other activities aimed at maintaining the association's network in proper conditions, developing this network and improving the status of irrigated and reclaimed lands.

### **3. STUDY APPROACH**

The study approach for the preliminary assessment of WUA is based on the development of a set of performance measures and indicators, and testing these indicators through participatory field visits. In the following sections, a description is given for both the development of the assessment indicators and the participatory approach.

#### **3.1. Development of Assessment Indicators**

The assessment indicators of WUAs are considered a tool to evaluate the performance of these associations and to monitor their status over the time. Hence, it is a very helpful tool in developing future action plans and in applying suitable correcting mechanisms at the right time. The main functions of indicators are simplification, quantification, communication, ordering and allowing for the comparison of different regions and different aspects. Simplifying indicators make complex phenomena quantifiable in such a manner that communication is either enabled or promoted.

The development and implementation of assessment indicators should be based on the core elements in the management process of these associations and give fair attention for all aspects to ensure their sustainability. Accordingly, indicators may have to be focused on the main issues, concerned with better management of various activities and their different related outcomes. Therefore, the main topics, e.g. legal and institutional issues, management and financial issues, socio-economic and environmental impacts, operation and maintenance of irrigation schemes and facilities, and irrigation performance and expenditures / benefit analysis have to be considered. Assessment indicators must be evaluated through a good designed questionnaire. For example, questions concerned with their budget, the extent of their operation and maintenance work, the extent of farmers participation (i.e. meetings, payment of fees, etc.), the number of complaints they receive, the mechanism for resolving conflicts, the impact of WUAs on the yield, farming activities, and relations with other farmers, their major problems, how they go about solving them, the fee payment method, may be asked.

Reviewing the previous studies in the literature, the legal framework of the associations, and according to case studies of Egyptian and Turkish experiences with WUAs, presented during the fourth water demand management forum in February 2002 in Cairo, it was possible to identify socio-economic factors influencing the performance of the associations. Consequently, it was possible to put down the first version of the assessment indicators for evaluating these associations. The preliminary set of indicators was reviewed and discussed among the project team work and an expert of IAS staff. The discussions have resulted in some modifications and the second version of indicators was reached.

A one-day workshop was held to get an input from the authorized experts in the field through discussion groups on the second version of assessment indicators that have been suggested by the teamwork members. Many of the discussion participant groups are directly authorized in the field, and they have their own experience, and some of them have published material on the area. Very detailed discussions and the elaboration on the assessment indicators have been directed by the authors within the discussion groups to get from the participants input through a pre-prepared questionnaire form. The contribution from all participants to the workshop discussion groups was highly appreciated, and they provide a good input to change the second version of the indicators. The workshop was closed by the presentation of discussion groups' results and by the identification of the main and critical issues raised in the discussions. The workshop brought valuable feedback from participants through a filled questionnaire form, which was analyzed later by the authors.

The collected filled-in questionnaire forms were weighted and ordered, according to the weight of each expert with respect to her/his degree of specialization in the subject, experience, reputation, and authority. Then, an extensive analysis was carried out to give points and study notes for each indicator, according to the weighted value of each questionnaire form that has resulted in other modified or semi-final set of indicators. Another elaborated discussions among the authors has taken place for more refinement to set down the final version of assessment indicators, as they presented in table (1). A Participatory Rural Appraisal (PRA) was conducted to test the final set of indicators and their applicability on the ground of real practices.

### **3.2. Participatory Rural Appraisal**

A Participatory Rural Appraisal (PRA) survey is used in this study for testing the previous indicators. PRA is a sociological survey technique, or a type of research, which is designed to provide timely, relevant and beneficial information. It can achieve a rapid assessment of conditions and problems in a particular area or community. Additionally, in relation to its speed, the major advantage of PRA survey is its information structure. Different types of data and information were collected through the PRA. PRA survey of the current study consists on a meeting of a group of 10-15 attendees, lasting approximately two hours. The PRA involves investigators from different disciplines, with the key information or community leaders, who invite the attendees to the meeting. Different type of data from different resources is used in the study. The main target of the PRA survey analysis is to test the applicability of the developed/selected WUA indicators that are presented in Table (1) with their categories.

### 3.2.1. Preparation for the PRA meetings

To prepare for the PRA meetings within each of the investigated associations, several steps were carried out as follows:

1. A good link between SRU and IAS directorates (Sharkia, Minia, and Behira) was established through various office meetings and field visits.
2. In order to get a reliable mean for accessibility to the secondary required information in Bustan area, special communications and field visits were paid to establish strong connection with the Bustan Development Project (BDP) coordinators. This project has been established and supervised by the Ministry of Agriculture and Land Reclamation for realization and development of participatory approach in water management through pilot WUAs in Bustan area.
3. A check list including 60 questions was prepared (SRU, 2005) and discussed with IAS staff members and engineers in the office prior to the field visits. The questionnaires was prepared to cover the following topics:
  - Management responsibilities
  - Technical aspects dealing with irrigation water.
  - Financial aspects
  - Social aspects
  - Environmental aspects
4. Several office meetings and field visits were paid to select locations of the three pilot study areas: Kemry canal in Sharkia, Mantoot canal in Minia, and Bustan canal in Behira governorate. Figure 1 shows these three locations.

Table 1: Developed Assessment Indicators of WUAs in Egypt.

No	Name	Definition	Area Coverage
<b>Water Use and Environment</b>			
1	Availability of irrigation water	Percentage of time with continuous flow from main source (working days) out of total number of days of the season.	Command area
2	Sufficiency of irrigation water amounts from main source	Fraction of irrigation water from main source to the total irrigation amounts based on irrigation times.	Head, middle, and tail of each mesqa
3	Equity and fairness of distribution	Irrigation water amount available from the main source at mesqa tail end divided by the corresponding available amount at mesqa head	Mesqa
4a	Farmers' attitude towards solid waste disposal in water body	Percentage of positive farmers' response out of the sample	Mesqa
4b	Farmers' attitude towards sewage disposal in water body	Percentage of positive farmers' response out of the sample	Mesqa

<b>Socio-Economic</b>			
5	Change in irrigation cost	Percentage change in irrigation costs before and after association	Mesqa
6	Benefit Cost Ratio (BCR)	$BCR = \frac{\text{Total Returns}}{\text{Total costs}}$	Farmer and average for the mesqa
7	Women's participation in WUA	No (of) women members in the board	Command area
8	Decrease of conflict among farmers	Percentage of satisfied farmers out of the sample size	Mesqa
<b>Maintenance</b>			
9	Average number of Pump's breakout occurrence	Total number of breakout occurrences during the year divided by the Total number of surveyed farmers	Command area
10	Average Time of Pump's breakout	Total time of pump's breakout (Hrs) divided by the Average number of pump's breakout occurrences.	Command area
<b>Institutional</b>			
11	Administrative council elections	Election for members of administrative council held in last 2 years (Yes/No)	Command area
12	Overall farmers' satisfaction of WUA performance	Percentage of satisfied farmers out of the sample	Command area
13	Farmers participation in general assembly	Majority of attendance (Yes/No)	Command area
<b>Management</b>			
14	Presence of banking account for the WUA	(Yes/No).	Command area
15	Emergency reserve funds	Money in hand or account balance.	Command area
16	Presence of good contact with the IAS	(Yes/No).	Command area

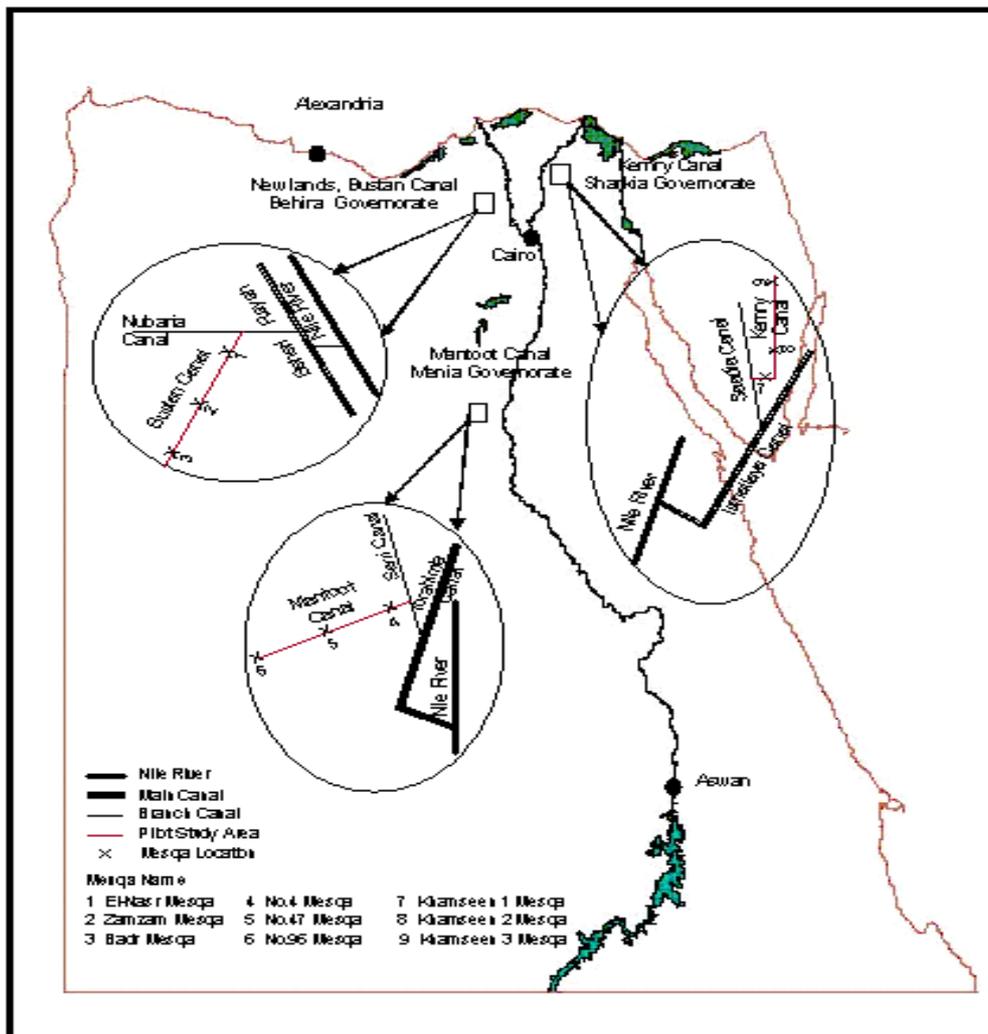


Figure 1: Locations of the Three Pilot Study Areas (SRU, 2005).

**3.2.2. Conducting the PRA survey meetings**

In cooperation with IAS directors and BDP administration, a total of six PRA meetings were arranged and carried out in the three pilot study areas. The overall PRA survey meetings are described as follows:

1. The attendees in the meetings were the boards' heads of the WUA or WUU along the secondary canal (the sheikhs of the mesqas), other members of the WUA in the old land or WUU in the new lands, some key persons from the area and a facilitator from IAS or officers from BDP.

2. The prepared questionnaire mentioned above was discussed during the meetings. The questionnaire was mainly concerned in the associations' budget, the extent of their operation and maintenance work, the extent of farmers participation (i.e. meetings, payment of fees, etc..), the number of complaints they receive, the mechanism for resolving conflicts, the impact of WUA on the yield, farming activities, and relations with other farmers, their major problems, how they go about solving them, and the fee payment method.

## 4. DATA ANALYSIS AND RESULTS

The collected data and information from PRA were analyzed to provide more insight about the reliability of the developed/selected indicators that are presented in table (1). The analysis of the collected data is presented.

### 4.1. Institutional Aspects

- Meetings are not registered and there are no organized files for the WUAs in Kemry canal. WUAs of Mantout and Bustan canals register meetings and keep records for all the activities of the associations in organized files.
- Board members are elected. One or all of them can be replaced if their performance is not successful.
- In the old land, they have good relation with the IAS officers. In the new land, there is no IAS in the area. The agricultural extension agent meets regularly the IAS officers and also the officers of the Bustan Development Project.

### 4.2. Management and Financial

- Managing the activities of the WUA is the responsibility of the board members, sometimes with the help of other members.
- Members are informed with all the activities of the board.
- In the old and new lands, the woman has the right to participate as a member in the WUA, if she owns the holding. In the old land, she appoints her father, husband or son to replace her in the activities of the association. In the new lands, a woman member appoints another member of the WUU to replace her in the meetings and voting.

### 4.3. Maintenance

- The pump breaks down 2-3 times a year except in *Mohamed Refat Villag*. The pump breaks down 2-3 times a month because the spare parts are not the originals and they do not have a special mechanic for maintenance. They often do the maintenance.
- In most cases the average time needed to fix breakout is 2-3 days.

### 4.4. Water-Use and the Environment

- There is a continuous flow of water in the canals and mesqas in Mantout and Bustan canals and a rotation system in Kemry canal. In the new lands water is not available in the mesqas one day a week.
- In the old land, traditional system of irrigation is followed, while in the new lands modern systems of irrigation are applied.
- Underground water is used if there is a shortage in the Nile water. The problem is the low quality of this water, which causes the salinity of the soil and the decrease in yield.

### 4.5. Socio-Economic Impacts

- The costs of O& M of the mesqa and the lifting pump are paid by the members of the WUAs either per hour or per feddan. In WUUs each member pays LE 5-10 per feddan a year, according to the rules of the union and each group of 4 holders is responsible for O&M of their own pump. Usually, farmers pay their (shares) spare parts in the costs. In the new lands each holder pays LE 85/ feddan/ year for the electricity consumption.
- Each WUA or WUU has a bank account and a fund for emergency cases except in Sharkia associations.
- The cost and the time of the irrigation period have decreased after the improvement of the mesqas and the establishment of water user associations.
- All type of farmers in the old and new lands were not accepting the idea of joining a WUA or a WUU, until they visited successful WUAs or WUUs in other areas and after having had a lot of discussions with mesqa improvement agents.
- In general, the crop yield has been increased, except in Ahmed Ramy village. In Ahmed Ramy village they cannot say that crops' yields have increased because of the shortage in water during the critical time of plant growth.
- Conflicts between members are solved by discussions and convincing.

From previous discussions and meetings, sixteen final indicators were selected. Table (1) presents the final indicators with their categories. The final indicators were selected according to the following criteria:

- a) Relevant and understandable by those who have to use them and have to reflect public objectives.
- b) Helpful in interpreting the state of the environment and the pressures exercised by human activities in relation to national and local programs.
- c) Able to summarize a large quantity of information.

## 5. CONCLUSIONS AND RECOMMENDATIONS

Through the current study a set of indicators for evaluating Water User association's performance were developed. The developed assessment indicators may be fairly considered as a hard foundation for the evaluation purposes. These indicators could be applied for evaluating the performance of WUAs from management responsibilities, technical aspects dealing with irrigation water, financial, social, and environmental aspects points of view. A preliminary set of suggested indicators was reviewed and discussed among the project team work, an expert from the *Irrigation Advisory Service (IAS)*, and experts from MWRI during a workshop. Final indicators are selected and tested through the PRA survey in three pilot areas, as follows: Kemry Canal in Sharkia Governorate, Mantout canal in Minia Governorate, and Bustan canal in the new reclaimed lands of the West Delta, Behira Governorate. Statistical analyses for the collected data and information were performed. Finally, based on the different results, obtained from the previous activities, sixteen final indicators were selected. The developed indicators of WUAs may be considered as a tool to evaluate the performance of these associations and monitoring their status over the time. Hence, it is a very helpful tool in developing future action plans and applying suitable correcting mechanisms at the right time. The developed indicators through the current study helps in discovering the malfunction of WUAs and helps the decision makers in taking positive steps to improve them. From the previous study, it is recommended to carry out annually study applying the developed indicators through the current study, in order to evaluate the performance and the effects of the Egyptian water user associations in the water management.

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