

## FINANCING OPERATION AND MAINTENANCE IN INDIA

### 1. INTRODUCTION

#### 1.1. Importance of maintenance

India has seen rapid progress in irrigation development during the past few decades. This can be illustrated by the figures on new irrigation schemes and the investments incurred, both for the subsequent Plan periods, see Figure 1 (taken from D. Hillel, ed.: *Advances in Irrigation*, Vol. 3, 1985).

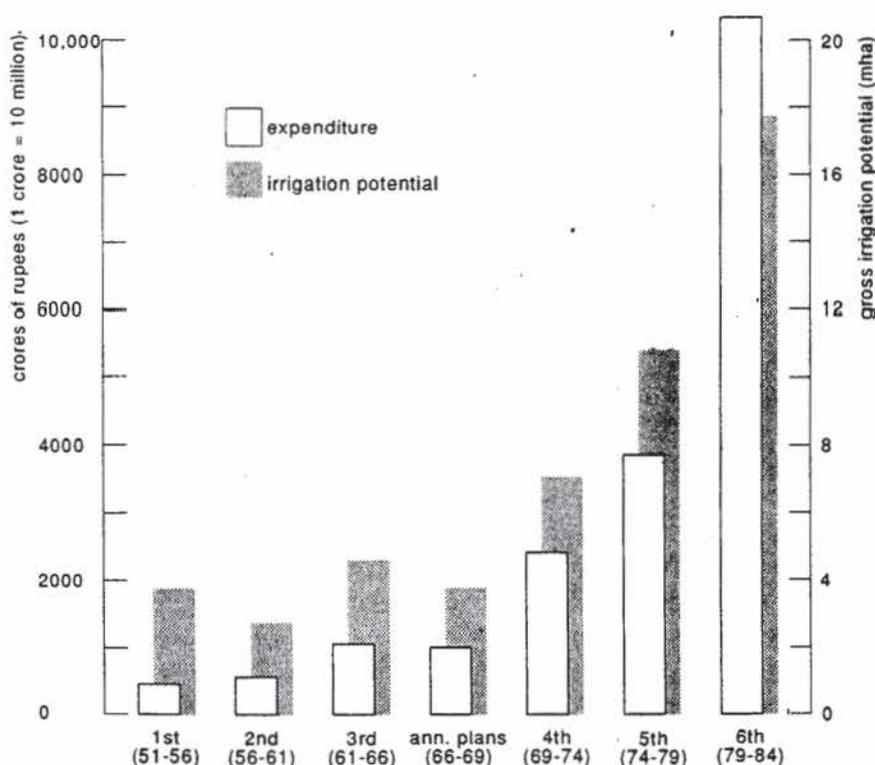


Figure 1. Expenditures on new irrigation and gross irrigation potential created for the subsequent Plan periods

In the past, focus of irrigation development in India was on the design and construction of civil works for storage, conveyance and distribution of water. With rapid changes in Indian agriculture over the last two decades, there is a

growing realization in the country of the need to improve the quality of the supplies and services from irrigation, particularly from existing large and medium projects.

As a consequence, the emphasis is now shifting to rehabilitation and improvement of water management of existing projects, instead of the earlier focus on construction of new systems. The revised "20 Point Programme" enunciated by the then Prime Minister Indira Gandhi laid emphasis on proper management of irrigation facilities created. The attention of the irrigation authorities was drawn on proper maintenance of the already established systems, among others by providing adequate financial resources for the same.

The huge outlay on the irrigation sector would not be remunerative if the assets created are not properly maintained. Proper maintenance is at least required to realize important objectives of irrigation and drainage systems such as:

- increasing the productivity per unit of water or land;
- improving equity of water distribution among users;
- thereby increasing the cost effectiveness of the system;
- all asking for increased control on water distribution, with an increased reliability of supplies;
- and all with improved environmental stability and sustainability of land and water productivity over time.

In short, the main aim of those in charge of managing a system, should be to maintain the system in proper shape to yield optimum benefits with least costs on a sustained basis over the longest possible time horizon.

## **1.2. Responsibility for maintenance**

In India, irrigation development takes place in both public and private sectors. Surface water projects like dams, diversion works (barrages, weirs) and canals for major and medium schemes are being constructed and maintained at government account. Works like small lift schemes from rivers or ground water, "bandharas", small tanks etc., are normally being executed by local bodies under district "panchayats" through cooperative institutions. Ground water works like dugwells, filterpoints, shallow and deep tubewells are mostly undertaken by private organizations either from own resources or through institutional funds or loans. In states like Uttar Pradesh, Bihar and Gujarat, deep tubewells are being executed, operated and maintained by the respective governments.

The modalities of O&M by private bodies or individuals are remarkably

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different from those in the public sector, the first often being more efficient and reliable. This is confirmed by the fact that farmers are willing to pay three to five times the water rate for water from a private source compared to that for water from a public system managed by the government.

Emphasis in this paper will be on the public sector, where the government, apart from funding, designing and constructing the systems, is also primarily responsible for their operation and maintenance (O&M). The paper discusses a number of financial aspects of operation and maintenance of irrigation and drainage systems. Basic data used are given in Annex 1 in addition to those presented by Singh and Jain, and listed in detail in that paper.

## 2. IRRIGATION COSTS

### 2.1. Total expenditures on operation and maintenance

A summary of the total O&M expenditures per ha, averages over the period 1986-1991 for five states, is given in Table 1, together with the same information for the most recent year, which was 1989-1990 for Madhya Pradesh and Uttar Pradesh and 1990-1991 for the other states. Data are processed from the basic data given in the paper by Singh and Jain.

Table 1. Reported expenditures on O&M in five states; 1986-1991 (Rupees per ha)

| STATE      | Average | Last year |
|------------|---------|-----------|
| Bihar      | 171     | 220       |
| Haryana    | 146     | 176       |
| Madhya Pr. | 82      | 91        |
| Punjab     | 117     | 133       |
| Uttar Pr.  | 138     | 179       |

The table shows variations between the states in O&M expenses from Rs 80-170 per ha on the average and Rs 90-220 per ha for the most recent year. This concerns surface irrigation projects in plain areas. For the hilly regions of Himachal Pradesh, O&M expenditures for river lift schemes were reported to

be Rs 600-700 per ha. For lift irrigation schemes in Uttar Pradesh the O&M costs varied over the said period from Rs 3000-3600 per ha and for tubewell schemes in the same state from Rs 770-1190 per ha.

It is noted that the most of above recent figures are lower than the most recent recommendations of Rs 180 per ha, see the paper by Singh and Jain.

## **2.2. Components of maintenance funds**

The above figures on O&M expenditures include two components: i) for physical works carried out for maintenance and repair and for (small) new constructions and ii) for salaries and wages ("establishment") of the government personnel involved. According to Indian practices this personnel can be dealing with operational matters or with maintenance activities. It is not possible to give separate figures for maintenance alone, although the expenditures on works might largely concern maintenance activities.

In earlier years, as an average for the mentioned states, about 55% of the total O&M cost was towards the work portion and 45% for the establishment. Gradually, however, the administrative system has changed to such extent that the establishment part has increased in all states. In 1989-90 the average situation was reversed: 45% of the total costs for works and 55% for establishment. In some states, only one-third of the total costs is now going into actual works. More details on this issue are given in the paper by Singh and Jain.

## **2.3. Required funds for maintenance**

It should be realized that these figures concern the actual expenditures and do not express the real costs required for good maintenance. Unfortunately, nobody has ever worked out realistic figures on requirements for good maintenance.

Yet, it is generally observed that funds allocated for maintenance are insufficient to do a good job. In 1977 already, a Central Water Utilization Team reported to the Seventh Finance Commission that provisions of the State O&M budgets were grossly inadequate in most cases and systems were gradually deteriorating. Similarly, the 1983 Public Accounts Committee of the Union expressed that maintenance of irrigation and drainage systems was not receiving due attention due to inadequate allocations made available by the states. Moreover, the Finance Commission of 1983 also found that there was no uniformity of norms in providing funds for maintenance and variations were noticed in allocations

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not only between states, but from project to project within the same state as well. The paper by Singh and Jain gives more information on this issue, including a listing of the most recent recommendations, coming down to at least Rs 180 per ha in 1988.

With regard to the real funds required it is now estimated that these would be in the order of Rs 250 to Rs 450 per ha in general, against the above actual provisions of roughly Rs 100-200 per ha only. The O&M cost for lift schemes is much more because of the substantial energy component.

#### **2.4. Capital cost component**

Cost of construction per ha for new schemes varies widely, depending upon the size of the system, type of water source and whether it is gravity or lift scheme. The investment costs of major and medium irrigation schemes over the recent years have generally been in the order of Rs 20,000-40,000 per ha. Taking an average of Rs 30,000 per ha, with an average of 10% rate of interest, the annual capital cost would be Rs 3000 per ha. If O&M cost at an average of about Rs 350 per ha are added the minimum economic cost per year comes down to Rs 3350 per ha.

### **3. WATER RATES**

#### **3.1. Level of water rates**

Detailed norms for the level of water charges are given per state but vary widely from state to state. Table 2 provides a summary of water rates for some crops in some states as an illustration. Figures are from the Report "Rates for Surface Water in India", of the Central Water Commission (CWC), 1988. The table shows wide variations, for rice for instance from some Rs 50 to 150 per ha, for wheat and cotton in the same order and for sugar from about Rs 70 to 380 Rs per ha.

As a rough indication, one could say that levels vary from some Rs 50-120 per ha (not counting the rates for sugar, because this is not common crop in most states). It is observed that this is less than the recommended needs of Rs 180 and more, and also less than the actual expenditures of Table 1.

Although it is always said that water rates, besides being based on area and crop, are roughly in proportion to the amount of water a crop consumes and to

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the value of the crop, this is not reflected by the figures. Sometimes the rate for rice and wheat is the same and sometimes the rate for wheat is even higher.

Table 2. Water rates in Rs per ha for some crops in several states

| STATE       | Rice   | Wheat  | Sugar  | Cotton | Year |
|-------------|--------|--------|--------|--------|------|
| Andhra Pr.  | 148.27 | 148.27 | 370.67 | 148.47 | 1986 |
| Bihar       | 89.45  | 51.15  | 157.65 | -      | 1983 |
| Gujarat     | 110.00 | 110.00 | 380.80 | 100.00 | 1981 |
| Haryana     | 74.13  | 61.78  | 98.84  | 61.78  | 1975 |
| Karnataka   | 86.49  | 54.86  | 370.67 | 98.94  | 1985 |
| Madhya Pr.  | 59.31  | 61.78  | 296.53 | 92.66  | 1984 |
| Maharashtra | 50.00  | 75.00  | 750.00 | 250.00 | 1975 |
| Punjab      | 48.19  | 14.93  | 66.72  | 38.92  | 1974 |
| Uttar Pr.   | 143.32 | 143.32 | 237.23 | 56.84  | 1983 |

In fact, the norms are much more complicated than indicated above. Firstly, water rates for major and medium systems usually differ from those for minor schemes. Secondly, there are wide variations between the states in the further degree of details. Only one, relatively simple, example of such details is given in Table 3, taken from the above mentioned CWC Report.

Table 3. Example of detailed water rates for rice in Uttar Pradesh (Rs per ha)

|                     |        |                                     |
|---------------------|--------|-------------------------------------|
| Schedule-I canals   | 134.32 |                                     |
| Schedule-II canals  | 56.84  | Doon canals                         |
|                     | 86.49  | Excl broadcast paddy on Doon canals |
| Schedule-III canals | 64.25  |                                     |
| Schedule-IV canals  | 19.77  |                                     |

Sometimes it has been advocated to base the water rates on volumes of water delivered. However, this will probably not be feasible because of the inability of most agencies to accurately measure water consumption by the farmers, due to the absence of the required water measuring devices and other practical complications involved.

### 3.2. Collection of water fees

The above illustrates that generally, water fees are not sufficient to cover the actual costs. Moreover, they are not always fully collected. Complete figures on fee collection for the entire country are not available. But Table 4 provides information for some states, on demands raised to the farmers (column 2) and the amounts actually collected (column 3). Figures are taken from the basic material given in Annex 1.

Table 4. Data on water fee collection (in million Rupees)  
(totals for the period 1986-1991)

| STATE       | Demand raised | Actual collected | (3) as % of (2) | Cost of collection | (5) as % of (3) |
|-------------|---------------|------------------|-----------------|--------------------|-----------------|
|             | (2)           | (3)              | (4)             | (5)                | (6)             |
| BIHAR       | 493,3         | 276,2            | 65              | 546,6              | 198             |
| HARYANA     | 450,7         | 455,3            | 101             | -                  | 2               |
| MADHYA PR   | 936,1         | 580,8            | 62              | 88,8               | 15              |
| MAHARASHTRA | 957,6         | 725,0            | 76              | N.A.               | N.A.            |
| PUNJAB      | 491,1         | 571,7            | 116             | 15,0               | 3               |
| RAJASTHAN   | 322,8         | 216,4            | 67              | 95,3               | 44              |
| UTTAR PR    | 2468,9        | 2305,0           | 93              | -                  | 10-12           |

It is seen that in most states only part of the demands are actually being collected. This varies from 62% in Madhya Pradesh to 93% in Uttar Pradesh. The demands are for the year concerned, while figures on collection also include collection of arrears. This explains the more than 100% results for Haryana and Punjab.

Table 4 also gives the costs involved in collecting the fees, as totals over the period 1986-1990. It is seen that the recorded administrative cost of collecting the fees varies widely. In Haryana, Punjab and U.P. these costs are relatively low, from 2-12 % of the revenues. But in Bihar costs are nearly twice the revenues!

Unfortunately, the issue of collection is complicated and needs some explanation. The entire "collection" consists of three activities: the assessment of crops and areas, the billing and the collection proper. There is considerable diversity in the existing practices on these activities.

At one extreme are the old irrigation works of Andhra Pradesh, Tamil Nadu and parts of Karnataka, where farmers are not required to pay a separate irrigation fee, because this is included in the land revenue.

Where separate water charges are levied, and this is the most common feature, the responsibility for all activities sometimes lies with the Irrigation/Water Resources Department (Bihar, Madhya Pradesh, Maharashtra, and two large systems in Gujarat and Rajasthan). In other states (Haryana, Punjab, Uttar Pradesh and West Bengal) the assessment is done by the Irrigation Department, the collection itself being the responsibility of Revenue Department and Irrigation Department pays a certain percentage of the collected amount to Revenue Department. In yet other cases finally, the Revenue Department is responsible for both assessment and collection (Karnataka, Andhra Pradesh, Orissa and Tamil Nadu).

This variety of practices explains the diversity in the figures of Table 4 and the low (percentage) figures for some states. It might (partly) explain the high establishment costs for some other states. Thus, the figures can only give an indication of the real costs involved in collection of water rates.

Finally, for the figures which are not based on a fixed percentage, it is not always clear to what extent cost collection figures of Table 4 also include personnel costs which are already included under establishment. This means that the two cannot be simply be added to come to total costs.

Table 4 is for the entire period 1986-1991 and gives total amounts in million Rupees. It may be interesting to see the amounts in Rs per ha and for the first and last year of this period. These figures have been worked out in Table 5.

There are problems with the interpretation of the table. First, collections most likely also include arrears, the portion of which may vary over the years. Second, it is difficult to compare collections with water rates, not only because of the above reason, but also because of the widely varying water rates, and all

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the details in that respect (as explained earlier) are not available.

Table 5. Demands and collections for two years, in Rs per ha

| STATE     | Period  | Demand raised | Collected | %   |
|-----------|---------|---------------|-----------|-----|
| BIHAR     | 1986-87 | 44            | 32        | 73  |
|           | 90-91   | 87            | 23        | 27  |
| HARYANA   | 1987-88 | 55            | 21        | 37  |
|           | 90-91   | 59            | 80        | 136 |
| MADHYA PR | 1986-87 | 117           | 81        | 69  |
|           | 89-90   | 175           | 79        | 45  |
| PUNJAB    | 1986-87 | 34            | 37        | 110 |
|           | 90-91   | 35            | 37        | 105 |
| UTTAR PR  | 1986-87 | 107           | 103       | 97  |
|           | 89-90   | 114           | 107       | 94  |

Yet, the following might be indicatively observed:

- Compared to the water rates of Table 2, demand figures seem to be lower in several cases; roughly, demands for the most recent year vary from Rs 35-115 per ha (with one case of Rs 175 per ha);
- Demands tend to raise over the years, but not substantially;
- There is substantial variation in the degree of collection amongst the states; on the average it is 81%, and figures vary from Rs 20-105 per ha;
- There seems to be a slight tendency of decreasing collection over the years.

Realizing all the variations, the general tendency from the above figures seems to be that average demands are less than water rates and collections again are less than demands.

#### 4. COMPARISON OF EXPENDITURES AND FEE COLLECTION

In the foregoing we have compared water rates, demands and collections. Here,

we will compare the collections with actual expenditures, as given in the paper by Singh and Jain.

To compare the per ha figures for expenditures and collections, these are given in Table 6, again for the same states. It gives the expenditures, collections and the differences, all in Rupees per ha, and the collections in percentage of the expenditures. Figures are given as an average over past 5 year period as well as for the most recent year.

Table 6. Comparison of expenditures and fee collections, in Rs per ha

| STATE     | Expenditures |             | Collected |     | Difference |      | Percentage collected |     |
|-----------|--------------|-------------|-----------|-----|------------|------|----------------------|-----|
|           | (2)          | (3)         | (4)       | (5) | (6)        | (7)  | (8)                  | (9) |
|           | Average      | Recent year | Avg       | Rec | Avg        | Rec  | Avg                  | Rec |
| Bihar     | 171          | 220         | 29        | 23  | -142       | -197 | 17                   | 10  |
| Haryana   | 146          | 176         | 58        | 80  | -88        | -96  | 40                   | 45  |
| Madhya Pr | 82           | 91          | 90        | 79  | + 8        | -12  | 91                   | 87  |
| Punjab    | 117          | 133         | 41        | 37  | -76        | -96  | 35                   | 28  |
| Uttar Pr  | 138          | 179         | 100       | 107 | -38        | -73  | 72                   | 60  |
| Average   | 131          | 160         | 64        | 65  | -67        | -95  | 49                   | 41  |

The differences in columns 6 and 7 give an indication of the annual "losses" in the irrigation sector, without considering the capital costs. In some states Government subsidies raise to a very high percentage. Collection percentages in the recent year vary from 10% to 87% with an average of 41%. As an average over the entire period about half of the expenditures have been collected. For these five states this comes down to a total deficit of about 5300 million Rupees.

When the capital costs are added, this would indicate that the irrigation sector would be a heavy burden on the State Exchequer. When costs for collection and accumulated arrears are added the picture would become even sadder. The total cumulative arrears for the listed cases is given as Rs 2157 million.

It is noted that details for India are available for a few states only, which are forefront in the field of maintenance and cost recovery in the country and

therefore do not represent the actual picture of the entire country. This is very disheartening when looking to states as Assam, Jammu and Kashmir and others, where practically no revenues are being recovered and full costs of maintenance and operation are being incurred not only from Non-Plan funds, but as Plan expenditures as well.

The preceding sections support the frequently heard opinion that water rates are insufficient to cover expenditures. It is usually advocated to increase the water rates. But the above figures also show that it would be more appropriate first to increase the rate of collection of existing fees. Yet, in the following some aspects of possible increase of water fees will be discussed.

## 5. FARMER ABILITIES TO PAY FOR IRRIGATION SERVICES

The National Council for Applied Economic Research, New Delhi has conducted field studies in various projects on financial aspects of irrigation at farm level. It was found that water rates were less than 5% of the net farm benefits from irrigation.

One example is from a project in Bihar. Here, with a cropping intensity of 180%, a farmer having 1 ha of irrigated rice and 0.8 ha of irrigated wheat had a gross income of Rs 8438, compared with Rs 4450 from equal non-irrigated land. Taken into account the cost of labour, capital and management of one family, net income from irrigated agriculture was arrived at as Rs 5774 per year and net benefits from irrigation at Rs 2511 per year.

The water rate was Rs 72 per ha per year. This would be 1.2% of the net income from irrigated agriculture and 2.9% of the estimated net benefit from irrigation.

This example would indicate that in states where there is a reasonable irrigation service, the incremental benefits derived from irrigation would enable higher water charges to be levied. Even charging full O&M costs of for instance Rs 400 per ha would still leave a considerable net benefit. Full recovery of O&M costs plus capital costs, estimated above at about Rs 3350 per ha, would mean about 2/3 of the estimated net benefits from irrigated agriculture, and is therefore not a realistic option.

Apart from being politically unacceptable, inclusion of 50% of the capital costs would already discourage farmers to demand for irrigation water. Moreover, the huge capital investments have already been sunk in the irrigation projects and there is no justification for insisting on the recovery of this sunk capital from the present generation of farmers.

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## 6. OVERALL ECONOMIC VIEW ON THE IRRIGATION SECTOR

### 6.1. Need for a broad view

In the above, emphasis has been on a comparison of direct costs of O&M on the one hand and water tariffs on the other hand. However, in discussing the rationale for higher water rates it seems appropriate to take a broader view on the issue. One should also include considerations on related economic-financial issues, both with respect to the total agricultural sector as to the farm level. This would enable a more relevant discussion on water rates than the simple comparison of administrative costs of irrigation and rules of thumb on water rates.

In such discussion a broader view would imply not only to consider water but also other (irrigated) agricultural inputs, and not only to look at direct costs and benefits but at indirect costs and benefits as well. Thus, due attention should be given to aspects of prices, taxes and subsidies (both implicit and explicit) related to the input and output of the agricultural sector. For the national level this would give estimates of total resource flows to and from the public managed irrigated agricultural sector and for the farmer level it would reveal a better picture of the overall profit and loss to the farmer.

On the cost side, construction cost and O&M costs are only part of the total expenditures made by government to the agricultural sector. Other costs concern for instance i) subsidies on investment and O&M of public tubewells and privately managed small tubewells (as for example subsidies on fuel/diesel oil), ii) price subsidies and iii) subsidies on fertilizers, pesticides and other inputs. And on the other side, water rates are only one (small) resource for government income from the agricultural sector. The increased agricultural production yields extra economic activities and extra incomes from various taxes.

The analytical work carried out by some research institutes mentioned above have indicated that in specific case studies the total estimated resource flows (revenues) to governments related to canal irrigation were much higher than the current expenditures. And the gross receipts obtained directly from farmers through charging water rates were only 17% of the total receipts from this sector. Similarly net flows of resources into canal irrigation were about the same as subsidies on the use of imported fertilizers consumed on these farms.

This analysis shows that the canal irrigated agriculture is providing substantial financial resources indirectly through commodity taxes etc. This underlines that

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discussions on economic aspects of irrigation should not be confined to a mechanical approach which suggests raising water rates not only to cover the O&M expenses but also certain percentage of capital costs.

## 6.2. Other factors to be considered

With respect to considerations on prices, the following aspects should be taken into account.

a) Although in theory all efforts are made to ensure that the farmers get remunerative prices, in practice, the price that a farmer get for his produce depends on the market structure. This has been confirmed from the analysis of data on procurement prices and open market prices during the harvest season. In states where infrastructures are good as in Punjab and Haryana, market prices for wheat are higher than official procurement prices fixed by the government but in Rajasthan wheat is quoted at times at prices which are about 20% lower than the procurement prices.

This factor has to be kept in mind while estimating the additional benefits to irrigated agriculture across the regions and over time. A comparison of water rates with procurement prices may not reveal the true relationship between input and output prices as would follow from simple arithmetics.

b) The prices of agricultural products consequent to the use of irrigation can also be affected indirectly by macro policies of trade restriction "zoning" and other administrative controls. This also needs to be taken into account when analyzing various alternatives of raising resources from the agriculture sector. The import prices also affect the agricultural pricing.

c) When the changes in farm harvest price do not keep pace with changes in prices of inputs and other commodities purchased by the farmers, there will be a definite erosion in the purchasing powers of goods by the farm sector.

All this is being pointed out to draw attention to the fact that raising water rates is only one (direct) method of creating government income and that transferring resources from irrigated agriculture to the rest of the economy could also be realized by policies on prices of outputs and inputs as well as policies of direct and indirect taxation of income accrued in irrigated agriculture.

## 7. SOME RELATED CONSIDERATIONS

With respect to the issue of water rates, finally some miscellaneous aspects are

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mentioned that should not be neglected.

\* **Reliable water services**

Due to a variety of reasons, operation of many irrigation systems is deficient, and inadequate water distribution results in improper and unreliable water supplies to the farmers. Given this state of affairs it is reasoned that it would not be reasonable to ask farmers to pay a higher water fee as they do not get adequate services in return.

The other way around, collecting too little water charges, together with insufficient allocations by government, will jeopardize improvement of the water distribution. In fact, this has become sort of a vicious circle in many developing countries.

In developed countries like USA and The Netherlands (see the paper by Deurloo), and even in The Republic of Korea, water management has been made self supporting, among others by charging adequate contributions from the beneficiaries, which is accepted because they know they can be sure to really benefit from reliable and proper services.

For India, this point can be illustrated by the performance of the private irrigation sector. Here, economic performance is often realized by recovering adequate charges, for which well planned and executed operation and maintenance services are rendered.

\* **Farmers role below the outlet**

The plea for water users organizations or farmers cooperatives "below the outlet" is also valid with respect to maintenance. On the one hand collaboration of farmers would facilitate collection of fees for the government, particularly in situations with many small and fragmented holdings. On the other hand maintenance of the field ditches and small structures below the outlet could be entrusted to the farmers, thus reducing the government burden on maintenance costs.

Sofar, however, very few water cooperatives have come up in India. The Mohini Cooperative Society of water users in Kakrapar Command in Gujarat is one of the few examples of exemplary management by the farmers. The result is that for the country as a whole there is virtually impossible to envisage a workable scenario where with the price set for irrigation water, a well working farmer organized maintenance system could be evolved.

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## 8. SUMMARY AND CONCLUSIONS

The huge outlay on the irrigation sector would not be remunerative if the assets created are not properly maintained. Proper maintenance is at least required to realize the fundamental objectives of irrigation and drainage systems. The paper reviews a number of financial aspects of operation and maintenance, including real needs, actual expenditures, water rates, and cost recovery.

Maintenance needs and costs vary considerably, between states, between Government and private schemes and between type of system. Emphasis is on Government managed surface systems. Data on financial issues have been collected and processed for 5 large irrigation states, for the years 1986-1991.

The actual expenditures on O&M have increased from about Rs 80-170 per ha in 1986 to Rs 90-220 per ha for the recent years. Over the period, the percentage of the total expenditures taken by establishment costs have increased for 45% to 55%, however. The real costs required for good maintenance are estimated to be in the order of Rs 250-450 per ha, not counting the capital costs. The latter would dramatically increase the annual total with some Rs 2000-4000 per ha.

Cost recovery is done (partly) by collection of water charges. The norms and levels of water rates in some states are reviewed. The criteria vary widely and are often quite complicated, so that standard figures cannot be given. The general overall picture is that water rates vary from some Rs 50-120 per ha, which is considerably less than the actual expenditures and certainly less than the required funds.

Subsequently information is given on the collection of the water charges. The demands billed to the farmers again vary considerably, generally being in the order of Rs 35-115 per ha, which seems to be less than the level of the water rates. Next, these demands are not fully being collected. The average rate of collection is about 80%, with variations from 60-120%, the latter figure showing that collection of arrears is included as well. The average amount collected in the most recent year was Rs 65 per ha, varying from Rs 20-105 per ha.

Some information is given on the cost involved in the collection activities. It is shown that this is a complicated issue with highly varying practices in the country. It is therefore not possible to give good indicators on this aspect.

Next, the actual collections are compared to the expenditures. The average percentage of the expenditures finally collected seems to slightly decrease from

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49% (17-91%) for the entire period to 41% (10-87%) in the recent years. This leaves an average deficit of Rs 95 per ha (varying from 10-200). Similar figures are given for some other Asian countries.

The above would suggest that first the degree of collection should be increased to reduce the deficits. Yet, some thoughts are also given to the possibilities to increase water rates, as is often advocated. Farm economic studies indicate that for the farmers, the water rate is only a negligible percentage of the net benefits from irrigation. Substantially higher water rates seem well be possible without seriously affecting the farm budget. But inclusion of any portion of the capital costs does not seem realistic.

Yet, it is argued to take a broader view on the financial aspects. Not only water should be considered, but also other inputs and not only direct but also indirect cost and benefits should be taken into account, incorporating all aspects of prices, taxes and subsidies. O&M costs and benefits are only one element of the many other cost and benefit elements for both farmer and Government.

Finally, two related issues are briefly raised: one is the fact that higher water rates can only be implemented when the quality of the water service would improve, and the other is that a workable solution should be found to make the farmers within the outlet command responsible for their own maintenance.

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## DEMANDS AND COLLECTION OF WATER FEES

## ANNEX 1.1

## BIHAR

| Year   | Demand raised | Actual collected | (4) as % of (3) | Cost of coll. | irrig. area | dem. /ha | coll. /ha |
|--------|---------------|------------------|-----------------|---------------|-------------|----------|-----------|
|        | (2)           | (3)              | (4)             | (5)           | (6)         | (2)/(6)  | (3)/(6)   |
| '86-87 | 84.7          | 62.0             | 73              | 76.5          | 1.931       | 44       | 32        |
| 87-88  | 102.0         | 75.3             | 74              | 107.5         | 1.731       | 60       | 44        |
| 88-89  | 75.0          | 67.8             | 90              | 107.2         | 1.963       | 38       | 35        |
| 89-90  | 47.5          | 21.7             | 46              | 141.8         | 2.149       | 22       | 10        |
| 90-91  | 184.1         | 49.4             | 27              | 113.6         | 2.108       | 87       | 23        |
| tot/av | 493.3         | 276.2            | 62              | 546.6         |             | 50       | 29        |

## HARYANA

| Year   | Demand raised | Actual collected | (4) as % of (3) | Cost of coll. | irrig. area | dem. /ha | coll. /ha |
|--------|---------------|------------------|-----------------|---------------|-------------|----------|-----------|
|        | (2)           | (3)              | (4)             | (5)           | (6)         | (2)/(6)  | (3)/(6)   |
| '86-87 | -             | -                | -               | -             | 2.004       | -        | -         |
| 87-88  | 104.2         | 38.7             | 37              |               | 1.881       | 55       | 21        |
| 88-89  | 111.8         | 128.4            | 115             |               | 1.958       | 57       | 66        |
| 89-90  | 117.9         | 129.8            | 110             |               | 2.023       | 58       | 64        |
| 90-91  | 116.8         | 158.4            | 136             |               | 1.972       | 59       | 80        |
| tot/av | 450.7         | 455.3            | 100             | * 2%          |             | 57       | 58        |

\* fixed percentage

- "demands raised" and "actual collected" in million Rs
- irrigated areas in million ha
- tot/av = total or average

Source: Committee on pricing of Irrigation Water, Planning Commission of India, 1988

## MADHYA PRADESH

ANNEX 1.2

| Year   | Demand raised | Actual collected | (4) as % of (3) | Cost of coll. | irrig. area | dem. /ha | coll. /ha |
|--------|---------------|------------------|-----------------|---------------|-------------|----------|-----------|
|        | (2)           | (3)              | (4)             | (5)           | (6)         | (2)/(6)  | (3)/(6)   |
| '86-87 | 201.0         | 138.3            | 69              | 20.0          | 1.717       | 117      | 81        |
| 87-88  | 220.1         | 136.5            | 62              | 20.4          | 1.559       | 141      | 88        |
| 88-89  | 235.8         | 179.6            | 76              | 25.3          | 1.588       | 149      | 113       |
| 89-90  | 279.2         | 126.4            | 45              | 23.1          | 1.597       | 175      | 79        |
| 90-91  | -             | -                | -               | -             | -           | -        | -         |
| tot/av | 936.1         | 580.8            | 63              | 88.8          |             | 145      | 90        |

## PUNJAB

| Year   | Demand raised | Actual collected | (4) as % of (3) | Cost of coll. | irrig. area | dem. /ha | coll. /ha |
|--------|---------------|------------------|-----------------|---------------|-------------|----------|-----------|
|        | (2)           | (3)              | (4)             | (5)           | (6)         | (2)/(6)  | (3)/(6)   |
| '86-87 | 96.1          | 105.7            | 110             | 2.9           | 2.827       | 34       | 37        |
| 87-88  | 100.5         | 121.0            | 120             | 3.0           | 2.844       | 35       | 43        |
| 88-89  | 90.7          | 128.5            | 142             | 2.9           | 2.900       | 31       | 44        |
| 89-90  | 107.7         | 112.1            | 104             | 3.2           | 2.659       | 41       | 42        |
| 90-91  | 99.1          | 104.4            | 105             | 3.0           | 2.853       | 35       | 37        |
| tot/av | 494.1         | 571.7            | 116             | 15.0          |             | 35       | 41        |

## UTTAR PRADESH

| Year   | Demand raised | Actual collected | (4) as % of (3) | Cost of coll. | irrig. area | dem. /ha | coll. /ha |
|--------|---------------|------------------|-----------------|---------------|-------------|----------|-----------|
|        | (2)           | (3)              | (4)             | (5)           | (6)         | (2)/(6)  | (3)/(6)   |
| '86-87 | 615.3         | 594.6            | 97              |               | 575.3       | 107      | 103       |
| 87-88  | 582.2         | 458.5            | 79              |               | 5.654       | 103      | 81        |
| 88-89  | 628.5         | 648.4            | 103             |               | 6.003       | 105      | 108       |
| 89-90  | 642.9         | 604.1            | 94              |               | 5.663       | 114      | 107       |
| 90-91  | -             | -                | -               | *             | -           | -        | -         |
| tot/av | 2468.9        | 2305.6           | 93              | 10-12%        |             | 107      | 100       |