

R&C Unit
Record copy

IIPA/RCU/R/54

Final Report

**ENSURING HIGHER INVESTMENT IN
IRRIGATION: ISSUES & MECHANISMS**

(Sponsored by the Ministry of Water Resources, GOI)



**INDIAN INSTITUTE OF PUBLIC ADMINISTRATION
I.P. ESTATE, RING ROAD, NEW DELHI
May, 2008**

***Prof. Pranab Banerji
Project Director***

Acknowledgments

We would be like to thank the Ministry of Water Resources (MoWR) for sponsoring this study and for facilitating its conduct. The MoWR provided the required background material and helped in formulating the issues. We are specially grateful to Shri M. E Haque, Commissioner (PP), for discussions and valuable suggestions. Shri G. D. Sharma, Director (PP) was extremely helpful in all administrative matters. We also benefited from the suggestions and comments received in the meeting of the Committee to "Identify mechanisms for large scale investments in irrigation, both by the Centre and State Governments and on Intra-State and inter-State Projects" held on 10.4.2008 at the Shram Shakti Bhawan, New Delhi. We are particularly grateful to Shri U. N. Panjiar, Secretary and Shri S. Manoharan, Additional Secretary, (MoWR) and various delegates from the states.

The study could not have been completed on time without the support of the staff and management of IIPA. Special mention must be made of the support provided by the Library staff, IIPA. Thanks are also due to the academic support section, the accounts section and to the R & C Unit.


Pranab Banerji
Project Director

TABLE OF CONTENTS

	Page
I Introduction	1-3
II Financial Requirements	3-8
III Sources of Finance	8-12
IV Financing Capital Costs	12-20
V Financing Operational Costs	20-23
VI Conclusions & Recommendations	23-24
References	25
Annexure – I	26-27
Annexure- II	28

ENSURING HIGHER INVESTMENT IN IRRIGATION:ISSUES & MECHANISMS

*Pranab Banerji**

I Introduction

1.1 There can be little difference of opinion regarding the current state of Indian agriculture. Agriculture, which was considered to be a success story in the 1970s and 1980s, is presently passing through a crisis. Agricultural production, which recorded an annual growth rate of 4.7 percent during the Eighth Plan (1992-97), has been growing at an average rate of barely 2 percent per annum in the last ten years. Foodgrains production in 2006-07 was no better than the level reached in 2001-02. Since agriculture provides livelihood to over 60 percent of the nations' population and is vital for food security, the slowdown in agricultural growth rate is a cause for serious concern.

1.2 The current crisis faced by Indian agriculture is due to a number of reasons. The slow growth of irrigation and the poor maintenance of the existing irrigation structures is one of them. There is little doubt that irrigation contributed substantially to the development of agriculture in the decade of 1970s and 1980s. As pointed out by Vaidyanathan, the gross value of crop production roughly *"doubled between 1971-3 and 1991-3 from Rs. 845 billion to Rs. 1628 billion. Nearly 70 percent of this increase has come from irrigated areas, with roughly equal contributions by the expansion of irrigated area and increased per hectare yields of irrigated crops. In the case of unirrigated crops, the decrease in area cropped was more than compensated by higher yields."* In the 1990s, irrigation potential expanded at the rate that was *"one third less than the maximum growth achieved in the past"*. As pointed out by Selvarajan, a four percent rate of agricultural growth requires that the irrigation sector should grow at least by five percent per annum; given the one percent rate of growth in rain-fed sector.

* Professor of Economics, Indian Institute of Public Administration, New Delhi..

1.3 It may also be noted that there is a negative correlation between irrigation and the incidence of rural poverty. Generally, poverty incidence is low in states such as Punjab & Haryana, which have a high percentage of area under irrigation. Assured irrigation provides the basic conditions necessary for the adoption of high yielding varieties of seeds, higher cropping intensity and production of high value crops. This generates increase in incomes, employment and wages and therefore lowers the incidence of poverty.

1.4 The state of irrigation infrastructure is not in a very healthy state at present. As far as major & medium irrigation (MMI) projects are concerned, the area irrigated under them have either been stagnating or declining from mid 1980s in a number of states. As pointed out by Selvarajan, the canal irrigated area declined in Uttar Pradesh, Andhra Pradesh, Bihar, Orissa and Tamil Nadu since 1985 to the second half of 1990s. These five states together account for 50 percent of potential created. Groundwater, which contributes to half of the total irrigated area in the country, is becoming increasingly less sustainable. Administrative blocks categorized as "dark" or critical have been increasing at an alarming rate. As far as tank irrigation is concerned, this traditional method has been facing a major crisis in a number of states. Selvarajan notes that the states of Andhra Pradesh, Tamil Nadu, Karnataka and Orissa, which together account for sixty percent of India's tank irrigated area, have lost about 37 percent of the area irrigated by tanks during 1965-2000.

1.5 It is in this context that the Eleventh Five Year Plan (2007-12) aims at doubling the agricultural growth rate to about 4 percent per annum. To achieve the higher rate of growth, it proposes, *inter alia*, to double the rate of growth of irrigated area and improve water management, rain water harvesting and watershed development. It has long been felt that the decline in public investment in agriculture may be the significant factor underlying agricultural stagnation. The Common Minimum Programme (CMP) of the government, states that the "government will ensure that public investment in agricultural research and extension, rural infrastructure and irrigation is stepped up in a significant manner at the very earliest. Irrigation will receive the highest

investment priority and all on-going projects will be completed according to a strict time schedule". The Bharat Nirman Programme, designed to substantially augment public investment in infrastructure, also envisaged the creation of 10 million hectares of additional irrigated area during the period 2005-09. The Approach Paper to the Eleventh Plan talks about the creation of 11 million hectares of new potential during the plan *"consisting of 5.5 million hectares in major & medium irrigation, 3.5 million hectares through minor irrigation and about 2 million hectares through ground water development. In addition, another 3-4 million hectares of land is to be restored through modernization of tanks."* These targets, however, are lower than those recommended by the *"Working Group on Water Resources for the XI Five Year Plan (2007-12)"*. The Working Group recommended the creation of 9 million hectares of new potential in major & medium irrigation and 7 million hectares in minor irrigation, making a targeted total of 16 million hectares (of which 1 million hectare would be through restoration of water bodies).

II Financial Requirements

2.1 The financial resources involved in achieving the targets are large and one of the main reasons hampering the growth of irrigation capacity has been the constraint imposed by financial resources. The resources required for investment in irrigation have been increasing steadily. As can be seen from the table below, the total expenditure, at current prices, for Irrigation & Flood control has increased from Rs. 1744 crore in the First Five Year Plan to an estimated Rs. 101700.4 crore in the Tenth Five Year Plan. Despite this steep increase, irrigation & flood control expenditure as a proportion of total plan expenditure has fallen from 22.5 percent to 6.3 percent during this period.

Plan -wise expenditure on Irrigation & Flood Control Sectors

(Rs. Crore)

Sl.No.	Plan Period	MMI	MI&CAD	Total Irrigation	Flood Control	Total	Total Plan Expenditure
1	First (1951-56)	376.2	65.6	441.8	13.2	1743.8	1960
2	Second (1956-61)	380	161.6	541.6	48.1	589.7	4672
3	Third (1961-66)	576	443.1	1019.1	82.1	1101.2	8577
4	Annual (1966-69)	429.8	560.9	990.7	42	1032.7	6625
5	Fourth (1969-74)	1242.3	1173.4	2415.7	162	2577.7	15779
6	Fifth (1974-78)	2516.2	1409.6	3925.8	298.6	4224.4	28653
7	Annual (1978-80)	2078.6	1344.9	3423.5	330	3753.5	22950
8	Sixth (1980-85)	7368.8	4159.9	11528.7	787	12315.7	109292
9	Seventh (1985-90)	11107.3	7626.8	18734.1	941.6	19675.7	218730
10	Annual (1990-92)	5459.2	3649.5	9108.7	460.6	9569.3	123120
11	Eight (1992-97)	21071.9	13885.3	34957.2	1691.7	36648.9	483060
12	IX Plan 1997-02)	49289	13760	63049	3038	66087	941041
13	X Plan (2002-07) Outlay	71213	24521.4	95734.4	5965	101700.4	1525639

As can be inferred from the table above, the expenditure on irrigation as a proportion of total plan expenditure had declined from 22.54 percent in the First Plan to 14.22 percent in the Fifth Plan and further reduced to 6.28 percent in the Tenth Plan. Irrigation may be losing out to other competing demands on public resources.

2.2 One of the principal reasons for increased expenditure on irrigation projects has been that the cost of creating irrigation potential has increased enormously. The cost of creation of potential in major & medium projects increased from Rs. 1200 per hectare in the First Plan to Rs. 66,570 per hectare in 1990-92 (at current prices). The Eleventh Plan Working Group on Water Resources has put this cost (i.e. the cost of potential creation through MMI projects) at Rs. 1,70,000 per hectare for the Eleventh Plan. The Group has also put the average cost of potential creation at Rs. 90,000 per hectare for minor surface irrigation and Rs. 45,000 per hectare for ground water, making the total average cost of potential creation as Rs. 1,10,000 per hectare.

2.3 The steep increase in per hectare costs of irrigation can be attributed to a number of factors. The first is the obsession of the Government with large irrigation projects. Vaidyanathan has pointed out that the irrigation development strategy followed since independence may be flawed "*both in concept and implementation ... (because of its) excessive preoccupation with, and indifferent implementation of, large canal irrigation projects*". The financial estimates of the resource requirements would therefore critically depend upon the mix of various types of irrigation projects to be included in the National Plan. The costs can be considerably lower if greater emphasis is placed on minor irrigation schemes, including traditional methods of water harvesting, community tanks, small reservoirs etc. It may however be noted that the Working Group has laid greater stress on creation of irrigation potential through MMI sector (9 mha) compared to the MI sector (7mha including 1mha through restoration of water bodies) for the Eleventh Plan. It would be instructive to note that the potential created during the Tenth Plan through MMI projects was 5.3 mha and the potential utilized was only 3.41 mha .

2.4 The capital costs for MMI projects, as estimated by the Eleventh Plan Working Group, may be an underestimate. This is because the Planning Commission figures do not include the costs of the interest during the period of construction—i.e. there is no capitalization of the interest costs. *Gulati et.al* (1995) have estimated the capital costs assuming twelve years as the average gestation period for MMI projects and have also included a social rate of discount of five percent. According to their estimates, the capital costs of MMI schemes (at 1995-96 prices) increased from Rs. 75,681 per hectare in 1980-81 to Rs. 1,90,401 per hectare in 1995-96. As far as the costs of potential utilization are concerned, these were much higher in 1995-96 and were Rs. 2,14,297 per hectare. Therefore, the costs during 1995-96, as estimated by *Gulati et al*, (1995) were higher than the estimates made by the Eleventh Plan Working Group for the Eleventh Plan.

2.5 Studies have also shown that the steep increase in capital costs has been a feature of the 1980s & 1990s. The cost of potential created was only Rs.

36,445 per hectare during 1978-79. At constant prices this figure grew steeply to over Rs.1,90,000 in 1993-94. According to Dhawan, (1997) the reasons for the escalation in capital costs of MMI projects are attributable to (a) taking up projects in more difficult areas (b) additional costs of resettlement & rehabilitation and environmental protection, (c) lining of canals, (d) additional expenditures on command area development and (e) possible corruption in the provision of canal irrigation.

2.6 All these imply a steep increase in expenditure to achieve the goal of substantial increase in potential. For example, the Working Group's estimates of outlays for irrigation for the Eleventh Plan may be compared with the Tenth Plan Expenditures. This has been done in the table below:

Tenth Plan Expenditure and suggested Eleventh Plan Outlay on Irrigation
(Rs. Crore)

	Tenth Plan	Eleventh Plan	% Increase
Major & Medium Irrigation	71,213	1,53,000	114.85
Minor Irrigation (including RRR for Water bodies)	24,521	44,750	82.50
Total Irrigation	95,734	1,97,750	106.56

As can be seen from the table, the estimates indicate that there may be a need to double the expenditure in the Eleventh Plan as compared to the Tenth Plan expenditures. However, it must be pointed out that the Working Groups' estimates of the potential created under MMI schemes during the Tenth Plan is 5.30 mha with an estimated expenditure of Rs.71,213 crore during the Tenth Plan. However, the new potential utilized under MMI schemes during the Tenth Plan has been reported as 3.41 mha. Therefore, the cost of potential utilization works out to be Rs. 2,08,835 per hectare even during the Tenth Plan, as per the Working Group's estimates. Since these are only estimates for the Tenth Plan, the actual costs would possibly be even higher when the interest costs are taken into consideration. It would, therefore, not be an overestimate to put the MMI costs at over Rs. 2 lakh per hectare of potential utilized for the Eleventh Plan.

This would imply that given the target of new potential creation & utilization of 9 mha under MMI schemes during the Eleventh Plan, the costs would be at least Rs. 1,80,000 crore for MMI schemes alone. The Working Group has estimated an outlay of Rs. 1,53,000 crore for the MMI sector during the Eleventh Plan to create a potential of 9 mha. It would not be surprising if the actual costs become 50 percent higher than the estimated outlay during the plan.

2.7 As far as the capital costs of minor irrigation schemes are concerned, the Eleventh Plan Working Group has put the average cost of potential creation at Rs. 90,000 per hectare for surface irrigation and Rs. 45,000 per hectare for ground water. If we take these cost figures, then the total costs of potential created during the Tenth Five Year Plan would be considerably lower than what the expenditure estimates indicate. It can therefore be inferred that minor irrigation costs estimated for the Eleventh Five Year Plan are grossly underestimated. Needless to say, that the costs for potential utilized would be substantially higher than the costs of potential created. During the Tenth Five Year Plan, the potential created under MI schemes have been reported as 3.52 mha, whereas the potential utilized has been estimated at 2.82 mha, by the Working Group, indicating a short fall of 20 percent even in the case of minor irrigation schemes. There is good reason to believe that the capital costs of minor irrigation would be increasing because of decline in the level of ground water in large parts of the country and because of increasing costs of labour and material. There is also the factor that newer schemes would be situated in areas where the accessibility to ground and surface water will be more difficult.

2.8 Based on its assumptions relating to per hectare costs of potential creation, the Eleventh Plan Working Group has made the following estimates regarding the outlay that would be necessary to meet the potential creation targets during the Eleventh Plan:

Eleventh Plan Outlay on Irrigation & Flood Control

(in Rs. Crore)

State Plan	Expenditure Outlay	
MMI	1,33,000	
MI	35,850	
CAD & WM	3,000	
FC	10,200	
Total		1,82,050
Central Plan	Expenditure Outlay	
CSS	16,000	
CS	33,750	
Total		49,750
Grand Total		2,31,800

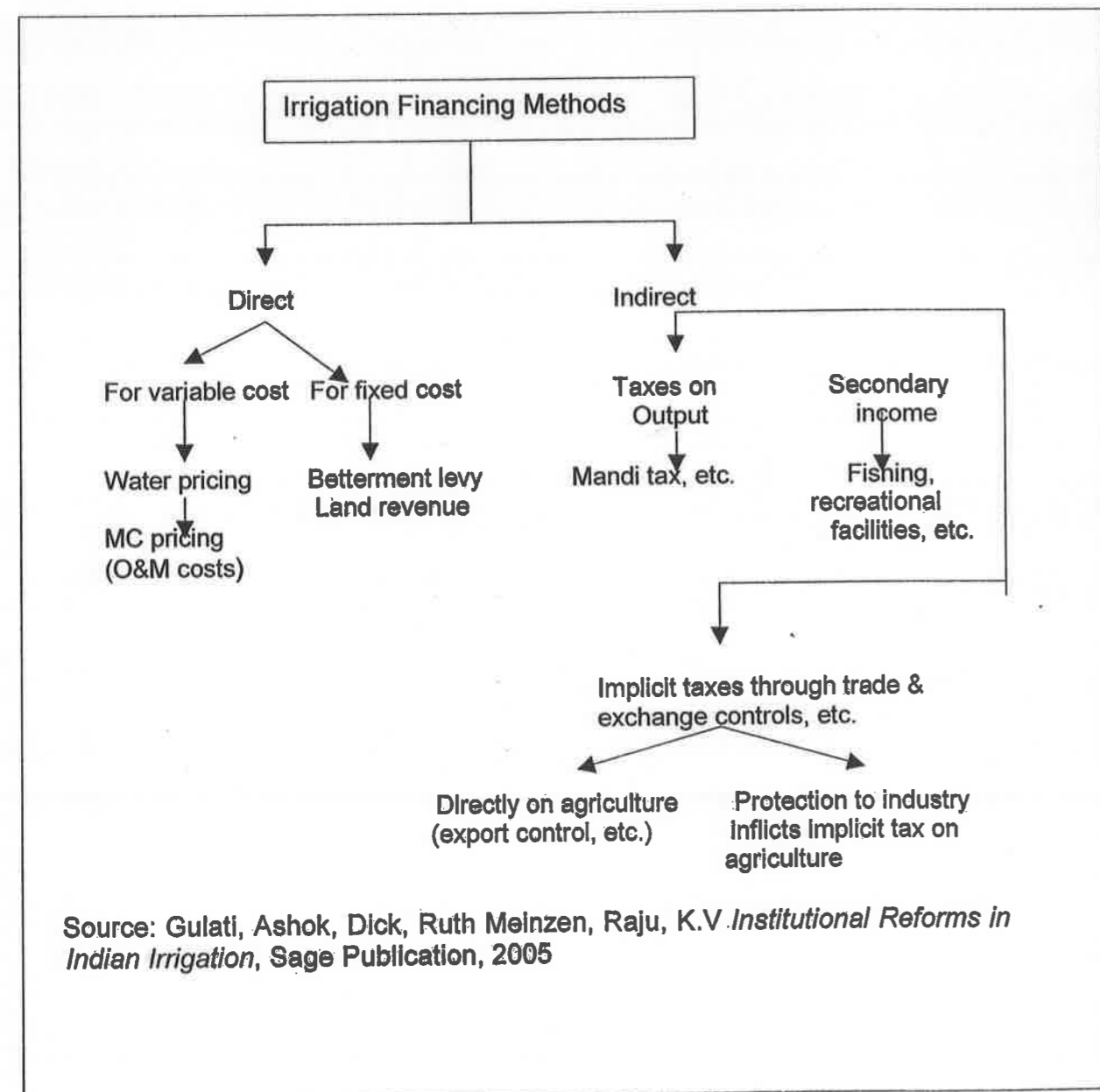
As discussed, this amount of Rs. 2,31,800 crore is likely to be an underestimate for meeting the target of potential creation of 9 mha through MMI schemes and 7 mha through MI schemes during the Eleventh Plan. The total outlay for the Eleventh Plan on irrigation & flood control, as noted earlier, is a little more than twice the amount of estimated expenditure of the Tenth Plan. It needs to be pointed out that doubling the rate of growth of potential creation will not only double the total expenditure but will increase the expenditures by an even greater amount, because the capital costs of potential creation have been increasing rapidly. It would not be an underestimate to expect that the actual costs of meeting the proposed targets could be at least 50 percent more than the costs estimated by the Working Group.

III Sources of Finance

3.1 As can be seen from the table above, the total expenditure on irrigation during the Eleventh Plan would be divided between the Centre and the States, with the states bearing the bulk of the burden of investment. Of the total outlay of Rs. 2,31,800 crore, the state plan outlay has been put at Rs. 1,82,050 crore. The central plan outlay has been estimated as a meager Rs. 49,750 crore. There is little doubt that the states' burden is large, given the position of the states'

resources. During the Tenth Five Year Plan the states and UTs' resources for all items of expenditure during the plan have been estimated to be Rs. 5,91,520 crore (at current prices). This implies that the proposed allocation for irrigation in the Eleventh Plan works out to 30 percent of total state outlay of the Tenth Plan. The state governments would require substantial central assistance to meet the investment requirements for irrigation in the Eleventh Plan.

3.2 The sources of funding for irrigation have been classified in the literature as the direct and indirect sources. A classification presented by Gulati *et al* (2005) is presented below:



Source: Gulati, Ashok, Dick, Ruth Meinzen, Raju, K.V. *Institutional Reforms in Indian Irrigation*, Sage Publication, 2005

3.3 The classification suggested by *Gulati et al* provides an useful starting point for looking at the issue of irrigation finance. The distinction between direct and indirect sources highlights the point that irrigation projects may be financed out of the benefits accruing to the users, or the same may be financed by the entire agricultural sector. The direct methods of financing of capital costs (called fixed costs in the figure), include only those resources which are generated as a result of the irrigation project and is paid by the beneficiaries alone. At the time of independence the direct sources of financing were considered to be the more important source. "*The net direct revenue earned by canals in undivided India, after deducting the cost of maintenance and operation, represented about 8 percent of the outlay*" (NCAER, 1959). This was the result of the policy followed during the British period since 1879, which stated that "*the best test for their (irrigation projects) utility*" is the "*financial results of works of irrigation*". The financial results were calculated as follows: Capital Costs were actual cost of construction and annual costs were to be given by simple interest on the capital costs at the commencement of the year and working expenses of the year. Annual receipts included:

- (a) direct receipts (from the sale of water to towns, rents, fines under canal act and other miscellaneous receipts), and
- (b) indirect receipts (like the share of enhanced land revenue, interest on sale of proceeds of Crown Waste Land, rents on cultivation of Crown Waste lands, etc.). The criteria suggested was that the rate of return; calculated as

$$\frac{(\text{Annual Receipts}-\text{Annual Costs})\times 100}{\text{Capital Cost}+\text{Arrears of interest}}$$

should be greater than the stipulated rate (generally 6 percent) from the tenth year after its opening. (See Singh & Banerji, 2002)

3.4 Over the years, the financial criterion for the sanction of irrigation projects was replaced by a quasi-economic criterion. This followed the recommendations of the Gadgil Committee which concluded that there are substantial economic benefits from major and medium irrigation projects in terms of multiple cropping, diversification and better quality crops, higher yields, larger incomes and greater employment, in addition to indirect benefits to industry, trade & transport. A cost benefit approach was thereafter officially adopted for the sanction of irrigation projects. In the decade of 1980s & 90s, as a result of the fiscal crises faced by the governments, the question of financial viability became once again important in the Indian context. In 1992, the Vaidyanathan Committee recommended the re-introduction of a minimum financial return as an essential criterion for sanctioning all investment proposals along with the social benefit-cost criteria. Earlier, the Public Accounts Committee (1983), the Irrigation Ministers' Conference (1986), the National Water Policy (1987) and successive Finance Commissions had also stressed the need for partial cost recovery through direct methods like increasing water rates. Despite all this, the recovery rate (percentage recovery of working expenses through gross irrigation receipts) fell from 93 percent in 1976-77 to 47 percent in 1980-81 and further to a meager 9 percent by the end of eighties. The irrigation sector had become a huge fiscal liability with annual operational losses crossing Rs. 3000 crores in 1993-94. In recent years, there has been increasing pressure to make the irrigation systems financially viable—i.e. move towards full cost recovery from direct methods—because of the fiscal constraints and due to the "advise" from international agencies like the World Bank. It is in this context that alternative institutional arrangements, including private sector participation, are being tried out.

3.5 It is, however, a debatable issue whether irrigation losses represent, in the ultimate analysis, a subsidy to the farmers. Various studies have shown that agriculture in India has been subject to large implicit taxation. *Gulati et al* (2005) note that by the mid 1990s the implicit taxation on agriculture due to restrictive trade policy was reported as 38.5 percent of the value of agriculture produce by the WTO in 1998. (Details in Annexure I). The subsidies to farmers through

subsidies on power, fertilizers, rural credit and irrigation water was only 7.5 percent of the value of agriculture. Thus, the implicit taxation on agriculture (the negative aggregate measure of support) was 31 percent of the value of agriculture produce. *Gulati et al* (2005) therefore reach the following conclusion: *"Thus, Indian agriculture has been subjected to large implicit taxation through trade policies, which is an indirect method of financing not only canal irrigation but also various other input subsidies going to agriculture. Even after taking care of these positive input subsidies, Indian agriculture remains net taxed by a huge margin. The implication of this is that it is not farmers that are riding on the back of rest of society for financing its irrigation needs, but the other way round"*.

3.6 The distinction between direct & indirect methods of financing used by *Gulati et.al* is useful to show that though the farmers may be paying the water rates which do not cover the costs of irrigation supply; nevertheless, the costs to the farmers are large enough for us to conclude that there are indirect ways through which the farmers may be bearing more than the costs of irrigation and subsidies. However, it may be better from the point of view of finance to segregate the costs into two parts: (a) capital costs and (b) the operation and maintenance costs. The capital costs of irrigation projects may be recouped from the project itself through water and other charges or the capital costs may be financed through budgetary support through taxation, cess etc., or through debt finance.

IV Financing Capital Costs

4.1 The capital costs of irrigation projects are so high and the revenues from water rates etc. are so low that it is inconceivable that the capital costs of the projects can be financed from irrigation revenues alone. As mentioned earlier, the recovery rate shows that gross irrigation receipts cover a small fraction of the working expenses. This is a phenomenon that is common to a large number of developing countries. A World Bank study reviewing the projects assisted by the Bank found that the proportion of the operation and maintenance costs recovered

generally ranged between 15-45 percent. Although India is not an exception, the proportion of O&M costs recovered from water rates is lower than that in many other countries with hardly 10 percent of the irrigation costs being covered through irrigation charges. Therefore, to expect that revenues from water rates would cover the capital costs of irrigation projects is, at present, only a distant dream. The capital costs of irrigation projects will for a long time continue to be raised either through the budgetary channels or through recourse to the capital markets, mainly for debt capital.

4.2 There is also good reason why the capital costs should be borne through taxation/cess. Irrigation projects have very large external effects that are both positive (beneficial) and negative. The positive externalities include recharging of ground water in the command areas. This benefit is not even considered in the appraisal of project proposals. Recharge of ground water reaches non-gravity areas and provides sustainable ground water for minor irrigation and drinking. This is a benefit, which accrues not only from major projects in the command area but also from minor surface irrigation projects. It is well known that tank storage increases the water yield from wells in tank commands. Over exploitation of ground water has led to rapid depletion, salinization and pollution of ground water. The administrative blocks characterized as "dark" has increased rapidly. Groundwater mining has resulted in fluoride contamination in some areas. Recharge of groundwater through surface irrigation schemes therefore is one major positive externality of irrigation investment. In addition to this, there are other positive externalities like flood control, recreational facilities, improved linkages etc. The negative externalities have been widely discussed and include environmental & health effects as well as submersions and resettlement problems. Over the years, due to increasing pressure from environmental groups and other NGOs, larger parts of the negative external costs are getting included within the project costs. This is one of the reasons why the capital costs of projects have been increasing in the last two decades. It is common knowledge that in cases of strong positive externalities, there is a good case for the government to subsidise such projects. It is also well known in the literature of

market failures that in cases of strong positive externalities the private entrepreneurs are usually not forthcoming to make the required quantum of investment without either subsidies or an assured rate of return on the projects.

4.3 It must also be pointed out that some of the financial benefits from irrigation projects do not accrue to the irrigation department. For example, the revenues from fisheries, recreational activities etc. often go to the concerned departments and not necessarily to the water resources departments. Similarly, increase in land revenues as a result of the provision of irrigation goes to the general revenues of the state government. The extent of subsidy, as calculated on the basis of water revenues alone, does not therefore reflect the benefits to society as a result of the project. It is worth noting here that the pre-independence criteria included both direct and indirect receipts from irrigation, whereas the present trend is to consider direct receipts only. It may however be pointed out that even when all the indirect receipts are included, irrigation projects will still continue to be financially non-viable mainly because of the twin problems of high capital costs and low revenues, (with the notable exception of large multi-purpose irrigation projects generating substantial quantum of electricity). There is therefore a strong case for basing the capital costs of the projects substantially on revenues from taxation.

4.4 There is however a severe crisis of budgetary resources for investments in irrigation projects. This is because irrigation being a state subject is expected to be financed by the state governments. The state governments generally have had large revenue deficits in their budgets. For example, the state revenue deficits, as a proportion of GDP, was 2.6 percent in 2001-2 and the gross fiscal deficit figure stood at 4.2 percent of GDP in the same year. The state governments have also been under pressure, in recent years, to reduce their fiscal deficit and eliminate revenue deficit. Given the fact that the revenue account has generally been in the red during the past two decades, resources through taxation and/or non-tax revenues have not been available for investments in irrigation projects. The states have therefore depended on borrowed funds for capital expenditures on irrigation projects. In the past, these

resources have often come from international lending agencies like the World Bank at concessional rates of interest. These resources have declined in the 1990s and the classic case was the withdrawal of the World Bank from the Narmada/ Sardar Sarovar Project. As a result of this the Government of Gujarat established the Sardar Sarovar/Narmada Nigam Ltd. as a corporate entity to raise funds from the capital markets. Similar experiments have followed in Maharashtra, Andhra Pradesh, Karnataka etc. The pattern of financing now, as before, is dependent upon debt capital with the important difference that borrowing by the state governments have been replaced by borrowings by state companies/corporations.

4.5 Debt capital therefore has been the predominant source of financing for the capital costs of irrigation projects for the last two decades or so. The problem with debt financing is that the debt needs to be repaid and also there is an interest burden to be borne on the borrowed amounts. Although several Finance Commissions and a number of committees have recommended that a part of the interest on the capital costs should be recovered from water rates etc., the quantum of this recovery as suggested by these commissions have always been minimal. For example, the Tenth Finance Commission recommended that the financial returns from irrigation projects should not only cover the O & M expenses but also cover 1 percent interest on the capital expended. The Vaidyanathan Committee also recommended, in 1992, that irrigation revenue should also recover at least 1 percent of the interest costs on the capital invested. It is instructive to compare this with the rate of interest actually paid by some of the corporations. The Krishna Bhagya Jal Nigam Ltd. in Karnataka raised debt capital at interest rates that touched 17.5 percent, in order to raise capital for expeditiously completing the projects. It is, therefore, difficult to see how reliance on debt capital can be a viable means of financing irrigation projects. State governments have generally been providing counter guarantees for the borrowings by the corporations both for interest and repayment.

4.6 Even in states where there are no corporations and the irrigation projects are implemented through departmental agencies, the state governments have been relying on borrowed funds for irrigation investments. These funds have generally been coming from the central government, which has provided lower interest loans for irrigation, together with a grant element, to meet the capital costs. It must also be mentioned here that the powers of borrowing from the open market are limited for the states as a part of the overall controls exercised by the Planning Commission and the Reserve Bank of India to keep fiscal deficits in check. State Governments, therefore, have depended on central assistance for irrigation projects, which have been a mix of grants and loans, with the loan component being the overwhelming one. Since these loans need to be repaid and the interest charges have to be borne, the state governments financial situation will come under greater stress in the future and the state governments are likely to be wary of too much borrowing from the center. The total resources available for investments for the development of irrigation potential and for modernization and restoration of existing structures are therefore likely to be inadequate. There is, in recent years, another source of debt finance and that is the Rural Infrastructure Development Funds created by the NABARD. Though during the 1990s the utilization of this fund was just over one third of the sanctioned amount, still it (the RIDF) was an addition to the total resources available to state governments. However, the problems of debt capital remain even with this source and, it may be possible that the state governments were not willing to stretch their borrowings beyond certain limits.

4.7 The corporatisation of irrigation for the purpose of construction and delivery of irrigation has been a new initiative, which dates back to mid-1990s. Notable examples are the Krishna Bhagya Jal Nigam Ltd. in Karnataka and the corporates of Maharashtra, Gujarat & Andhra Pradesh. In Maharashtra, for example, a number of basin-based corporates have been set up such as the Maharashtra Krishna Valley Development Corporation (MKVDC), the Godavari Marathwada Irrigation Development Corporation (GMIDC), the Vidarbha Irrigation Development Corporation (VIDC), and the Konkan Irrigation

Development Corporation (KIDC). The state Government of Maharashtra has also set up a dedicated body for raising resources from the market for capital expenditures, namely, the Maharashtra Irrigation Finance Corporation (MIFC). It is necessary to examine the financial aspects of these new initiatives.

4.8 The case of Krishna Bhagya Jal Nigam Ltd. (KBJNL) has been studied in detail by *Gulati et.al (2005)*. They come to the important conclusion that the KBJNL has exhibited certain advantages. The corporate has been successful in mobilizing funds from the capital markets, but this has been possible because the state government provided counter-guarantees on interest and principal. The borrowings by the corporate has reduced the pressures on the state exchequer for the present, so that drastic reductions in allocations to other sectors was avoided. What is more heartening is that the project implementation has been more or less on schedule. Although the KBJNL has been theoretically given greater freedom with regard to the levy and collection of water rates, there has been inadequate progress in this direction. But the greatest weakness of the KBJNL experiment is that the company *"is not generating any income on its own. The organization depends on the government's budgetary support even for interest and principal payment to bond subscribers and shareholders."* *Gulati et al (2005)* also point out that although these corporations are meant to usher in comprehensive reform in the irrigation systems, they have largely functioned as vehicles for mobilizing debt capital and implementing the projects. As regards the financial aspects of the new experiments are concerned, they reach the following conclusion: *"A detailed analysis of the style of their functioning reveals that although these corporations, including KBJNL, appear to be FAIAs (Financially Autonomous Irrigation Agency), they are really still financially dependent on the state, and they fail to deliver reforms beyond mobilization of capital funds and construction of physical infrastructure. These corporations basically remain a means for raising funds from the market, thus bypassing the limits imposed on state borrowing by the Planning Commission and the Reserve Bank of India. Failure to consider repayment of the capital remains their greatest weakness. As a result, they do not inspire confidence in farmers to overcome*

images of inefficiency and corruption. The result is that farmers are opposing increases in irrigation fees.

Since they fail to generate internal resources to pay back the loans, sooner or later the burden will fall back on the state, and like many other corporations, whether they are for state transportation or for power generation and supplies, these are also likely to become financially sick."

4.9 There has also been some discussions relating to the possibility of tapping private sector resources for investments in irrigation. This would fall under arrangements such as Build-Operate-Transfer (BOT), Build-Own- Operate (BOO), etc. With strong externalities and very little power to set and collect the water rates, it is unlikely that the private sector would be willing to enter this field unless they are guaranteed an assured rate of return on their investments. This would mean that the state governments would continue to bear the subsidy costs of irrigation. In addition to this, the private irrigation provider would be a monopolist and it would be difficult to assess the costs of the monopolist. If the private irrigation provider is also allowed to charge and collect the water charges based on profitability considerations, it would be difficult to regulate them as the pricing may be monopolistic pricing. The transaction costs of collection of water charges are also very high, and some state governments feel that it may be more economical not to collect these charges, as the administrative and other costs are very high. It is therefore extremely unlikely that the private sector would venture into this area in the near future. The notable exception to this, of course, may be projects that yield substantial quantities of hydropower.

4.10 Although irrigation projects, in recent years, have been financed predominantly through debt capital, this method does not provide a sustainable basis for irrigation development. It merely postpones the problem of dependence on state revenue receipts. Given the fact that irrigation has very strong externalities and also larger projects have long gestation periods, there is a strong case for greater reliance on taxation as a source of finance. However, the state government's base for taxation finance is low and hence, they have been

depending upon central assistance which again has been largely in the form of loans. In the case of road construction, including rural roads with strong externalities, there has been a shift in the pattern of financing of these projects. Resources for road construction are generated by levying a cess. The general principle is that those who use the roads pay for it through a cess. The cess has therefore been levied on petrol and diesel. If this general principle is applied, then the "beneficiaries" of irrigation investments may be seen as the farmers who are in any case substantially taxed, as indicated by the aggregate measure of support (AMS) to agriculture. In a broad sense, the beneficiaries of an improved agriculture are not only the farmers, but the non-farm sectors, which depend upon agriculture both for foodgrains and other agricultural products. It can therefore be argued that a cess should be imposed on the non-agricultural sector, which are the prime beneficiaries of the negative AMS and shall also benefit from improvements in agricultural production. It is necessary to stress that this cess, as in the case of roads, should be levied and collected by the center and the proceeds of this should be given to the states only for capital expenditures on irrigation projects (including modernization, renovation and restoration works). This cess could be levied on personal and corporate incomes.

4.11 The practicability of cess needs to be explored a little further. One percent of the gross tax revenue of the center (before deducting states' share) could yield about Rs. 6,000 crores (all estimates are rounded and back of envelope calculations). One percent of corporate and income taxes with mean around Rs. 3,000 crore annually. Given the magnitude of investment required (say rupees forty to fifty thousand crore annually during the eleventh plan), this may seem a small amount. But this must be compared with the central assistance to state plans, which was a mere Rs. 6077 crores (total capital account) in 2007-08 (RE). Thus, on the margin, this amounts to a substantive increase. Also, in the last two years, the states have been able to increase capital expenditure on irrigation by large amounts (see Annexure II). This has been possible because of debt relief given to them by the Twelfth Finance Commission. The states have been able to

borrow more from other sources and increase their capital expenditure on irrigation by large amounts. The states therefore respond to the fiscal assistance provided by the center by increasing investment in irrigation and flood control.

V Financing Operational Costs

5.1 The case of financing of O & M expenditures have been widely discussed in the literature on irrigation reforms. The World Bank point of view, that projects should be financially viable, has been the main source of inspiration of this debate. Generally, the O& M expenditures are based on a "norm" of required expenditure on a per hectare basis. For instance, the Tenth Finance Commission fixed the norm at Rs. 300 per hectare for the utilized potential and Rs. 100 per hectare for the unutilized potential for the plains. The actual expenditures in general have been, unfortunately, much lower than the norms. Further, establishment costs as a proportion of O&M expenses have risen sharply while the expenses on maintenance and repair have not increased. As a study of mid-1990s had pointed out, this has led to a paradoxical situation where huge amounts are spent on construction work whereas the existing irrigation infrastructures remain under-utilized because of lack of small expenditures on maintenance, repairs, renovations etc. There is a strong case for increasing the O&M expenditures so that existing irrigation infrastructures are fully utilized and the longevity of these structures are ensured.

5.2 Although O&M expenses are of critical importance and revenues from water ought to cover the O & M expenses, the actual trend has been that even the O&M costs have not been covered entirely. This has been a matter of serious concern and the losses from the irrigation sector have mounted over the years. These losses, which were Rs. 146 crore in 1975-76 grew to Rs. 403 crore in 1980-81 (PAC 1983). Several committees and Finance Commissions have examined this issue. The Irrigation Commission 1972, the Committee on Taxation of Agricultural Wealth and Income (Raj Committee), various meetings of

the National Development Council, the National Commission of Agriculture, the National Water Policy and the Committee on Pricing of Irrigation Water have all expressed serious concern over these losses and suggested the coverage of O & M costs through water charges. The Vaidyanathan Committee (1992) also pointed out that the CWC figures under-estimate the actual losses on account of four factors. First, the interest (and depreciation) shown are with regard to commercial projects (a vestige of the earlier productive irrigation category). It does not include interest on capital expenditures of the non-commercial (protective) projects and on command area development. Second, the rate of interest shown is a book adjustment based on rates indicated by the state government and not actuals. To correct for this the Vaidyanathan Committee used the "average interest rate paid on the outstanding public debt of each state". Third, interest during construction is not capitalized. Finally, "gross receipts" or incomes from irrigation projects include a number of items, which are not irrigation income and can account for upto a fifth of "gross receipts". Quick but incomplete estimates made by the Committee for the year 1986-87 showed that losses were in the region of Rs. 1526 crore compared to CWC estimate of Rs. 1379 crore, nearly 11 percent more in a single year.

5.3 The principal reasons for operational losses are well known. The factor that has commanded the maximum attention is that of water rates. These rates are "politically" fixed and remain unchanged for prolonged periods. The charges are mostly on per hectare basis and not on volumetric basis. The levels at which these rates are fixed are low compared to the cost of providing irrigation or to the productivity increases resulting out of the provision of irrigation. Even where the rates are levied and assessed, these are often not collected. As the Vaidyanathan Committee noted : "*Revision of water rates has been infrequent, hesitant and very much less than the increase in costs. For instance, water rates in Tamil Nadu were last revised 30 years back. In Punjab, Kerala, Haryana, Jammu and Kashmir and Himachal Pradesh, there has been no change in rates since the mid-seventies. Several (states) announced revisions during 1981-86,*

but in some cases the implementation of the revised rates was held up by the Governments....The rate increases were themselves rather modest and no state has accepted, much less implemented, the Irrigation Commission's recommendation for reviewing and adjusting rates every 5 years...During this period, the prices of agricultural produce have roughly doubled and overall yields of irrigated crops were also rising."

5.4 Following the recommendations of the Vaidyanathan Committee, the Planning Commission accepted, in principle, that volumetric supply based pricing should be adopted gradually. In the meantime, water rates should be based on the number of watering per hectare. It also decided that the state irrigation departments should form water user associations and some financial incentives should be available to these associations. Finally, the Planning Commission agreed that irrigation revenues should not only cover the operational expenses but also meet one percent of the interest on capital costs of the project. As summed by *Gulati et al* the *"thinking on the subject of cost recovery has moved almost in a circle: from full cost recovery, including capital costs, during 1940s and 1950s to partial cost recovery, i.e., full O & M costs and only a fraction of capital costs during 1960s and 1970s to only O & M costs in 1980s, and back towards recovery of full O & M and 1 percent of capital cost during 1990s."*

5.5 Some important measures have been taken to increase irrigation revenues following the Vaidyanathan Committee Report. The most important of these is 'Participatory Irrigation Management'. This involves the formation of water user associations in the command areas for more participative and decentralized management of the irrigation distribution systems. These associations have been of various types in different states. In some cases the water user associations have been involved in the collection of irrigation fees. A number of studies have been made on the operation of the water user associations and the general conclusions, as far as the financial implications are concerned, are that these associations have been only modestly successful. One reason for this is that the irrigation acts do not allow the stoppage of water supply to defaulters. Also these associations do not have authority to charge higher rates than those

prescribed by the government. In fact, water user associations receive management subsidies from the government. The strength of these associations lie in the facts that they (a) reduce the transaction costs of collection of irrigation charges to the state, (b) allow for more efficient management and maintenance of systems in some cases and (c) improve the effectiveness, equity and efficiency of water distribution at the cutting-edge levels.

VI Conclusions & Recommendations

6.1 The capital costs for increasing irrigation coverage are high and rising. One of the reasons for this is that greater emphasis has been placed on major and medium projects. Placing greater emphasis on traditional and minor irrigation methods can reduce the overall costs of irrigation investments.

6.2 The financial requirements for irrigation development in the Eleventh Plan have been estimated at Rs. 2,31,800 crore by the Eleventh Plan Working Group on Water Resources. This may be an underestimate as the actual costs of both MMI & MI schemes are considerably higher.

6.3 There are direct and indirect sources of financing of irrigations projects. Although the direct receipts from irrigation projects is a paltry sum compared to the costs involved, yet the farmers (the agricultural sector) are implicitly taxed. As a recent study has concluded *"it is not farmers that are riding on the back of rest of society for financing its irrigation needs, but the other way round"*.

6.4 Irrigation projects have been increasingly financed through debt capital. Although this reduces the immediate burden on the state exchequer, debt capital does not provide a sustainable basis for irrigation investments.

6.5 Since there are strong externalities of irrigation projects, there is a good case for funding irrigation investments through taxation. Since the resource base of the states is small, the center should finance such investments. As in the case of development of roads, a cess could be imposed on the incomes of the non-agricultural sector to finance irrigation development. The possibility of raising private equity capital for irrigation development remains remote at present.

6.6 Greater amount should be spent on operation and maintenance of existing systems. The measures taken following the Vaidyanathan Committee Report, including participatory irrigation management, are in the right direction and help to reduce the transaction costs and to improve management of distribution.

References

Dhawan, B.D, "Large Canal Irrigation: How Cost Effective?", Economic and Political Weekly, June 28, 1997.

Eleventh Plan Group on Water Resources, Ministry of Water Resources, Government of India. (Eleventh Plan Working Group)

Gulati, Ashok, Mark Svendsen and Nandini Roy Choudhury, 'Capital Costs of Major and Medium Irrigation Schemes in India', in Mark Svendsen and Ashok Gulati (ed). Strategic Change in Indian Agriculture, New Delhi: Macmillan, 1995.

Gulati, Ashok, Dick, Ruth Meinzen and Raju, K.V. "Institutional Reforms in Indian Irrigation", Sage Publication, 2005

Selvarajan, S, "Sustaining India's Irrigation Infrastructure" (policy brief based on a study on Water-Food Security Scenario Analysis for 2025 by Agro-Ecological Regions).

Singh Shekhar and Banerji Pranab, "Large Dams in India: Environmental, Social & Economic Impacts", Indian Institute of Public Administration, New Delhi, 2002

Vaidyanath, A, "India's Water Resources Contemporary Issues on Irrigation", Oxford University, 2006

Annexure- 1

India's aggregate measure of support (AMS), 1995-96

Product	
Product-specific AMS	-29,518 (-38.47 percent)*
Rice	- 7,577
Wheat	- 9,625
Coarse cereals ^a	- 4,530
Pulses ^b	- 1,706
Groundnuts	- 1,809
Rapeseed & mustard toria	- 1,689
Cotton	- 2,106
Soya beans	- 192
Tobacco	- 181
Jute	- 388
Sugarcane	285
Non Product-specific AMS	5,772.06 (7.52 percent)*
Fertilizer subsidy ^c	1,864.16
Credit subsidy	101.95
Electricity subsidy ^d	2,436.64
Irrigation subsidy ^e	1,345.41
Seed subsidy	23.92
Total product and non-product-specific AMS	-23,745.94

Source: WTO 1998.

Notes: Fiscal year—1 April to 31 March.

^a Including bajra, jowar, maize, barley.

^b Including gram, urad, moong, tur.

^c Fertilizer subsidy is based on the difference between the price of the fertilizer to the farmer and the cost of production minus the distribution margin; in the use of decontrolled phosphoric and potassic fertilizers, the subsidy is the difference between the cost of production or import and concessional prices to farmers, plus the distribution margin.

^d Power subsidy is measured as the unit cost of supplying electricity to all customers and the tariff charged to agricultural customers (multiplied by the quantity of power supplied to rural areas).

^e Irrigation subsidy is calculated as the difference between the operation and maintenance costs, annual depreciation, and interest costs of the irrigation infrastructure and the water charges recovered.

*Figures in parentheses are percentage to the value of output of selected crops.

Exchange rate: 1995-96: US\$1=Rs. 33.447.

1986-87 to 1988-89 average: US\$1= Rs. 13.409.

Annexure II

Capital Expenditure on Major and Medium Irrigation and Flood Control by Major States (Rs. Lakh)

	2003-04	2004-05	2005-06	2006-07 RE	2007-08 BE
Andhra Pradesh	153,803	330,306	615,775	846,214	1,122,705
Assam	8,153	10,988	11,200	27,670	32,155
Bihar	73,026	44,252	59,146	108,085	143,817
Chhattisgarh	41,724	62,149	54,707	76,502	88,340
Gujarat	134,029	176,537	225,139	408,351	352,461
Haryana	22,416	26,254	46,916	35,660	55,500
Jharkhand	32,408	43,363	44,811	48,770	53,390
Karnataka	188,146	300,973	332,969	440,976	386,993
Kerala	15,919	17,518	20,837	22,607	17,743
Madhya Pradesh	108,132	169,906	125,377	158,892	176,709
Maharashtra	610,229	600,285	606,431	528,367	479,431
Orissa	40,128	48,643	48,402	73,909	72,904
Punjab	8,164	19,529	30,442	42,047	85,153
Rajasthan	89,153	82,968	99,142	81,680	95,111
Tamilnadu	24,529	27,760	26,505	41,760	57,261
Uttar Pradesh	74,097	87,866	164,127	172,452	227,433
West Bengal	15,472	16,362	19,576	30,293	47,699
All States	1,683,125	2,114,146	2,613,627	3,275,050	3,640,561

Source: RBI, compiled by CMIE

