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IRRIGATION AND SOCIETY

IN

RURAL EGYPT

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بحوث القاهرة في العلوم الاجتماعية

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IRRIGATION AND SOCIETY IN RURAL EGYPT

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> "To a remarkable degree, many writers on irrigation ignore and even appear unaware of the relationships between people and irrigation water. Attention is usually fixed on hydrological, engineering, agricultural, and economic aspects. Especially in official documents it is rare to find described, let alone analyzed, the human side of the organization and operation of irrigation systems - the management of those who manage the water, the procedures for irrigation control, the processes of allocation of water to groups or individuals, the distribution of water within groups." (Chambers 1980/1977: 28)

Social and Ecological Approach to Irrigation

An irrigation system flows not only according to the dams and ditches of its physical structure, but flows also according to the social and political structures of villages and ministries. Although official documents rarely take this social component of irrigation into account, social theorists and anthropologists have long noted the special relationship between the needs of water management and the scope and style of the related social formations. It is ironic that although Ancient Egypt provides the theorists with their prototype of an irrigation-based social structure, the realities of the modern relation between irrigation technologies and Egyptian farmers' organization remain largely undocumented. The present study makes a beginning at describing and analyzing the local organization of water allocation as it

most directly effects the patterns of cooperation and conflict among farmers, and as it most strongly influences their receptivity to planned changes in the system and technology.

Our general approach is similar to that adopted by Walter Coward (1980) in that we stress the links between ecology, technology, and social organization. Irrigation, more than any other form of agriculture, requires the coordinated behavior of a number of adjacent farmers, at a minimum, within a larger system of irrigation organization. The lower level of the system is of crucial importance for it is here that all the plans made higher up, and all the expensive dams and devices upstream, achieve or fail to achieve the desired results. In Egypt, the Ministry of Irrigation's control and responsibility (and systematic knowledge) stops at the gates of the main distributory canal. After that, the water flows into a ditch (mesqa) and travels up to eight kilometers, irrigating perhaps 500 feddans belonging to hundreds of farm families. The farmers along this ditch cooperate and compete with regard to that precious water. Their system of such cooperation and the patterns of their conflicts (and fear of conflict) have important implications for the operation of the Egyptian irrigation system. Other levels of the social organizational system are also important, such as on-farm water use or the managerial structure of the ministry itself. However, for this study

we have chosen that level of social organization where the ministry's national bureaucracy articulates with the farmers' locally rooted society.

The ecological perspective of institutions and social organization means that we emphasis the irrigation system as a socio-technical adaptation to a particular habitat. Our analysis starts with the land (slope, location, elevations, etc.) and looks at the techniques for watering it (channelling, storing, and lifting devices), and relates this basic local context to the forms of social organization for allocation of water and water-related responsibilities and rights. For example, such an approach leads us to ask why middle Egyptian farmers do not have any traditional local water groups. The Egyptian Water Use and Management Project noted this crucial gap, and set out to create such water user associations. We ask why there were none to begin with. Within a socio-ecological approach, we can compare this middle Egyptian situation with two other Egyptian systems with different ecologies and which do have forms of local water user institutions. This comparative ecological approach answers the question of the 'missing' institutions of middle Egypt and also reveals the foundations of local water allocation systems in a way that provides a strong basis for evaluating the probable effects of proposed alternative technologies.

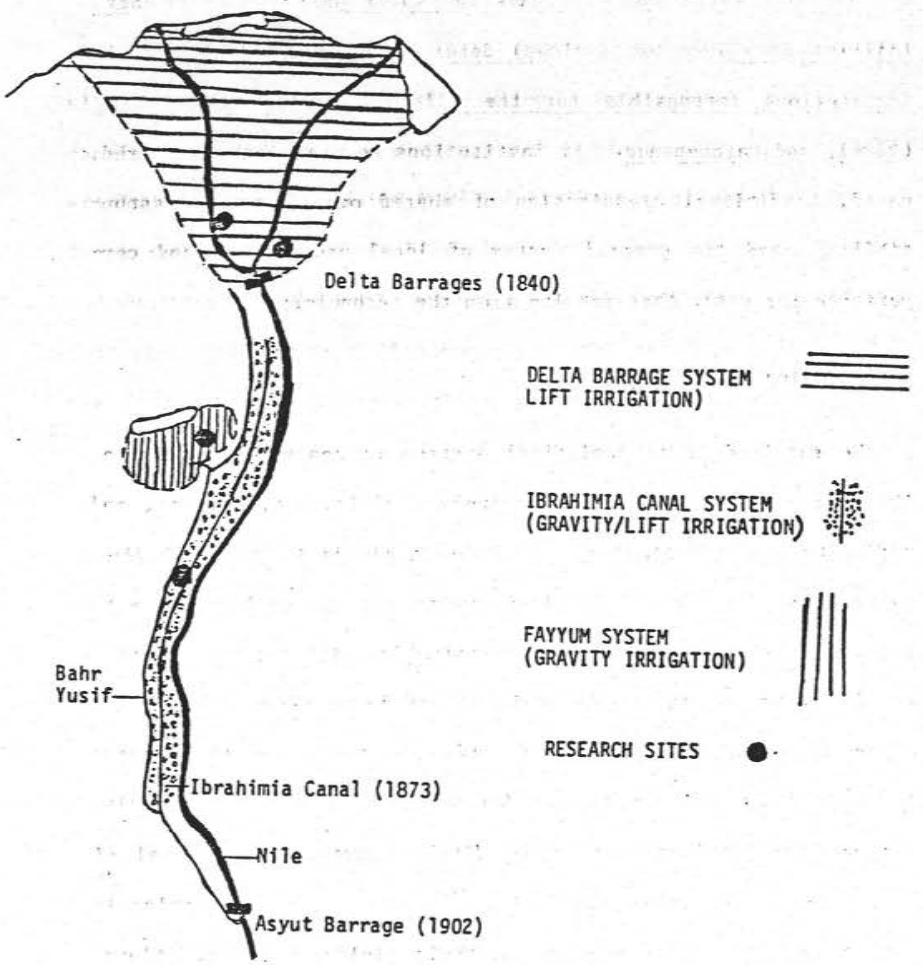

Fig. 1. Three Ecological Systems

We hypothesize that the existing water delivery technology (lifting or allocation devices) determines the style of social institutions responsible for the allocation of water, labor (time), and maintenance. By institutions we mean both the fixed, named, traditional organization of shared ownership and responsibility, and the general system of local cooperation and competition for water that results from the technology.

Three Ecological Systems

We examined three ecological systems or zones of irrigation. The most important (in terms of numbers of farmers, feddans, and agricultural production) is the below grade lift system of the Delta. The flat, rich, low-lying Delta was the earliest area to be brought under modern perennial irrigation with the construction of the Delta barrages and canal systems begun under Mohamed Ali during the 1840's. The essence of this system as it operates today is that water is delivered through major and minor canals, through regulated openings into ditches (mesqa) at a level of almost one meter below the field. The farmers must organize to lift this water and convey it to their fields. The traditional organization of the farmers is attached to the lifting technology: the cow-powered water wheel (saqia), and, these days, the diesel pump.

The Faiyum system is, from an ecological perspective, the opposite of the Delta system. The essence of Faiyum is its steep slope and varied elevation which allow construction of a system of canals which brings water down to each field. It is a classic gravity feed system in which the organization of the farmers relates to the allocation of precisely calculated irrigation turns and durations. This basic gravity adaptation and resultant social formations of Faiyum irrigation date to ancient times, although the system has been considerably refined and formalized in recent decades.

Between these extremes of the flat Delta lift system and the steep Faiyum gravity system, is the system attached to the Ibrahimia Canal which runs all the way from Asyut to the fields near the great pyramids of Giza. This long narrow strip varies in terms of slope so most areas practice a kind of mixed irrigation system, relying on gravity at times but often needing to supplement this with the relatively simple tambour (Archimedes' screw), and more recently, the diesel pump. Furthermore, until the completion of the High Dam in 1964, this area combined, in various ways, perennial irrigation from the Ibrahimia Canal (constructed in 1873 and modified by the Asyut Barrage in 1902) with basin irrigation from the annual flood of the Nile. Today, it is common in this system for water to be available from two sources.

Following our hypothesis of a direct relation between the water allocation institutions and the nature of the technical adaptation, it is not surprising to find a lack of a fixed traditional water user group in the Ibrahimia system. The technological and ecological basis for such a group is absent. What we do find among these farmers is an extraordinary tradition of ad hoc organization and cooperation to accomplish specific short duration irrigation tasks. This cultural capacity has its roots in flood management emergencies and remains appropriate for a shifting, multi-technology, multi-water source environment.

Irrigation Development

There are two contexts for irrigation development: a) situations where irrigation is being introduced for the first time, and b) locations already containing irrigated agriculture (Coward 1980: 22). Both of these contexts are important in Egypt and correspond roughly to the "new lands"/"old lands" distinction. The present study is concerned with the "old lands" context in which the existing irrigation practices are an important building block or constraint to future irrigation development.

To state that one should know the existing system before attempting to change it is an obvious platitude, but one all too often ignored by development planners from above and experts from

abroad. Most obviously, "decisions will be enhanced if they are made on the basis of a good understanding of what exists rather than on the assumption that nothing of importance is present or that the existing patterns are simple and rigid and therefore inappropriate for 'modern' irrigation management" (Coward 1980:23).

There are, however, several less obvious, but equally important, reasons why it is necessary to document the present system before planning its modification.

(1) Any new technology will be accepted or rejected, understood or misunderstood, on the basis of the farmers' past and present irrigation experiences. Perhaps a university economist can calculate the costs and benefits of hypothetical systems, and thereby recommend the best choice. The farmers' decisions, rational and calculated, are based on experienced reality and not on imagined hypotheses.

(2) Of even more importance is the fact that this reality, for a crucial period of time, is a mixed reality including a combination of old and new technologies. The experts postulate new technologies versus traditional technologies and analyze the advantages of each system, but in the countryside, diesel pumps and cow-powered water wheels form a single system of water lifting

for a whole generation of farmers. Pumps, one by one, are integrated into a pre-existing system of water delivery and only gradually does the system get transformed. Decisions about new technology must analyze not just the new versus the old, but the nature of the mixed system which is the real context of the socio-technical transformation.

(3) Yet another reason for studying the extant system, we feel compelled to stress, is that this system may prove superior to the proposed alterations and modifications. It may be adapted to variables that are not immediately apparent but which would render a new system useless. These hidden variables are often cultural or social factors such as the operation of kinship networks or status hierarchies, but they also can be ecological attributes such as a slight variation in soil quality which becomes a problem with faster water flow through ditches. The history of planned technological change is full of instances in which one minor unforeseen factor, hidden by the very success of the old adaptation, emerged to destroy the more modern replacement.

(4) One final reason for studying the local social context of irrigation is that irrigation systems in themselves are not total social systems. Every irrigator is also a member of a community. In classical social theories of the evolution of irrigation-based

societies, the community achieves its final structure as a result of the need to organize the distribution of water. However, once the system is developed and planned on a nation-wide scale it is the political structure which affects the irrigation program rather than vice versa. The system-rational plans for efficient water delivery are compromised by the realities of political power as that water flows toward the villages and fields. On one hand, this spells corruption and the diversion of water to the fields and projects of the rich and powerful. The other side to this is the operation of patron-client relationships. Poorer farmers are often assured a share of water as a result of their loyalty to an important local person. One could view water, not only as a substance needed for agriculture, but also as one of the scarce currencies diverted to maintain the structure of general village political relationships.

Irrigation Issues for Egypt

Until the present time, Egypt has been blessed with more than enough water to irrigate adequately the six million or so feddans of agricultural land bordering the Nile and its branches. For Egyptian agriculture, land, not water, has been the limiting factor. However, Egypt is moving quickly toward an era when water as well as land will limit agricultural production. The task before

Egyptian agriculture is to change over from a system of water abundance to one of tighter water budgeting at all levels. There is no question that the day when water demand exceeds water supply is approaching. The expert studies differ only as to the date of this event. The optimists (A.R.E. Water Master Plan, 1981), counting on the timely completion of the Jonglei Canal project in Southern Sudan and other uncertain events, predict that water will be adequate for another two decades. The pessimists (Waterbury 1979) calculate that the supply and demand lines will cross in less than a decade.

These projections, optimistic and pessimistic, were made before the drought which has now continued for several years. By December 1984, the Blue Nile which flows out of the Ethiopian highlands and supplies 80% of the water entering Lake Nasser was virtually dry. Civil disorder and military activity in Southern Sudan has now halted work on the Jonglei Canal. Resumption is not currently anticipated. These events are hastening the day of significantly decreased water supply for Egypt and diminishing the chances of future increases.

There are additional reasons for embarking on a policy to conserve as much as possible the irrigation water. Since the construction of the High Dam at Aswan, the water table in the

Delta has risen steadily and currently threatens the fertility of much of what was traditionally the richest land. One way to reduce this problem is to irrigate with greater efficiency.

Irrigation is part of the general development of agriculture. During the last decade, Egypt has become dependent upon foreign food imports to a large and growing degree. Egypt does not follow a program of trying to achieve food self-sufficiency, but rather to increase production of those crops in which it has a comparative advantage. Plans call for shifting from traditional field crops to crops such as vegetables which are extremely water-demanding. Other pressures lead farmers to invest in animals and hence use the land to grow clover, also a water demanding crop for fodder. All in all, the increase in food production, for export and for local consumption, in order to offset the "food gap", will call for more water to be applied more effectively to each feddan.

Water shortage and tight water budgeting entails the likelihood of increased levels of tension and dispute among competing farmers and between farmers and the national water delivery bureaucracy. Water shortage and tight budgeting will also call for a greater degree of local organization for the allocation of the scarce resource. The purpose of the present study is to document the local systems of water allocation, and the patterns of

cooperation and conflict, as they currently exist. There are two areas of direct policy implication of such a study.

First, one might consider organizing local water user groups to be responsible for the increased regulation of irrigation at that level. Or the government may wish to consider providing legal status to informal organizations that already exist.

Second, there are currently proposals to alter the irrigation technology in various ways. These proposals range from "simple" plans to increase the number of diesel pumps to complicated schemes of altering the entire delivery system to gravity flow. Technological changes have their organizational correlates. This research demonstrates the types of organization and organizational problems that accompany different irrigation technologies in Egypt.

Research Methodology

We studied four sites - two in the Delta lift system, and one each in the Ibrahimia and Faiyum systems. For each site we chose a distributory canal and mapped its points of water allocation and its subsidiary feeder canals (mesqa). We interviewed the district engineer responsible for the canal and obtained from him the official technical data on canal design, capacity, water regulation

system, and water allocation budgets. Most engineers were also quite willing to share with us their unofficial experiences and viewpoints on this particular canal. We benefitted greatly from such insights. We also interviewed the gate keepers or guards of the canal. The gate keepers (bahhar) were often quite articulate about their experiences as gate keeper on "some other canal", but were rarely willing to discuss the canal under study in much detail. Again, we gained precious insights into the relationship between the farmers and the ministry from our discussions with the gate keeper, the man in the middle.

Once we established the overall system of the distributory canal, we chose one long feeder canal (mesqa) for more intensive mapping and study. Our procedure, again, was to map the feeder canal, marking all the points of water lifting and allocation. In the Delta, this meant noting all the water wheels and diesel pump placements (usually the same location). In Faiyum, we mapped the mesqa and all of its branches and diversions. In the Ibrahimia location, the system was a bit different due to the unique arrangement of the field canals into an inter-connected grid.

Having established the maps and points of allocation, we interviewed the farmers in the area, and gathered histories of disputes or problems in water supply. In the Delta system, this

involved formal interviews with all the members of each saqia along the canal at one site, and with the leader of each saqia along the canal at the second site. In Faiyum, the interviews were with the leaders and members of the two levels of local water user groups. In the Ibrahimia site, we focused on the farmers with contiguous land in a certain section of the agricultural reform lands there. In all three sites we made extensive observations of actual irrigation practices which often vary from the responses to our interview questions. The dialogues about these seeming discrepencies were our most important source for understanding the real dynamics of the local system. Additionally, we interviewed the village mayors, omdas, responsible for resolving irrigation disputes, and the irrigation police responsible for pursuing and investigating offences against the ministry's canal system. Additionally, our presence and observation continued throughout the annual cycle. This enabled us to view the different water requirements of winter and summer crops, the winter closure and maintenance period, and the changing patterns of water availability according to season.

Irrigation and World Food Supply

Although the focus of this study is on the local organization of irrigation, we wish to remind the reader at the outset of the global significance of irrigation in the efforts to feed the people of this planet. In the whole history of human civilization there are only three ways to increase the scale of food production significantly and cumulatively: (a) domestication of plants, (b) irrigation, and (c) industrial agriculture. And the second of these three "inventions", irrigation - the timely and precise application of water, is a crucial element for the third, modern industrial agriculture.

For the future, we cannot overstate the importance of irrigation for feeding the growing population, especially in third world countries. India, Pakistan, Egypt, and Indonesia, to name a few of the most important and most populous countries, all have huge systems of canal/river irrigation providing both domestic food for their people and necessary export earnings for their economies. Many poorer and smaller countries such as Sudan, Madagascar, and Sri Lanka are utterly dependent upon their own significant irrigation infrastructures for food and finance.

In most of these countries, large and small, the irrigation infrastructure is deteriorating. The initial gains in productivity