ISN = 69017
PNABG520

Recurrent Cost Study of Operation and Maintenance of Irrigation Systems in Maharashtra

Case Study Prepared for
USAID

By

Jagannathrao R. Pawar
M.Sc.(Agri.), P.M.A., Ph.D.

Professor of Agril. Economics, &
Associate Director of Research,
Mahatma Phule Agricultural University,
RAHURI-413 722, Maharashtra, India.

March, 1985

CONTENTS

		Page
1.	Introduction	1
2.	Methodology	3
3.	Development of Irrigation Resource in Maharashtra	6
4.	Arrangements for Operation and Maintenance of Irrigation Systems	12
5.	System Level Study of Operation and Maintenance of Irrigation Projects	34
6.	Conclusions	58
	Annexures I to III	i to xvi

ACKNOWLEDGEMENT

The concurrent Cost Study of Operation and Maintenance of Irrigation Projects in Maharashtra was undertaken at the instance of the requirement of the special project handled jointly by M/s Samuel R. Daines Research Group Inc., Utah, U.S.A. and Utah State University, Logan, Utah, U.S.A. The study was guided by Dr. Samuel R. Daines and it was encouraged by Dr. D.K. Salunkhe Vice Chancellor, Mahatma Phule Agricultural University, Rahuri, Maharashtra, India. I am thankful to both of them for their valuable guidance and encouragement during the course of completion of the study.

Mr. P.R. Gandhi, Secretary, Irrigation Department and Mr. R.K. Inamdar, Deputy Secretary, Irrigation Department, Government of Maharashtra, showed keen interest in this study. The officials of the sample irrigation systems, Chief Engineers of the Irrigation Regions and the sample farmers took lot of pains in providing information on various aspects. I am grateful to all these officials and farmers for their co-operation.

The assistance given by the post-graduate students in the discipline of Agricultural Economics of this University was of immense use in the completion of work of compitation and analysis of data. Similarly, the contribution of Mrs. Indumati J. Pawar in preparation of final tables and manuscript enabled me complete the work in time. The secretarial help provided by Shri R.K. Wandhekar and Shri P.S. Sarode was quite prompt. I am thankful to all of them for their valuable assistance.

March 10, 1985.

(Jagannathrao R. Pawar)

1. INTRODUCTION

The problem of inefficient use of irrigation water is common in almost all the developing countries and Maharashtra is not exception for the same. There are various reasons as a result of which a considerable quantum of expensive irrigation water resource remains unused at the system level as well as the same is not used optimally at the farm level. The inefficiencies/drawbacks in operation and maintenance of irrigation systems have been observed to be the important factors among several reasons withholding efficient use of irrigation water both at the system level and farm level as well. The problems such as excessive use of irrigation water, water logging, water losses, inadequate and untimely supply of irrigation water, inequitable distribution of irrigation water among the beneficiaries, improper use of input-mix and crop-mix at the farm level, etc., are directly or indirectly associated with the inefficiencies/drawbacks in the operation and maintenance of irrigation systems.

Topic of the Study

The aspect of efficient operation and maintenance of irrigation systems, many a times, seems to have not been given due attention as it involves additional burden in the public exchequer. Similarly, from the view point of giving social benefits of irrigation water to a vast majority of farming community, it goes difficult to the Government to raise the level of water rates and thereby collect additional

revenue resource to provide for higher level efficiency in operation and maintenance of irrigation systems. However, looking to the importance of efficiency in operation and maintenance of irrigation systems, it is necessary to find out the ways and means for effecting improvements in operation and maintenance services to realize maximum returns from irrigation water.

To explore the above possibility, the present study tries to delineate some of the aspects relating to operation and maintenance of irrigation systems in Maharashtra. In that, an attempt is made in the study firstly to understand the existing arrangements for operation and maintenance of irrigation systems based on Statewide information and secondly, to estimate empirically the costs of operation and maintenance of irrigation systems in relation to revenue receipts from collection of water charges for the sample of irrigation systems.

2. METHODOLOGY

The study was divided into three parts. In the first part, an attempt was made to understand in detail the existing arrangements for operation and maintenance of irrigation systems in the State. The second part related to the aspect of systems characteristics, systems operation and paying for operation and maintenance for the sample irrigation systems selected for the study. An attempt was made in the third part to substantiate the results obtained at the system level by way of gathering relevant farm level information from the sample of beneficiaries in the command.

To accomplish the requirements of the first part, the relevant information on different aspects was obtained from the office records of the Irrigation Department. Personal discussions were held with the senior officials of the Department to understand the procedures and practices of operation and maintenance of irrigation systems.

For the system level study involved in second part, a sample of major, medium and minor irrigation projects was selected randomly. The number of irrigation projects selected under the individual system categories is given in Table 2.1. The information on different aspects of operation and maintenance of the individual sample systems was obtained with the help of a questionnaire specially designed for the

purpose. Further, the information thus obtained was screened critically and finally the sub-sample of 5 irrigation projects belonging to each of the three system categories was selected for the detailed study. This approach facilitated selection of representative systems by way eliminating the old and extreme irrigation projects..

Table 2.1 : Number of Irrigation Projects in the Sample and Sub-Sample

System category	Total number of projects	Number of projects in the sample	Number of projects in the sub-sample
Major	19	16	5
Medium	140	28	5
Minor	1160	41	5
Total	1319	85	15

The farm level study involved in the third part was based on the sample of 192 farms selected at random from 24 sample villages spread over in the command of the 6 sample irrigation projects (comprising of 2 major, 2 medium and 2 minor irrigation projects). The detailed information on different aspects of farm economy and irrigation water use was obtained by survey method with the help of a questionnaire designed for the purpose.

The data/information thus obtained were compiled and analysed to work out estimates of different indicators/ variables separately for the average irrigation projects and farms.

The results of the entire study are discussed in the following chapters.

3. DEVELOPMENT OF IRRIGATION RESOURCE IN MAHARASHTRA

It is well-known that Maharashtra State is relatively less blessed with natural resource endowments; especially with regard to natural precipitation and irrigation water potential. The performance of agriculture, therefore, depends largely on the vagaries of monsoon. In recognition of this fact the State Government has made several efforts during the Plan period for exploitation of irrigation potential by way of completing a large number of irrigation projects and sponsoring programmes for establishment of lift irrigation schemes and digging the wells.

Plan Allocations for Development of Irrigation Potential

Since the commencement of the First Five Year Plan, the State Government has provided separate budget allocations for undertaking irrigation works in different parts of the State. Table 3.1 provides Planwise details of budget allocations for irrigation works in Maharashtra.

On the whole, the State Government has provided almost one-fifth of its total Plan allocations for the development irrigation potential through undertaking different types of irrigation projects. The budget provided for irrigation works also included the expenses on account of operation and maintenance of existing irrigation systems, old and new as well, in the State.

Table 3.1 : Planwise Budget Allocations for Irrigation Works in Maharashtra

(Rs. in crores)

Plan period	Allocations for irrigation works	Total Plan allocations	Proportion of total Plan allocations on irrigation works (per cent)
Pre-independence	16.60	-	-
First Plan (1951-56)	8.11	147.10	5.51
Second Plan (1956-61)	33.94	229.76	14.77
Third Plan (1961-66)	64.99	434.73	14.95
Annual Plan (1966-69)	59.79	385.85	15.50
Fourth Plan (1969-74)	233.07	1006.40	23.16
Fifth Plan (1974-78)	425.51	1877.61	22.66
Rolling Plan (1978-80)	307.73	1511.53	20.36
Sixth Plan (1980-85)	1334.62	6174.74	21.61
Seventh Plan (1985-90)	2130.00	N.A.	-

Source - Documents of Five Year Plans of Maharashtra

Irrigation Projects in Maharashtra

Table 3.2 presents information on the number of irrigation projects in Maharashtra.

Table 3.2 : Number of Irrigation Projects in Maharashtra

Particulars	Major projects	Medium projects	Minor projects	Govt. lifts
1. Projects completed during pre-independence period	5	15	N.A.	-
2. Projects completed during Plan period upto July, 1984	14	125	1160	354
3. Projects already sanctioned of which work is in progress	45	105	453	-
4. Projects already sanctioned of which work is yet to be started	5	47	461	1
Total	69	292	2074	355

Source - Office Records of Irrigation Deptt., Govt. of Maharashtra

Maharashtra has succeeded in completing 14 major projects, 125 medium projects, 1160 minor projects and 354 irrigation lifts during the Plan period upto July, 1984. The position of exploitation of irrigation potential will improve a lot on completion of the projects which have been sanctioned so far.

Increase in Area under Irrigation

As a result of completion of different irrigation projects, the area under irrigation has increased during

the Plan period. Table 3.3 presents the details of gross cropped area and gross irrigated area in the State for the period from 1962-63 to 1979-80.

Table 3.3 : Gross Cropped Area and Gross Irrigated Area in Maharashtra

('000' hectares)

Year	Gross cropped area	Gross irrigated area	Percentage of gross irrigated area to gross cropped area
1962-63	18963	1278	6.73
1966-67	19202	1476	7.68
1971-72	18115	1622	8.95
1976-77	19742	2242	11.35
*1981-82	20386	2686	13.18

*Provisional

Source - Handbook of Basic Statistics of Maharashtra, Bureau of Econ. & Stat., Maharashtra 1964 - 1983

The proportion of gross irrigated area to gross cropped area has increased from 6.73 per cent to 13.18 per cent during the period of about 20 years upto 1982.

Planned and Actual Area Irrigated by Irrigation Projects

The post investments in irrigation projects have enabled the State to create additional irrigation potential. However,

the entire irrigation potential of these irrigation projects seems to have not been utilized to the fullest extent. The details of the seasonwise irrigation potential and its actual utilization in 1982-83 are given in Table 3.4 separately for the major, medium and minor irrigation projects in the State.

Table 3.4 : Seasonwise Potential and Actual Area Irrigated by Different Types of Irrigation Projects in Maharashtra During the year 1982-83

('000' hectares)

Season	Potential/ actual	Major projects	Medium projects	Minor projects and lifts	Total for irrigation projects
Kharif	Potential	476.90	279.13	235.99	992.06
	Actual	107.33	86.54	57.06	250.93
		22.51	31.00	24.18	25.29
Rabi	Potential	372.06	189.62	281.96	843.64
	Actual	176.25	75.53	53.89	305.67
		47.37	39.83	19.11	36.23
Hot weather	Potential	55.98	9.85	9.81	75.64
	Actual	37.34	9.99	13.52	60.85
		66.70	101.42	137.82	80.45
Perennial	Potential	99.45	34.17	20.17	153.79
	Actual	30.26	45.75	19.11	95.12
		30.43	133.89	94.74	61.85
Total	Potential	1004.39	512.78	547.93	2065.10
	Actual	351.18	217.81	143.59	712.58
		34.96	42.48	26.21	34.51

(Figures in parentheses indicate percentages of actual irrigated area to potential area)

Source - Office Records of Irrigation Department, Govt. of Maharashtra

The information presented in Table 3.4 gives a disappointing picture with regard to the use of the irrigation potential created so far by spending huge amount of money. Almost 65 per cent of the irrigation potential remained unused during the year 1982-83. The problem of under-utilization was relatively more chronic in case of the minor irrigation projects as compared to the major and medium irrigation projects. Besides, the utilization of irrigation potential in the kharif and rabi seasons was quite low as compared to the hot weather season.

The low water use efficiency could be attributed because of the following reasons.

1. Lack of proper land development, especially construction of field channels with proper flow control structures.
2. Inadequate drainage facilities resulting in water logging and evils associated with ill drained conditions.
3. Heavy percolation losses.
4. High rate of transmission losses due to unlined channels.
5. Poor and irregular maintenance of field channels.
6. Absence of suitable cropping pattern.
7. Inefficiency in operating the irrigation system.
8. Lack of sense of water management practices among the farmers.

Thus the inefficiency in irrigation water use could be attributed partly to the drawbacks/shortcomings with the operation and maintenance of irrigation systems in the State.

4. ARRANGEMENTS FOR OPERATION AND MAINTENANCE OF IRRIGATION SYSTEMS

The Statewide arrangements for operation and maintenance of irrigation systems are discussed in this chapter.

Agency for Operation and Maintenance

There is no separate agency for operation and maintenance of irrigation projects. However, the Management Wing of the Irrigation Department is involved in the operation and maintenance of all irrigation projects in the State sector. The lift irrigation schemes of the Irrigation Development Corporation of Maharashtra (IDCOM), a government company, are also looked after by the Management Wing of the Irrigation Department on agency basis. The small irrigation projects (having irrigation potential upto 100 hectares) of the Zilla Parishads are looked after by the irrigation staff working under Zilla Parishads for their operation and maintenance.

After an irrigation project is completed and commissioned, it is handed over to the Management Wing of the Irrigation Department for operation of irrigation system and maintenance of dam, canal and distribution system.

Responsibilities of Irrigation Wing

The Management Wing of the Irrigation Department is expected to perform the following functions relating to operation and maintenance of irrigation.

(i) Regulation of flood and water storage in the reservoir;

(ii) Proper estimation of available water in the reservoir and planning its distribution;

(iii) Calling irrigation water demand applications and sanctioning the same after scrutiny;

(iv) Maintenance of canal and distribution system;

(v) Proper distribution of irrigation water amongst the sanction holders;

(vi) Preventing unauthorized use of irrigation water;

(vii) Measurement of crop acreages; and,

(viii) Assessment and recovery of water charges.

The maintenance of irrigation projects includes various activities such as (a) ordinary and special repairs, (b) extension and improvement to the completed works including drainage schemes to prevent salinity and water logging, (c) proper upkeep of the dam, canal and distribution system including periodical maintenance of steel work, gates, regulators, etc., (d) removal of silt and weeds from canal; and (e) upkeep of the inspection bunglows, buildings and canal chowkies.

Funds for Operation and Maintenance

The expenditures on maintenance and repairs of irrigation projects are met with from the budget provisions made by the State Government as a part of revenue expenditure. The costs on extension and improvements including construction

of drainage works are met with from budget provisions made by the State Government as a part of Plan outlay under capital account.

The budget provisions under revenue expenditure for operation and maintenance of irrigation works in Maharashtra are shown in Table 4.1 for the last 3 years.

Table 4.1 : Yearwise Budget Provisions* under Revenue Expenditure for Operation and Maintenance of Irrigation in Maharashtra

Year	Irrigation potential (lakh ha)			Budget provision (Rs. in cro		
	Major & medium projects	Minor projects	Total	Establi-shment	Works	Total
1981-82	13.16	4.02	17.18	7.28	5.30	12.58
1982-83	14.11	4.18	18.29	8.61	6.98	15.59
1983-84	15.21	4.33	19.54	10.65	9.48	20.13

* These exclude costs for IDCOM lifts which are met with from the funds provided by the said company.

Source - Office Records of Irrigation Deptt., Govt. of Maharashtra

Organizational Structure of Operation and Maintenance

Since Maharashtra has adopted the optional system of irrigation with a view to obtain optimum economic returns from better class of crops grown under irrigated conditions, the responsibility of Irrigation Department does not cease at the

outlet but continues till water is supplied to the variety of crops grown in the command at required irrigation intervals and in required quantities. Owing to this responsibility and small size of holdings of individual cultivators, the management staff requirement is much higher. Recently, the committee under the Chairmanship of D.N. Capoor went into this problem and made certain recommendations for evolving staff norms. Based on these norms, a normal irrigation section headed by a Junior Engineer is provided to look after irrigation water distribution for the concentrated area of 3000 to 4000 hectares of standard rabi irrigation. In case of scattered irrigation of two or more Minor Irrigation Tanks spead over a taluka or two talukas, one section is provided for about 2000 hectares of standard rabi area. For the individual sections, separate staff is provided for operation (i.e., irrigation water distribution,control of unauthorised irrigation use, assessment of irrigation water demand, etc.,) and maintenance of irrigation system. Normally, a sub-division has 4-6 such sections and a division has a control over 4-6 sub-divisions. The division is headed by the Executive Engineer and sub-division by the Deputy Engineer. In case of the irrigation projects under Command Area Development Authority (CADA), the divisions and sub-divisions meant for operation and maintenance work under the Administrator who is a multi-disciplinary authority co-ordinating the activities of land development as well as operation and maintenance of irrigation system in the command.

Collection and Utilization of Water Charges

The responsibility of collecting water charges from farmers and other beneficiaries is vested with the management staff provided under each of the irrigation sections. The arrears of water charges (i.e., irrigation and non-irrigation revenue) of the water users who do not pay the current water charges within a period of 3 years even after due persuation by irrigation staff are recorded by revenue officers as arrears of land revenue by resorting to coercive measures.

The water charges are levied on the area basis for different crops irrigated in any year. In case of the supply of water for non-irrigation purposes, however, the water charges are levied on volumetric basis.

The position of actual demand of water charges and recoveries thereof is indicated in Table 4.2 for the last 3 years.

Table 4.2 : Actual Demand and Recoveries of Water Charges in Maharashtra

Year	Current demand excluding past arrears (Rs.in lakhs)	Recovery during the year (Rs.in lakhs)	Recovery percentage
1980-81	1165.30	812.51	69.73
1981-82	1169.40	967.23	82.71

Source- Office Records of Irrigation Deptt., Govt. of Maharashtra

The water charges and other revenue from the irrigation projects are credited to the General Revenue Account of the State.

Process of Fixation of Irrigation Water Rates

The water rate has been defined as charge or fee for providing facility of supply of water.

The Maharashtra State Irrigation Commission has prescribed the following principles for fixation of water rates.

(i) The total recoveries on account of water rates during the year should not be less than the annual cost incurred by the State for providing the services.

(ii) The water rate for a crop should be equitable in the sense that it should be related to the ability of the crop to bear it.

(iii) Water rates should be so pitched as not to leave any irrigation potential unutilized on account of either the detects in charging rates or the level of particular rates.

At present, the water rates for flow irrigation in respect of food and non-cash crops are fixed at roughly 6 per cent of the average gross income from these crops. In case of cash crops the rates are fixed at about 12 per cent of their average gross income.

The present water rates which are in force with effect from 1st July, 1975 and charged on flow irrigation for all irrigation projects alike are indicated in Table 4.3.

Table 4.3 : Per Hectare Water Rates Charged for Flow Irrigation from Major, Medium and Minor Irrigation Projects in Maharashtra

	Crop with season	Water rates (Rs./ha)
1.	Sugarcane and plantations	750
2.	Other perennial crops	500
3.	Kharif seasonal crops	50
4.	Rabi seasonal crops	75
5.	Hot weather seasonal crops	150
6.	Seed production crops in kharif season	100
7.	Seed production crops in rabi season	150
8.	Hot weather cotton (water supply from 1st March)	400
9.	Hot weather cotton (water supply from 15th April)	250
10.	Hot weather groundnut (water supply from 1st March)	300
11.	Hot weather groundnut (water supply from 15th April)	200
12.	Pre-seasonal watering	75
13.	Post-seasonal watering to kharif crops	20
14.	Post-seasonal watering to rabi crops	25

(Note - 3/4 rate is to be charged for the annual and perennial crops where water supply is not assured from the irrigation projects).

Source - Office Records of Irrigation Dept., Govt. of Maharashtra.

The water charges as given in Table are uniform throughout the State and they do not differ among the irrigation systems and for the same seasons. There are, however, seasonal differences in the water charges for the individual crops. These differences

are mainly on account of duration of the crop over which irrigation is required and quantum of precipitation likely to be received during the season.

Type of Water Charges and Pricing Policy

The water charge for a crop is usually a charge per hectare of the area under the crop. Wherever the water is supplied for non-irrigation use (i.e., for domestic and industrial use), the water charge is per volume of water. Over and above the water rates, Local Fund Cess is charged as per Zilla Parishad Act at the rate of 20 paise per rupee of water rate.

The Crop-Area basis is adopted for irrigation water rates as it is convenient for measurement. Besides, in almost all the irrigation projects the facilities for measuring water quantities on volume basis are absent. The volume basis of water rate is adopted for the water supplied for non-irrigation use as the water measurement devices for the purpose are required in smaller number.

As stated earlier, the irrigation charges collected by the Irrigation Department are remitted to the State Treasury. The basis for water charges has remained the same in the State. The charges in irrigation charges are not made frequently. However, over a period of time, these charges are effected

Concern of State Government for Water Use

Because of the necessity to increase food and fibre production to meet the needs of expanding population and to improve the status of agriculture which is the vital component of State economy, the State Government has given a very high priority for the development of irrigation since the inception of first Five Year Plan. Large allocations for this sector were the features of all the Five Year Plans. Table 4.4 presents the information on Planwise budget allocations for irrigation projects in Maharashtra.

Table 4.4 : Planwise Budget Allocations for Irrigation Projects in Maharashtra

(Rs. in crores).

Plan period	Allocation for irrigation projects
Pre-independence	16.80
First Plan (1951-56)	8.11
Second Plan (1956-61)	33.94
Third Plan (1961-66)	64.99
Three years	59.79
Annual Plan (1966-69)	
Fourth Plan (1969-74)	233.07
Fifth Plan (1974-78)	425.51
Rolling Plan (1978-80)	307.73
Sixth Plan (1980-85)	1334.62
Seventh Plan (1985-90)	2130.00

At the beginning it was observed that the performance of the new projects was not upto the expectations. A study was, therefore, undertaken during the sixties to evolve strategies to improve the utilization of irrigation protential and to remove bottlenecks in utilization of available irrigation potential. One of the major drawbacks which was noticed initially was the lack of infrastructure beyond the outlet. Therefore, construction of water courses and field channels including ancillary structures thereon was one of the important factors inducing farmers to utilize irrigation water. Keeping this point in view, certain amendments were made to the irrigation laws so that irrigators in the lower region of the outlet could take resort to get the water courses constructed. However, this was not enough to accomplish the goal of fuller utilization of irrigation potential. The State Government, therefore, undertook the activity of constructing water courses under the provisions of Bombay Land Improvement Scheme Act-1942 and the costs were recovered from the beneficiaries in yearly instalments. From 1980 onwards, the State Government has decided to construct all channels right upto last farm gate at project cost.

Secondly, leveling and bunding of lands in the command area to make them suitable for irrigation was found to be another bottleneck in the realization of potential benefits from irrigation. This activity was, therefore, taken up under the Bombay Land Improvement Scheme Act with the consent of the beneficieries. The cost on this account is being recovered from the beneficiaries in yearly instalments.

The other measures relating to credit supply, seed distribution, etc., were adopted with the help of other departments and Zilla Parishads to enhance production.

Subsequently, it was found that the irrigation distribution system is deficient, water losses are more, irrigation water control facilities are inadequate and canal capacities are not sufficient to meet the peak crop water demands. The Irrigation Department has, therefore, decided to effect improvements in these aspects through remodelling and modernization programs. Moreover, this is going to be the priority sector item for the Seventh Five Year Plan.

In spite of the above steps, there remained several inefficiencies and deficiencies in the operation and maintenance of irrigation projects in the State. In recognition these facts, there has been a growing concern these days regarding effecting improvements in the operation system and developing procedures for proper water delivery schedules. The aspects such as water budgeting and estimation of water demands of crops adjusting the release to suit the changes in climate are considered to be much dependent on scientific knowledge relating to crop water demands at various stages of crop growth. The Government is, therefore, making efforts to create a quick feedback information system by way of providing telephone and wireless systems in various parts of the command.

Efforts are being made to improve the existing 'shejpali' system on scientific lines. The maintenance norms has also been updated and adequate funds are being provided for proper maintenance of the systems.

Though the concern for improved water use has begun since last decade, the existing efforts do not seem to be sufficient to bring about desired charges. In case of the newly designed projects, however, separate provisions have been maide for operation and maintenance of irrigation system.

Government Policy regarding Collection of Water Charges

At the beginning of the Plan period, the water rates were fixed on ad-hoc basis. However, in accordance with the recommendations made by the Maharashtra State Irrigation System, the policy was changed to relate water rates individual crops to their average gross income such that the Government would be able to recover atleast the annual cost on account of providing services.

The Government has adopted the policy of changing water rates after a period of ten years. The current water rates of individual crops as given in Table 4.8 were fixed in 1973-74 and made effective from July, 1975 onwards. Owing to this policy, the changes in water rates have not matched with the changes in general price level.

So far as the agency for collection of water rates is concerned, the Government policy was to collect water rates with the help of Revenue staff. This policy was, however, chaned from 1976 and the responsibility of collection of water rates from the beneficiaries was vested with the Irrigation Department staff looking after operation and maintenance of irrigation system.

Water User Organizations

The State Government has tried to establish Pani Panchayats (water user organizations) and Canal Advisory Committees. The objectives of such bodies could be seen from the rules for the same as outlined in Annexure I.

The canal advisory committees are existing on almost all the canals. However, because of certain disputes among the irrigators, Pani Panchayats have not become popular. In recent days, with the introduction of rigid Shejpali or modified Warabandi system, the outlet committees are coming into prominance for the purpose of distribution of irrigation water.

So far as the use of irrigation water on volumetric basis is concerned there is only one co-operative society of farmers viz., Sadwad Mali Pani Puravatha Mandali, which is taking water from Nira Right Bank Canal and distributing it among its members. The other users of irrigation water on volumetric basis are the large farms of Maharashtra State Farming Corporation Ltd.

With a view to maximize use of canal water, to reduce complaints about irrigation water distribution, to decentralise powers and to train the irrigators in co-operative living, the Maharashtra State Irrigation Commission in its report of 1962 had recommended that the work of distribution of canal water should be entrusted to the co-operative societies of irrigators. The State Government accepted the recommendation of the Commission in principle and initially proposed to hand over the work of distribution of canal water to the co-operative sugar factories where 75 per cent of the irrigators agree to entrust the responsibility to the co-operative sugar factories. However, this could not become a reality as there was no response to this proposal. Only two co-operative sugar factories on the Pravara canals in Ahmednagar district accepted this responsibility but gave up the same to the Government after the experience of one year. Thereafter, none of the co-operative sugar factories came forward to take up this work.

Subsequently, the State Government has made a provision under Section 72 of the Maharashtra Irrigation Act, 1976 for handing over the responsibility of management and distribution of water to water committees in case of the canal which is likely to irrigate lands not exceeding 200 hectares. This provision has been made to ensure more economical distribution of irrigation water.

Though there are no water user organizations in a large number, a provision has been made to supply irrigation water to

such organizations at the concessional rate and they are expected to charge the water rates from the co-operators not exceeding. the rates charged for the general irrigators who are not members of the organizations.

Legal Sanctions for Recovery of Arrears of Water Charges

As per the Maharashtra Irrigation Act, the Irrigation Department has prescribed the following dates for payment of the current water charges by the irrigators.

1. Kharif season - 31st May of following year
2. Rabi season - 31st August of following year
3. Hot weather season - 31st January of following year

If the water charges are not paid on the prescribed dates, an extra penalty charge at the rate of 10 per cent on the amount due is to be levied. Similarly if an applicant is in arrears of payment of water charges which became due before the date of application for supply of water, the application is either rejected or sanction is given provisionally subject to the condition that such arrears are paid before a specified date prior to commencement of irrigation supply. The enforcement of this provision, as per canal rules, is dependent on the general rainfall conditions in the commands of the irrigation projects and consequent replenishment in the storages.

In case if an irrigator fails to effect payment of arrears as outlined above, the arrears of water rates are recovered through coercive measures by resorting to the provisions made under the Maharashtra Land Revenue Code.

Government Policy towards Input and Crop Pricing

The general policy of the Government is to supply various forms of inputs to the farmers at reasonable prices and to give them incentives to produce more by way of assuring minimum remunerative prices for the crop output. However, the implementation of this policy is limited to specific forms of inputs and to certain crops. For example, the Government has a control over the prices of fertilizers, electricity, seeds of improved and high yielding varieties of the crops such as foodgrains, oilseeds and cotton, and canal water. The prices of these inputs are declared well in advance and, many a times, they are subsidized. The policy of charging differential interest rates on the loans berrowed by farmers for production purposes is in operation. Such types are price policy measures are, however, totally absent in case of plant protection chemicals and fixed capital inputs.

The assure minimum remunerative prices for crop output to the farmers, the State Government has constituted the Agricultural Prices Committee which is supposed to make recommendations relating to minimum prices of output based on cost of production of different crops. The crops covered under this policy are

major foodgrain crops, cotton, onion, tobacco and sugarcane. The minimum statutory prices are declared well in advance after obtaining consent of the Central Government. The farmers are free to sale their produce at higher price in the market. In case if the market prices fall below the statutory prices declared they are able to sale their produce to the procurement centres/organizations operated by the Government. The monopoly cotton procurement scheme operated by the State since last decade prohibits the private traders effect direct purchases of cotton from the producers.

To make recommendations of minimum prices, the State Government makes use of the farm level cost of production data of various crops collected with the help of a separate machinery operating at the Agricultural Universities in the State.

Finacing of Operation and Maintenance of Irrigation Projects

As stated earlier, the financing of operation and maintenance of irrigation projects is done through the budget provisions made by the State Government as a part of revenue expenditure. Besides, all the irrigation projects are treated similarly for financing the operation and maintenance. In case of the irrigation projects completed through the World Bank finance, however, these norms are on higher side so as to meet the obligations arising out of the agreement between the State Government and World Bank.

Per Hectare Budget Allocation for Operation and Maintenance

Once the irrigation project is completed and goes into the operation and maintenance phase, the provision for operation and maintenance is made in the non-plan sector of the annual budget. The budget provision for the purpose is made on the basis of the following norms which have been laid down in 1980 based on the 1980 cost.

(a) Rs. 80 per hectare of the irrigation potential on the World Bank aided irrigation projects (inclusive of establishment charges).

(b) Rs.60 per hectare of the irrigation potential on all old and new irrigation projects in the State with gated spillways (inclusive of establishment charges).

(c) Rs. 50 per hectare of the irrigation potential on all old and new irrigation projects in the State with ungated spillways (inclusive of establishment charges).

The establishment cost component of the norms has been assumed at 30 per cent of the norm. In practice, however, the provision for establishment is made on the basis of the trend of actual expenditure on establishment and related aspects. The weighted average cost of operation and maintenance as per above norms works out to Rs. 60 per hectare of irrigation potential created. Of this the establishment cost component is taken to be one-third i.e., at Rs. 20 per hectare.

The total budget provision for operation and maintenance would thus depend on the total irrigation potential created for use in a particular year and not as a fixed proportion of the total irrigation budget.

Staffing Levels for Operation and Maintenance of Irrigation Projects

The State of Maharashtra has been divided into six regions for the purpose construction of new irrigation projects and operation and maintenance of existing irrigation systems. The distribution of districts in the individual regions is indicated in Table 4.5.

Table 4.5 : Distribution of Districts in Individual Regions

Region	Districts
1. Konkan	Thane, Raigad, Ratnagiri, Sindhudurg
2. Pune	Pune, Satara, Sangli, Kolhapur, Solapur
3. Nasik	Nasik, Ahmednagar, Dhule, Jalgaon
4. Aurangabad	Aurangabad, Beed, Parbhani, Jalna, Latur, Nanded, Osmanabad
5. Amaravati	Buldhana, Akola, Yavatmal, Amaravati, Wardha, Chandrapur, Gadchiroli
6. Nagpur	Nagpur, Bhandara

The Chief Engineer is incharge of one region and he has to co-ordinate the activities relating to construction of irrigation projects, operation and maintenance of irrigation systems and monitoring and evaluation. Separate wings are created under the Chief Engineer to look after these activities.

Each of region is divided into 3 to 5 circles depending upon the river basins and sub-basins and number of irrigation projects (both under construction and in operation) in each

each region. The Superintending Engineer is incharge of the circle. He has to look after the activities of construction of irrigation projects, operation and maintenance of irrigation systems and monitoring and evaluation of irrigation projects in the circle. The separation of these activities really start from the circle level. In that, so far as operation and maintenance of irrigation systems are concerned, the individual circle is divided into 2 to 4 divisions and the Executive Engineer incharge of the division is responsible for operation and maintenance of irrigation systems. Similarly, the Executive Engineers incharge of construction activities work under the Superintending Engineer of the concerned circle.

As stated earlier, each of the division responsible for operation and maintenance of irrigation systems is divided into 4 to 6 sub-divisions and each sub-division is composed of 4 to 6 sections. The sub-division headed by a Deputy Engineer and the section is headed by a Junior Engineer.

Thus, there exists a separate cadre of staff at the division, sub-division and section levels for operation and maintenance of irrigation systems. The original staff norms prescribed in the year 1968 have been changed in the year 1982. The staff norms for operation and maintenance of irrigation systems prescribed during the years 1968 and 1982 are given in Annexure-II separately for the division, sub-division and section levels.

Objectives of Collecting Water Charges

The primary objective of the Government in collecting water charges from the farmers and other beneficiaries is to obtain revenue from water rates to be able to recover the cost on account of operation and maintenance of irrigation projects and to provide in addition 1 per cent return to the Government to meet the depreciation cost of the project.

Keeping in view the losses being incurred by the irrigation projects in the country, the Eightth Finance Commission has mentioned in para 3.18 of its report the irrigation projects should atleast recover the cost on operation and maintenance though there may not be any return on investments in these projects in the forecast period. Similar view was held in the Seventh Conference of the Irrigation Ministers held in December, 1982 .

Table 4.6 gives information on actual expenditure on operation and maintenance of irrigation projects in Maharashtra and the revenue receipts for the period of five years.

Considering the irrigation charges along with other receipts (viz., Employment Guarantee Scheme and Education cesses) it is seen that the revenue receipts exceeded the actual working expenses on the irrigation projects in Maharashtra.

Table 4.6 : Actual Working Expenses on Operation and Maintenance and Revenue Receipts of Irrigation Project in Maharashtra

(Rs.in lakhs)

Particulars	1979-80	1980-81	1981-82	1982-83	1983-84	Total
I. Working Expenses						
i) Establishment	598	722	797	947	1160	4224
ii) Works	458	554	769	845	1084	3710
Total	1056	1276	1566	1792	2244	7934
II. Revenue Receipts						
i) Irrigation Water charges	970	1057	1130	1122	1313	5592
ii) Other water	253	116	316	349	260	1294
iii) Employment Guarantee Scheme cess on irrigated areas	156	177	191	175	216	915
iv) Education cess on irrigated areas	178	199	214	201	130	1022
Total	1557	1549	1751	1847	1919	8623

Source - Office Records of Irrigation Deptt., Govt. of Maharashtra

5. SYSTEM LEVEL STUDY OF OPERATION AND MAINTENANCE OF IRRIGATION PROJECTS

The present Chapter is devoted to discuss in detail the aspects of systems characteristics, systems operation, paying for operation and maintenance and water charges - incremental farm income relationship in respect of the average irrigation systems of three types i.e., major, medium and minor. The system level and farm level data/information of the year 1984-84 have been used for studying these aspects.

I. Systems Characteristics

Age of the System

The frequency distribution of the sample irrigation systems is given in Table 5.1 according to different age classes of the irrigation systems.

Table 5.1 : Frequency Distribution of the Sample Irrigation Systems According to Age Classes

System types	Number of systems in age classes					Average age (years)
	Less than 10 years	10 to 20 years	20 to 30 years	30 to 40 years	Above 40 years	
Major	1	1	-	1	2	37
Medium	1	2	1	1	-	22
Minor	1	1	2	1	-	23
Total	3	4	3	3	2	27

The sample irrigation systems have been completed at different time periods. The age of the average irrigation systems worked out to be 37, 22 and 23 years in case of the major, medium and minor irrigation systems, respectively.

Important Features of the Irrigation Systems

Table 5.2 presents information relating to some of the features of the average irrigation systems.

Table 5.2 : Information of Important Features of the Average Irrigation Systems

Particulars	Major project	Medium project	Minor project
1. Length of main canal(Kms)	95.98	25.13	6.47
2. Length of branch canal (Kms)	69.64	29.54	2.70
3. Length of distributories (Kms)	387.20	40.71	1.50
*4. Command area (ha)	73557.20	8357.40	658.40
5. Number of villages in command	154	27	5
6. Number of operating sections	15.40	2.20	0.40

* Includes culturable area only.

The features of the average systems belonging to individual categories are self-explanatory.

History of Rehabilitation of the Systems

It was rather difficult to obtain detailed information on major rehabilitation in case of the old irrigation systems. At the same time it was reported that the new irrigation systems did not require major rehabilitation programmes. The minor rehabilitation programmes, however, included the activities of repairs to canals, branches, distributories and field channels, removal of silt in some cases, cleaning of field channels, removal of trees and bushes, etc., and the same where performed as and when required. No separate account of expenses on these activities was available.

Seasonwise Area Irrigated in the Command

The details of the total command area irrigated during individual crop seasons are given in Table 5.3 for the average irrigation systems.

Of the total command area of 73557.20 hectares, 8357.40 hectares and 658.40 hectares of the major, medium and minor irrigation projects, respectively, about 30 to 45 per cent area was irrigated by the systems, the lowest and the highest proportions being for major and minor projects. About 17 per cent of the command area was irrigated in rabi season and 8 per cent in hot weather season in case of the major irrigation projects. In case the medium irrigation projects 24 per cent of the command area was irrigated in

rabi season and 9 per cent in hot weather season. Contrary to this, about 34 per cent of the command area was irrigated in rabi season and 4 per cent in hot weather season in case of the minor irrigation project. The area irrigated in kharif season ranged between 6 and 9 per cent of the total command area in case of all the irrigation projects. The supply of irrigation water for annual and perennial crops was observed only in case of the major and medium irrigation projects and the proportion of such area was 3 to 4 per cent of the total command area.

Table 5.3 : Seasonwise Area Irrigated in the Command of the Average Irrigation Systems

(Hectares)

Particulars	Major project	Medium project	Minor project
Total area in the command	73557.20 (100.00)	8357.40 (100.00)	658.40 (100.00)
Total irrigated area	27974.49 (38.03)	3706.46 (44.35)	293.40 (44.56)
(a) Kharif season	6495.80 (8.83)	751.31 (8.99)	41.50 (6.32)
(b) Rabi season	12259.80 (16.66)	2012.71 (24.08)	225.60 (34.26)
(c) Hot weather season	6176.19 (8.40)	725.58 (8.69)	26.20 (3.98)
(d) Perennial	3042.70 (4.14)	216.86 (2.59)	- -

(Figures in the parentheses are percentages to the total command area)

Ownership of Water and System Facilities

The ownership of water and system facilities is vested with the State Government. The distribution of irrigation water among the farmers is managed with the help of the staff in the Irrigation Department separately meant for operation and maintenance of irrigation systems.

Availability and Use of Water in Different Seasons

The details of the availability and use of water in different seasons are given in Table 5.4 for the average irrigation systems.

The use of water for irrigation has been observed to be relatively more in rabi and hot weather seasons in case of the major and medium irrigation projects. On the contrary, the availability of water for irrigation was observed in kharif and rabi seasons only in case of the minor irrigation projects.

The limited use of irrigation water in kharif season was due to the constraint on availability of water in the reservoir at the time of effecting kharif sowings.

Table 5.4 : Details of Availability and Use of Water for the Average Irrigation Systems

(Million cubic feet)

Particulars	Major project	Medium project	Minor project
1. Designed storage capacity	17940	2386	122
2. Carry over for next year	3080	165	-
3. Actual storage on 1st July	2124	212	24
4. Actual storage on 15th October	17438	1829	114
5. Actual storage on 1st March	10867	1118	40
6. Maximum storage observed	17681	1754	112
7. Water used for kharif irrigation	2206	206	26
8. Water used for rabi irrigation	9747	882	76
9. Water used for hot weather irrigation	7800	610	-
10. Water used for lifts	155	86	-
11. Water for domestic use	3598	28	-
12. Water allowed to flow through river course	12346	103	-

Projected and Actual Area Irrigated in Different Seasons

Table 5.5 presents the details of seasonwise projected and actual area irrigated in the command of average irrigation systems.

Table 5.5 : Seasonwise Projected and Actual Area Irrigated in the Command of Average Irrigation Systems

(Hectares)

System types	Projected/ Actual	Kharif season	Rabi season	Hot weather season	Perennial	Total
Major	Projected	19347.20	20155.20	3339.40	2539.00	45380.80
	Actual	6495.80	12259.80	6176.19	3042.70	27974.49
		(33.57)	(60.83)	(184.95)	(119.84)	(61.64)
Medium	Projected	3618.80	3080.60	641.00	294.00	7634.40
	Actual	751.31	2012.71	725.58	216.86	3706.46
		(20.76)	(65.33)	(113.20)	(73.76)	(48.55)
Minor	Projected	250.60	352.20	60.20	-	663.00
	Actual	41.60	225.60	26.20	-	293.40
		(16.60)	(64.05)	(43.52)	-	(44.25)

(Figures in the parentheses indicate percentages of actual irrigated area to projected irrigated area).

The critical examination of the figures given in Table 5.5 reveals that there existed wide variations in the projected and actual area irrigated in all the seasons for different types of irrigation systems. It is rather difficult to point out a specific reason for such wide variations in the projected and

actual area irrigated. Perhaps, defects in choosing the base for setting projections of irrigated area and underutilization of available irrigation in kharif and rabi seasons resulting from several inefficiencies in irrigation water use at the system and farm levels could be thought of as the probable reasons for these variations. The actual area irrigated for growing hot weather and perennial/annual crops was quite higher than the projected area irrigated in case of the major and medium projects. Mostly the water left over in the reservoirs after meeting the demand for kharif and rabi crops seems to have been used advantageously for irrigating areas under hot weather and perennial/annual crops.

If we reconcile the information given in Tables 5.4 and 5.5, it could be conduded that adequate water was not available in kharif and rabi seasons in case of all the irrigation systems. The enquiries with the sample farmers further made it clear that the irrigation water supplies were not predictable and reliable in kharif season and they used irrigation water for supplemental irrigation to the food-grain crops grown in rabi season.

Number of Farms and Average Farm Size

The information on the number of farms served and total area owned by the farms per average irrigation system is given in Table 5.6 according different size classes of farm holdings.

Table 5.6 : Number of Farms Served and Average Farm Size in the Command of the Average Irrigation Systems

Size class and particulars	Major project	Medium Project	Minor project
Less than 2 hectares			
(a) Number of farms	8527	2913	109
(b) Total area owned (ha)	11940.40	3405.15	196.20
(c) Average farm size (ha)	1.40	1.17	1.80
2 to 4 hectares			
(a) Number of farms	4614	694	46
(b) Total area owned (ha)	14342.60	1860.59	116.80
(c) Average farm size (ha)	3.11	2.68	2.54
Above 4 hectares			
(a) Number of farms	4934	389	48
(b) Total area owned (ha)	26362.00	2152.25	259.60
(c) Average farm size (ha)	5.34	5.53	5.41
Total (a) Number of farms	18075	3996	203
(b) Total area owned (ha)	52645.00	7417.99	572.60
(c) Average farm size (ha)	2.91	1.86	2.82

The average major, medium and minor irrigation systems served 18075, 3996 and 203 farms, respectively and the total area owned by these farms was 52645.00 ha., 7417.99 ha and 572.60 ha. At the overall level, the average farm size worked out to 2.91 ha., 1.86 ha and 2.82 ha in case of the major, medium and minor irrigation systems, respectively.

From the classification of the farms into three size classes (i.e., Less than 2 ha, 2 to 4 ha and above 4 ha), it was observed that the average farm size ranged between 1.40 to 5.34 ha in major irrigation project command, between 1.17 to 5.53 ha in medium irrigation project command and between 1.80 to 5.41 ha in minor irrigation project command.

Cropping Pattern and Crop Yields

Table 5.7 presents the cropping pattern in irrigated command area of the average irrigation systems alongwith per hectare yields of different crops.

Among the foodgrain crops, jowar (kharif and rabi), bajra and wheat are the important crops. The commercially important crops grown in the area are groundnut (kharif and hot weather), cotton and sugarcane.

No separate crop yields were available for the crops grown under irrigated and rainfed conditions. However, the farm level crop yield estimates revealed that the yield levels of crops such as jowar, bajra, wheat, cotton and groundnut were almost 2 to 3 time higher when grown under irrigated conditions as compared to the yield levels for rainfed conditions.

The cropping intensity worked out to 128.30, 124.25 and 115.20 per cent in the areas served by major, medium and minor irrigation systems, respectively.

Table 5.7 : Cropping Pattern and Average Crop Yields in the Irrigated Command of the Average Irrigation Systems

Crop	Major project		Medium project		Minor project	
	Area (ha)	Yield (qtls/ha)	Area (ha)	Yield (qtls/ha)	Area (ha)	Yield (qtls/ha)
1. Paddy	2043	15.47	272	11.52	6	9.47
2. Kharif jowar	5726	19.96	1361	17.21	204	12.34
3. Rabi jowar	8644	11.62	264	16.33	159	13.80
4. Bajra	8498	14.75	259	10.25	35	8.58
5. Wheat	8307	16.04	1408	14.96	37	14.50
6. Gram	790	9.84	416	8.00	8	9.84
7. Maize	577	13.00	68	-	-	-
8. Kharif groundnut	4872	12.78	783	14.00	68	11.50
9. Summer groundnut	2847	18.46	1336	17.55	29	14.50
10. Chillies	2924	-	54	-	-	-
* 11. Banana	819	15.44	-	-	-	-
* 12. Sugarcane	2102	103.60	404	110.30	-	-
13. Cotton	9187	11.90	1776	12.69	11	8.65
14. Other crops	1274	-	216	-	34	-
Gross cropped area	58610		8617		591	
Net cropped area	45682		6935		513	
Cropping intensity (per cent)	128.30		124.25		115.20	

* Yield in tonnes per hectare

Annual Rainfall

Table 5.8 presents the details of annual rainfall in the command of the average irrigation systems.

Table 5.8 : Annual Rainfall in the Command of the Average Irrigation Systems

(mm)

System type	Rainfall range	Average annual rainfall
Major	625 to 1200	946
Medium	543 to 920	740
Minor	560 to 875	712

The annual rainfall ranged between 543 to 1200 mm among the command areas of the sample irrigation systems. The average annual rainfall was 946, 740 and 712 mm in the command of the average major, medium and minor irrigation systems.

II. Systems Operation

The systems operation has been described below with special reference to the existing method of delivering water, farmers' complaints and involvement of officials and water user organizations for operation and maintenance at different levels of the system.

Method of Delivering Irrigation Water

The rotational method of delivering irrigation water has been adopted in case of all the sample irrigation systems under study. In that, the water is allowed to flow through canals and the same is delivered to the users at fixed intervals The dates of delivering irrigation water are notified well in advance and water is supplied to the farms with field to field method on rotation.

The rotation intervals are determined depending upon the type of irrigation blocks sanctioned on a particular distributory and seasonal conditions. The interval period usually remains quite long with less concern about water requirement of crops. This practice has usually resulted into the increased tendency of farmers to use excessive irrigation for the crops without bothering about the consequent ill effects of excessive irrigation.

Farmer Complaints

The major complaints of the farmers related to timely supply of irrigation water and obtaining sanction for the irrigation block desired. The complaints with regard to the difficulties in obtaining for the irrigation blocks were made firstly to the Section Officer and then to the Deputy Engineer in-charge of the division. It was reported in certain cases that farmers used to take help of local leaders in getting the problem solved.

The complaints relating to timely supply of irrigation water were usually made to the canal Inspectors and help of Section Officer was taken under the circumstances when the complaints remained unattended at the level of Canal Inspector.

The Officials responsible for operation and maintenance of the irrigation systems reported that they receive complaints quite often in large number. However, from the point of view of giving benefits of limited irrigation water to a maximum number of farms on equitable basis within the ~~for~~ framework of government policy, it goes difficult for them to attend all such individual complaints positively. Many a time,the officials remained prompt in attending to the genuine complaints.

Responsibility of Operation and Maintenance

The existing arrangement, for operation and maintenance of irrigation systems in the State has already been discussed earlier. The similar pattern was observed in case of the sample irrigation systems.

For the major irrigation systems, the Superintending Engineer is responsible for operation and maintenance of the system and he is assisted by the Executive Engineer at the division level, Deputy Engineer at the Sub-division level and Junior Engineer at the section level. At the grass-root level, the Canal Inspectors are looking after the activities of

distribution of irrigation water to beneficiaries, maintenance of field channels, drainage works, etc.

In case of the medium irrigation projects, the Deputy Engineer in-charge of the system and he seeks guidance of the Executive Engineer in the matters relating to operation and maintenance of the system. He is assisted by the Junior Engineers and Canal Inspectors at the section and field levels.

The Junior Engineer is in-charge of the minor irrigation project. He is guided by the Deputy Engineer of the Sub-division. At the field level, he is assisted by the Canal Inspectors in operation and maintenance of the system.

Water User Organizations

Though there is a provision for formation of water user organizations, no formal organizations of water users were observed in case of all the sample irrigation systems. The Canal Advisory Committees, however, meet periodicaly to render guidance to the officials in the matters of operation of the systems. A few informal organisations of water users were reported to be active in maintaining field channels at limited places.

When enquired with the sample farmers, it was reported that there was a need for having water user organizations for allocating water and maintaining field channels. Quite a few farmers expressed doubts about the effectiveness of such organizations due to probable interference of political forces.

From the farm level study, a few examples were observed wherein farmers provided free labour for maintaining field channels.

III. Paying for Operation and Maintenance

The efficiency of operation and maintenance of the irrigation systems needs to be judged on the basis of the comparison of recurrent costs with revenue receipts realized through collection of water charges. An attempt is made in this section to discuss in brief the various aspects relating to recurrent costs of operation and maintenance and revenue receipts of the irrigation systems included in the sample. Wherever required, the farm level data have been used to work out estimates of some of the variables to supplement observations at the system level.

Types and Amounts of Water Rates

The water rates of individual crops are charged on per hectare irrigated basis and these rates remain common for all the irrigation systems in the State sufficiently for a long period of a decade or more. Table 5.9 presents the per hectare water rates of different crops for the years 1960-61, 1970-71, 1975-76 and 1983-84.

Table 5.9 : Per Hectare Water Rates for Different Crops

(Rupees)

	Crop	Per hectare water rates in			
		1960-61	1970-71	1975-76	1983-84
1.	Kharif jowar	15.00	15.00	50.00	50.00
2.	Paddy	15.00	15.00	50.00	50.00
3.	Bajra	15.00	15.00	50.00	50.00
4.	Groundnut	30.00	30.00	100.00	100.00
5.	Rabi jowar	22.50	22.50	75.00	75.00
6.	Wheat	22.50	22.50	75.00	75.00
7.	Gram	22.50	22.50	75.00	75.00
8.	Summer groundnut	-	-	300.00	300.00
9.	Cotton	75.00	100.00	250.00	250.00
10.	Sugarcane	300.00	450.00	750.00	750.00
11.	Plantation crops	300.00	450.00	750.00	750.00

The water rates of different crops, which were fixed during 1960-61, continued to be the same for a period of fifteen years. The present water rates were brought in force from the year 1975-76.

The farmers are required to pay the amount of water rates directly to the Irrigation Department. In addition to the water rates, the farmers are required to pay extra charges on account of Employment Guarantee Scheme and Education cesses imposed by the State Government since last decade in the proportion

of 1 per cent and 10 per cent of the water rates, respedtively These payments are made to the Revenue Department at the time of paying annual land revenue taxes on the land owned by the farmers.

From the farm level study it was observed that some of the farmers incurred additional informal expenditure on entertainment and other account besides paying formal water charges (inclusise of water rates and cesses). However such cases were rare and difficult to quantify.

Proportions of Farmers Paying Water Rates

All the farmers taking benefit of irrigation water from irrigation systems are required to pay the amount of water rates regularly. Yet some farmers do not paythe amount in time or some others pay only a part of the total amount. Table 5.10 indicates the proportions of farmers paying water rates in time alongwith the recovery percentages for the average irrigation systems.

Table 5.10 : Proportions of Farmers Paying Water Rates in Time and Water Rates Collection Percentages for th Average Irrigation Systems

System type	Percentage of farmers paying water rates in time	Percentage of amount of water rates collected during the year
Major	63.84	67.12
Medium	68.23	64.49
Minor	51.45	58.33

The proportions of farmers paying water rates in time ranged between 51.45 and 63.84 per cent, the lowest and the highest proportions being in case of the minor and major irrigation systems, respectively. Similarly, the amount of water charges collected during the year was 67.12, 64.49 and 58.33 per cent of the total amount, respectively, in case of the major, medium and minor irrigation systems.

Cost Recovery Index

The data on total amount of water charges, amount of water charges received, other receipts and costs on operation and maintenance of irrigation system were obtained for three years from 1981-82 to 1983-84 for the sample irrigation systems. The details of the annual receipts and recurrent costs of the average irrigation systems are given in Annexure III.

Based on the details of receipts and recurrent costs as given in Annexure III, the cost recovery indexes have been worked out and the same are presented in Table 5.11.

The cost recovery indexes varied considerably during the period of three years for the sample irrigation systems. The overdues of water charges have resulted into keeping down the cost recovery indexes at a lower level. If the cost recovery indexes are estimated by considering total water charges as the percentage of total recurrent cost, the same give encouraging picture relating to functioning of the irrigation systems. However, this could become a reality only on increasing the efficiency level of collecting water charges.

Table 5.11 : Cost Recovery Indexes of the Average Irrigation Systems

	Particulars	Year	Major project	Medium project	Minor project
1.	Total water charges as percentage of total cost	1981-82	173.53	100.18	137.50
		1982-83	146.67	111.11	138.46
		1983-84	132.81	96.03	113.79
2.	Total water charges and other receipts as percentage of total cost	1981-82	175.44	107.22	137.79
		1982-83	149.89	118.87	138.46
		1983-84	135.51	100.13	113.79
3.	Amount of water charges collected as percentage of total cost	1981-82	81.55	50.88	91.67
		1982-83	90.99	67.73	60.71
		1983-84	88.84	61.92	65.52
4.	Total annual receipts as percentage of total cost	1981-82	99.61	121.30	116.67
		1982-83	100.22	94.37	67.86
		1983-84	102.82	96.03	86.21

Comparison of Changes in Water Rates and General Price Index

Table 5.12 presents the comparison between changes in water rates index and general price index over the period from 1970-71 to 1983-84.

Table 5.12 : Changes in Water Rates Index and General Price Index

Year	Water rates index		General price index
	Foodgrain crops	Cash crops	
1970-71	100.00	100.00	100.00
1975-76	333.33	250.00	172.90
1980-81	333.33	250.00	257.30
1982-83	333.33	250.00	288.60

The comparison of charges in water rates index and general price index reveals that the increase in water rates of foodgrain crops was more than proportionate as compared to the increase in general price index. The increase in water rates of cash crops was, however, less than proportionate in relation to the increase in general price index. It may be mentioned here that the water rates prevalent in 1970-71 were fixed in the year 1960-61.

Method and Time of Collection of Water Rates

As prescribed by the Irrigation Department, the farmers are required to pay water rates of the crops grown in differen seasons in lump-sum on or before the dates as indicated below.

1. Kharif season crops - 31st May of following year
2. Rabi season crops - 31st August of following year
3. Hot weather crops - 31st January of following year

The water rates are collected in the office of the individual sections.

Link Between Water Rates and Operation and Maintenance Services

It has been observed that the costs on account operation and maintenance were not considered for deciding water rates. On the contrary, the water rates were fixed on per hectare irrigated basis of different crops depending upon their incremental income levels when grown under irrigated conditions. However, fixation of water rates was not done quite often as it involved some difficulties.

The sample farmers reported that the yield levels and incremental income of the crops grown under irrigated conditions are quite high as compared to the rainfed crops. They would not consider water rates as a burden so long as irrigation water supply remained timely and in adequate quantities.

Factors Helping Collection of Water Charges

The following factors were reported to be helpful for the most successful efforts to collect water rates :

1. Government rules for sanction of application for supply of irrigation water on payment of water charges of previous year;
2. Imposition of penalty for non-payment of water charges on prescribed dates;
3. Good services, and
4. Close contact with the farmers.

Among the above factors, the farmer two have been observed to be the most important for helping the collection process. This observation was supported substantially by the farm level enquiry.

Spending for Operation and Maintenance

Table 5.13 presents information on per hectare norms and actual expenditure incurred on operation and maintenance of the sample irrigation systems.

Table 5.13 : Per Hectare Norms and Actual Expenditure for Operation and Maintenance of Irrigation Systems

(Rs. per hectare)

System type	Prescribed norm	Actual expenditure
Major	60.00	261.06
Medium	60.00	210.44
Minor	50.00	98.84

It is evident from the table that the per hectare actual expenditure incurred was quite higher than the prescribed norms for operation and maintenance of the irrigation systems. The amount needed for effecting improvements in operation and maintenance would necessarily be higher than the existing expenditure level. The sample farmers opined that they would readily meet a part of incremental expenditure on account of improved operation and maintenance provided such improvements help them getting timely and adequate water supplies.

Penalty for Non-payment of Water Charges

The following penalty measures are adopted for non-payment of water charges.

1. An extra penalty of 10 per cent on the amount of water charges is recovered from the farmers for non-payment of water charges in time.

2. The application for sanction of irrigation water supply for the next season is refused and it is considered only after effecting payment of all the dues of water charges.

3. In case of non-payment of water charges as per above provisions, the arrears of water charges are recovered through coercive measures by resorting to the provisions made under the Maharashtra Land Revenue Code.

Water Charges and Incremental Farm Income

The estimates of incremental farm income and cost on account of irrigation water charges are given in Table 5.14 on per farm basis. These estimates are worked out on the basis of the costs and returns structure of crop production activities of the sample farms for two different situations i.e., irrigated and rainfed.

Table 5.14 : Per Farm Water Charges and Incremental Farm Income of the Sample Farms

Particulars	Amount (Rs.)
1. Cost of irrigation water charges	852.66
2. Incremental cost of crop production	4577.62
3. Incremental gross income	11663.20
4. Incremental farm income	7085.58
5. Irrigation water charges as percentage of incremental farm income.	12.03

The per farm cost of irrigation water charges was 12.03 per cent of the incremental income of the sample farms.

6. CONCLUSIONS

Based on the foregoing discussions, the study concludes that :

1. The State Government has given due attention for operation and maintenance of irrigation systems by way of creating a separate wing for the purpose. The operation and maintenance mechanism is, however, not sufficient for scientific use of irrigation water at the system and farm levels.

2. As a result of several inefficiencies inherent with the operation and maintenance mechanism, quite a large proportion of irrigation water resource remains unutilized.

3. The State Government has set definite procedures for fixing water rates, norms for operation and maintenance sot cost, sanction of water demand application, collection of water charges, formation of water user organizations, etc. There are, however, some drawbacks in execulation of these procedures. In that, the water rates are not revised from time to time and the norms for operation and maintenance cost are quite low as compared to the amount actually spent for the purpose.

4. The estimates of water availability and projected area for irrigation in different seasons need to be worked out on scientific basis for the individual irrigation systems.

5. The farmers expect prompt services of water supply. They would respond positively for paying higher water rates under situation of assured water supply.

Annexure-I

Canal Advisory Committees and Water Panchyat Committee; Establishment of the on the Various Canal System.

GOVERNMENT OF BOMBAY.
PUBLIC WORKS DEPARTMENT.
Resolution No. 3647/36 - II.
Bombay Castle (Bombay No.1), 17th May 1951.

Read Government Resolution No. 3647/36-II, dated the 30th May 1947.

Letter No.G.R. 49, dated the 17th February,1949 from the Superintending Engineer, Karnatak Irrigation Circle.

Letter No. G.R. 49, dated the 29th June, 1949, from the Superintending Engineer, Southern Circle,

Letter No.P.F.-51/5017, dated the 7th June,1950, from the Superintending Engineer, Deccan Irrigation Circle.

RESOLUTION : On the recommendations of the local officers, Government is pleased to revise the constitution and Rules of Business of Canal Advisory Committees and Water Panchayat Committees. The accompanying revised rules will come into force hereafter.

By order of the Governor of Bombay.

Sd/x-x-x
V.W.GOTHOSKAR,
Deputy Secretary to Government.

To,

The Finance Department.
The Revenue Department.
The Agriculture and Forests Department.
The Development Department
The Chief Engineer, Public Works Department.
The Superintending Engineers of Circles.
All Collectors of Districts
The Accountant General, Bombay.
The Deputy Accountant General, Baroda,
The Executive Engineers in charge of Irrigation Works.
The Director of Publicity.

No. of 1951

Copy forwarded and guidance to

Accompaniments to Government Resolution, Public Works Department.

No.3647/36-II, dated the 17th May 1951.

CONSTITUTION AND RULES OF BUSINESS OF CANAL ADVISORY COMMITTEES.

Rules.

1. These Rules may be called "The Canal Advisory Committee" Rules, 1947."

2. In these rules.

(a) "Canal Advisory Committee" shall mean the "Committee" constituted in accordance with the rules.

(b) "Executive Engineer" shall mean the Executive Engineer of the Public Works Department Division" concerned or any other officer deputed by him in this regard by a general or special order.

(c) "Sub-Divisional Officer" shall mean the "Sub-Divisional Officer of the Public Works Department Sub-Division" concerned.

3. Subject to the approval of the Superintending Engineer the activities of a Canal Advisory Committees will extend over the entire area served by one (or more) specific irrigation system, provided that no Committee shall have to deal with more than one Executive Engineer.

4. The whole body of irrigators in the sphere of activities of each Committee will consitute a "Bagaitdar Sangh" and every irrigator will ipso facto be a member of the Sangh as long as he holds a valid pass for irrigation on the irrigation system concerned.

5. The composition of the Canal Advisory Committee shall be as under :

Chairman-
Executive Engineer.
Member-

1) One representative of the Agricultural Department.

(2) One representative of the Revenue Department.

(3) One representative of the Sugar Factories nominated by the Deccan Sugar Factories Association.

(4) Two Local Irrigators for each canal nominated by Government.

(5) Two Local Members of Legislative Assembly or Members of Legislative Council nominated by Government. The Sub-Division- officers concerned will be present at the meetings but will not be members of the committee.

Secretary-

The Executive Engineer may select one of the Sub-Divisional Officers mentioned above as the Secretary (non-member)

6. The non-official members will hold office for two years. The retiring members will, however, be eligible for renomination.

7. The functions of the Committee will be strictly advisory and will generally cover the following items :-

(a) The exchange of views on the needs of irrigated crops as regards the quantity of water required, irrigation invervals, dates of plantation and harvest, etc.

(b) The collection and distribution amongst irrigatiors of information about new varieties of crops.

(c) Suggesting measures for improving the supply of seed and the prevention and eradication of crop pests and diseases.

(d) Submission to the Irrigation Department of information and requests in respect of (a) to (c) abov

(e) Maintenance of a continuous liaison with the Water Panchyats operating on the canals concerned.

(f) Receiving petitions, appeals, etc. of a general nature from Water Panchayats and discussieng the same

(g) Holding Irrigators' Conference in January every year when demonstrations, exhibitions and lectures by experts on irrigation, agriculture, co-operation, etc., may be arranged.

(Note- The Committee will have no authority to inquire into or interfere with the internal administration and working of the Irrigation Department or with questions of personal and discipline; and if any question arises at any meeting as to the validity of a matter raised for discussion, the decision of the Chairman will be final).

8. The Chairman will ordinarily convene meetings of the Committee at least three times a year. The dates of the meetings should be so arranged that there is at least one meeting in each of the kharif, rabi and hot wheather seasons. The notice for such meetings will not be less than 10 days. The Chairman will be at liberty to request any other persons, official or non-official to attend any meeting of the Committee whenever their presence and advice appear to him to be desirable. The person or persons so invited will, however, have no right of voting.

9. Any subject relating to irrigation on the canals concerned may be brought up for discussion by any member of the Committee.

10. The agenda for each meeting shall be circulated to all members ten days before the date of such meeting and it will include all items received and approved by the Chairman up-to-date, Urgent business may, however, be taken for consideration at any meeting without notice, with the consent of the Chairman.

11. The Chairman will keep the Superintending Engineer informed from time to time regarding work done by the Committee.

12. Non-official members of the Committee will be eligible for travelling expenses under the rules in Appendix XLII-A of the Bombay Civil Services Rules Manual as amended from time to time.

CONSTITUTION AND RULES OF BUSINESS OF A WATER PANCHAYAT COMMITTEE.

Rules

1. These Rules may be called "the Water Panchayat Committee Rules, 1947".

2. In these rules :

(a) "Panchayat Committee" shall mean the "Panchayat committee" constituted in accordance with the following rules.

(b) "Group" means the "particular group of Irrigators" as defined in Rules No.3.

(c) "Executive Engineer" shall mean the "Executive Engineer of the Public Works Department Division" concerned or any other Officer deputed by him in this regard by a general or special order.

(d) "Sub-Divisional Officer" shall mean the "Sub-Divisional Officer of the Public Works Department Sub-Divisional" concerned.

3. The sphere of activities of each Panchyat Committee shall ordinarily be equivalent to the beat of a Canal Inspector and the Executive Engineer shall have the power to fix its exact limits in each particular case. All the irrigators within this limit shall be collectively termed the "Group of Irrigators".

4. Each Panchayat shall consists of three to seven Panchas, and the Executive Engineer shall have the power to fix the exact number in each case and also to nominate additional Panchas to secure sufficient representation of small bagayatdars and also of bagayatdars at the tail on the Panchayat Committee.

5. At a meeting held in accordance with Rule 8 the group shall elect candidates for being appointed as Panchas and number to be elected shall be double the number of vacancies to be filled. The names of all the elected candidates shall be arranged to discending order of number of votes secured by each, and from the list so prepared, the first half shall be appointed as Panchas.

6. Panchas* shall be appointed for a period of two years. About half the number of Panchas shall retire in rotation each year. Elections shall be held each year for

the purpose of filling such vacancies. The retiring Panchas will be held eligible to contest the new elections.

(Explanation - When a Panchyat is newly established, about half the number of Panchas in the order of votes secured will be appointed for two years and the rest for only one year).

7. If any Panch retires before the expiry of his term of office, the vacancy so caused shall be filled by appointing the next available elected candidate on the list prepared as laid down in Rule No.5 above, When no such candidates are available, the required number will be elected in accordance with the provision of Rules Nos. 5 and 8.

8. For the purpose of holding the elections of candidates for being appointed as Panchas the Sub-Divisional Officer shall convene a meeting of the group with a notice of not less than seven days as regards date, time and place thereof. The elections shall be made by majority of votes of eligible bagaitdars in the group under the supervision of the old Sarpanch or another President specially elected at the meeting. The President shall communicate to the sub-Divisional Officer within 3 days the results of such elections, failing which the sub-divisional officer shall assume that the elections were not held and shall then take such further action as would appear to him necessary.

9. Any bonafide irrigator who has had sanction of irrigation in the preceding year within the limits of the Group concerned shall be eligible to vote at the election meetings, provided he attends the meeting in person.

10. Any bonafide irrigator who has had sanction of irrigation in the preceding year within the limits of the group at the time of an election shall be eligible to contest for the seat of Panch.

11. A Panch shall cease to be a Panch and vacate his seat in the Panchyat if he fails to have any sanction of irrigation on the Canal for a period of 12 months while water could have been made available to his land or if he takes water unauthorisedly to a crop not sanctioned under the Irrigation Rules. A Panch who takes water unuthorisedly should not be eligible for re-election for a period of two years.

12. As soon as the annual elections of new Panchas are declared, the old and new Panchas together shall elect Sarpanch for the ensuing year.

13. The business year of the Panchyat shall be reckoned from 15th February to 14th February. The election of Panchas for the ensuing year shall be held in the second fortnight of January.

* Panch = member of Panchyat Committee.

Please see rule No.9.

14. As soon as a Panchyat is constituted, it shall be held responsible for carrying out the following duties.

(a) To prepare Pali-Patraks.

(b) To estimate the quantity of water required in the ensuing rotation and inform the Sub-Divisional Officer about it, so as to make it convenient for the latter to arrange for a suitable supply of water consistant with the interest and convenience of the Canal as a whole.

(c) To advise the irrigators as necessary and to ensure that water is not used without a valid pass, out of turn, unauthorisedly or extravagantly and to prevent waste of water.

(d) To hold panchamas, etc., in accordance with rules against those who commit such offences as are mentioned in (c) above.

(e) To settle mutually the complaints arising in connection with items (a) to (d) above and to communicate to the Sub-Divisional Officer, in writing their disposal together with the complainant's acceptance, of such disposal.

(f) To offer suggestions to the Sub-Divisional officer regarding equitable and economic distribution of canal water.

(g) To disseminate among the Irrigators information regarding the latest Government orders and notificatio concerning irrigation and agricultural matters.

15. The Sarpanch shall convenee meetings of the Panchyat at a suitable place and from time to time as may be necessary, provided that the interval between any two such meetings shall not exceed 3 months. Representatives of the Irrigation and Co-operative Departments shall all be requested to attend these meetings though they shall not vote. The reports of the meeting shall be sent to the Sub-Divisional Officer in writing.

16. A Canal-Inspector or Patkari appointed by the Executive Engineer shall continue to carry out all the duties mentioned in Rule 14 above, with the assistance of the Panchayat, for so long as the latter is not considered by the Executive Engineer to be fully capable of undertaking these duties independently.

17. The Panchyat shall be eligible after duly passing a resolution to that effect, to request the Executive Engineer to withdraw the Canal Inspector or the Patkari and if such demand is not fulfilled within 6 months, to appeal to the Superintending Engineer, (Circle, whose decision in the matter shall be final.)

18. If at any time it would appear to the Executive Engineer that the Panchyat is not satisfactorily carrying out the duties entrusted to it as mentioned in Rules 14 above, the Executive Engineer shall have the right again to depute a Canal Inspector or a Patkari for assisting the Panchayat, or to dissolve the Panchyat altogether and order fresh elections.

19. The Panchyat shall arrange to collect from the irrigators, at a rate not exceeding half an anna per rupee of the water rate payable by the irrigators funds necessary to meet its current or future expenditure. Any member who fails to contribute his share shall be disqualified and strunck off the list of members.

18

20. The Panchyat shall be competent to appoint one or more paid servants for carrying out the clerical work in connection with the duties mentioned in Rule 14 above when it is functioning without the help of the Government Canal Inspector or Patkari. These servants will, however, not be entrusted with any administrative duties, which must be performed by the Panchyat itself.

21. The accounts of the panchyat shall be maintained in a form approved by the Executive Engineer and shall be audited annually.

22. The funds of the Panchyat shall be deposited in a bank approved by the Registrar of Co-operative Societities.

23. The Panchyat can, after obtaining previous sanction of the Executive Engineer, also undertake the following functions in addition to those shown in Rules 14 above :

(a) To disseminate by means of propoganda among the irrigators, knowledge regarding the improved practiveand methods of irriculture in accordance with the suggestions of the Canal Advisory Committees.

(b) To place in a collective form before the irrigation officers and Canal Advisory Committee the suggestions and complaints of irrigators in the Groups.

(c) To collect the water applications of the irrigators and present them to the irrigation officers, after duly completing them, for facilitating their quick disposal.

Canal Advisory Committees and Water Panchyat Committees- Establishment of the - on the various Canal System.

Government of Bombay,
Public Works Department,
Resolution No. CME. 1058-T,
Sachivalaya, Bombay-1.

Read : Government Resolution No.3647/36-II, dated 9th March 17th May,1951.

Letter No. : Gen/Irri/63856 dated the 15th November 1958 from the Superintending Engineer, Gujarath Irrigation Circle.

Resolution : On the recommendations of the local officers, Govtnment is pleased to direct that the duration of a canal Advisory Committee should be 3 years instead of 2 years as hitherto.

2. Government is also pleased to direct that the non-official members will hold office for a period of 3 years instead of 2 years. Necessary corrections should accordingly be carried out in item 6 of the constitution and Rules of Business of the Canal Advisory Committee printed as an accompaniment to Government Resolution, Public Works Department No. 3647/36-II, dated the 17th May,1951.

3. Government is further pleased to direct that 50 per cent of the representatives of local irrigation to be appointed to such committees should represent small irrigators.

By order and in the name of the Governor of Bombay.

Sd/x-x-x
(A.R.Kaulgud)
Officer On Spl.Duty,

Annexure-II

Staff Norms for Operation and Maintenance of Irrigation Projects, at Different Levels

A) Division Level

Staff category	Number of posts 1968 norms	Number of posts 1982 norms	Remarks
Executive Engineer	1	1	
Deputy Engineer	1	1	
Tracer	1	1	
Assistant Tracer	-	2	
Draftsman	3	3	
Divisional Accountant	1	1	
Accounts Clerk	2	1 or 2	
Chief Accountant	-	1	
Auditor	-	1	
Assistant Superintendent	1	1	
Senior Clerk	1	1	
Junior Clerk	10	7 or 8	
Typists	-	3	
Record Keeper	1	1	One for each sub-division
Store Keeper	-	1	
Assistant Store Keeper	-	1	For store material value exceeding Rs.3 lak
Store Clerk	-	1	For store material valu exceeding Rs. 5 lakhs.
Watchman	-	1	

B) Sub-Division Level

Staff category	Number of posts	
	1968 norms	1982 norms
Deputy Engineer	1	1
Junior Engineer	1	2
Senior Clerk	1	3
Junior Clerk	2	2
Record Keeper	1	1
Attendents	3 or 4	3 or 4

C) Section Level

Staff category	Section with concentrated area irrigating more tahn 2000 hectares		Section with scattered area irrigating upto 2500 hectares	
	1968 norms	1982 norms	1968 norms	1982 norms
Junior Engineer	1	1	1	1
Branch Clerk	1	2	1	1 or 2
Mistri	1	2	1	1
Muster Keeper	2	2	-	-
* Canal Inspector	4	8	2	1 or 2
Record Keeper	1	2	-	-
Surveyer	3	4	2	2
Messanger	1	1	-	-
Junior Clerk	1	-	-	-
Patkari	2	-	2	-
* Choukidar	4	2	2	1 or 2
Attendent	2	2	1	1

* In case of the sections with scattered irrigation, the number of posts will vary depending upon the number of irrigation tanks.

Annexure III

Operation and Maintenance Cost, Total Water charges and Annual Receipts of the Average Irrigation Systems.

(Rs. in lakhs)

Particulars									
	1981-82	1982-83	1983-84	1981-82	1982-83	1983-84	1981-82	82-83	83-84
A. Annual operation and maintenance cost									
1. Staff salaries	30.67	35.39	42.75	3.05	3.86	4.63	0.14	0.16	0.17
2. Recurring non-salary cost	26.18	29.17	30.28	2.63	2.71	3.17	0.10	0.12	0.12
Total cost	56.85	64.56	73.03	5.68	6.57	7.80	0.24	0.28	0.29
B. Total water charges and collection									
1. Total water charges	98.65	94.69	96.66	5.69	7.30	7.49	0.33	0.36	0.33
2. Collection of water charges	46.36	58.74	64.88	2.89	4.45	4.83	0.22	0.17	0.19
3. Overdues of water charges	52.29	35.95	31.78	1.80	2.85	2.56	0.11	0.19	0.14
C. Annual Receipts									
1. Collection of water charges	46.36	58.74	64.88	2.89	4.45	4.83	0.22	0.17	0.19
2. Overdues of previous year	8.12	3.25	6.45	2.08	1.23	2.33	0.06	0.02	0.06
3. Penalty receipts	3.06	0.60	1.46	0.02	0.01	0.01	-	-	-
4. House rent & other receipts	1.09	2.08	2.30	0.40	0.51	0.32	-	-	-
Total receipts	56.63	64.70	75.09	6.89	6.20	7.49	0.28	0.19	0.25