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Socio-Economic Impact of Irrigation Projects

MANAGING IRRIGATION SYSTEM IN DROUGHT-PRONE AREAS

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Investment in irrigation continues to form a major part of the strategy for increasing agricultural production in successive Five Year Plans. There is now an urgent need for laying stress on economic efficiency in planning, implementation and management of irrigation projects so that the projected benefits to the farmers are actually achieved. Irrigation planning and management pose problems which are extremely complex. This is specially so in the case of drought-prone areas where the policy is mainly to provide protective irrigation to as large an area as possible. The present paper is addressed to some of these problems with a view to identify and analyse the factors responsible for low efficiency in planning, implementation and management of irrigation projects.

The particular irrigation project referred to in this study is Mula Irrigation Project in Maharashtra, an on-going irrigation project, the irrigation from which began in the year 1972-73 and the full potential of irrigation from which, as per the latest report, should have been developed by 1980.

Objective of the Study

The study envisages to examine the following aspects in respect of the Mula Irrigation Project.

1. Time taken by the construction and gestation period in the development of the project in order to see how the ultimate cost of the project is affected by this.

2. Actual availability and use of water under the system as against the projected coverage and use in order to ascertain the reason for divergence.

Relevant Data and the Methodology of the Study

(i) In order to calculate the cost of construction of the system, we have obtained from the official records the total cost each year on the dam and the distribution system. It has taken 20 years to complete the distribution system and ten years to complete the dam.

(ii) Data on potentiality created and utilized, available from official records, have been analysed in depth to ascertain the reasons for the slow creation of potential.

(iii) The more serious problem seems to be great divergence between the potential created and actual utilization. In order to examine these questions, it has been necessary to get information on area irrigated yearwise and distributarywise. This point has been further investigated in the sample villages under distributaries showing varying degrees of utilization.

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Mula Canal System—Project Outlay

The Mula project was administratively approved for Rs. 932 lakhs in 1957. According to the original plan, the project with gro storage of 22,252 m.cft. of water was to irrigate 53,137.65 hectares of land with a cropping intensity of 102 per cent. The dam site was changed and the project was revised in 1966 with gross storage contents of 26,000 m.cft. to irrigate 64,372.47 hectares with a cropping intensity of 112 per cent according to the revised crop pattern. The revised project was estimated to cost Rs. 1,611 lakhs in 1966. Subsequent to the finalisation of the project, there had been persistent demand for extending the irrigation benefits to a larger area. Accordingly, the crop pattern was modified in 1973 with 106 per cent cropping intensity in the previously contemplated area and 123 per cent cropping intensity in the extended area respectively. The revised project cost, in view of this change, was estimated to be Rs. 2,501 lakhs in 1974. The project was to be completed in all respects by March 1980. As such, the revised estimate took into account the actual cost incurred uptil 1974 and the expenditure that was likely to be incurred thereafter to complete the project in all respects. However, according to further revised estimate (1979), the cost of Mula project would be approximately Rs. 2,767 lakhs.

The actual execution of project work in different stages shows that gorge filling of the dam was done in the year 1968-69 and a partial storage was created in 1969. Irrigation was started from 1971. The remaining works of the dam were further completed during the subsequent years and full storage against gates were created in 1974.

Out of the total network of distribution system the construction of Mula Right Bank Canal (MRBC) and Mula Left Bank Canal (MLBC) was taken up simultaneouly with the dam and after completing part length irrigation was started since 1972, further canal network as per 1966 report was completed by the end of 1978, creating an irrigation potential of 65.38 thousand hectares. The work in the non-perennial zone as per the revised project of 1974, was started in 1975 and was to have been completed latest by 1983, but, is still in progress.

The obvious consequence of the long gestation period, which is the characteristic of all irrigation projects, is that in the interval between initiation and completion the cost of construction and operations is likely to increase well beyond that was planned. Two other important consequences are, firstly, that since the difficulties become apparent only gradually, an irrigation project once started is rarely abandoned; there is a risk therefore that the good money will be thrown after bad, and secondly that, in the interval, the original objectives may be lost sight of.[1] This has certainly come true in the case of Mula project so far as the cost escalation is concerned and should properly be accounted for by interest capitalisation during the entire period of construction of the project. As mentioned earlier, it was only in 1976-77 that a substantial proportion of potential irrigable command area was brought

1. Robert Wade, "Performance of Irrigation Projects", *Economic and Political Weekly*, Vol. XI, No.3, January 17, 1976, p.64.

under irrigation. In effect, therefore, it took almost 20 years for the investment to yield a sizable return, and hence the interest should be capitalised until the project is completed and full irrigation potential developed. It is only after that the cost of the project is to be computed considering the remaining life of the project and is to be compared with the commensurate benefits. This would certainly adversely affect the benefit-cost (B-C) ratio of the project and the B-C ratio may even turn out to be less than the stipulated 1.5 recommended by the Second Irrigation Commission. This aspect certainly needs to be looked into.

Irrigation Potential and Utilization

We shall presently see if the objective of extending the irrigation over a wider area is fulfilled.

Table I gives the details of potential planned and created potential and planned utilization and actual utilization.

TABLE I—YEARWISE POTENTIAL PLANNED AND CREATED AND ITS PLANNED UTILIZATION AND ACTUAL UTILIZATION

(*Hectares*)

Year	Planned potential	Created potential	PLanned utilization	Actual	Utilization of the potential created (per cent)
1969-70	1,700	–	–	–	–
1970-71	15,587	–	569	–	–
1971-72	19,838	20,400	5,768	7,960	37.7
1972-73	34,008	29,310	12,372	15,850	54.1
1973-74	42,510	47,770	23,129	13,091	27.4
1974-75	51,012	49,393	32,119	14,942	30.2
1975-76	72,097	54,372	42,609	28,569	52.5
1976-77	72,097	59,757	55,298	33,962	56.8
1977-78	72,097	60,730	65,032	35,710	58.8
1978-79	72,097	65,560	72,097	33,430	51.0
1979-80	72,097	66,360	72,097	28,733	43.3
1980-81	72,097	72,097	72,097	30,816	42.7

It is seen that except for the initial years the yearly potential created fell far short of the yearly potential planned. This happened mainly because of the slow progress of the work of construction of distribution system and outlets. Though the work on the network of distribution system began along with the headwork, soon it started lagging behind and by the time full storage was created the canals, distributaries and outlets were ready for use only at the upper reaches of the system. A comparison between planned utilization and actual utilization also shows that except for the initial few years, yearly actual utilization fell far short of the planned utilization. In fact, the gap between the utilization planned and actual utilization is much larger than the gap between the planned potential and created potential and this gap has been increasing over the years.

The actual utilization of the potential created given in percentage terms in the last column of Table I shows that the utilization percentage is very low and it varies from year to year. There could be several reasons for the low and variable percentage utilization. Inadequate storage as one such reason has been ruled out because the actual storage for eight years (from 1973-74 to 1980-81) is found to be more than the dead storage and carry-over. Another reason that the potential is generally added in lumps whereas its full utilization is spread over a few years would somewhat explain the fluctuation. The main reasons for the low utilization and a large fluctuation in that are the way the potential created is defined and the manner of reporting utilization by the Irrigation Department. The potential is assumed to have been created when all the works upto outlet are completed without any consideration for the works below the outlet, *i.e,* construction of field channels, field drains and land levelling, etc. Similarly, annual utilization given by the project authorities are as per water application received from the irrigators and not as per actual area irrigated.

In a study on crops and soils, a realistic picture of the potential created and actual utilization in different reaches of Mula Right Bank Canal has been attempted.[2] Realistic figures of potential created are worked out by subtracting from 'Irrigatable Command Area', *(i)* areas without field channels or areas where field channels are faulty, and *(ii)* areas lost due to waterlogging, salinity and alkalinity. Actual utilization figures are worked out from the records of the revenue assessment prepared in the office of the irrigation division. Table II gives the results.

TABLE II—REALISTIC POTENTIAL CREATED AND ACTUAL ANNUAL UTILIZATION THROUGH MULA RIGHT BANK CANAL

(hectares)

Year	A. Net area available for irrigation			
	Head reach	Middle reach	Tail reach	Total
1. 1979-80	14,434	5,577	16,472	36,483
2. 1980-81	15,028	8,752	16,597	40,377
	B. Realistic potential (A × Cropping intensity)			
1. 1979-80	15,156	5,856	17,296	38,308
2. 1980-81	15,779	9,190	17,427	42,396
	C. Actual annual utilization			
1. 1979-80	8,504	4,636	7,311	20,451
2. 1980-81	9,450	7,142	10,933	27,525
	D. Utilization percentage			
1. 1979-80	56.1	79.2	42.3	53.4
2. 1980-81	59.9	77.7	62.7	64.9

2. A Note on Crops and Soil, Water and Land Management Institute, Aurangabad, 1982, pp. 16-19 (mimeo.).

It is noted that even after adjusting for area not available for irrigation to get at the realistic potential created, on an average, only 53 per cent and 65 per cent of the realistic potential created were utilized during 1979-80 and 1980-81 respectively. The percentage of utilization was comparatively smaller in 1979-80 because of the adequate and well distributed rainfall. Nevertheless, considerable discrepancy between the realistic potential created and actual utilization remains inexplicable. Mula project records on water storage in the reservoir show that during the eight years, 1973-74 to 1980-81, an average storage of 23,300 m.cft. was created on 15th October. Allowing 4,500 m.cft. for dead storage and 1,000 m.cft. for carry-over, on an average, 17,800 m. cft. would be available for irrigation in the *rabi* and hot weather seasons. But the actual utilization was only about 12,700 m.cft. Thus about 5,100 m.cft., *i.e.*, around 29 per cent of the water available for irrigation seemed to remain unutilized in the reservoir.

This is a very peculiar situation; on the one hand, only around 60 per cent of the potential created is actually utilized and on the other, not an inconsiderable amount of water seems to remain unutilized in the reservoir. An explanation to this peculiar situation may be sought in the fact that there exists a significant area of sugarcane on wells in the command area of the canal. The statistics show that the area of cane on wells supplemented by canal water has increased considerably from about 1,700 hectares in 1972-73 to 4,400 hectares in 1980-81, whereas for sugarcane, exclusively on canal, annual sanctions are restricted to the percentage permitted in the sanctioned cropping pattern, *i.e*, 4 per cent or 1,500 hectares. The number of wells increased from about 6,800 to 8,200 during the period 1972-81. As the water was remaining unutilized, seasonal sanctions for sugarcane on wells have been given resulting in an increase in area under cane on wells supplemented by canal water. Thus, in fact, there may be actually no unutilized water in most of the year, as is estimated to be by considering the area irrigated according to the suggested cropping pattern in the respective years. As a matter of fact, there may be an attempt to cut down unofficially the area under the seasonal crops in order to accommodate more and more area under cane on wells requiring supplementary actual water.

It may be noted that by the time construction of reservoir was completed and full storage was created and the irrigation started from 1971, the full canal system was not ready, also field channels in some areas were yet to be made. As a result, large quantity of water remained unused in the reservoir from year to year and farmers growing cane on wells started demanding increasingly the supply of canal water to supplement the water available from wells. Realising that there exists an unending possibility of getting the supply of canal water to supplement the water available from the wells for growing cane the farmers in general, and well-to-do farmers in particular, have been increasing the area of cane on wells over the years. The area of cane raised exclusively on well water is also very substantial and has increased from around 1,700 hectares in 1972-73 to more than 5,000 hectares by 1980-81. In view of this, there is every possibility that a considerable proportion of this so-

called area under cane, exclusively on wells, is either getting fully irrigated by canal water or at least getting supplementary water supply from the canal, of course, unaccounted for. This may largely be the reason why only around 60 per cent of the created realistic potential is utilized according to the irrigation statistics, and needs a detailed investigation. Commonly farmers in the head reaches are allowed to take water while the canals further down are under construction. They, therefore, have ample water in this initial period and adopt water intensive cropping pattern. When lower reaches are ready they mount intense resistance to the consequent reduction in their water supply. This has been a particular problem of canal schemes in drought-prone areas, where irrigation policy aims to spread water over as large an area as possible and in that sense is protective.[3]

Clusterwise Analysis of the Cropping Pattern of Sample Farmers

In order to throw more light on the extent of availability of canal water in different reaches of the canal and the consequent cropping pattern adopted, we have analysed the data on the cropping pattern of the sample farmers collected through field survey from clusters I, II and III, depicting groups of farmers from upper reaches, middle reaches and tail reaches of the canal respectively. In this regard, a clearer picture emerges when we look into the crop pattern in respect of these three clusters, separately for canal and well irrigated areas. Table III gives the details.

TABLE III—CLUSTERWISE CROPPING PATTERN UNDER CANAL AND WELL IRRIGATION

(percentage to gross irrigated area cropped)

Crop	Cluster I		Cluster II		Cluster III	
	Canal	Well	Canal	Well	Canal	Well
1. Jowar	27.30	16.78	33.05	15.56	37.06	19.78
2. Bajra	–	–	7.74	–	16.20	9.18
3. Wheat	25.96	19.36	16.48	15.53	15.56	9.73
4. Groundnut	17.14	1.89	17.33	2.30	11.18	1.65
5. Pulses	4.43	2.40	5.50	1.28	6.52	2.59
6. Sugarcane	24.51	55.46	16.28	60.66	11.44	48.52
7. Others	0.66	4.11	3.62	4.67	1.94	8.55

We find that sugarcane accounts for around 25 per cent of the gross irrigated area under canal in cluster I and only around 16 per cent and 11 per cent in clusters II and III respectively. Further, the proportion of area under wheat and groundnut is again much smaller in clusters II and III than in cluster I. Concentration of sugarcane in the upper reaches of the canal is thus evident and it is also evident that two other crops which require timely and adequate quantity of water for their proper growth, *viz.*, wheat and groundnut (summer groundnut in particular) are also found to be largely confined to the

3. Wade, *op.cit.*, p.64.

upper reaches of the canal. Jowar and bajra, two least water requiring crops, are seen to have a higher proportion of total irrigated cropped area in the tail-end of the canal compared to the upper reaches.[4]

In point of fact, in the tail-end of the canal, jowar and bajra, which are reported to be grown on canal water, more often than not, do not get any water or get very inadequate quantity (may be only one irrigation in the whole season). This is why complaints are received from the tail-enders in not getting timely water and in adequate quantity. As such, even though more than 50 per cent of the total cropped area under canal in the tail-reaches is seen to be irrigated jowar and bajra, in reality it may not be so. Therefore, if we include all the reported area under jowar and bajra as canal irrigated area, the proportion of canal irrigated area in the tail-end gets inflated and appears to be comparing favourably with the head reaches of the canal, which seems to be misleading because of the aforementioned factors.

A different picture emerges when we examine the crop pattern under well irrigation presented in the same table. Sugarcane is seen to be the dominant crop, irrespective of the reaches of the canal, accounting for more than 50 per cent of total irrigated cropped area. The proportion of area under wheat is however much smaller in the tail-end of the canal. This may be because of the limited availability of well water in cluster III, being in the tail-end of the main canal, which when used up mainly for growing sugarcane, is not available for growing other crops like wheat and groundnut over a large area. A clusterwise analysis thus shows a concentration of heavy water using crops in the upper reaches of the canal, thereby adversely affecting the policy aims to spread water over as large an area as possible more in the nature of protective irrigation.

Conclusions

In this paper we have raised and examined a few important issues which have considerable bearing on irrigation planning and management specially in respect of areas which suffer from recurring droughts and need protective irrigation over an extended area. These issues, like, unduly long gestation period and resultant cost escalation, the great divergence between potential created and actual utilization and conjunctive use of surface and groundwater have to be taken into consideration while justifying the project in terms of its benefit-cost ratio.

4. In this context, the Supplementary Report of the Comptroller and Auditor General of India for 1975-76, presented in December 1977, is revealing.