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Proposed Strategies for Irrigation Management Transfer in Libya

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ABSTRACT

LIBYA IS A sparsely populated country with limited water supplies. Being in the heart of the Arid Zone all agricultural production depends on irrigation. Irrigated areas are developed by both government agencies and private initiatives. Government projects including the irrigation schemes of the Great Man-Made River (GMR) Project began to represent heavy financial and administrative burdens which must be alleviated through turning their management, operation and maintenance directly to the beneficiaries. It has been recommended that community-based institutions such as farmers' associations and irrigation cooperatives should be established and encouraged to take over or at least partially help manage these irrigation projects. Several problems are encountered, however. The highly sophisticated water distribution and application systems require operational and maintenance skills which are locally lacking and expensive. An intensive training program to familiarize the proposed associations and cooperatives with the basic operational and maintenance principles is a necessary starting point before Irrigation Management Transfer (IMT) is totally or partly implemented. The legal and institutional structures of the society must also undergo radical reorientation to fit the management objectives intended by IMT. It is concluded that during the transition period through which IMT is achieved the official government agencies must continue to provide their normal services and support along parallel lines with the newly established community-based institutions until these institutions are able to stand on their own capacities to achieve the desired objectives. This paper recognizes the fact that the issues related to IMT are culturally specific, socioeconomically dependent and geographically versatile. This necessitates the pooling together of international experience and effort in this field and directing them on selective bases towards solving IMT problems in each country.

INTRODUCTION

Similar to several other countries in the Middle East and North Africa which are deprived of high precipitation and perennial rivers, Libya is exposed to intensive hydroclimatic aridity which imposes severe constraints on its future sustainable development and welfare. Up to the 1950s the human and economic activities in the country have been stabilized in a delicate balance between available natural resources and sociopolitical relations based on subsistence rain-fed agriculture and local forms of nomadism. But after the oil discoveries during the late fifties and early sixties of this century, there has been a remarkable switch over from dry farming to extensive irrigated agriculture to meet the demand for food by an expanding economy and increased urbanization.

The present annual per capita share of potentially available water resources is estimated at less than 500 cubic meters per person per year (Alghariani 1993). According to the concept of Water Stress Index (Falkenmark et al. 1990) this value puts the country deep into the water stress zone making it the poorest North African country in potentially available water resources. Despite these facts several hundreds of thousands of hectares (ha) have been put under permanent irrigation of one form or other during the last three decades. A large number of irrigation projects of various sizes have been constructed and operated by government agencies and irrigation departments. These projects which began recently represent heavy financial and administrative burdens which cannot be fully alleviated by public money and irrigation bureaucracies alone. It is felt that this problem may be solved by turning the management, operation and maintenance of these projects either totally or partially to the beneficiaries through the establishment and encouragement of local community-based institutions such as farmers' associations and irrigation cooperatives. These organizational forms and the feasibility of their success will be examined and discussed in this paper within the context of the desired irrigation management objectives as dictated by the local physio-economic and sociopolitical settings of irrigated agriculture in Libya.

IRRIGATED AGRICULTURE IN LIBYA

The total irrigated area at present is estimated to be around 450,000 ha. More than 190,000 ha have been developed by the private sector while the rest of this area has been put under permanent irrigation by government

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agencies in the form of small-scale projects ranging from 3,000 to 10,000 ha each. These projects are usually widely scattered throughout the country as dictated by the environmental and demographic factors as well as by the availability of suitable water resources and productive agricultural soils.

Compared to the huge and extensive large-scale irrigation schemes of Asia and other parts of the world, these projects offer a unique challenge and a different set of problems to water management. The absence of surface water supplies at high flow rates and the low productivity of groundwater aquifers combined with the high infiltration rates of most of Libyan soils excluded the possibility of introducing gravity flow surface irrigation with any acceptable degree of water application efficiency. The remaining choices have been limited to pressurized systems of sprinkler and localized irrigation of various types and designs. Center pivot sprinkler systems have been successfully installed and operated on almost all large production farms owned by the public sector. Solid-set and hand-move sprinkler systems are widely used to irrigate field crops on small farms in both settlement projects and privately owned farming areas. Localized irrigation is limited to orchard irrigation and high value vegetable crops in both the private and public sectors.

Although small irrigation systems similar to those in Libya are structurally simpler and thus expected to be more easily and efficiently managed, most of them failed to meet these expectations. Several factors contributed to this failure. The hydraulic sophistication of pressurized systems requires a high level of technical skills for their operation and maintenance on the part of both the beneficiaries and the irrigation bureaucracies. This technical skill is simply unavailable at present. In addition, these small projects require lifting water from deep underground aquifers. The cost of water pumping devices and their energy requirements add considerably to the complexity and expense of project operation. Furthermore, serving the energy supply, repair and maintenance requirements of many small lifting devices also require a complex network such as an electric grid or liquid fuel delivery system and engine repair service with an almost continuous flow of cash inputs for even operation.

For the abovementioned reasons, many of these irrigation projects in the country are failing to achieve their design objectives of delivering irrigation water where it is needed in the proper time and the right quantity. At the same time, irrigation agencies in several projects have been suffering financial difficulties recently and are looking for other ways of project management to reduce operation and maintenance costs. It has been [observed] lately that farmers in public irrigation projects may be better motivated if they are allowed to participate in management decisions and operation of the projects by transferring part of the management responsibilities and costs directly to them through some form of locally based farmers' organization.

IRRIGATION WATER MANAGEMENT

Before conceptualizing in what forms of organizational and institutional setup the beneficiaries can participate most efficiently in irrigation water management at the local level, it is necessary to clarify certain aspects related to management in general and to irrigation management in particular. Irrigation management can be considered as the complex integrative art of bringing together the objectives of irrigation projects and the most appropriate ways and means to achieve them. As such, it is a continued process of organizing the activities of all parties concerned and guiding their collective efforts to realize preset well-defined goals held in common. Thus defined, irrigation management must be looked upon as a holistic approach of defining overall objectives, selecting specific goals according to their priorities, initiating plans and organizing actions to achieve those goals, delegating the authority and control measures of the action process, monitoring and evaluating the results of the actions against predetermined standards, and servicing the plans where it is desirable. Therefore, efficient irrigation management requires effective people and a managerial process that can be easily understood and acted upon.

The functions of irrigation management mentioned above may need further elaboration. Planning implies that those responsible for irrigation management must decide all the what, when, where, how, and who questions required for the sound operation and maintenance of the irrigation systems and related activities. Organizing means that the management body must secure financial resources, spare parts, required skills and necessary labor. This process requires specialized divisions and personnel to whom the overall managing body must delegate authority. The managing body must also coordinate and control the entire process and monitor its impact on the irrigation system performance. Periodic evaluations should be undertaken to determine the degree of success of the management plan in achieving the desired preset objectives. This feedback is necessary to advise the management body of any desirable modifications of the management plans and thus take management back to the planning stage and close the circle of management process as define above.

The overall irrigation management plan under Libyan conditions should strive to achieve the following broad objectives:

1. The improvement of irrigation system performance in terms of water application efficiencies, reliable water deliveries and equity of water distribution among beneficiaries.

2. The realization of potential benefits of irrigation through increased levels of other agricultural inputs and improved cultural practices which tend to increase both crop productivity and water-use efficiency.

3. The reduction of operating costs, including maintenance and repair, and sharing these costs between the government irrigation departments and the beneficiaries.

4. More emphasis on applied irrigation research and on training of both the project beneficiaries and the irrigation management personnel at all technical and administrative levels of the irrigation bureaucracies.

The successful achievement of these objectives requires the full understanding of the structural and physical components of irrigation projects and how these components are related to each other. This understanding facilitates the delineation of management levels and the responsibilities associated with each level. Thus it enables management decision makers to clearly define the areas and extent of beneficiary participation and the specific functions that the organizational forms of management transfer can perform according to their managerial abilities and technical skills.

DOMAINS OF IRRIGATION PROJECTS

As indicated by Keller (1987) it may be useful to think of irrigation projects as composed of several physio-managerial domains. Three major domains are relevant to most irrigation projects in Libya including the GMR Irrigation Scheme. These are the groundwater basin domain, the water supply domain, and the agricultural domain. They are either partially overlapped or totally superimposed on each other. The groundwater basin domain comprises all activities related to aquifer physical properties, storage volume, recharge rates and sources, water quality deterioration and any external influences that may have a direct or indirect bearing on the sustainability of groundwater resources in this domain.

The water supply domain comprises all components of the irrigation system and is identical to it. It includes the well fields, the pumping stations and collection reservoirs, the water conveyance and delivery pipelines and regulating structures and the on-farm irrigation works. Surface and subsurface drainage systems, if they exist, are also considered a part of the project water supply domain. Effective and efficient management of the water supply domain requires highly trained technical skills to operate and maintain the complicated hydraulic components of the system and to interpret and anticipate the hydrological data such as the expected yields and drawdown of wells, estimating irrigation water requirements, sizing irrigated farm areas and estimating pumping costs.

The agricultural domain is the arena where the major irrigation project objectives are realized. Whether these objectives are the commercial production of food and fiber or the achievement of sociopolitical and geopolitical goals or anything else, all of them can only be realized by successfully manipulating the project beneficiaries as farmers and the other physical project inputs and outputs in the agricultural domain through some form of management and organizational arrangements. This domain is normally composed of several farming units or groups, each composed of a number of farms of variable sizes and farming activities. These farming groups are served by the water supply system through secondary and tertiary branchings of the water delivery structures which end up with single outlets at the farm level. Thus, as pointed out by Keller (1987) four levels of irrigation water management may be distinguished in most irrigation projects. These levels are:

1. The main water conveyance pressurized pipeline and its branches and associated hydromechanical equipment and structures.

2. The secondary and minor distributary pressurized pipelines which distribute water through outlets or reservoirs serving the farms in each group or unit of the project farming groups or units.

3. Pressurized pipeline distribution network within the farming units or groups of farms serving the individual farms or irrigated fields.

4. Application of irrigation water in the fields of each farm.

The objective of irrigation water management at the project level is to meet the irrigation water requirements of the various crops grown in all farms and to achieve a certain acceptable degree of equity in water distribution among the farmers. Thus management decisions of water allocations and deliveries in space and time are essentially of a bottom-up nature. But the execution of these decisions is a top-down process through managing and regulating the flows from the water source to the plant roots by the irrigation bureaucracies. Under these operational conditions it is impossible to properly manage irrigated projects without effective cooperation between the farmers and the irrigation bureaucracies in one form or another.

The above discussion suggests that two basic managerial entities are needed to manage irrigation water. These include a separate public or private irrigation bureaucracy to manage the water supply domain and some form of farmers' associations to help in water management within the agricultural domain. These two forms must collaborate and collectively participate in the management issues at the interface where the water supply domain overlaps with the agricultural domain.

PROPOSED FARMERS' ASSOCIATIONS

Since 1976, all farmers in Libya have been registered and organized in small congresses at the local project and community level. The members of each congress elect a directory committee among themselves every three years. The members of the directory committee are elected on the basis of personal merit regardless of social and property status. The directory committee is responsible for calling farmers' meetings to discuss their problems and concerns and to supervise and manage all the activities related to agricultural production within the congress geographical domain. These activities include:

1. The provision of farming inputs including heavy machinery, farm implements, irrigation equipment, seeds, fertilizers, pesticides and other materials. The farmers' congress buys these materials at low prices, sometimes subsidized, from publicly owned commercial companies and sells them to its members at a marginal profit.

2. The farmers have the option to market their produce by themselves or through their congress. But, usually, marketing the agricultural products through the farming congress gives them more bargaining power and better prices.

3. The farmers' congress provides the formal communication and contact links between the individual farmers, their problems, concerns and aspirations, on the one hand, and the official administrators and government agencies, on the other. They also mediate transactions among member farmers and intervene to resolve conflicts arising among farmers and between farmers and officials.

It is proposed here that these congresses located on the different irrigation projects should directly participate in the management activities of the irrigation systems in their projects and bear part of the cost of operation and maintenance of these systems. For this participation to succeed, the members of each congress should start their involvement at the simplest management level by doing the things they can easily understand and perform, probably sharing the responsibility of maintaining the secondary water delivery and application systems within their project units and individual farms. But since they lack the required skills, the official irrigation bureaucracy must provide them with training programs for this purpose. Maintenance costs can be covered in part by the profits made through commercial dealings of the farmers' congresses and in part through levying water utilization taxes or through an effective water pricing system.

The congresses can directly hire operation and maintenance technicians to replace the official irrigation bureaucracy. This may overcome the problems of government bureaucratic inefficiencies and administrative corruption. The public agencies may contribute financial support to the congresses to cover part of their costs. Once the farmers develop the confidence and skills to manage the irrigation systems on their individual farms and within their project units, they can proceed to take part in water management at the interface of the water delivery system and the agricultural domain. The official irrigation bureaucracy must always provide help and training to the farmers' congresses and their members and consult with them about every management problem encountered and expected. The main purpose of the official management should be changed to helping the farmers help themselves instead of dictating management decisions from above. This collaboration between the farmers' congresses and irrigation bureaucracies must be programmed and directed towards the eventual replacement of the bureaucracies by the congresses. A detailed program delineating the respective management responsibilities of each party during the transformation stage must be immediately formulated. It must be safeguarded by an effective legislation to

secure the successful implementation of this program. Political strife and tribal affiliations must be avoided in organizing the farmers' congresses. Their sole purpose should be to achieve the desired goals of irrigated agriculture and the welfare of the beneficiaries. It is suggested that project official bureaucratic administrations should start experimenting with irrigation management transfer to the farmers' congresses as soon as possible. The lessons learned from this experience and gained from experiences of other countries must be incorporated in the large-scale application of irrigation transfer programs in the future.

CONCLUSIONS AND RECOMMENDATIONS

In view of the rising costs of operation and maintenance of irrigation projects worldwide, Libya started to consider seriously the option of transferring part or all of irrigation management responsibilities and their associated costs directly to the beneficiaries. However, the concept of irrigation management transfer is only recently introduced in irrigation science and not clearly developed yet. Any sound program for the application of the concept must take into consideration several factors including the full understanding of the basic structural components of irrigation projects and how they are managerially related to each other. The hydraulic complexities of irrigation projects precludes the complete transfer of their management at the present time. It is recommended that the present farmers' associations which are organized in the form of people's congresses may offer the potentially viable organs of beneficiary participation if they are encouraged and involved in the irrigation management process. It is the responsibility of the official irrigation bureaucracy to provide such encouragement and training to the members of these congresses at the local community level and involve them in the management process until they develop the skills and the confidence to take over part or all the responsibilities related to irrigation. The experiences of other countries may help in formulating local irrigation management transfer programs and safeguarding them with effective legislation.

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