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RATIONALIZATION OF IRRIGATION WATER CHARGES IN PAKISTAN: ANSWERS TO SOME POLICY QUESTIONS

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RATIONALIZATION OF IRRIGATION WATER CHARGES IN PAKISTAN: ANSWERS TO SOME POLICY QUESTIONS

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No. 9

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1. IRRIGATION SYSTEM AND WATER CHARGES: AN OVERVIEW

A significant feature of Pakistan's irrigated agriculture is the Indus Irrigation System, which is the largest contiguous irrigation system in the world. The system encompasses the Indus River and its tributaries, three major storage reservoirs, 19 barrages/headworks, 12 link canals, and 43 canal commands covering about 90,000 chaks[1] (World Bank, 1984). The total length of the canal system is about 40,000 miles with watercourses, field channels, and field ditches running for another 1 million miles. Approximately, 100 million acre feet (MAF) of surface irrigation supplies are diverted annually into this canal system. However, only 60 percent of this water reaches the farmgate. Another important component of the public irrigation system is the SCARP tubewells. There are about 14,000 public tubewells which supply 10.1 MAF of water at the farmgate.

Operation and maintenance (O&M) of the canal system and public tubewells is the responsibility of provincial irrigation departments (PIDs). PIDs are large, hierarchically structured, labor-intensive organizations, and their responsibility for irrigation water delivery is, correspondingly, highly centralized (Wolf, 1986). The irrigation bureaucracy in Pakistan is extremely large: the Punjab PID alone has more than 50,000 employees. About 40 percent of the total labor force in PID, Punjab, is assigned to canal irrigation, followed by 26 percent who work with tubewells, 15 percent in the special revenue group, and 6 percent who work with drainage (Wolf, 1986).

The provincial finance departments provide funds to the PIDs for O&M activities through the non-development budget (NDB). The PIDs prepare the annual O&M budget by applying a "yardstick model" to the existing inventory of irrigation facilities. On the revenue side, water charges are levied on a per cropped acre basis which varies by crop. However, since revenues from water charges are pooled in the provincial treasury along with other tax revenues, they lose their source identification. Therefore, revenues from water charges cannot be claimed to bear any direct relationship with funds allocated for O&M activities. Receipts from water charges generally exceeded the O&M expenditure before the mid 1970s, but the magnitude of O&M subsidies has been rising since than. Total irrigation subsidies for the period 1981-1985 were some 3.78 billion rupees which is equal to 1.3 percent of non-developmental expenditures for the same period (USAID, 1987).

2. PRELIMINARIES

A review of the history of water charges in Pakistan reveals that the question of raising water charges to make them compatible with other relevant economic parameters has surfaced again and again. Recommendations of the committees formed from time to time to rationalize the structure of water charges were either accepted partially or not at all. The data with respect to historical increases in water charges reveal that water charges were increased by about 120 percent between 1971 and 1986. However, in absolute terms water charges are so low that these large percentage increases do not mean much.

In order to overcome deferred operation and maintenance (O&M) and to restore the original capability of the irrigation system, various components of the system are being rehabilitated with the technical and financial assistance of international lending agencies. These agencies have realized that it is not sufficient to build massive dams and extensive irrigation schemes especially when the host country governments are unwilling or unable to supply adequate funds for O&M (Westgate, 1985). Instead, the important issue is to strengthen the recipient country's capability to budget for O&M funding and to identify the sources of O&M funds (GAO, 1983). Therefore, in recent years, specific covenants have been included in various "Project Agreement Papers", which require the Government of Pakistan (GOP) to increase water charges periodically or make other appropriate financial arrangements to cover larger portions of O&M costs. However, in practice the GOP has not been able to keep up the same enthusiasm in raising water charges that was expressed while securing financial assistance to begin new projects.

In almost all developing countries it is always tough for the policymakers to make decisions regarding enhancement of water charges. One possible explanation is that the governments are not politically stable and therefore the whole planning and development process is viewed in a short-run perspective. This problem is further aggravated when technocrats discount policy alternatives to meet political demands.

In order to make economic and political requirements compatible with each other, it is important that technocrats inform policy-makers of the negative consequences of neglecting important policy actions. More specifically, this requires that proposals regarding enhancement of water charges be formulated in the context of policy questions frequently raised at the decision making level. In practice, some sound proposals are rejected because they are weighted with too much information; while this may be very valuable, it does not answer the specific questions which face a policymaker at the time of making the decisions.

If an idea is not stated simply, there is a risk that the analysis itself is confused (Leman and Nelson, 1981).

Experience with respect to water charges policy in Pakistan shows that both the institutional and the policy framework to develop and implement water charges has been missing from the scene. For instance, in the past, efforts to increase water charges have tended to be based on ad hoc criteria, such as "increasing the charges by x percent." The objective of this paper is to identify specific policy questions frequently raised regarding development and implementation of water charges at the policy making level. These questions are then used as a framework to analyze the present status of the water charges policy in Pakistan.

3. SELECTED POLICY QUESTIONS

Some policy questions frequently raised regarding development and implementation of water charges in Pakistan are:

a. Should the water charges be increased or not?

b. If yes, how much should water charges be increased?

c. Are proposed increases in water charges within the payment capacity of farmers?

d. Should there be a differentiated water charge policy or a uniform water charge policy?

e. What should be the assessment mechanism?

f. Should there be a modest and gradual increase or a one-time big increase in water charges?

g. How can an increase in water charges be made acceptable to farmers?

h. How can more funds for efficient O&M of the irrigation system be ensured?

These policy issues are examined in the following section.

4. DISCUSSION

4.1 Should Water Charges Be Increased or Not?

This question warrants evaluation of the existing water pricing policy against the objectives which could be accomplished by using water charges as a policy instrument. Theoretically, water pricing can be used as a policy instrument to encourage efficient use of water, reduce income inequalities among various socio-economic groups within the farming community and support the financial base of the state. In practice, it is difficult to have a policy which could pave the way for reacning all these objectives simultaneously. Nevertheless, this policy instrument can be manipulated to an extent where the rate of trade-off between various developmental objectives is economically justifiable and socially acceptable. In the following section, existing water charges are reviewed in the context of the objectives outlined above.

4.1.1 Efficiency

The present level and structure of water charges do not provide meaningful economic signals to farmers because these charges constitute a very small fraction of cash production costs of major crops (about 2-3 percent) and are not related precisely to yield values. Moreover, present water charges are significantly lower than those rationalized either on the basis of applying a cost or marginal value product principle (Chaudhry, 1985). High water losses at the watercourse level and low application efficiencies at the farm level imply among other things that farmers are failing to utilize irrigation water satisfactorily.

This leads to the question, will an increase in water charges improve the efficiency of water use under the area-based pricing system? According to economic logic, the answer is no because payments are unrelated to the quantity of water taken by the farmer. We do economic theory grave injustice, though, when we expect it to perform an "efficiency" miracle on commodities that are not priced or paid for on a per unit basis (Svendsen, 1986). However, under the area-based pricing system, if the water charges of various crops are increased significantly, the likely change in relative profitability of various crops may indirectly effect water use (water use shifting to more water responsive and profitable crops). Moreover, very high water charges may also induce cooperative action among the farmers, leading to establishment and institutionalization of local level groups. Acting cooperatively, farmers may find ways and means to reduce water losses at the watercourse level.

4.1.2 Equity

Under the present water pricing mechanism, all categories of farmers have to pay the same water charge per cropped acre. However, present water charges are so low that income distribution effects are not very striking across different categories of farmers. Nevertheless, a very high increase in water charges (approximately 3 to 5 percent of the gross income) may have some negative income distribution effects on farmers with holdings of different sizes and those located on different points of the canal or distributary or watercourse.

A differentiated water pricing policy is regarded as the most plausible solution to this problem. However, Svendsen (1986) argued that such a policy would tend to legitimize and institutionalize a system of unequal access to water within the irrigation system, which is certainly not a desirable longer-range outcome. The problem of unequal distribution of water in the Indus Basin, however, has already been explicitly recognized in almost all of the on-going and proposed irrigation development projects. We suggest that, to select among alternative policy instruments, the decision criterion should be that of relative costs and benefits attributable to these policy instruments. It appears that the institutional costs (such as assessment, collection, and leakages) involved in administering differentiated water pricing policy are going to be relatively high, but this pricing mechanism should not be rejected outright unless it is proven to be uneconomical.

4.1.3 Cost Recovery

The revenue-expenditure gap of the Pakistan irrigation system has been consistently increasing at a relatively high rate over the past many years. The subsidies on irrigation water have gone up from Rs.578 million in 1980-81 to Rs.1175 million in 1985-86. Excessive financial leakages resulting from under-assessment/reporting of tax and very low water charges are the two major reasons for this growing gap. A major portion of the subsidy is going for O&M of the public tubewells. A system-wise analysis of total subsidies indicates that in 1985 the subsidy on public tubewells amounted to Rs.788 million as compared to Rs.387 million estimated for the surface system. Alternatively stated, receipts from water charges in 1985 were 70 percent and 20 percent, respectively, of the O&M investments made in the canal system and in SCARP tubewells.

Very low water charges in Pakistan have restrained the irrigation system from generating funds required for its efficient O&M. Consequently, the public irrigation infrastructure has deteriorated because of continuously deferred O&M. Many of the negative consequences of inefficient O&M pointed

out by Carruthers (1981) are already in evidence in Pakistan[2]. Therefore, substantial investments are being made to overcome deferred maintenance and to restore the original capability of the system. However, these efforts will not yield expected benefits if the system is not maintained according to the technically designed criteria. Since the provincial governments have very few ways to raise the revenues required to pursue various types of developmental programs, increasing current water charges would be one of the most promising alternatives to generate funds required for efficient O&M of the system.

4.2 How Much Should Water Charges Be Increased?

The answer to this question depends on the objective being pursued through an increase in water charges. Cost recovery was concluded to be the priority objective in the preceding section. In order to recover the target costs, water charges of major crops in Punjab and Sind provinces are estimated on the basis of per unit cost of water (calculated on the basis of a pre-determined cost recovery target) and actual water applied to crops[3]. A comparison of current water charges with estimated water charges (Table 4.1) reveals that: (i) current water charges of all crops need to be increased significantly; and (ii) the magnitude of the required increase in the current water charges in the SCARP areas is significantly greater than that required in the non-SCARP areas.

Since it is becoming increasingly expensive to operate public tubewells, the government is presently pursuing a plan under which public tubewells in fresh ground water zone will be transferred to the private sector. However, for the time being, it would be appropriate to follow the same schedule of water charges in both the SCARP and non-SCARP areas, as is the case in Sind Province[4]. The underlying rationale is that increased water availability from public tubewells would result in higher cropping intensities in SCARP areas and as such farmers would pay directly in proportion to the benefits derived from increased water availability.

If the cost recovery objective is to be pursued in the long run, water charges must be linked with the benefits conferred by irrigation. It is unfortunate that Pakistan has the largest contiguous irrigation system in the world, but no precise or reliable estimates of additional benefits from irrigation. A review of various project papers and feasibility studies prepared by the GOP and International Agencies shows economic/financial analyses based on heroic assumptions. It is important that a comprehensive program be initiated to collect information on various benefit parameters attributable to a system's rehabilitation and its improved O&M practices.

4.3 Are Proposed Increases in Water Charges Within the Payment Capacity of Farmers?

The "capacity to pay" umbrella is frequently used by the governments to fend off increases in water charges. Returns imputed to irrigation water through the residual budgeting method[5] were approximated as the farmer's maximum income liable for water charge tax (Table 4.1). This approach was used as proxy to the additional net benefits from irrigation. In both the Punjab and Sind Provinces, water charges of most of the crops estimated to recover total O&M costs were well below the returns imputed to irrigation water in non-SCARP areas. However, in SCARP areas, water charges estimated for different crops were either higher or were not significantly different from the net returns estimated for those crops.

In non-SCARP areas, water charges estimated for a flat rate policy were 17 and 27 percent, respectively, of the returns estimated to irrigation water in Punjab and Sind provinces. In SCARP areas, however, these figures were about 63 to 69 percent of the income of the farmer liable for the water charge tax. If water charges are set so high, there would not be much incentive for the farmers to participate in irrigation development projects. Review of relevant literature for India and Pakistan suggests that water charges should be within the range of 25 percent to 50 percent of additional net benefits (NCAER, 1959; Harman, 1964; Government of India, 1964; Government of Pakistan, 1970). According to this criterion, water charges are far above the payment capacity of farmers in SCARP areas.

4.4 Should There Be a Differentiated or Uniform Water Charge Policy?

Theoretically, water charges should vary in different canal commands due to the variation in the cost of supplying irrigation water. On the one hand, there are canals on which very little money is spent because they are new or recently rehabilitated, while, on the other hand, O&M costs of some of the canals are very high because proper maintenance of these canals has been neglected in the past. Contrarily, a uniform water charge policy can be advocated on the grounds that: (i) the services rendered to the farms and the resulting increased productivity, by and large, are uniform within broad geographical regions; (ii) differentiation of water charges in adjacent areas of a region may lead to political unrest among the farmers; and, (iii) the development of separate water rate schedules for different canal command areas and their subsequent implementation would be a laborious as well as administratively complex process. Given the current institutional set-up and administrative efficiencies of existing institutions, it seems that a uniform water charge policy would be the right choice for each province.

Table 4.1: Comparison of Current Water Charges With Estimated Water Charges and Farmers' Net Income in Non-SCARP and SCARP Regions of Punjab and Sind Provinces

(Figures in Rs per Acre)

Crops	Non-SCARP Region			SCARP Region		
	Current Water Charge	Estimated Water Charge*	Financial Net REturns**	Current Water Charge	Estimated Water Charge*	Financial Net REturns**
Punjab Province						
Cotton	33.60	30.31	257.00	66.00	238.10	-168.00
Rice	32.00	45.15	111.00	64.00	354.79	210.00
Wheat	21.60	36.07	200.00	43.00	173.13	245.00
Sugarcane	64.00	87.07	300.00	128.00	684.16	366.00
Flat rate***	36.26	48.24	291.88	72.24	213.51	340.12
Sind Province						
Cotton	36.02	69.64	267.00	36.02	233.20	242.00
Rice	34.37	63.39	-97.00	34.37	212.24	122.00
Wheat	20.62	54.32	271.00	20.62	111.25	277.00
Sugarcane	70.40	136.12	444.00	70.40	455.79	662.00
Flat rate***	33.66	79.90	291.11	33.66	246.55	357.34

Source: Chaudhry, M.A. "Water Charges and Farmers' Payment Capacity in Punjab and Sind Provinces". Pakistan Irrigation Systems Management Project, PRC/CHECCHI/USAID, Islamabad.

Notes:

* Water charges estimated to recover total O&M costs of the system. These charges are calculated on the basis of per unit cost of water and actual water applied to crops.

** Returns to irrigation water are imputed through residual budgeting method.

*** The flat rate parameters have been worked out as follows.

$$\text{Current water charge} = \frac{\text{Receipts from water charges}}{\text{Irrigated area}}$$

$$\text{Estimated water charge} = \frac{\text{Cost recovery target}}{\text{Irrigated area}}$$

$$\text{Financial net returns} = \frac{\sum_{i=1}^{n} ((\text{Net returns of crop } i)*(\text{Area of crop } i))}{\text{Total farm area}}$$

A uniform water charge policy also seems to be the right option for SCARP and non-SCARP areas. This policy should ensure higher recovery of O&M costs in SCARP areas because the availability of additional water from public tubewells would result in higher cropping intensities in these areas. Since water charges are levied on a cropped acreage basis, the farmers in the SCARP areas would end up paying in proportion to the benefits derived from increased water availability. In addition, drainage cess can be levied, if necessary, as some fraction of the drainage benefits attributable to public tubewells, to improve the O&M cost recovery position in the SCARP areas.

Theoretically, water charges should also vary on farms classified by size, tenurial arrangement, and location on the canal/distributary/watercourse because of the differences in farm productivity. However, in view of the arguments made earlier, a uniform water charge policy across all categories of farmers seems to be the best course of action. Moreover, the water charges constitute such a small fraction of farm production costs and income that differences across farm categories become almost negligible.

4.5 What Should Be the Assessment Mechanism?

The selection of an assessment method greatly depends upon the objective(s) being pursued through water pricing. If cost recovery is the objective, as is the case under discussion, flat rate policy is the best. Amongst the flat rate water pricing options, the flat land water charge has some distinct advantages. Institutional costs of administering this pricing method are very low because it requires only the knowledge of the farmer's land holdings. The required information is available from land revenue records which are accurate, of long standing, are kept current, and are understood by all. Adoption of this pricing policy would result in saving of huge amounts presently leaking from the system due to under assessment/reporting.

Equity and efficiency implications of this method are not very striking in the Pakistani context. For instance, from an equity standpoint, it may appear that the farmers at the tail-end are worse off because they will have to pay this charge in accordance with their farm size, though the water available to them is not sufficient to irrigate all of their land. This problem can be easily taken care of by fixing some proportion of the land that is liable for water charge. Even if this adjustment is not made, adoption of a flat rate policy is not going to cause any change in the "status quo" as far as equity implications of water pricing policy are concerned[6]. As regards efficiency of water use, this method encourages farmers to apply more water to their lands than is economically desirable, resulting in turn in the excessive use of other complementary

inputs (Asopa, 1977). This, however, is not a problem in Pakistan because of the given scarcity of irrigation water.

4.6 Should There Be Modest, Gradual Increases or a One-Time Big Increase in Water Charges?

Frequent revisions in water charges create a sense of insecurity among the farmers and involve additional expenditure by the government. On the other hand, continuation of the same rates for too long throws them out of their intended relationship with the benefits. At the same time, it may not be practically possible for many economic and political reasons to raise the existing water charges to the target level in a single stroke. Therefore, the most appropriate way to reach the target level would be to implement a schedule that is based on gradual increases so that increased charges are accepted by the farmers with less resistance.

This, however, is not a permanent solution because cost recovery targets and farmers' payment capabilities keep changing on a year to year basis. As such, it becomes very difficult for the government to develop a water charges schedule on a yearly basis, which is in line with stated economic objectives. This underscores the need to develop an automatic mechanism that would minimize administrative costs and discourage political manipulation of the process. Since output prices are reviewed/revised every year and inflation rates are not too high, the possibility of indexing water charges with output prices could be considered.

4.7 How Can An Increase in Water Charges Be Made Acceptable to Farmers?

Obviously, the farmers are going to resist any increases in water charges. Therefore, considerable political support would be needed to implement a policy that calls for an increase in water charges. In reality, it would be difficult to develop such political support especially due to the dominance of agrarian elites on the national political scene. However, if water charges are increased gradually, farmers are likely to be less resistant. Alternatively, as discussed in the preceding section, if water charges are linked with the output prices, farmers would not resist as strongly as otherwise because the ratio of water charges to output price would remain the same.

In addition, an overall structure of economic incentives should be designed in a manner that should ensure fairly steady growth in farm incomes. The government's current stated policy is to withdraw subsidies being paid on agricultural inputs, especially, fertilizer, seed and irrigation water. Elimination

of these subsidies would cause the production costs to increase which, in turn, would weaken the cost-income relationships at farm level. To ensure steady growth in farm incomes, output prices must increase at a faster rate than the rate at which input subsidies are withdrawn.

4.8 How Can More Funds for Efficient Operation and Maintenance of the Irrigation System be Ensured?

In future years, a necessary condition for efficient, continued O&M of the restored system is that the funds required for O&M are available as and when needed. However, in view of the tight budgetary constraints it may not be possible unless the system is made financially self supportive. In order to accomplish this objective, a four-point strategy is outlined as follows.

First, the cost recovery situation should be improved through an increase in water charges. Since there is no guarantee that increased revenues from water would be reappropriated to irrigation system maintenance, receipts from water charges and O&M appropriations should be internalized. In other words, receipts from water charges should be earmarked specifically for O&M activities.

Second, apart from low water charges, methodological deficiencies in present budgeting procedures also contribute to inadequate budgets for O&M funding. The annual O&M budget is presently prepared on the basis of a "Yardstick Model" which was developed decades ago. Although various parameters of this model have been revised over the years to take into account cost escalation factors, it still has a number of deficiencies. Yardstick rigidities do not allow the model to capture the effects of various economic and technological changes that take place over the long-run. Therefore, the yardstick model should be technically revised so that it can be used as an effective tool for budgeting procedures.

Third, financial leakages present in the existing revenue collection/assessment should be eliminated to achieve the cost recovery objective. It can possibly be done by switching over to a flat rate pricing policy. The flat rate policy would result not only in the elimination of financial leakages but would also help to save the funds being spent on administering the existing pricing mechanism.

Fourth, it is explicitly mentioned in various "Project Agreement Papers" that provinces should increase the water charges or make other appropriate financial arrangements to cover an increasing percentage of O&M costs. But, in practice, more emphasis is placed just on increasing the water charges. It may be so because the variable "other appropriate financial arrangements"

is vague and undefined. This variable must be explored in more detail. It is proposed that the structure of various types of taxes (agricultural income tax, property tax on irrigated land, and ushar tax) be analyzed in detail to see whether or not some proportion of these taxes can be utilized for improved O&M of the irrigation system. In practice, it has been observed that the canal roads/banks are excessively used (and in some cases abused) for transportation purposes and marketing of agricultural commodities. Since these activities lead to deterioration of canal banks/roads, it seems appropriate to levy some kind of toll tax on vehicles/commodities passing through these roads. Revenues from such taxes can be utilized for improved O&M of canals.

5. SUMMARY AND CONCLUSIONS

Adequate maintenance of the irrigation system is one of the most important conditions to maximize social benefits from heavy investments being made in the irrigation sector. However, in view of the tight budgetary conditions at the macro level, this condition can be fulfilled only if the system is made financially self supportive. In turn, this suggests the need to increase existing water charges.

However, this is not an easy task because both the institutional and policy framework necessary to develop and implement water charges is non-existent. Nevertheless, it is believed that if proposals with respect to enhancement of water charges are prepared in response to questions frequently raised at the policy making level, these may receive positive attention from those responsible for decisionmaking. These policy questions are used as a framework to analyze the existing water charges policy in Pakistan. Major conclusions emerging as a result of the discussion on selected policy questions are summarized in the ensuing paragraphs.

If O&M costs are to be recovered, water charges could be increased on a gradual, scheduled basis in non-SCARP areas. Water charges designed to recover O&M costs of the system are within the farmer's payment capacity. However, since payment capacity and cost recovery targets change every year, indexation of water charges with output prices could be considered. Farmers would likely be less resistant to increases suggested under this pricing method because the ratio of water charges to output price would remain the same.

Water charges should be uniform across different farm categories and regions in a province. Even in the SCARP areas, where the cost of water is very high, water charges should be the

same as are applicable in non-SCARP areas. Availability of additional water from public tubewells would result in higher cropping intensities in SCARP areas, and hence more revenues. The on-going SCARP transition program should be monitored closely to ensure that the large public tubewells are being replaced with the small private tubewells at a satisfactory rate. Otherwise, the negative consequences of waterlogging would outweigh the anticipated positive achievements of the SCARP transition program.

Adoption of a flat rate pricing policy would ensure recovery of more funds than through the crop-wise assessment policy currently followed. Moreover, if the cost recovery objective is to be pursued in the long-run, water charges need to be linked with the additional net benefits conferred by irrigation.

NOTES

1. Chak is the lowest order command which covers, on an average, about 400 acres and 35 farm units.

2. According to Carruthers (1981), poor O&M in agriculture will,among other things, lead to below-capacity working and/or to erratic water supplies which will, in turn, reduce the area cultivated; it will depress yields; it will result in a shift to lower value crops; it will lower investment in yield enhancing variable inputs such as fertilizer; and it will reduce on-farm investments.

3. Details regarding cost recovery targets per unit cost of irrigation water and actual water applied to various crops can be found in Water Charges and Farmers Payment Capacity in Punjab and Sind Provinces, by Chaudhry, M. Aslam PRC/CHECCHI/USAID, Islamabad, 1986.

4. Existing water charges in SCARP areas of the Punjab province are double those in non-SCARP areas. However, in the Sind province, water charges are the same in both the areas.

5. The residual budgeting method defines net returns to irrigation water as the residual after costs of all cash and non-cash inputs, other than water charges, have been subtracted from gross returns. The net returns estimated in this manner could be safely attributed to water inputs. However, a major limitation of this method is that it may underestimate (or overestimate) the contribution of irrigation water by assigning (or not assigning) to it a part of the contribution of other inputs used in the production process.

6. Under the existing system, downstream farmers grow most of their crops under stress conditions due to shortage of water, but pay the same water charge as the upstream farmers.

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