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**INNOVATIONS IN IRRIGATION FINANCING:
TAPPING DOMESTIC FINANCIAL MARKETS IN INDIA**

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ABSTRACT

Financing for water projects, especially for irrigation, has been moving towards collapse in recent years due to declining donor and government funding. Some Indian states have undertaken innovative institutional reforms by setting up financially autonomous corporations to mobilise required funds from the domestic bond market. This analysis of the performance of one such corporation, Karnataka's Krishna Bhagya Jal Nigam Limited, indicates that although adequate funds were mobilised, and physical works are on schedule, the new institution did not attempt to enhance overall irrigation performance and to move towards financial sustainability of the irrigation project. This paper describes the background of this institution, its achievements, inadequacies and potential of the innovative efforts made in irrigation financing reforms.

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INNOVATIONS IN IRRIGATION FINANCING: TAPPING DOMESTIC FINANCIAL MARKETS IN INDIA

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1. INTRODUCTION

Irrigation and domestic water supply projects worldwide face serious underfunding. The World Water Commission (2000) reported that worldwide, additional investment of \$100 billion per year is needed to meet needs of irrigation, water supply, and sanitation infrastructure to meet the food and domestic needs of a growing population. At the same time, funding from traditional sources—government budgets and development assistance—is drying up. Alternative financing arrangements are needed even to sustain existing investment in water systems. This is not only a concern of governments, but also of the international community. For example, the World Water Council, the Third World Water Forum and the Global Water Partnership have formed a high-level panel led by M. Michel Camdessus, former General Manager of the International Monetary Fund, to consider solutions to the future global financial needs of the water sector. The panel is to identify innovative approaches to mobilizing resources, as well as how financing arrangements can contribute to better water governance. Yet

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much of the emphasis in global discussions has been on international financial markets, and particularly the role of multinational corporations in financing water-related infrastructure. Much less attention has been given to the potential of domestic financial markets to provide such funding. Even in developing countries, these may control substantial resources. Since the 1980s, the Indian capital markets have emerged as an important source of funds for corporate units in the private and public sectors. Primary capital mobilization by private sector companies in the form of equity and debt rose from less than Rs 2 billion in 1980 to over Rs 43 billion in 1990-91 and then recorded a quantum jump to over Rs 260 billion by the end of 1994-95 (GOI, 1996; 81). During this period, several state governments have begun to tap into this domestic financial market to finance irrigation development.

Canal irrigation financing in India suffers from several inter-related problems: First, the funding for construction of on-going or new canal networks has been shrinking, leading to undue delay in completion of projects, which in turn raises costs and reduces benefits. At the same time, the resources for normal operation and maintenance are also under severe pressure as the cost recovery from canal irrigation is extremely low, and the state budgets are not able to allocate more funds because of the overall fiscal crunch. Furthermore, existing systems do not perform well, which is often attributed to management problems, agency incentives, as well as inadequate maintenance. In turn, the poor performance of many surface irrigation systems makes farmers unwilling to pay more for their water, thus limiting the resources that irrigation systems generate to cover their own costs, leading to further resource shortages and inadequate maintenance. This

state of affairs points towards impending financial crisis in Indian canal irrigation.

Without urgent steps to reverse this trend, such as through innovative institutional reforms, canal irrigation would remain much below its potential and could be heading for a collapse.

This is not the first time that such institutional reform is being proposed. Indeed, the working group on major and medium irrigation projects for India's Eighth Five-Year Plan (1992-97) considered the issue of inadequate funding for projects in the Seventh Plan. Against the spill over liability of Rs 260 billion for major and medium projects that remained uncompleted from previous Plans, the Seventh Plan outlay was only Rs115 billion. To enable the central government to assume a more positive role, in 1988 the Ministry of Water Resources formulated a proposal for establishment of an Irrigation Finance Corporation to provide financial assistance to projects of national importance in the irrigation sector (GOI, 1995). Though this proposal was supported by a large number of states, the planning commission did not approve it. Over the years, the states that had important ongoing projects established autonomous irrigation finance corporations. In south India, Karnataka's Krishna Bhagya Jal Nigam Limited (KBJNL) is one of them.

Does KBJNL provide a model for institutional reforms to solve the problems of canal irrigation financing? Can one take the structure and functioning of KBJNL as a model for ensuring efficiency, equity and sustainability of canal irrigation? The theoretical literature suggests that converting government irrigation departments into financially autonomous irrigation agencies (FAIA) can contribute to these objectives. However, the extent to which this type of reform has been effective in practice also needs to be examined. This paper provides an in depth evaluation of KBJNL, particularly its record in addressing the critical

problems of canal irrigation financing and management. In the following section we discuss the potential of such reforms. We then turn to the origin of KBJNL, its accomplishments and weaknesses, and conclude with broader recommendations.

2. POTENTIAL OF FINANCIALLY AUTONOMOUS IRRIGATION AGENCIES

While conventional government and multilateral financing for irrigation is decreasing, the capital and debt markets provide an important alternative source of funding. The debt markets trade bonds of public sector undertakings and corporate debentures. In India, major investors in these bonds are institutions, due to the investment pattern specified by the Indian government.⁴ There are prospects for such financing to become a major source of funding in the near future, but there are certain conditions to be met:

- Only companies and corporations can issue papers, which can be traded in these markets to raise funding. State-issued papers are subject to the overall ceiling on state borrowing.
- The bonds must be professionally designed and issued, with terms, interests, and payments modes, which attract the specific market segment to which a particular issue is addressed.

⁴ The Indian government specifies a pattern of investment to be followed by non-government institutions to invest their provident funds, superannuation funds, and gratuity funds. The revised version, effective from April, 1998 (Government of India, Ministry of Finance notification dated 12 June 1998) includes: 25% of investment in central government securities; 15% in government securities issued by any state government; and 40% in bonds or securities of public financial institutions, public sector companies (including KBJNL), the Infrastructure Development Finance Company, and/or certificate of deposits issued by public sector banks.

- The issuing companies or corporations must have the capacity to generate enough cash flow to service the bonds, which is constrained by the very low levels of water charges at present.

But the potential of setting up financially autonomous irrigation agencies goes beyond raising funds. A review of irrigation financing in several countries (Small et al.1989) identified FAIAs as a potentially powerful reform for improving irrigation performance. Small and Carruthers (1991) argue that this approach is desirable from the efficiency perspective because a policy of user fees implemented by a FAIA creates the potential for improvements, both in the operation and maintenance of existing irrigation facilities and in the process by which investments decisions are made.

The creation of FAIA can be an effective means for: a) introducing administrative and financial autonomy; b) increasing accountability; c) facilitating contacts with, and contracting out to farmers, NGOs and private firms; d) introducing less politicized procedures to set and collect water charges; and e) mobilizing private sector funds. The key concept here is self-financing. After a pre-defined nascent period, such corporations must provide for O&M and recurrent expenditure out of their own revenues, even if capital expenditures may still continue to be funded by the state. They must have both the mandate and the authority to set water charges at a level adequate to cover their expenses and service their debts. Once such self-financing has been established and recourse to treasury funding for recurrent and O&M expenditure cut off, they can also sell debt in the bond market (World Bank, 1997a: 26).

The potential for improvements in O&M stems in part from the greater control that a FAIA can have over its budget. But the key to attain higher efficiency under FAIA lies in linking incentives of the agency staff with their performance in satisfying the demands of end users. Having the income of these FAIAs dependent on the revenue they themselves collect for irrigation service would provide incentive for more regular and stricter collection of revenues from user groups. Because users withholding payment in response to poor service will then have a direct impact on agency budgets (including salaries), it also creates incentives for better irrigation service to facilitate fee payment. Financial autonomy thus provides a functional link between collection of revenue from users of irrigation water and more effective irrigation performance by suppliers of water, as confirmed by Svendsen's (1991) study of the reforms of the National Irrigation Agency (NIA) in the Philippines. Further, with financial autonomy, incentives are created to increase agency income, and to reduce costs.

Taken together, these factors should help establish a relationship of mutual dependence between the supply agency (i.e. irrigation department) and the farmer user-group. The irrigation agency provides an essential service to farmers, i.e. irrigation water in the quantity and quality desired by the user, while users, in turn, provide the agency with the financial resources necessary for its existence and operation. This mutual dependence can result in greatly expanded potential for efficient irrigation management (Gulati, Svendsen, and Choudhury 1994: A-78). It is the possibility of creating this critical link that distinguishes the FAIA from the typical irrigation department approach. To be an effective

FAIA, it is necessary to establish the link between incentives and performance, irrespective of the kind of financial autonomy it has.

Structurally, FAIA can be an agency of user groups, or a private company, or an autonomous corporation created by the government under the Company Act, or a combination of any two or more of these. What matters is that it should introduce commercial principles, link incentives with performance, meet the O&M costs (and a part of capital cost), and promote efficiency, equity and sustainability in the use of canal irrigation waters. The concept of a corporation like KBJNL is one of these.

KBJNL is not the first attempt in India in this direction. Andhra Pradesh State Irrigation Development Corporation was registered in 1974 to function on corporate lines and access private and institutional finance. But cost recovery never even approached actual expenses; the corporation accumulated heavy losses and could not service its bank loans. It no longer attracts bank finance due to its arrears. The Gujarat Water Resources Development Corporation, wholly owned by the Government of Gujarat and registered under the Companies Act, engaged in groundwater exploration, construction, and management of the public tubewells, but faced worsening financial and operational conditions ever since its inception in 1975.⁵ The 1994 finance committee suggested the corporation should be wound up (Kolavalli and Raju, 1995; Shah et al., 1995).

⁵ The corporation has accumulated a loss of over Rs 700 million and depends on the government for large subsidies to continue its operations. It faces constraints on what it can charge for its services and cost escalation add to the deficit every year. Nearly 20% of the deep tubewells that were not being adequately utilized have been closed down; the corporation began leasing out the tubewells to users in 1987 to reduce costs. It had a staggering wage bill of Rs 220 million for a staff of 6400, while its annual gross income was only Rs 60 million.

Four Indian states (Gujarat, Maharashtra, Karnataka, and Andhra Pradesh) have now set up corporations, or Nigams, that focus on mobilizing funds for surface irrigation. All four states started their corporations mainly to overcome the reduced budgetary allocations for the irrigation sector. These corporations were broadly established on the lines of public sector companies, to mobilise funds.⁶ Emphasis was on mobilising funds from institutions like commercial banks, cooperative banks, urban and rural cooperatives, and financial institutions, directly or indirectly regulated by or linked to government, rather than individuals.

However, it is easy to underestimate the dangers of introducing commercial principles in a situation where the forces of competition don't work. The Expert group on Commercialisation of Infrastructure (India, 1996) examined the potential to raise finances from markets and improve operational efficiency by introducing some commercial principles in infrastructure projects, but it also warns that despite the new possibilities of competition, most infrastructure services retain very strong monopolistic elements. The state continues to be responsible for providing appropriate regulatory frameworks, which assist investors and infrastructure entities on the one hand and protect consumers from monopolistic exploitation on the other. The commercialization of infrastructure and unbundling also lead to a considerable increase in transaction costs which have to be mitigated through transparent and appropriate regulation (GOI, 1996; 2). In a free market environment, costs of production/service are kept low by competition. But canal irrigation is more of a natural monopoly, and unless its costs are kept under tight control and its

⁶ The ordinance and the Act issued to establish these corporations indicate the broad intentions.

operations made transparent, it runs the danger of passing on the high costs to the users of water (Herath and Gulati, 2002). Indeed, the corporate arrangement provides *less* accountability and transparency than for government expenditures. The price for faster turn-around in expenditure appears to be a reduction in crosschecks. Thus, there is need for an independent regulatory body such as an IRCCI as a complement to financially autonomous agencies, to ensure transparency in the operations of such an agency. These reforms should have consumer as their priority and social interests and not the means or intermediate goals such as privatization, or bringing about independent regulation. Many contradictions which regulators today face would not exist had the consumer been given primacy (Morris, 2001).

In such a context, setting up some form of independent regulatory commission is needed to bring transparency in the operations of FAIA, especially if it is to work on commercial lines, and to ensure that pricing of water is distanced from political interference. FAIA represents a move towards bringing some elements of corporate culture in irrigation financing. One thinks of charging the users of water to recover all costs of O&M at least, and if possible even capital costs. A regulatory body that creates transparency is essential to keep costs down and prevent exploitation of water users by the corporation. This same transparency can also help distance pricing from political interference. When the current level water tariff is so low that even recovering O&M costs may require drastic increases in water rates (often more than four times), users are likely to object, which obviously has political repercussions, and no political party can afford to ignore this. It becomes essential to involve farmers in the entire exercise of setting fees and checking on how they are spent,

and to instill confidence in them that higher tariff would help the agency to render better service.

3. ORIGINS OF KRISHNA BHAGYA JAL NIGAM LIMITED

At the root of the KBJNL formation lies the sharing of the Krishna river water between Maharashtra, Karnataka and Andhra Pradesh states. As each state developed projects to use water, conflicts arose between them. In 1971, the Krishna Waters Dispute Tribunal (KWDT) was set up to allocate utilisation levels of Krishna river waters. The Tribunal reported its findings by 1973, and the states provided the answers for the queries raised by the Tribunal. In 1976, the Tribunal said that the award (popularly known as the Bachawat Award) may come under review by May 2000 AD. (However, due to lack of initiative from these states, the award has not been reviewed and the old status is continuing into 2002.) Thus a deadline was set to utilize the given water allocations by three states. Under this Award, Karnataka is to utilize 734 TMC (20.7 million ha m) of water from Krishna river.

The Upper Krishna Project (UKP) was developed to take advantage of the award.⁷ The state government sought World Bank assistance for UKP during 1980. The World Bank gave two credits: one expired by 1986 and another by June 1997, for a total loan of Rs 5.48 billion. Meanwhile, in 1988, the state felt the need for an authority to look into required land acquisition, which was posing a major problem in project implementation.

The triggers for setting up KBJNL were: the cumbersome process of land acquisition and the

⁷ The UKP consists of construction of two dams across the Krishna river and a network of canals. The main storage is at Almatti Dam and a lower Dam at Narayanpur is to serve as a diversion dam. The project is planned to be implemented in different stages and phases. A river bed project to generate 672 million units of electricity under the Almatti Dam is also planned.

deadline of 2000 AD to complete all physical works of UKP. In 1993, only seven years were left to complete the project. The future World Bank aid was uncertain because of problems with rehabilitation and resettlement in the UKP,⁸ and a dispute with Andhra over the height of the Almatti Dam, with its consequent impact on water availability for Andhra. The stipulations of the World Bank loans became difficult for the Government of Karnataka to meet, and further credit on UKP was suspended owing to inadequate efforts by the state government in rehabilitation and resettlement (R&R) in the UKP. Further, the focus of the World Bank also shifted to water resources consolidation projects, which accorded priority to basin development over individual projects.

In a normal course, the state budget could have supported the entire UKP execution, but then the project completion could have been anywhere from 15 to 20 years, since the state budgetary allocation of around Rs 10 billion is meant for all major and medium projects in the state. UKP alone needed Rs 10 billion every year from 1994-95 to 2000.⁹ The goal was to mobilise massive funding (up to Rs 60 billion) in a short time. The World Bank funding for UKP was drying up, and the revenue from existing irrigation projects was too meagre to give any support to the huge funding requirements of UKP. In Karnataka, revenue generation from the irrigation sector is not very encouraging. Out of Rs 2.3 billion outstanding, actual collection is only Rs 300 million. Penal water fees of around Rs 2.15 billion were waived during the parliamentary elections held in March 1996. Current water fee levels in Karnataka remained quite low, ranging from Rs 37 to 370 per ha,

⁸ Even after 12 years after the Bachawat Award, the R&R work has remained incomplete. The revised estimates for compensation increased the R&R budget to Rs 25 billion.

⁹ The financial scenario was not much different in the other states sharing Krishna water - Maharashtra and Andhra Pradesh. The other states also established similar corporations for the same reason, i.e, to mobilize more funds in shorter time.

depending on the crop. A high level committee headed by the finance minister, set up in 1993 to consider raising water fee levels, had not come out with clear suggestions by mid-1998 because of concerns over political implications. In its July 1998 meeting the committee suggested but did not officially announce doubling the current water fee levels, and gradually raising it by four times—still well below the amount needed to recover recurrent O&M.

These conditions led to an all-party support in the Karnataka Assembly for the formation of an autonomous irrigation agency that could raise funds, design and ensure construction of UKP within the stipulated time frame of up to 2000, and manage it on efficient basis. The outcome was KBJNL, which was registered under the Companies Act in August 1994, and charged with mobilizing funds for UKP.¹⁰ To fulfil the objectives and reap the benefits listed above, the company is authorised to borrow or raise required resources through issue of shares or debentures or any other securities. The company has been empowered to sell water and recover revenues from individuals and groups of farmers including those in the CADA, town and city municipalities and industries. It is also entrusted with rehabilitation and resettlement of the people affected by the project.

In 1995, the government contemplated an outlay of Rs 57.45 billion for the completion of

¹⁰ KBJNL was created to ensure completion of UKP with the following main objectives: a) to undertake planning, investigation, estimation, execution, operation and maintenance of all the irrigation projects coming under the Upper Krishna Project in the Krishna river basin or Karnataka up to outlet point only, keeping in view the Tribunal award, and the allocation of water made by the government of Karnataka; b) to prepare detailed project reports and estimates of irrigation projects and to obtain their approvals as the case may be; c) to implement the externally aided Upper Krishna Project in Krishna valley; d) to undertake resettlement and rehabilitation of the people affected by construction of the Project; e) to undertake measures for the protection and improvement of environment and health and well being of the people including the treatment of catchment areas of the project; f) to draw standards and specifications for implementation of the project and maintenance thereof; g) to promote schemes in the state for flood control in the Krishna river basin in Karnataka; h) to promote schemes for irrigation and navigation; i) to promote schemes for irrigation and water supply in the state for utilisation of water from the Upper Krishna Project.

UKP, which was revised to 82 billion in 2001. It included Rs 30.5 billion from market borrowing, Rs 24.5 billion from the government of Karnataka, and another Rs 2.45 billion from internal generation. Internal accruals are mainly through interest earned from market borrowings, which are parked temporarily in commercial banks. To raise funds from the market, KBJNL needed some assets. So by November 1995 the state government transferred about Rs 10 billion worth of assets, including dam, canal network, buildings, vehicles, and all other physical works completed by that date, to KBJNL.

Initially only non-World Bank funded works was supposed to be undertaken for completion by KBJNL. After the Bank's credit date was over, from April 1998, all works were transferred to KBJNL for implementation. With this change, the outlays were revised twice (in July, 1998 and in 2001) and fixed at Rs 82 billion. This includes Rs 10 billion on five lift irrigation schemes. By 2000 KBJNL planned to spend Rs 55 billion, mostly on completion of physical work.¹¹ The second revision was made to include lining of canals (Rs 25 billion) and carry out construction of field channels below the outlet.

What has been the result of creating KBJNL? In the following sections we assess the financial outcomes in terms of successful mobilization of capital, physical accomplishments in terms of pace of project implementation, reduction and reduction of the financial burden on the state, cost recovery, and overall improvement in delivery of improvement in delivery of irrigation services.

¹¹ KBJNL has to mobilize funds to meet R&R costs also. From 1996-99, KBJNL incurred Rs.3.4 billion on R&R.

4. PERFORMANCE OUTCOMES

MOBILIZATION OF CAPITAL FUNDS

The state government's efforts to raise funds through KBJNL are an innovative experiment. To borrow funds from the market, the company got a rating from CRISIL, a credit rating agency. The rating is based on the financial health of the government of Karnataka, which provided the guarantee to all the issues of KBJNL, and gets revised each year. In 1998, the rating for KBJNL bonds was 'A (SO)', which is considered quite a safe investment from risk point of view of the investors.

KBJNL is eligible to borrow up to 1.25 times its assets. The government has transferred all project assets to the KBJNL account, including lands, colonies, buildings, canals, dams, and other physical work. Based on book value, total assets are worth of Rs 24 billion, according to KBJNL records. To begin with in March 1996, funds were borrowed through public issue at a hefty 17.5% interest, owing to tight money market conditions. Over time, as market conditions eased, the interest rates were reduced. The issue in July 1998 was at 14.25% interest rate.

In the beginning, KBJNL went in for public issue mainly to reduce the risk perception. But the transaction cost of raising funds through public issue are very high, almost 7-8% of the sum raised. On private placement, the company appoints a few lead managers, on commission basis, who in turn take responsibility to get full subscription (generally from financial institutions, corporate bodies, and other agencies) to total issue amount. This costs the company only 0.5%. All except the second issue (a public issue)

used private placement of bonds. Under private placement, each issue has on an average of about 300-400 applicants, which makes for easy debt servicing and cuts down the transaction costs significantly. Initially the company officials and ministers pursued investors to subscribe to the KBJNL issues. From the 5th series onwards, the company opted for professional help. It had appointed seven lead managers (with 0.3% commission) who have taken responsibility to get subscription to all issues.

By August 2001, KBJNL raised Rs 46 billion through ten issues (see Table 1 and Figure 1) and responses to issues are good. Every time the issue gets over subscribed as shown in Table 1. With that, the company is confident of raising the remaining Rs 36 billion to meet that total target of Rs 82 billion by 2005. In recent years, KBJNL has increasingly tapped central government schemes to mobilise funds.¹² Through the Accelerated Benefit of irrigation Project Fund scheme of the Government of India, it has mobilised Rs 23 billion during 2001/02.

¹² The National Bank for Agriculture and Rural Development has created the Accelerated Benefit of irrigation Project Fund to complete the long-pending projects owing to financial constraints. Through this scheme, Government of Karnataka has tapped the central funds.

Table 1—Yearwise amount mobilized by KBJNL through August 2001

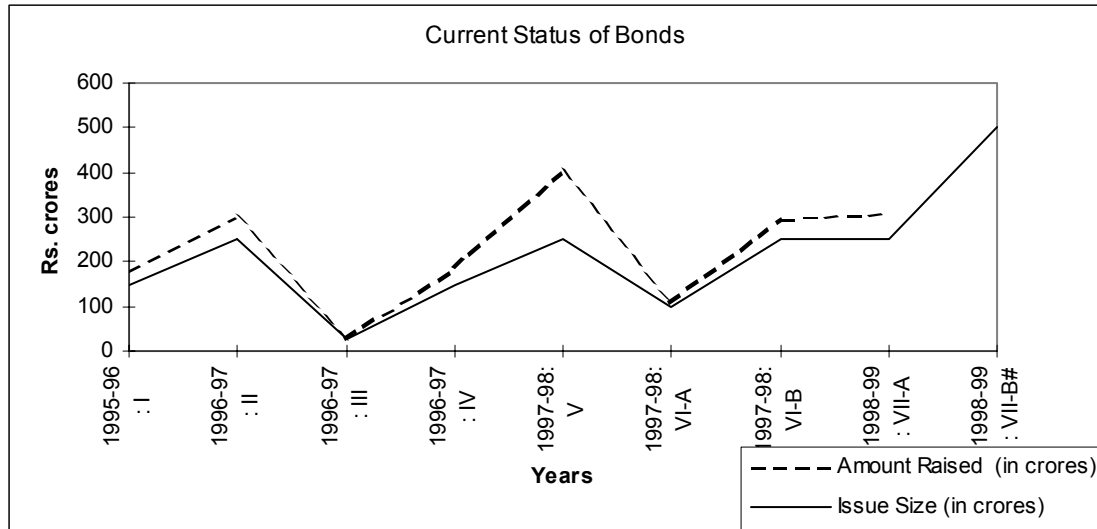
Year	Series	Issue Size	Interest Rate (percent)	Amount Retained (million Rs)	Amount/yr (million Rs)
1995-96	I	1500	17.50	1800.00	1800.00
1996-97	II	2500	17.50	3000.00	5090.48
	III	250	17.50	250.15	
	IV	1500	17.50	1840.33	
1997-98	V	2500	15.75	4030.98	8090.58
	VI-A	2500	15.75	1080.74	
	VI-B	2500	15.75	2960.86	
1998-99	VII-A	2500	14.25	3200.20	6100.61
	VII-B*	5000	14.25	2900.41	
1999-00	VIII	3700	14.25	3720.00	3720.00
2000-01	IX	1160	12.00	1164.80	1164.80
2001-02 (till August)	X	5000	12.00	4150.00	4150.00
Total					30116.37

Source: KBJNL, August 2001

Notes: Series II (1996-97) was public placement; all other issues were private placements.

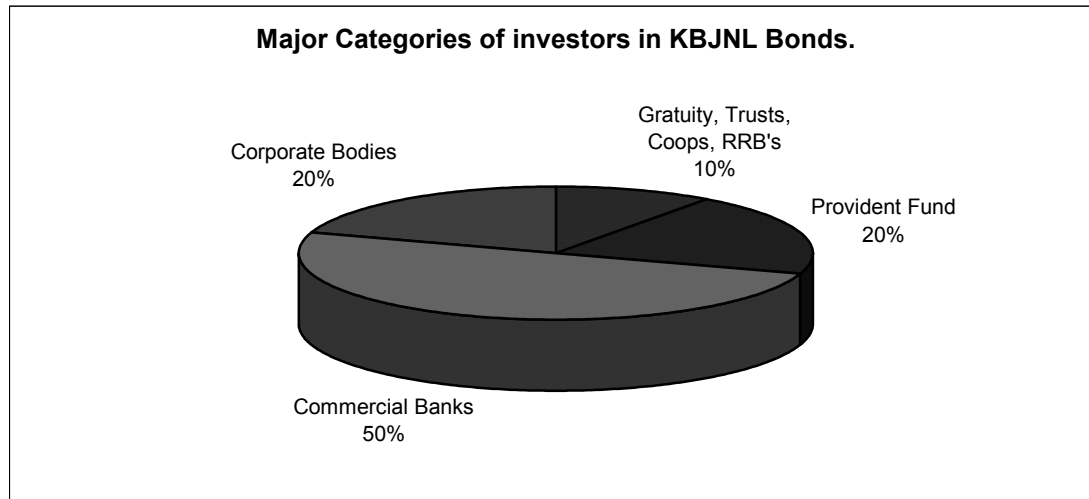
Amount retained exceeded the issue size because almost all issues were over-subscribed and KBJNL was allowed to retain somewhat more than its issue size.

Figure 1—Current Status of Bonds



As of 1998, KBJNL had a total of 397,000 bond holders. The KBJNL bonds and public issue have been subscribed to by investors from all over the country. They include commercial banks and rural and urban cooperatives (including Maharashtra and Gujarat cooperatives). A majority are institutional investors, while the first public issue had numerous individual investors. Major categories of investors include: Commercial banks (50%), Corporate bodies (like Sahara, Peerless) (20%), Provident Funds (20%) and Gratuity, Religious Trusts, Coops, and RRBs 10% (Figure 2).

Figure 2—Major Categories of Investors in KBJNL Bonds



One of the major reasons behind KBJNL's success in raising funds appears to be the involvement of the Government of Karnataka, (GOK), which has guaranteed the payment of interest and the principal amount through a tripartite agreement between GOK, KBJNL and the trustee of bond holders (earlier ICICI and now Vijaya Bank). Under this agreement, an escrow account has been created and it is funded substantially through budgetary resources of the state, including any revenue of KBJNL through water fees. The GOK has to transfer funds to escrow account 45 days before the due date for interest payment. By June 1998, GOK paid Rs 2.94 billion as interest through this account. From the investor's security point of view, therefore, an annualized yield ranging from almost 19% (for issue no.2) to 14.76% (for issue no. 7-A) on these bonds looks attractive. The bonds are in fact better priced than recent offerings from other companies (eg., IDBI). Liquidity during the life of the bonds is

sought to be provided through the exit routes as well as by listing them on two leading stock exchanges.

KBJNL has done quite a successful job of mobilizing capital resources for irrigation. The additions in structures over the last five years will keep raising the book value of assets. Fund raising has become easy for KBJNL because Karnataka is not a heavily indebted state, and Rs 50 billion is not so high as to shake up the government's financial health in crucial conditions. According to KBJNL management, the highest repayment of Rs 17 billion in 2004 is manageable. KBJNL's borrowing is only for a fixed period. Investors know the purpose of borrowing and to boost up their confidence, the project completion is on schedule. Other reasons include the lack of political interference and the fact that the company also places its funds temporarily in other banks to earn interest (at 9-10%).

PACE OF PROJECT IMPLEMENTATION

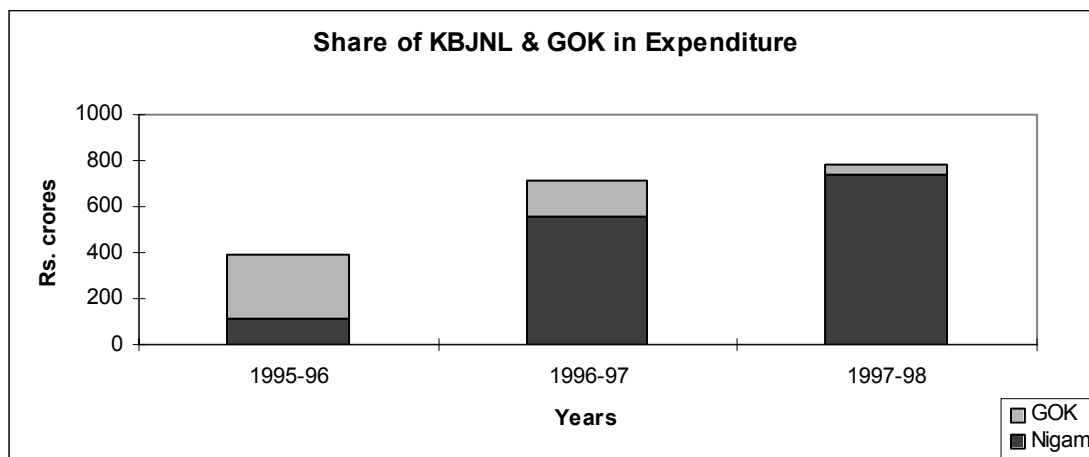
Because of the regular flow of funds through KBJNL and the high priority given in the state to complete all structures of UKP by the initial deadline of the year 2000, the project made reasonably good progress, both in terms of physical construction as well as in spending financial resources. By March 1999, the project achieved 50% of its financial target and 48% of its physical target set for the year 2000 in terms of irrigation potential created (259,000 ha) and 28% in terms of actual utilization (145,000 ha till mid-1997). Originally, KBJNL was entrusted the task of providing storage of 173 TMC and the main canals, but due to inadequate performance of command area development, even the lining of canals and construction of field channels were entrusted to the KBJNL at the cost of Rs 25

billion to be mobilised during the next four years. KBJNL has allocated Rs 6.5 billion during 2001/02 to construct field channels to irrigate 145,000 ha.

FINANCIAL BURDEN ON THE STATE

During the last 20 years, the government of Karnataka had allocated Rs 13 billion for the UKP project. As KBJNL increased its market borrowing, the state support (state's share of capital outlay) was reduced from 71 per cent in 1995-96 to just 6 per cent in 1997-98, while KBJNL's share increased from 29 per cent to 94 per cent over the same period (see Figure 3).

Figure 3—Share of KBJNL and government in expenditure on UKP



KBJNL had to maintain the regular flow of funds to complete its planned physical works by the year 2005. The company has planned to borrow up to Rs 36.7 billion during the next four years. The KBJNL has relieved the Karnataka government from the larger chunk of financial burden of UKP, at least in the immediate short run. But in due course, if KBJNL fails to mobilise enough internal resources to pay back the loans raised,

ultimately it is going to fall on the state government, as that is the ultimate guarantor. Over the years, KBJNL has made some experiments to use its funds more efficiently. Some of them are: a) it is getting Rs 4.04 billion at lower interest rate (Rs 2.04 billion at 9%, and another Rs 2 billion at 12.5-14%) from the Housing and Urban Development Corporation for housing activity in the rehabilitation and resettlement area; b) it is planning to return funds borrowed at higher interest rates (14-17.5%) through borrowing funds at lower interest rates, currently prevailing in the money market; c) it has got approval to raise funds under infrastructure schemes, which are available at cheaper interest rates because the returns to investors are exempt from income tax; and d) it has requested the a credit rating agency to suggest avenues to raise revenue in the UKP project. This would include toll tax on 600 km roads in the UKP command area, toll collection on six bridges constructed on the Krishna river, fishing rights, leasing out fibre optical lines for communication to be installed along the major canals, growing and selling of trees on canal bunds, and others.

Although KBJNL has made considerable progress in mobilizing capital for construction, it has not made structural reforms within the organization, nor has it paid attention to repayment. KBJNL is not generating income on its own. So far KBJNL has failed to revise the water rates to any reasonable level that can cover O&M costs, let alone repayment of debt. The organisation depends on the government's budgetary support for both interest and principle payments to bond subscribers and shareholders. Because of the continued dependence on the state budget to pay for expenses, the "financial autonomy" of KBJNL is really a myth.

COST RECOVERY

Theoretically, KBJNL is empowered to levy and collect water rates in areas where water is supplied or made available by the company.¹³ A Committee was constituted in December 1995 to make recommendations on the necessary organizational set-up and modalities for levy and collection of water rates. The Final Report of the Committee was discussed with the Chief Secretary in June 1996, and it was agreed that a revised proposal would be prepared considering the following aspects: a) Organizational cost of the proposed set up for levy and collection of water rates; b) Action plan for the development of Water Users Co-operative Societies (WUCs) and supply of water in bulk to these societies, including the plans for rehabilitating the distribution network and fixing of measuring devices; c) Rationalization of the staffing pattern for the Operation and Maintenance zone of KBJNL considering the pace of turnover of irrigation management to water users societies and the organizational arrangements required during the transition period.

The existing water rates were very low, covering less than 4 percent of the O&M cost (about 3.75%). The Committee on Pricing of Irrigation Water (India, 1992) suggested that, to begin with, cost recovery should be aimed at least to cover the O&M costs and 1% interest on capital employed. Based on this approach, the pricing per hectare in KBJNL area would work out to Rs 962/ha--close to Rs 945/ha. calculated by the state irrigation

¹³ The Karnataka Irrigation (Levy of Betterment Contribution and Water Rate) (Second Amendment) Act, 1995, (Karnataka Act No. 21 of 1995) empowers the Krishna Bhagya Jala Nigam Limited for this activity.

department.¹⁴ Even the Agricultural Policy of the government of Karnataka (Karnataka, 1995), has suggested increasing the water fee levels to 5% of the gross value of the produce.¹⁵ As indicated in Table 2, the water rates for irrigated dry crops in the Upper Krishna Project vary from Rs 37.50/ha (for pulses) to Rs 100/ha (for cotton). If water rates are progressively increased at 25% annually, as recommended by the board of directors of KBJNL to the state government, the water rates for different crop areas work out as shown in Table 2. The state Government agreed, in principle, to progressively increase the water rates for forecasting the revenues receivable by the Nigam. CRISIL accepted this intention of the government for rating of KBJNL, although the rate increase remained pending until 2001. In July 2001,

KBJNL implemented the same water rates that the Government of Karnataka announced for the whole state. This ended all speculations of having a different set of water rates for the KBJNL area. As indicated on Table 2, the new rates adopted are less than 17 percent of the KBJNL proposed rates for all crops except sugarcane and tobacco, which are minor crops in the KBJNL command, and less than 3 percent of the gross value of production.

¹⁴ Actual O & M costs in UKP are turning out to be Rs 912/ha, which is almost 200 per cent higher than projected by KBJNL (Rs 300/ha.) in its prospectus. Rs.945 per ha is based on the KBJNL's proposed water rates, which is 15 times higher than the current rates.

¹⁵ Based on the data for the year 1995-96, obtained from the agricultural wing of UKP-CADA, 5% of the gross value of produce per ha works out to:

Kharif Season		Rabi Season	
Bajra	325	Rabi Jowar	450
Hybrid Jowar	450	Bengalgram	500
Greengram	350	Sunflower	550
Sunflower	500	Groundnut	800
Groundnut	785		
Cotton	1050		

Paddy and sugarcane are not officially permitted to cultivate in the UKP-CADA area.

Table 2—Water rates for Karnataka and KBJNL (Rs/ha): 1965, 1985, and 2001

Crop	KBJNL rates (as per 1965 rules)	Karnataka rates (adopted 1985)	KBJNL proposed rates	Karnataka rates revised 2001	Revised rates as % of proposed rates
Sugarcane	617 ^a	555.75 ^b	891	988.45	111
Paddy	86 ^c	86.45 ^d	1473	247.10	17
Cotton	99	98.80	n.a.	148.25	-
Horticultural Crops	99	98.80	885	148.25	17
Wheat	54	54.34	885	148.25	17
Groundnut	59	59.28	885	148.25	17
Sunflower	n.a.	-	n.a.	148.25	-
Jowar, Maize, Bajra, Ragi and semi-dry crops	49	49.40	516	86.50	17
Pulses	37	37.05	n.a.	86.50	-
Tobacco	59	61.75	209	86.50	41
Fodder crops	n.a.	19.76	n.a.	37.05	-
Others	n.a.	-	n.a.	86.50	-

Notes:

a For 18 months crop. For 12 month crop, Rs 370

b For 12–18 months crop. For less than 12 months crop, Rs 150.

d For 1st crop. For subsequent crops, Rs 99.

d For 1st crop. For subsequent crops, Rs 40.

n.a. Not applicable

For levying and collecting water charges, KBJNL has accorded priority to bulk water supplies on a volumetric basis to farmers' societies and the collection of volumetric water rates.¹⁶ This type of wholesaling of water is a departure from the normal approach of collecting water fees from individual farmers based on the area and crop irrigated.

Volumetric wholesaling has the advantage to the agency of reducing its transaction costs in

¹⁶ In choosing this approach, the Nigam is bypassing the gram panchayats (village councils), that are otherwise empowered under section 203 of the Karnataka Panchayat Act, 1993, to contract to collect taxes on a tender basis.

collecting, by only having to collect from groups rather than many individuals. It could also introduce incentives to save water, because the groups would be billed based on amount of water used. However, this approach requires strong user groups that are able to collect fees from their members. Moreover, the groups have to pass on the incentives to conserve to their members, and this is not easy because water is not metered at the individual farm level (Meinzen-Dick and Mendoza 1996). The Karnataka state government's policy on participatory irrigation management is being formulated, and the various acts and rules are being amended as needed. KBJNL has to provide water supply to individual users in non-society areas.

To keep administrative costs low, KBJNL has proposed to entrust levy and collection of water rates to the O & M field staff, with one additional assistant engineer/junior engineer and one additional first division accounts assistant at the sub-divisional level, for effectively managing the process of levy and collection. After societies are adjusted to bulk water supplies, the O & M field staff will be re-deployed in new non-society areas.

KBJNL proposes three modes for collection of water rates, whereby users or societies can pay at the agency's sub-divisional cash counter, designated banks, or directly to the concerned section officer of the irrigation department. Levy and collection tasks will be carried out at the sub-divisional level, supervised at the divisional level, and monitored at the circle level. Passbooks will be issued to users as prescribed by the government. For delayed payments by a user/society a penalty at the rate of 18 percent will be levied for the

delayed period. Cases of non-payment of water rates and penalty may be referred to the Revenue Department for recovery as arrears of land revenue.

For effective levy and collection of water fee in the UKP, as outlined above, KBJNL has proposed the following changes in the legal framework suggested to transfer power to levy and collect water fees from the general revenue department or irrigation department of the state to the Executive Engineer of KBJNL, except in case of recovering the arrears.

In practice, KBJNL is assessing water charges of Rs 50 million per year, but the collection rate is only 50%. This is at least partly because KBJNL staff lack the enforcement powers accorded to the Revenue Department officials who collect water charges in the non-KBJNL area of the state. Even this 50% that is collected goes to the state exchequer, rather than directly to KBJNL, thereby losing any connection between farmer payments and KBJNL revenues, as would be required for a financially autonomous agency.

The new fee recovery strategy focuses on volumetric sales, and organizing users to become involved in system management and fee collection. But the failure to consult with users about basic issues in canal development, fees, or contracts, has created resistance. The approach remained typically top down. When farmers came to know of the hefty increases in the proposed water rates, they started agitations, mobilised political support, and thwarted any increase in water rates. As a result, the same old water fees are levied and only part of that is collected. This is nowhere near the actual expense on O&M of the project, not to talk of any interest or part of the loans raised. Thus, the potential of FAIAs seems to have remained unachieved, even after six years of its existence.

SERVICE DELIVERY

To address the problems of the irrigation sector, financially autonomous, farmer-financed irrigation agencies need to create different incentives for the agency and its staff. However, that has not been an objective of the agency as a whole, so it has not been translated into the work plans or reward structure of KBJNL.

A major reason that switching from a government irrigation department to KBJNL did not improve incentives for service delivery lies in the fact that more than 95 per cent of the staff, including the managing director and director of finance are on deputation from various government departments to KBJNL.¹⁷ As a result, the work culture has hardly changed in the new set up. Lack of proper recruitment policies and incentive and disincentives structures have led to inadequate professionalism. Even the management board hardly has any professionals.

A second reason that service delivery has not increased under KBJNL is that, although it was set up to be financially autonomous, in fact the state stands behind the organization. Water charges still go to the state treasury rather than directly to KBJNL, This means that, although KBJNL was originally designed to be a financially autonomous body, it functions as a conventional government agency. The staff's identity and reward structure are not related to the performance of KBJNL.

¹⁷ By the end of 1998 there were 1293 technical (up from 487 in March 1996) and 2478 non-technical (up from 721) staff on deputation; the majority belong to the irrigation department. To perform the key functions (like monitoring finance, handling computers, designing), KBJNL has 41 technical and 87 non-technical staff directly recruited on contract basis. At the field level, 70 per cent of the staff is on deputation from the government.

Third, there is no mechanism to generate and sustain farmer participation in this new set up. Although the state has a participatory irrigation management policy that encourages formation of water users associations in canal commands, the responsibility for such tasks rests not within KBJNL but with the Cooperatives Wing of the Command Area Development Authority. KBJNL has not designed any plans to involve water users and other stakeholders in the project to participate in resource mobilisation, system operation and maintenance, water distribution, and water fee collection and related activities. As a result, organisational structure and decision-making process has remained top-down.

This situation is aggravated by the lack of a regulatory body to examine costs, set fee levels, or respond to farmer complaints. The KBJNL by-laws make provision for the Nigam to reset water fee levels, levy and collect it. In practice, even after six years, it could not increase the water fee levels. Even a regulatory body has not been set up to examine costs and monitor the process. On the other hand, anticipating the proposed water fee hike, the farmers' lobby has organised a series of agitations over the last few years. These protests, held both in the project area and in state capital, were fueled by the lack of transparency and stakeholder involvement in the system management. Farmer's opposition to increasing irrigation charges is gaining momentum. The political implications of this opposition have made the government even more reluctant to address repayment issues.

Thus we see that because many of the staff are seconded from government line departments, KBJNL has not developed a distinct corporate culture. The expectation of the

staff is that they are only there for a fixed period of time. Further, the main clients are the bondholders, who are not the farmers. The need to assure the bondholders that they will be repaid provides some leverage to raise water fees, but because the farmers were not consulted about this and see no improvement in system performance, they oppose the increase. Moreover, because the expectation of bond-holders, rating agency, agency staff and farmers alike is that the government will pay, their behavior based on these expectations is no different from "business as usual." Functional hierarchy, lack of accountability, and inadequate performance measurement practices, lack of consultations with stakeholders, file maintenance, and method of management information system indicates it is more of an extension of government department.

Nor did the corporation link incentives with performance to do a better and quicker job. When the National Irrigation Administration of the Philippines became financially autonomous, it introduced incentives to increase agency income and reduce its costs at the project level, and included these incentives in the performance appraisals of the employees. KBJNL has had no plans (as of 2000) to do any of this.

REPLICABILITY

To some extent, the motives for and benefits of KBJNL cannot be understood without looking at water rights. Accelerating the process of irrigation development in UKP doesn't just reduce lags and therefore cut costs, but it also secures water rights under the Bhachawat Award. Delays in implementation between 1995 and 2000 not only increase the cost of irrigation, but risk having water taken away from Karnataka when the

Award is reviewed. If states see demand for water rising in the future, the value (in economic and political terms) of UKP in securing water may be greater than the estimated returns on the irrigation system alone.

One more corporation known as Karnataka Neeravari Nigam Limited (KNNL) has been formed on the lines of KBJNL, to raise funds and manage eight irrigation projects in the Krishna basin of Karnataka. Four more corporations are being planned on similar lines. The corporation is authorised to charge suitable water rates for irrigation, municipal, to city corporations, and industrial use. KNNL has an authorised capital of Rs 30 billion and it has so far raised Rs 2.47 billion from two issues.

Other Indian states have similarly adopted the Nigam approach to funding irrigation development. The extent to which other developing countries can rely on their domestic bond market is likely to depend on the size and structure of their capital markets and the level of investor confidence in repayment. Indian government rules governing investment of pension funds and other institutional funds has certainly helped KBJNL to raise funds, as have income tax exemptions on infrastructure investments. Confidence that investors will be repaid must come from either the organization's track record in raising resources or the financial stability of the government that backs it, since the systems' "assets" actually have little collateral value in the case of failure to repay.

5. CONCLUSIONS

The latest trend in financing canal irrigation in India harks back to colonial ventures to raise funds for canals and other infrastructure investments in India. Several states have now launched irrigation corporations, with the primary objective to raise financial resources from the market to build irrigation structures. Their genesis lies in the acute scarcity of financial resources faced by the respective state governments, and the compulsions to build the irrigation structures rapidly. The financial crunch for canal irrigation has been felt because of stoppage/suspension of loans from the World Bank or the Central government, as the concerned projects have invited criticism and dispute either from the people at large, due to poor implementation of R&R, or from the riparian states. These states, finding it difficult to mobilise funds under normal procedures, are raising funds from the market by floating a corporation. To get the confidence of lenders, the state governments not only gave a guarantee to the bondholders to pay back the interest and the principal amount if the corporation failed to do so but also actively persuaded them to buy these bonds.

Theoretically, these corporations can usher in reforms in the canal irrigation of those basins/projects, and put them on a sustainable track, but their activities largely have remained concentrated in mobilising large funds, and spending them liberally to complete the structures in reasonably short time. Flow of funds is faster: it takes only 1 to 2 weeks to get money from KBJNL and pay it to contractors, compared with 2-3 months in a system where funds have to come from the government. As a result, the construction activity stayed more or less on schedule. Thus, overall, it appears that there is some reduction in the time consumed, which should result in shortening the gestation lag

between expenditures incurred and potential created. This, in turn, should help towards containing the escalation in the costs to the extent they were due to delays in implementation emanating from lack of resources, or erratic/halting release of funds. But it is difficult to measure precisely how much is the gain in cost reduction under the current set up vis-a-vis the departmental set of GOK without looking into other aspects too.

Whether it has led to reduction in cost, whether expenditures patterns have been transparent and productive, and whether these corporations have infused the spirit of efficiency in the functionaries by linking incentives with performance, remains doubtful. A detailed analysis of the style of their functioning reveals that although these corporations, including KBJNL, appear to be financially autonomous, they are really still dependent on the state, and they fail to deliver reforms beyond mobilisation 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.

KBJNL has not ushered in major performance improvements, mainly because the agency has some in-built lacunae: a) The environs demanded raising money fast, and this they did. What it didn't do is pay any attention to the long-term sustainability of the system, either in terms of financial sustainability or managerial and infrastructure sustainability; b) To fulfill the credit rating agency requirements KBJNL had made some promises like raising water prices, formation of water users associations, and collection of revenue

through WUAs. Even after six years of KBJNL functioning, these promises were not kept nor were there serious attempts to move towards in that direction; and c) Improvement in performance of the system was neither part of its objective, nor do its current functions stress performance. This is in spite of most of the irrigation project review studies emphasizing the crucial need for performance improvement. Here, the emphasis is on rapid construction.

Clearly there is a lack of vision among the management staff about what a financially autonomous irrigation agency can do. Both agency staff and farmers interviewed believe that the state will repay all debts, and they continue to act based on that premise of "business as usual." Furthermore, many of the staff has no long-term identification with KBJNL, nor an incentive to see it succeed, because they are only on deputation from the government of Karnataka (especially the regular Irrigation Department).

KBJNL in its present form is not sufficiently equipped to address the larger issues of the reforms in the irrigation sector: increasing efficiency in project performance; increasing agricultural productivity; enhancing revenue generation; providing users more productive roles to play in the project; reducing operational costs over time; or sustainable management of the project. As a result, they do not inspire the confidence of farmers to overcome images of inefficiency and corruption. The result is that farmers are opposing increases in irrigation fees.

In the whole process, the KBJNL has achieved its key mandate of mobilising adequate funds and completing physical structures on schedule. But 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.

Furthermore, unless they address the need to improve service delivery and orientation of the staff, farmers will continue to resist any efforts to increase cost recovery and contribute to financial viability. After a decade or so, some expert committee may come and recommend their closure. The experiment of ushering reforms to improve the overall functioning of canal irrigation through financially autonomous irrigation agencies such as KBJNL may thus remain a missed opportunity.

REFERENCES

- Bhavanishankar, B.S. 1996. Water rate collection-mechanism to enhance recovery and revenue in large irrigation systems. U.O. Note. June 20 1996.
- Gulati Ashok, Ruth Meinzen-Dick.S., and K.V.Raju.2002. *Institutional reforms in Indian irrigation*. Forthcoming from Sage Publications, New Delhi.
- Gulati, A., M. Svendsen, and N.R. Choudhury. 994. Major and medium irrigation schemes: Towards better financial performance. *Economic and Political Weekly*, 29(26).
- Herath Gamini and Ashok Gulati.2002. Institutions and Infrastructure: Emerging Trends in Developing Countries. First Draft. (Mimeo), MSSD Division, International Food Policy Research Intitute, Washington DC.
- India. 1996. *The India infrastructure report: Policy imperatives for growth and welfare*. Report submitted by the Expert Group on the Commercialization of Infrastructure Projects (Chaired by Rakesh Mohan). 3 volumes. New Delhi: National Council for Applied Economic Research.
- India. 1995. *Private sector participation in irrigation and multipurpose projects*. Report of the High Level Committee (Chaired by P.V. Rangayya Naidu). Volumes I & II, Main Report and Annexures. New Delhi: Ministry of Water Resources.
- India. 1992. *Committee on the pricing of irrigation*. (Vaidyanathan Committee), New Delhi: Planning Commission.
- Karnataka. 1996. *Annual Reports of KBJNL—1995-96 and 1996-97*. Government of Karnataka.
- Karnataka. 1995. *Participatory Irrigation Management Report*. Bangalore: Department of Irrigation.
- Kolavalli, S. and K.V. Raju. 1995. Turnover of public tubewells by Gujarat Water Resources Development Corporation. In *Irrigation management transfer: Selected papers from the international conference on irrigation management transfer*, Wuhan, China, September 20-24 1994. Water Report, No.5, ed. S.H. Johnson, D.L. Vermillion, and J.A. Sagardoy. Rome: FAO and International Irrigation Management Institute.
- Meinzen-Dick, R.S. and M. Mendoza. 1996. Alternative water allocation mechanisms: Indian and international experiences. *Economic and Political Weekly* 31(13): A25-A30.

- Morris Sebastian. 2001. Issues in infrastructure development today: The interlinkages. In *India infrastructure report 2001: Issues in regulation and market structure* by 3i Network. New Delhi: Oxford University Press. pp 9-32.
- Shah, T. et al. 1995. Turnover of state tubewells to farmer cooperatives: Assessment of Gujarat's experience. In *Irrigation management transfer: Selected papers from the international conference on irrigation management transfer*, ed. S.H. Johnson, D.L. Vermillion and J.A.Sagardoy., September 20-24, Wuhan, China. Water Report No.5.
- Small, L.E. and I. Carruthers. 1991. *Farmer-financed irrigation: The economics of reform*. Cambridge: Cambridge University Press in association with the International Irrigation Management Institute.
- Small, L.E., M.S. Adriano, E.D. Martin, R. Bhatia, Y.K. Shim, and P. Pradhan. 1989. *Financing irrigation services: A literature review and selected case studies from Asia*. Colombo: International Irrigation Management Institute.
- Svendsen, M.1991. *Recovery of irrigation costs through water charges*. Reference paper prepared for Workshop on Irrigation Water Charges sponsored by Advisory unit for Agricultural Corporations and International Irrigation Management Institute, Khartoum, Sudan.
- World Bank. 1997a. *India: Water resources management sector review*. Final Draft, May 16.
- World Water Commission. 2000. *A water secure world: Vision for water, life, and the environment*. The Hague.
- World Water Council. 2002. International Panel Leads Search for New Investments in Water. Press release.
http://www.worldwatercouncil.org/download/Financ_panel_PR.pdf, accessed August 2, 2002.

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