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CAPTURING THE ECONOMIC SURPLUS CREATED
BY IRRIGATION

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In the colonial days irrigation works were looked upon as commercial ventures. Projects were required to cover annual operating and maintenance costs and to meet the interest charges on the loan for capital and even provide a profit. Many of the irrigation projects in India and Pakistan were of this type and the Gezira project in Sudan is one of the latest examples.

Currently, instead of making a profit that might supplement government budgets, irrigation projects incur losses and impose a growing burden on the general revenues. This situation is partly the result of higher construction, maintenance and operating costs. In addition the irrigation fees charged irrigated farmers have not increased in absolute terms and in many cases the percentage of farmers paying has also dropped.[1/] Therefore costs have been rising while revenues have declined.

Given this irrigation picture in many countries, including the U.S., what are some of the options available to extract more of the economic surplus created by irrigation projects? The first section of the paper lists the objectives of making charges for irrigation water. The second section considers the types of fees or charges that are used to collect

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[1/] The terms--"irrigation", "fees" and "charges" are used interchangeably throughout the paper to mean the amount farmers pay for irrigation water either per cubic meter or per acre.

revenues from irrigated farms. The third and fourth sections present discussions of some of the issues and factors that influence the type and level of fees used.

Objectives of Water Charges

The main objectives or purposes of most water charges are to: (1) recover some or all of the cost of providing the water and (2) influence the allocation of water over time and among farmers. Generally governments do not want irrigation projects to impose a burden on general revenues. The costs that are recovered can be reinvested to help maintain the irrigation systems and/or to improve growth and development in other parts of the economy. There also may be some income distributional concerns involved. If the economic surplus created by the irrigation is not collected, those who benefit from the project may be made much better off relative to farmers outside the project and to urban dwellers.

The second objective emphasizes economic efficiency in water use.[2/] The concern is that "cheap" water will mean wasted water and an over-investment in irrigation water supplies. Excess water use may not only be wasteful but it can also cause damage in terms of water logging and salinity. Appropriate water charges can be used to encourage efficient on-farm water use and provide signals for irrigation investment requirements.

[2/] Neghassi and Seagraves (1978) stress the difference between physical and economic efficiency. Physical efficiency refers to the ratio of water used by the plants to water diverted. As the value of water increases, it becomes rational (economically) to increase physical efficiency by adopting improved methods of controlling, measuring, and applying water, and to design better systems of prices that will promote optimum allocation. Schramm and Gonzales (1976) made one of the few studies that has documented the expected relationship between the method of charging for irrigation water and physical efficiency in its application.

If users know they will have to pay for a project, they will be more likely to participate in its planning. In some cases the feedback regarding the value of water and the quantity demanded could improve project design. The World Bank encourages cost recovery from the users of at least the costs of operation and maintenance. A study of 17 Bank projects revealed that on the average, users were paying back 29 percent of full costs (IBRD, 1974, Table 2). In the U.S. the users have paid less than 19 percent of the cost for federally sponsored irrigation projects. (Eisel and Wheeler, 1980)

Types of Water Charges

There are a number of ways the different types of charges can be classified. At the risk of oversimplification, the following six categories are used to examine the various water charges: (1) direct charges based on measured volume of water, (2) direct charges per share of the stream or canal flow or per irrigation, (3) direct charge per acre irrigated (may vary by crop grown), (4) indirect charge on crop outputs marketed or on inputs purchased such as fertilizer, (5) development rebate or promotional water charges, and (6) a general land or property tax. In some cases only one type of fee or charge is used while in others a combination of fees (i.e., fixed and variable or direct and indirect) may be used in an attempt to meet project objectives. Each type of charge will likely have different effects on water allocation efficiency, ease of collection, inputs use, cropping pattern, adoption of irrigation and cost of implementation.

1. Volumetric charges are best suited for water that has a high value to the country and needs to be allocated efficiently. Farmers are charged for the actual amount of water delivered to their farm headgate.

One of the key problems with volumetric based fees is the cost of measurement devices required to implement the system. If water is not high valued the expenditure necessary for volumetric measurement is probably not warranted.

Charges based on measured volumes are best suited for an irrigation project that delivers water on demand. The demand system involves the delivery of water to the farms at times and in quantities as requested by the water user. It is ideal from the user's point of view, since it permits irrigation at the time it is needed and in the quantities desired. This delivery system offers many opportunities to encourage efficient use of water. Although fees based on measured volume are practical under such a system this does not suggest that the same fee must apply to the whole volume purchased by one user; free quotas plus penalties for exceeding them, gradually increasing block charges, and declining block charges are all feasible.[3/]

2. Charges based on shares received or numbers of irrigations is an alternative system that provides some incentive to use water efficiently and relates fees to the amount of water individual farmers receive. Here a farmer is charged for the amount of time water flows into his field or per number of irrigations. The actual amount of water received will depend on the flow in the canal or river (which will vary over time) as well as with the time allowed for each share or irrigation. Thus, the amount of water delivered per share may vary among farms and time of the season.

[3/] Block charges mean that the price changes in steps or blocks. The first 1000 cm^3 will have one price whereas the second 1000 cm^3 will have a different price, etc. With increasing block charges, the fee will be higher for the second quantity of water, whereas for a decreasing block charge it will be lower.

Charges based on shares is best suited for rotating irrigations where water is delivered to the users along a canal in turns according to some prearranged schedule. Rotation systems are usually based on proportional division of stream or canal flows so that farmers receive shares of an annual flow rather than a certain volume. Volumes associated with such shares may be unknown. A fixed delivery schedule makes it difficult for a farmer to delay receipt of his water or to transfer it to someone else along a different canal. A flexible schedule, however, would also cause problems, by making it necessary to inform users of changes in the time of arrival of the water at their farms. Thus a good communications system would be necessary to implement a flexible schedule.

Water charges based on shares ties the cost of water to usage. Sometimes, however, shares are converted to estimated volumes per hectare and farmers are charged by the cubic meters they are estimated to have received. Often they are charged according to hectares served or hectares of each crop times a certain volume per hectare; this simply means that the water charge is a land tax or a differential land tax for different crops.

3. This brings us to the charge per acre irrigated. Here charges are collected from irrigated farmers based on the number of acres irrigated or supposed to be irrigated. These charges may also be varied by crops grown where crops that use more water have the highest water charge, i.e. sugar cane and rice. The higher charges may also be on crops the government is trying to discourage and low charges on crops they want to encourage. The charge may also be varied by season. The higher charge being made in the season when water is more valuable to farmers.

Charges per acre will have no effect on the efficiency with which water is allocated. The only exception to this is when the fees are based on crops grown. In this case the fees may encourage crops that use less water per season. Fixed charges per acre are primarily a means to collect funds and repay project costs. It is a way to collect some of the economic surplus created by irrigation without causing too many distortions. It tends to work best if the same crop is grown throughout the irrigated area for each season. Thus one charge can be fixed for each season.

If a land tax has been collected in the past the fixed charge for irrigation may be fairly easy to collect. No measurement, counting of irrigations or timing is necessary. In fact the fees can be collected by any existing government agency that has contact with farmers. However, if the charge is varied by crop grown the collection becomes more complicated. Data then must be available on crops grown. Of course, farmers will under-report acreage of high fee crops or pay government officials to under-report high fee crops.

The fixed charge per acre is best suited for continuous flow irrigation, where water flows continually through a canal on certain days and each farmer is free to take whatever quantity he needs. In some systems water flows continuously in the canals throughout the cropping season. The water itself may have little value at the margin even though the delivery system may be costly. Farmers usually pay annual fees for access to the water and/or contribute labor toward the maintenance of the canal. It is not practical to estimate the amount of water used. However, if the quantity and timeliness of water delivered varies by location on the canal this could become the basis for varying charges.

If the system for allocating water among farmers is based on crop priorities, then varying charges by type of crop grown may work best. In this type of system, crops are assigned orders of priority which are normally based on the economic value or importance of the crop. When water is in short supply, priority crops receive water first. If water remains after irrigating priority crops then it is distributed to other crops. It basically allows some crops to be saved during periods of drought. Water charges would be set highest on the crops assured of getting water (high priority) and lowest on those crops that have last priority and least assurance of obtaining water.

4. Indirect Charges on inputs or outputs will have no impact on the efficiency with which farmers allocate water. These charges are a means to collect funds to repay project capital costs and cover operating and maintenance costs. Ease of collection appears to be the main reason for using such a system. When the government is the primary market for the output, i.e. cotton or for the input, water charges can be collected at the same time the farmer sells his crop or buys the input.

The major problems are that it gives farmers distorted incentives concerning what crops to produce and provides no incentive for efficient water use. If the fee is only placed on cotton, farmers may produce less cotton and more clover or other crops. The government will lose both revenues for water and cotton export sales. When inputs such as fertilizer are taxed to pay for water this will discourage farmers from applying fertilizer and lower production. Thus, with indirect charges governments must be aware of the signals such charges are giving farmers.

5. Another type of charge that has been used is a developmental fee or promotional fee. This has been used in projects that are under-utilized when they are first opened. The idea is to encourage greater water utilization with lower fees at the start of the project. Once an irrigation system is in place and there is excess water, the cost of adding another farmer within the irrigated area is very low. The fees are usually scheduled to increase over a 4 or 5 year period until they reach the desired

level. However, increasing the fees once farmers are using the project has proven not to be an easy task. A system of promotional fees would probably be used in an area that has had no previous irrigation and should be combined with experimental plots and technical assistance for the farmers. The technical assistance and experimental plots are probably more important than the promotional fees.

6. Finally taxes or fees may be levied on all lands and property in the irrigated area or district. The idea behind such a tax is that the irrigation increases economic activity throughout the area and everyone benefits. It is not clear that this always happens but in some cases the benefits from the irrigation project have spread throughout the area benefiting businessmen, workers, and farmers. If this is the case, then the economic surplus should be collected from businessmen and farmers alike. Thus, a general tax on land or property can be used to pay at least part of the project's cost. Other fees may also be imposed on farmers either because they gain the most or to improve water use efficiency.

California's irrigation districts recognized long ago the benefits created in towns and cities serving the irrigated areas. They "acquired the rights to include cities and to tax their lands at market value to help finance the farmers' irrigation water. Far from resenting this, city voters have usually supported irrigation based issues by larger margins than associated farm voters! In a few cases they have carried them over a negative majority of farmers!" [Gaffney, 1969, p. 135]

The land tax or property tax like the charge per acre will have no direct effect on water use efficiency although a high land tax will encourage the highest valued use of the land. Still land taxes are primarily a method of collecting revenue from those benefiting from the project. It does allow for a larger tax base to support irrigation projects and will allow local areas or district to fund some of their own irrigation development.

If the tax is based on differences in land and property productivity, lack of information may make it difficult to implement. Many countries lack the data required to differentiate among various land and other property values. Thus a property tax to pay for an irrigation project may require a whole new data system for estimating property values.

Taxing power may also be limited to the bare land. This would prevent the tax from focusing on early improvers, intensive farmers and prevent the tax from retarding development.

Factors Affecting Methods for Financing Irrigation

Methods used for financing irrigation depend on many factors including: the value of the water, demand elasticity, dependability of supply, ability to control its flow, desires to subsidize agriculture, traditions of ownership and water law, system capacity, return flows, drainage problems, staff training, and information available. No one system is "best" for all areas.

The Value of Water

As pointed out above, if the value of irrigation water is low to farmers as is often the case, it may not be worthwhile to measure it or levy charges based on volume. More accurate measurements and more sophisticated systems for allocating resources tend to emerge the higher the value of the resource. Better measurements and recordkeeping schemes would be adopted when either the cost of measurements and administration falls or the value of the water increases.

In addition when water is in abundent supply and of low value to farmers, even moderate charges may discourage irrigation. Thus, charges may have to be varied by time of season to make use of the system during periods of low water value.

Elasticity of Demand

A closely related issue is the price elasticity of demand for water. Charges for water will have a greater impact on water use the more elastic the demand. The price elasticity of demand is a measure of the percentage change in quantity associated with a one percent increase in price or charge. If a one percent increase in price brings a 3 percent decrease in quantity we say that the elasticity is -3, or highly "elastic". A very low price elasticity of demand for water means: (1) changes in water prices will have little effect on water use, and (2) water pricing will have limited effectiveness as a method for rationing water.

In the very short run and at low water prices the elasticity of demand for water is likely to be low. And, as the water fees rise and the length of run increases the price elasticity increases. When charges increase it becomes profitable to consider ways to use water more efficiently. Higher water fees per volume or share received encourage farmers to adopt better control methods and to shift to crops which use less water. Therefore, as the one goes from lower to higher fees, and as one goes from short-run to long-run water demand curves, the elasticity will increase and water fees will have a greater impact on water use efficiency.[4/]

[4/]Shumway (1973) found that at prices above $8.50 per acre foot for California-Aqueduct water, the price elasticity exceeded -1.0 and reached -2.03 at $17 per acre foot. At $4.00 per acre foot the elasticity dropped to -.48. Shumway's derived demand can be characterized as a long-run demand. In contrast Moore and Hedges (1963) found in Tulane County, California, lower water price elasticities for what was a shorter-run demand situation. They found price elasticities for irrigation water of -.702 at higher prices and -.188 at lower prices.

Dependability of Water

In many cases water is not sold at its highest value because supplies vary a great deal depending on season, time of day, and other factors. Some stream flows jump up and down from 20 percent to 400 percent of their mean annual levels, in addition to seasonal patterns. [Gaffney, p. 143] If the value of water fluctuates widely, it may be too much trouble administratively to vary the charge. Hence, a low charge is assigned to encourage full use in periods of abundance, and, then quotas or regulations are used to allocate water among farmers in times of shortage.

High fees and variable supplies raise the problem of who pays if the water supply is short and the crop fails. This problem could partly be solved by allowing for variable fees that depend on the adequacy of water supply. If a farmer has a crop failure due just to lack of irrigation water delivery,then the fee could be dropped or reduced for that year. The decision about the fee could be left up to a committee of farmers.

If technically and politically feasible some type of market system works best with variable stream flows. Water users could bid each period for water needed to irrigate their crops or buy water shares for future irrigation. Water is allocated to the highest valued uses in each period as the market adjusts quickly to the variable stream flows. Only part of the water needs to be sold and a set base quantity could be allocated to each farmer at some fixed charge.

There are examples of water markets throughout the world. These range from the sale of tubewell water in India and Pakistan to water markets in Spain which have been operated by local communities for centuries [Maass and Anderson].

The Desire to Subsidize Food Production

Another factor that affects the charges for irrigation water is the desire of a government to subsidize agricultural production. Several reasons may account for these subsidies. If some countries subsidize their agriculture, then it may be necessary for others to do the same simply to compete. Also, farmers affected by large irrigation projects often have little to say in project planning. If a government has non-agricultural purposes for a large irrigation project such as keeping people out of the cities, full employment, cheap food, and national defense, then recovery of full costs from agricultural users is probably not reasonable.

A related question is who actually pays for the water? If land is held by large land owners but operated by a large number of landless laborers, who pays the charge, the land owner or the operator? Generally the benefits will go to the land owner through higher rents and land values. Thus charges should be collected from them. However, many times the fees are charged the operator who has low income and little ability to pay. Consequently many argue that the fees should be kept low so as not to over-burden the small scale operator. This argument ignores the fact that the real earners of economic surplus are not being charged and many times have the political power to capture and keep most of the rent created by the irrigation project.

Another argument is that a major beneficiary of large investments in agriculture are the consumers who often enjoy lower priced products. Since society as a whole benefits, and farmers may just go on earning competitive wages, society should pay for irrigation projects. The big losers in this case would be the non-irrigated farmers who gain no increase in productivity but suffer lower product prices. Large successful irrigation projects that increase agricultural production a great deal may reduce the incomes of farmers and reduce their ability to pay for those same projects. If these projects are to be implemented, they may have to be subsidized. The above argument assumes that the project is large enough to reduce product prices significantly and that the government will not institute policies to maintain higher prices through price supports or increased exports.

The importance of these arguments depends a lot on the land ownership and farm size. If most land is farmed by small owner operators, then who pays and who benefits is not a serious problem. In addition, if increased food production does decrease product prices, the small operator still benefits from increased consumption.

Capacity of System

Even though the total social benefits of new irrigation projects exceed the total costs, it may be difficult for governments to recover from users the fixed costs of the installations. One reason is that many irrigation systems are designed so that they will have excess capacity most months of the year. Since it is difficult to predict such periods and administer the required price flexibility, there is a tendency to cover the capital costs from general revenues. Hence, water charges tend simply to reflect current operation and maintenance costs. Another alternative would be to have two fees. One fee would be variable and tied to the operation and maintenance costs while the other would be a fixed fee on land or property to cover construction costs.

Traditions of Ownership and Water Laws

Water rights and customs pertaining to the distribution of water often have evolved over many centuries. These rights appear to have had a significant impact on the output of irrigation projects. Who owns the water should influence the fees charged and will likely influence the direct and indirect economic activity created by irrigation. Three alternative classes of ownership may be distinguished: private water rights, government ownership, and open access.

1. Private property rights usually give land owners the right to set quantities, shares or access to water. Knowledge of the amount of water they can count on as a "right" or a certainty is crucial to farmers, particularly those with perennial crops. This certainty can bring about increased investment in improving on-farm irrigation. In so doing it can provide the basis for larger fees for irrigation water because of water's higher value to the farmer and the farmers increased ability to pay.

As a general rule, private owners should be willing to pay for improvements in their irrigation system when they have requested the improvements. Charging for water improvements will force users to avoid unreasonable project demands. If water is free the value of the water rights will be capitalized into the purchase price of farms. Should a government begin charging what the water is worth after the land prices have been bid up, land values will fall and some farmers may even be forced to sell their land.

2. A system of government ownership implies that government has the right to distribute water or to sell rights to use water or a share of the water. Instead of selling rights or shares, governments generally attempt to ration water on the basis of cropping patterns and water requirements of each crop. Regulations of this type can be used as incentives to grow crops that are deemed to be in the national interest. Problems often arise in the estimation of individual crop irrigation requirements and in the supervision of individual farm usage. In some countries government ownership is interpreted to mean "free water" for the farmers who can capture it.

3. Open access means that the water is owned by anyone who can capture and use it. Groundwater resources tend to be open access with the water going to those who can pump it out. Lack of ownership and the fact that if one farmer does not pump the water his neighbor will, can lead to over-exploitation of groundwater resources. Water will be pumped to the point where the marginal returns are equal to the pumping costs. Over pumping can cause a rapidly dropping groundwater table and require farmers to continually deepen their wells. Charging for the use of groundwater is one means of reducing its over-exploitation; in fact, in some countries such as Thailand it may be easier to charge for pumped water than it is for surface water. Another alternative is to tax the electricity or fuel used to pump the water.

Staff Training and Control Structures

The water charges used also depends on technology available to and the ability and motivation of the people who run the system. Without appropriate control structures and a trained staff it is very difficult to deliver water to farmers at the time and in the quantities demanded. If water is not delivered in a timely manner it may be of little value to farmers and the fees they are willing to pay will be low. Uncertainty of water supply also may encourage farmers to use excess water when it is available as insurance against future shortages. This leads to water being wasted and to possible future drainage problems.

Operating an irrigation system so that the desired quantity of water reaches each farmer at the appropriate time requires a considerable amount of information flowing between the administrative staff and farmers. Before farmers can finalize their cropping plans, they need to know when and how much water they will receive. If they do not have this information, they cannot be expected to make the best use of the water received. On the other hand, the administrative staff must be aware of cropping and weather conditions so water delivery schedules can be designed to best fit cropping patterns and meet water demands.

A related issue is the ease of collecting the water charge or tax. Ability to collect water charges is a difficult problem in many developing countries. Farmers may not pay because they are unhappy with the way water is delivered or simply because of the lack of any effective collection agency in rural areas. Very likely as system management and operation is improved through training and investment in control structures collections will go up [Abel, 1976].

Return Flow and Drainage

Charges for irrigation may have to be adjusted because of secondary effects such as the re-use of water downstream and drainage problems. Only part of the water delivered evaporates or is absorbed by crops. "The rest is returned on or through the ground to some water course or aquifer where, if its quality permits, it may be used again. When a second diversion of the water is made, the same situation is repeated with the diminished quantity (and quality) of water.

"If these possibilities of re-use all occur within the legal control of the initial buyer of the water (e.g., on his property), his willingness to pay would reflect the net values generated through re-use. However, when the return flow escapes the initial buyer by passing over (or under) his property line, his willingness to pay will omit the net values generated by the return flow" [Howe and Easter, p. 24].

Drainage problems are the opposite side of the return flow situation. The water not evaporated or absorbed by the crops may accumulate in the ground and raise the water table or flood low areas and cause crop damage and salt accumulation.

Positive externalities, such as useful return flows, mean that irrigation water has a higher value to society than the charge that the farmer is willing to pay. Negative side effects, such as a drainage problem, suggest restrictions on wasteful usage upstream or raising the charge to upstream farmers to encourage them to use less water.

Level of Charges

There are a number of criteria which have been suggested as means for setting the level of the irrigation water charges. Fees based on target revenues, benefits, total costs and marginal costs are discussed below.

First the fees could be set to meet a given target revenue. This could be enough revenue to cover operating and maintenance costs or possibly enough to cover the full cost of the project. Once the target revenue is set then it can be divided by acres irrigated or average volume of water delivered to obtain a per acre or per cubic meter charge.

<u>Benefit pricing</u> is used to recover all or part of the economic rent or suplus generated by the irrigation project. The magnitude of the fees are related to actual on-farm production levels. Charges can be calculated on the basis of marginal returns per unit of water or gross returns. The government authority who buys the agricultural products, can deduct the water charge as a precentage of gross returns.

Alternatively the charges can be based on <u>net returns</u> from irrigation. Net returns per unit of water provide an upper limit on water charges since they reflect the maximum amount a farmer would be willing to pay. Net returns could be estimated as the difference in net income with and without irrigation. Alternatively net returns could be the residual after costs other than water charges have been subtracted from gross returns. Net returns will vary among farmers and may be difficult to calculate. The inefficiency involved in having different charges among farmers usually leads to a single fee based on the average net benefits in a region or area.

<u>Total cost pricing</u> is another alternative which could result in fees very similar to those obtained by target revenues. In total cost pricing, operating and maintenance costs plus a charge for capital costs are divided up among individual farmers. The water fee then becomes the sum of these costs divided by the acres irrigated. Thus the level of the charge is based on how much of the project costs are to be covered by the irrigated farmers.

<u>Marginal cost</u> charges are in theory based on the cost of adding another unit of water to the irrigation project or system. In actual practice this may not be possible because of the large lumpy investments required to increase irrigation water supplies. At best one may be able to talk about incremental changes of several thousand cubic meters of water. The cost of adding

another unit would be the appropriate fee when present facilities are being used to full capacity. If additional water can be provided by adopting water conservation practices then the cost of the lowest cost practices is an appropriate measure of marginal costs.

In an existing irrigation project with a fixed and not fully utilized capacity, marginal costs will equal operating and maintenance costs that are incurred to deliver water. Thus, the marginal cost would only include a charge for capital costs during periods when the project is used to full capacity. When there is excess capacity the rate will drop to the operating cost plus some maintenance costs.

For cases where the facilities are never used to full capacity the water rate based on marginal cost should not include any charge for capital. The capital (fixed) cost of the project should be covered by other means such as a land tax, a betterment level or general revenues.

Conclusion

Many problems will continue to face irrigation planners, managers and administrators. Unfortunately, there is a basic lack of understanding of the value of water. People still do not understand that water occurring naturally in a region is worth just as much as water that is conveyed there at high cost and should be priced accordingly. Otherwise you will be faced with the situation where water is being wasted by farmers in one area and those right next door do not have enough.

If a project is properly conceived, designed and implemented, it should create an economic surplus. If it does not, it should not have been built. "Water in locations where water is scarce is a rent-bearing resource. Developing water need not, therefore, require subsidy; on the contrary, it can yield a surplus" [Gaffney, p. 142]. Therefore, irrigation planners should begin considering the possibilities for collecting the rent while the project is being designed. The design will influence what charges are possible. In fact, a certain amount of project flexibility should be considered at the design stage so that the project can accommodate different allocation procedures and water charges.

Finally, the use of more flexible fee schedules need to be given serious consideration for two reasons: First flexible fees can be used as a means for improved water allocation. Peak water demands can be reduced by charging higher fees during periods when the system's capacity is overloaded (the dry season). Price rationing tends to be superior in many respects to alternative rationing methods. The absence of any rationing procedure for dry periods leads to a great waste in unneeded storage capacity [Gaffney, p. 144].

The other important reason for flexibility in charges is to allow for revisions over time. Clearly as inflation continues there will be a need to increase fees if only to be able to cover the increased operating and maintenance costs. To set a fixed per acre or even per cubic meter charge would seem to be short-sighted. Thus, farmers should know from the beginning that charges will be flexible and at least partly tied to increasing costs. Otherwise farmers will protest loudly every time irrigation officials talk of new, higher water charges.

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