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# REINVENTING THE COMMONS: TRANSFER OF IRRIGATION MANAGEMENT // AN EXPERIENCE AND AN ASSESSMENT

DR. RAOUF F. KHOUZAM
CONSULTANT
RESOURCE AND ENVIRONMENTAL ECONOMICS
P.O. BOX 150 GEZIRA
CAIRO, EGYPT 11568

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# TRANSFER OF IRRIGATION MANAGEMENT AN EXPERIENCE AND AN ASSESSMENT[1]

Dr. Raouf Khouzam

Availability of adequate irrigation water at the right time is a main constraint on both vertical and horizontal agriculture expansion in Egypt. To rlax that constraint, the Ministry of Public Works and Water Resources (MPWWR) have adopted four main approaches to: structural works, enforced rationing, cost recovery, and management transfer. The first is the most expensive. Considerable funds are being allocated by both the Egyptian government and foreign donors to rehabilitate and improve the system and its management. The Irrigation Management System (IMS) is a notable example of such efforts.

In addition to the rehabilitation huge funds, the operation cost is in increase year after another; in 1974-76, it ranged from LE 45 to 54 million (Cuddihy, 1980). In 1990/91-1993/94, it increased from LE 254 to 807 million (MOF, n.d.). That burden has risen with the liberalization of the Egyptian economy. Irrigation water was used to be charged for implicitly through price and quantity controls of the agriculture sector. Currently, with the liberalization process controls have been lifted. Since then, water is truly provided free. Subsequently, the government financial burden has increased tremendously.

Management transfer (MT; the main theme of this paper) and cost-recovery (CR) are two approaches to followed to reduce MPWWR financial burden. MT merits qualify it as a powerful solution to many of the irrigation-related issues. Nonetheless, those merits should not delude decision makers. Inadequate planning or deficient design could turn out destructive to the whole agriculture region. It is, thus, imperative, in the light of the absence of a well documented body of knowledge on the subject matter, that specialists exchange experiences.

This paper analyses MT model that has been applied in an Egyptian region. Farmers attitudes towards the model are investigated and analyzed. Lessons are derived. Qualifications that minimize MT failure are proposed. The following two sections describe the study area and the applied model with farmers attitudes

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[1]This paper was mailed to IIMI's conference in Wuhan, China but was not presented because of the lack of fund to finance travel expenses

summarized in a text box. Based on farmers' attitudes and other literature. Section III introduces aspects to be considered in MT design.

## I. STUDY AREA: DESCRIPTION

South Tahreer (the study area) is located 140 km in the desert north west of Cairo. It was reclaimed in the sixties and started as a state farm. Later, it was privatized in the late seventies as a part of dissolving the public sector in Egypt. Now, it is farmed by graduates, small-holders and some businessmen.[2] The farm size of a graduate ranges from 10 to 30 acres depending on his level of education while that of a smallholder tends to be uniform: 3 acres. A business farm starts at about fifty acres to several hundreds.

The relatively large size of graduates' farms encouraged the allocation of 24% of their lands to perennials (mainly citrus). Other than that, the main cropping patterns of both graduates and small-holders are similar: berseem and peas in winter and peanuts in summer. Both smallholders and graduates identified irrigation as the most binding constraint due to power failure, inefficiency of government pumping stations, poor maintenance and/or irregular water supply especially in summer (DDC, 1985; 1986). As a consequence, farmers are forced to leave some areas of their farms fallow during summer. Businessmen farms tend to use more advanced technology to cultivate nontraditional crops such as export varieties of strawberry, banana, grapes, asparagus... etc.

The region is fed by surface water from the Nile. Water is lifted and distributed to farms under pressure by electrical pumping stations. On average, a station serves 480 acres. The number of farmers served by a single station varies significantly. A station serves an average of 160 smallholders, 24-48 graduates and lesser number of business farmers (smallholders, graduates and businessmen are separate villages). As will be discussed below the number of farmers served by a station is an important variable in determining the success of MT. Irrigation method is almost uniform in smallholders' and graduates' farms; it is mostly portable sprinkler lines. Businessmen farms tend to use modern drip irrigation methods.

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[2]A graduate holds a secondary school diploma or higher whereas a small holder has an education level below secondary school certificate

The region has witnessed instances of temporary informal MT when farmers take the initiation to finance and fix a station's critical breakdown.[3] That way farmers avoid red-tape delays that might be disastrous to their crops. Moreover, farmers used to voluntarily pay incentives to the station's staff to work longer hours so as to allow longer irrigation periods.

## II. MT MODEL UNDER STUDY

MT model addressed here is a partial transfer (another classification is provided in the opposite box). Partial MT is applicable to water resources which by its very nature requires a degree of central management; the rive Nile is a well-known example. Physically, the Nile river is managed by a top-bottom hierarchical network that includes 19 directorates divided into 48 inspectorates which are further subdivided into 167 districts (ISPAN, 1990).

*The model addressed in this paper is classified in terms of its scale to a partial MT; a full MT could be found in small confined systems as in the case of deep aquifers. Another MT categorization can be made from a legal angle to authorized and taken-over. Authorized MT is observed in the case of drilling a deep aquifer well. MT is turned over from MPWWR to a user through a licensing process.*

*In other cases management is taken over without formal authorization. This is the case with the illegal large number of shallow wells spread in both the old and new lands. The government is either unaware of the incident (which is unlikely), or overlooks the incidents because of its favourable impact on lowering water table in the region.*

MT Classification.

In terms of property rights, it has a mix of them (sketched in figure 1). Within the Egyptian borders, it is a state property managed by MPWWR down to the ditch level where it becomes a common pool resource of farmers using that part. Once water is delivered to a farmer's plot, it becomes his private property.

[3]On one occasion (April 1990), farmers in one of the stations collectively paid LE 550 for spare parts and labor to fix the station

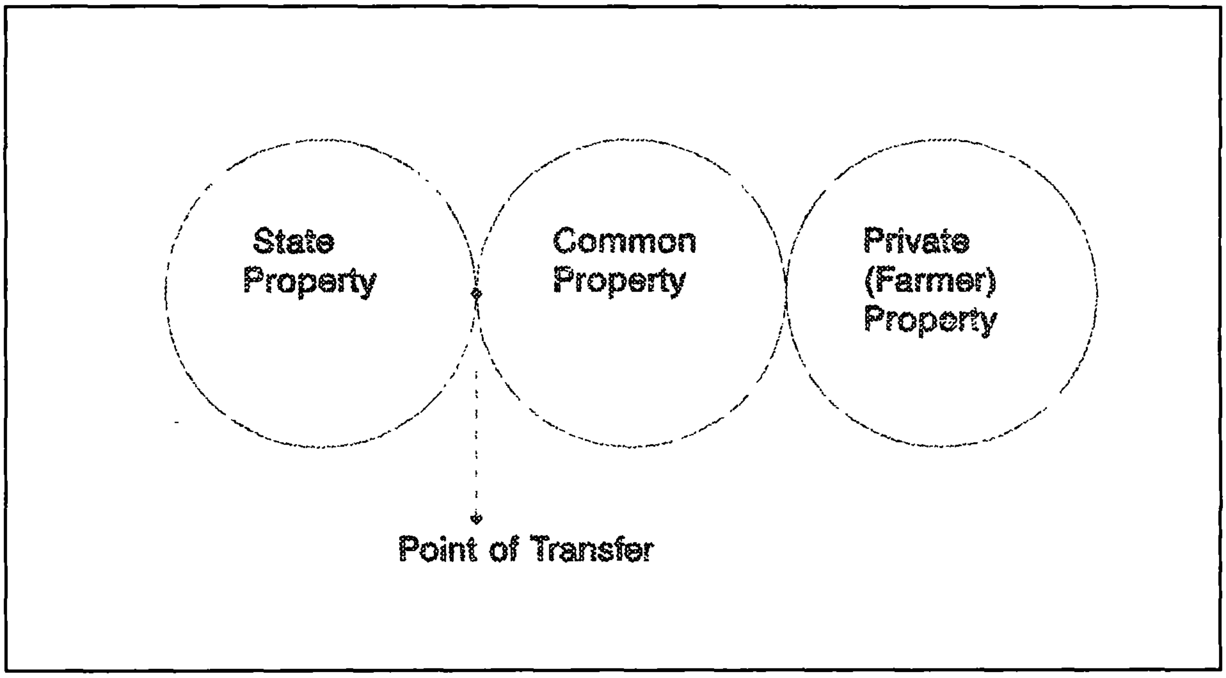


Figure 1 Point of Transfer in Terms of Properties

MT in that system takes place at the points of tangency between the public and common property. That remedy entails an alteration of the prevailing system of rights and duties along with financial obligations.[4] In terms of South Tahreer context, the component to be transferred is the electrical pumping station.

In 1986, two options were introduced to South Tahreer irrigators. The first is to transfer the control of an irrigation station to its users after some overhauling by MPWWR. Subsequent OMR is the responsibility of the new owner(s). The second option was CR. A farmer pays to MPWWR an annual service charge of LE 88 per acre of his land regardless the amount of water used, or the area left fallow. Of this charge, LE 55 is for electricity and LE 33 for OMR.

Most businessmen welcomed MT. Graduates and smallholders rejected both MT and CR. The writer interviewed a number of farmers about their views concerning the new policy. The interviews revealed that though the majority of farmers are clearly against the new policy for a number of reasons, they are willing to accept them if certain

[4]Presumably, MT takes one direction from an irrigation authority to some private institution The opposite case is not likely since it entails moving a financial burden to a public authority

requirements are met. The next section explains farmers attitudes and reaches recommendations to improve the success chances of MT.

## III. ISSUES IN MT

### III.A. Income-Related Aspects

Naturally, the impact of MT on farm income is a central issue to farmers. Smallholders and graduates in particular were concerned that farm income without the financial burden of MT is barely enough to support their families. Accordingly, they cannot afford any additional expenses.

Moreover, farmers concern was not confined to present income only but exceeded it to expected income. First, as it is with farmers everywhere, South Tahreer farmers are vulnerable to losses because of exceptional weather variations, devastating irrigation problem especially in desert hot summers, or unexpected drop (increase) in output (input) prices. Additional MT cost will aggravate losses in these instances.

Farmers rejection of MT is based on a Pareto rationale. MT will make them worse off as it adds to the cost of production only. However, they are willing to pay in a situation where both of them and MPWWR are better off when a system's improvement is carried out to secure reliable water supply. If this is accomplished, they would be able to cultivate the areas they are used to leave fallow during summer, obtain better yield, and diversify their cropping pattern to reduce the risk of price fluctuations.

*Farmers attitudes towards CR can be summarized in the following:*

** They fear that accepting the current CR charge would commit them to accept future increases which will be forced on them by MPWWR and or the Ministry of Electricity.*

** They are not sure that the proceedings of CR will not have the same fate of the land tax revenues.*

** CR has the disadvantage of being overestimated to cover for inefficient government management specially overemployment.*

** The one advantage they find in CR is that it is the responsibility (headache) of MPWWR. Moreover, they avoid fluctuations of expenditures that will be needed in MT.*

CR Aspects

Obviously, improvement in current and future income forms the momentum which will motivate farmers to MT. This is the motivation which has been stressed in many works (Ostrom 1991; Khouzam, 1994; 1992).

## III.B. Rather-Sentimental Factors

Farmers already pay land taxes at the rate of LE 12 per acre. Originally, part of the tax proceedings is directed to support irrigation. They wonder what the tax revenues are used for and what guarantees that the proceedings of CR will not have the same fate. This reflects lack of confidence because of the absence of farmers participation creates lack of confidence.

Moreover, some of their contracts with the government do not stipulate any provision for paying for irrigation water. However, an amendment was added to more recent contracts that authorized MPWWR to estimate and collect irrigation cost. That created two categories of farmers: old-contract holders and new-contract holders with each group expects to be treated differently with respect to the payment of irrigation charge.

Farmers believe they should receive water free of charge in recognition of their efforts in transforming what used to be losing governmental enterprises to profitable private farms and to be treated similar to the old-land farmers who are not charged for water. Farmers here ignore the fact that the energy cost of lifting water to higher elevations in the new lands is greater than that needed for the old lands where water is distributed by gravity.

The above points are based on farmers viewpoints. Farmers did not show awareness of the following questions (except for group size).

## III.C. Farmers Financial and Technical Capabilities

MT entails moving technical, financial as well as decision-making responsibilities to a group of users. As such, MT can not be successful unless the group is capable of carrying out those functions. That capability has to be assessed by MT designer before implementation.

A major breakdown in the old stations will require raising significant funds to fix it. Finance is not easily accessible for new land farmers because of the lack of a collateral.[5] That means that those farms will close down. As mentioned earlier business farmers, who are financially capable, accepted MT. If the designer finds that farmers do not possess these capabilities, then MT package should provide financial facilities for such situations as well as technical awareness and consulting services.

## III.D. Collective Action

MT provides new administrators with the authority to collect dues to finance necessary improvements and make their own decisions. Collective action is the framework within which a group of farmers can handle all management questions.

General conditions for successful collective action have been described in many works (see for example Wade, 1987; Olson 1971; 1989; Ostrom, 1991). One factor that received more attention is the group size. Olson stated that:

> *"...two conditions either of which is ultimately sufficient to make collective action possible... the number of individuals or firms ... is sufficiently small; the other is that the groups should have access to "selective incentives"..."* (Olson, 1989).

A few lines below, he scales down the importance of the second condition in face of a rising number of group members:

> *"...even if there were some incentive to act in the common interest, that incentive would cease long before a group-optimal is reached..."* (Olson, 1989).

The issue, then, boils down to group size. A group's ability to act collectively depends on how small the number of its members is. Hardin introduces the same condition in a different form: for the same group, chances to succeed in collective action decreases as its size increases. Or, for two groups the one with smaller sizè has

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[5]New land farmers do not receive titles of their lands because they pay its value in installments over about thirty years at subsidized interest

better opportunity to succeed in carrying out collective action than the larger group (Hardin, 1982).

Two factors a fortiori undermine the success of large groups. First, the larger the number of a group's members the less the joint benefit a participant receives in return to cooperate. As benefit per participant gets smaller and smaller, some members will find it rewarding not to contribute to the collective action. Second, a larger number will entail larger organizational cost which erodes action benefit further (Olson, 1971).

Interesting enough, two works alter the relative importance of group size. Upon examining a purposive sample of irrigation systems, Robert Hunt locates large as well as small systems which are run by local irrigation communities (Hunt, 1988). The sample includes fifteen cases from 10 different countries with system size ranging from 700 to 458,000 hectares. Assuming , realistically, that larger systems have larger user groups, Hunt's findings relax Olson's restrictive relationship between group size and its ability to act collectively. A conclusion which has been confirmed by Khouzam (1994): to a certain extent, larger number is a blessing because it is more able than smaller groups to accommodate free riders.

Examples of successful collective action are cited in many regions such as in San Lorenzo Irrigation Project Peru, Third Irrigation Project and (Ostrom, 1991 after Cernea, 1985) and Unidades de Reigo in Mexico (Hunt, 1989), in the Punjab and Sind in Pakistan (Freeman and Lowdermilk, 1985), in Sri Lanka (Chambers, 1980) and in the old land regions in Egypt (Mehanna et al., 1983).

In South Tahreer, the group size was one of the key factors in accepting MT. As mentioned above, varies significantly from as high as 160 smallholders to few businessmen.[6] In view of the Egyptian inheritance system,[7] number of users will multiply many folds each generation. The small group size of businessmen group encouraged them to accept MT. The current large size of smallholders and graduates groups, which will increase exponentially in the future, is one factors hindering the acceptance of MT.

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[6]In one of the interviewed cases, the businessman bought off the land of his neighbor in order to have full control over the irrigation station

[7]Roughly, all the sons and daughters split the farm among themselves.

As such, group size is an important size in determining the success of MT. Although larger size has some advantages, smaller size is more preferred by farmers.

## III.E. Resource Vitality

It is argued that disasters tend to reduce selfishness of the members of the hurt group as well as others. This phenomenon is known in the literature as "disaster syndrome" (Harrison and Hirshleifer, 1989). Accordingly, greater vitality of a resource boosts their responsiveness to fund raising.

This idea is supported by the observation that while group-management has better chances for success in the desert, it has been rejected in the old lands, where comparatively more water is available (Knop et al., 1982).

Furthermore, South Tahreer farmers who have stand-by shallow wells are less enthusiastic to MT than those who do not to system improvement. They are willing to pay a charge equal to or less than what a shallow well costs them. That charge is far less than what others are willing to pay. Farmers admitted that MT will be helpful to their incomes. Discussion indicated that they are not willing to pay more than 50% of the increment in farm income. Since the increment in benefit to farmers who do not have shallow wells is greater than those who do not have, the former are willing to provide greater contribution.

## III.F. Social Homogeneity

Variation in social rank involves the presence of individuals who can impair rules application in a way that serves their own purposes. The presence of such bias undermines the serious participation of other group members. Fortunately, South Tahreer is a new community which members have been selected according to a set of government criteria. That selection created social homogeneity (members are close in social rank); unlike old-land communities. As a consequence, a group is rather neutral and stronger in enforcing rules.

## III.G. Social Aspects

The benefits derived from solving problems of individual farmers can be secured for longer time if social angles are taken into consideration when designing MT. This section will dwell on those issues.

**III.G.1. Enhancement of water conservation.** Egypt is facing a rising demand for water being met with a constant water supply. While this problem is getting severer, Egypt, ironically, suffers the abuse of its limited water especially in the irrigation sector which consumes more than 80% of its fresh water. Water misuse is a result of a discrepancy between social and private optima. The discrepancy is a result of providing water free of charge which does not its value to the society. If MT is designed such that it narrows down that discrepancy then it will enhance water conservation.

The basic idea behind such design is that the act of conservation entails a sacrifice on behalf of one farmer in favor of others. Assuming that a farmer (denoted "A") withdraws a quantity of water corresponding to maximum yield,[8] if he is somehow induced to reduce that quantity his yield will drop subsequently. However, the saved water allows another farmer (denoted "B") to reduce his water deficit and raise his yield, consequently.[9]

The issue is, presumably egocentric, how would "A" be induced to save water and incur a loss.[10] Consider demand for water (represented in figure 2 by its value marginal product curve; $VMP_w$): quantity demanded is determined by the intersection between $VMP_w$ and water price. If water is provided free, "A" will altruistically get $w_0$ (the intersection between $VMP_w$ and the horizontal axis). If he is charged a price of $P_w$,[11] he will reduce the quantity demanded from $w_0$ to $w_2$.

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[8]A farmer could very well be drawing beyond that level

[9]Utilizing the principle of diminishing returns, it can be shown that this action will result in a net increase in agriculture production on the aggregate

[10]A farmer may be able to sustain the same yield, Bowen (1982) showed that saved water can be substituted for by other factors of production, specifically, capital and labor

[11]$P_w$ has to be greater than the value of the drop in yield, if any, else it would be more profitable for "A" to pay for $w_0$ and no saving will take place

Such design can be obtained if MPWWR provides a contractual relationship to the MT group that stipulates the provision of water according to an appropriate charge vehicle.[12] If it happens, MPWWR would hit two birds with one stone: raises the system's efficiency through water conservation and, at the same time, get rid of the

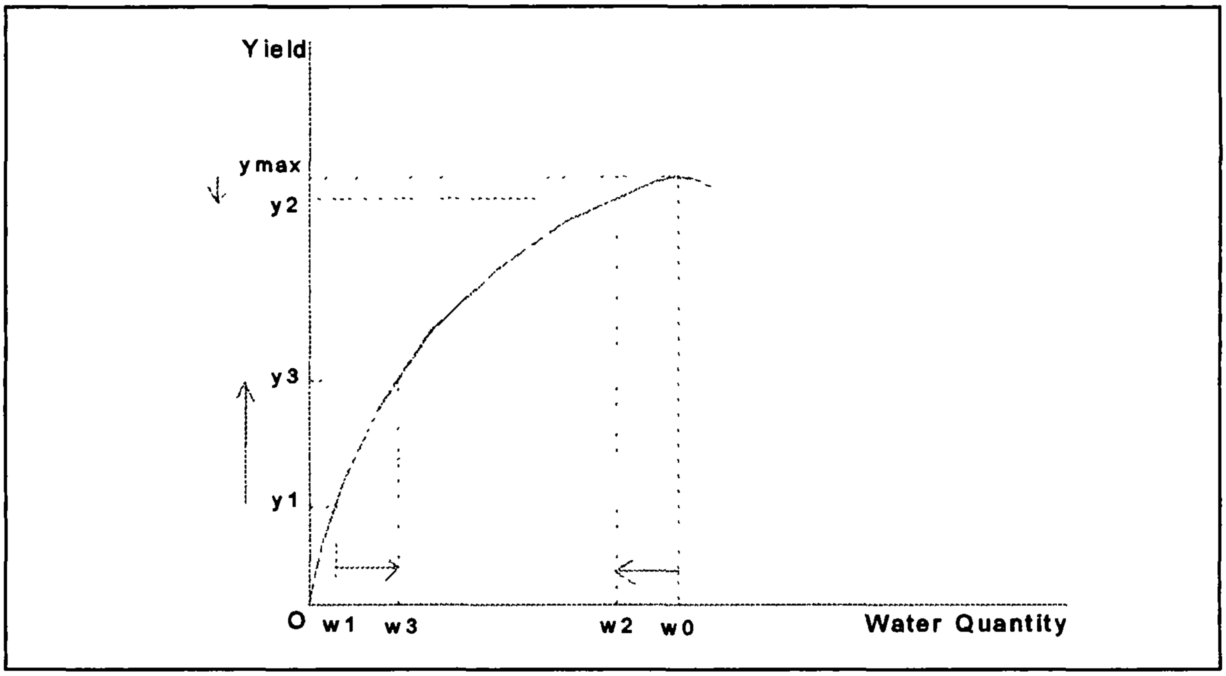


Figure 2. . A typical water-yield response curve is used to show the nature of conservation and its benefits.

financial burden of running the turned over unit. Unfortunately, this has not been tried because of the absence of the social science element in the process of decision making.

**III.G.2. Financial effectiveness.** Cost of transfer is far less than many other methods such as the policing system followed in Haryana in India which requires extensive flying squads patrol canals and channels (Chambers, 1980) or CR where officers are needed to collect charges and legal actions are taken against those who do not pay.

**III.G.3. Macroeconomic aspects.** Due to the fact that Egypt is a hydrological society where almost every activity is, one way or another, water-dependent. MT will result

[12]The reader is referred to James and Lee (1971) for a discussion of a number of charging vehicles

in raising irrigation cost which, by its turn, increase production cost and generate cost push forces that feeds inflation.

Moreover, significant distributional effects follow as part of cost increment will be passed to consumers and the rest is cut from producers income with shares depend on demand-supply elasticities of each product. An assessment of such implication requires special macroeconomic model relating water to other activities in the economy.

## IV. SUMMARY AND RECOMMENDATIONS

MT has significant prospectus as a policy tool to induce water conservation, improve the system's overall efficiency, and, subsequently, deal with present and future serious water shortage. In addition, MT reduces the financial burden faced by an irrigation authority; if saved public funds are directed to improve higher-level components of the system, then the deficit in OMR funds will be ameliorated.

Compared to other alternatives such as CR or pricing, it is financially efficient: since the users are those who run it staff wage bill and their shirking is eliminated. Besides, it avoids many sources of cultural opposition to water pricing and other technical obstacles (e.g. water measurement). Moreover, it expands the long-ignored farmers' role in decision making and enhances self-dependency.

MT significant potentiality in treating persistent irrigation problems, it has to be designed carefully in order to gain its acceptance by both irrigators and authorities.[13] A number of factors are identified as crucial elements for the success of MT. These can be classified into two groups: farmer-related and other social concerns. The key element in the first group is "incentive compatibility" (Ledyard, 1989). MT must not make a farmer worse off in terms of his current and future net income; if it does, the motive for MT adaptation and continuity is killed and MT failure is most certain since a farmer will prefer the *status quo*.

Other factors are related to farmers qualifications. Part of MT designing efforts has to be directed to the assessment of farmers financial ability to raise funds for emergencies,

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[13]Design includes the set of rules that define members duties and rights, the relationship between the transferred irrigation component and other components (a pumping station in the case of South Tahreer), and means of coordination between that component and an irrigation authority (MPWWR in Egypt)

skill needed for a general understanding of technical questions, and capability to act collectively. In that respect, deficiencies have to be confronted by providing the necessary supporting facilities as an ingredient of an MT package or redesign MT (especially with group size).

A macroeconomic model that relates various sectors to water resources is very helpful for the simulation of the economy-wide impact of various MT designs.

To conclude, it has to be made clear that MT strengthens a middle link in an irrigation hierarchy. As much as it needs autonomy, it needs strong coordination with higher levels in the hierarchy. MT can not be independent, and does not mean independence; it is a greater degree of farmers involvement.

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