A Simulation and Scenario Testing of Canal Irrigation Cooperatives in India for Financial Viability and Sustainability

By

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Abstract: *First, the study attempts to know the capacity and willingness to pay the water charges based on the water productivity of the farmers of newly formed Canal Irrigation Cooperatives in Dharoi Irrigation Project in Gujarat being developed by Development Support centre and AKRSP, Ahmedabad. The broad objective of this study is to use a new approach to help investigating on the sustainability of irrigation cooperatives with special reference to small holding and ability of the farmers to pay the water fees determined by Irrigation cooperatives through water productivity. The study tries to identify and analyze the critical factors for financial success/ failure of canal irrigation co-operatives, assess the capacity of the farmers to pay and elicit the conscious steps taken by the government and farmers for ensuring the financial strength of ICs. A new approach has been used to test the scenario for the financial viability of irrigation cooperatives. The approach acknowledges that there are costs incurred by supplying water and water-related services to farmers, and that an objective of financial viability is pursued at scheme level. This means that the management entity provides irrigation water and related services to farmers, such services generate costs, the management entity charges the farmers according to a system to be established, and the farmers tap into their monetary resources to pay these water service fees.*
Key words: Irrigation, command area, operation and maintenance, financial viability.

1.0 Introduction:

Among the key outcomes of the Earth Summit held in Rio de Janeiro in 1992 were the recommendations that water should be treated as an economic good (with a right attached to it), that water management should be decentralized, and that farmers and other stakeholders should play a more important role in the management of natural resources, including water. Increasingly, local management solutions are being sought for global problems of food and for resource problems (Ostrom 1990). Irrigation

management transfer, or turnover, has become a widespread strategy in Asia, Africa, and Latin America. Participatory irrigation management and irrigation management transfer reforms often have the stated objectives of providing sustainable and adequate financing for operation and maintenance of irrigation and drainage services and of facilitating investment in the required rehabilitation or upgrading of irrigation systems. Overall reform of water resources management often encompasses these reforms. It often includes demand management to encourage efficient water allocation and imposes new externalities on irrigation systems in terms of environmental performance.

The sustainability of the water users associations is however now seen to depend on their capacity to provide an adequate water delivery service and control and to allocate water and to provide an improved service to enable gains in agricultural productivity (Svendsen, 1997). This is essential for the capacity of farmers to pay water and for the water users associations to be financially viable. As a result, it is now recommended that strategies of gradual improvement of irrigation systems be adopted to support the transfer

Most often, governments pursue management transfer programs to reduce their expenditures on irrigation, improve productivity, and stabilize deteriorating irrigation systems. Over the past three decades, the world's irrigation sector has been increasingly exposed to a global trend towards decentralization and privatization. Many countries have embarked on a process to transfer the management of small as well as big irrigation systems from government agencies to local management entities (Vermillion, 1997). This process of Irrigation Management Transfer (IMT) includes state withdrawal, promotion of water users' participation, development of local management institutions, transfer of ownership and management. India has cautiously initiated IMT in government managed big and smallholding irrigation schemes and most transfer operators are still unsure about how to design and implement the process. At present, India has an estimated 100 million ha of gross area under irrigation and 58 million hectares of net irrigated area (Planning commission, 2007)). Owing to history and past policies, India is having irrigation projects of different sizes ranging from few thousand hectares to millions of hectares. Because of ever-increasing population, the average land holding in general and under irrigation in particular has gone down. Also, the new National Water Policy of 2002 promotes the creation of Water Users' Associations (WUAs). It is envisaged that such local institutions take over most irrigation management functions, i.e. water allocation and distribution, maintenance, water charging system, financial management, and so on. Absence of people involvement and participation is one of the several causes that have been mentioned (IWMI, 2001) for poor status of irrigation projects. With regard to a rehabilitation and Irrigation Management Transfer process, these issues raise a series of questions at different levels: national and provincial governments (rehabilitation policy and implementation, IMT procedure), WUA level (collective management of newly transferred irrigation schemes, institutional arrangements), and farmers' level (farming and cropping systems management).

Financial viability of a canal water users' association (WUA)/ICs implies that it is able to generate enough income to meet its regular and emergency expenses and at the same time invest adequately in the maintenance & repairs of canals.(Vaibhav Chaturvedi,2004). He

argues that though the financial viability of the Irrigation Cooperatives (ICs) is considered imperative and vital for the overall smooth functioning and sustainability of this institution, there are few studies specifically dealing with the financial functioning of ICs. This may be attributed to the fact that in the initial stages of formation of any institution, the social dynamics are very important. It is the social processes and the dynamics between the various stakeholders, which ensure a sound initiation of any institution. However, as the institutions start functioning they need money to cover their running cost. Thus, it is here that the financial working issue gains much importance along with the social dimension. The Irrigation Cooperatives should be able to generate some surplus for coping with the unforeseen requirements.

Participatory Irrigation Management in Gujarat: In Gujarat, the implementation of the National Water Policy guidelines was initiated on an experimental basis in the district of Bharuch. The results proved so encouraging that in 1995 the state government declared a policy on Participatory Irrigation Management (PIM), along the lines of the national policy, emphasizing farmer participation in the planning, implementation and management of direct and indirect irrigation projects, and seeking the co-operation of voluntary organizations. The basic philosophy of participatory irrigation management programmes in Gujarat as in other states has been to transform irrigators from beneficiaries to partners in the planning and development of irrigation. An analysis of the experience of the programme shows that farmers' involvement in water management has indeed led to a better and smoother resolution of irrigation-related conflicts. However, the other expectation that the programme would reduce state expenditure has not materialized as yet (Parthasarathy, 2000). Water users' associations will have to be more efficient in making allocative and investment decisions. For this a clarification of legal rights is imperative.

When the canal water charges are based on area and crops and the tube well charges are higher than the canal water, as the number of waterings from the canal increases, the marginal utility of additional watering should be positive, while the average price (per watering) declines. However, in most of north Gujarat's villages, farmers do not view marginal utility only by the cost parameter. This is because water supply by the 'tube well companies' is considered not only to be reliable but also efficient in terms of revenue. Many studies have shown that output is higher with the use of ground water rather than canal water (Dhawan 1990 as cited in Parthasarathy,2000).

Shah (1993) points out, water prices charged by owners of 'electric water extracting mechanisms' (including tubewells) are much higher even in Gujarat's water abundant areas and in states like Uttar Pradesh, Haryana, Andhra Pradesh, Bihar and Tamil Nadu. Shah's analysis suggests the possibility of lowering tubewell water rates as and when the number of waterings from the canal improves. This is the possibility the farmers counted too.

Summing up, the literature on IMT points out that farmers' involvement in water distribution and maintenance systems has led to an improvement in resolving irrigation related conflicts which were previously dealt with by government authorities. Though the IMT has led to an increase in the water fee collection rate and improvements in the O and M of the system (Parthasarathy, 2000) none of the studies shows that the cost of irrigation management by the government has been reduced. Importantly, there is little evidence to show that the per unit rate of water has been increased after the transfer. In fact, IIMI's

study (Vermillion, 1997) on irrigation service fees in five Asian countries including Gujarat concludes that irrigation agencies with a significant degree of financial autonomy have often been able to reduce the amount of direct payment required from farmers through institutional arrangements where the agencies earn secondary income from sources other than charges on water users (Small 1987). On the other hand, the newly created users organizations were also found to incur managerial expenses. Perhaps based on this evidence, Johnson III (1997) suggests a need for users to establish an investment fund to sustain the transfer.

The study by Development Support Centre (2007) on cost benefit ratio in PIM reveals that there was 30- 55% increase in efficiency in water utilization, saving in cost on water in the range of Rs. 848 to RS. 2026 per hectare. It also found the increase of the real wage income of Rs. 250 per hectare per year indicating additional employment generation. There was positive impact on livestock population and milk production of 1260 liters per animal per year. The Irrigation Cooperatives which had diversified activities were capable to generate more income as compared to those without diversified activities like Thalota Irrigation Cooperative . (Vaibhav Chaturvedi, 2004 and Garima Csrivastav, 2007). The other dimension brought out by various studies is the increase in the demand for water for non-agricultural use. Yet, in most of the places the legal system does not seem to specify the rights for irrigated agriculture and also fails to state how these rights can be protected against increasing demands for water from municipal and industrial users.

Some of the significant results achieved as a result of the canal rehabilitation as part of PIM in Gujarat are: More agricultural land, which was previously not under cultivation due to seepage from canal, was brought under irrigation. Overuse of water by head-reach farmers has been controlled as they were assured of getting their due share of water. Due to assured water supply, farmers agreed to pay water charges that were 40-60 percent higher than government rates. Equitable distribution of water, reliable water supply and appropriate water application in command area have increased wheat yields by 66 percent.

1.1 Background and Rationale: The study is based on two main propositions, first, in contrast to the current institutional strategies focusing on a narrow objective of reducing government costs in managing irrigation infrastructure, the study aimed at broader resource management goals. Second, the study also sought to identify a demand-driven bottom-up approach in establishing mechanisms for decentralized management of water resources and resource mobilization for the financial viability and sustainability of irrigation cooperatives. This study coincided with a policy resolve in India and several other countries in the region to introduce major reforms aimed at improving the effectiveness of water resources management institutions.

In the backdrop of the PIM policy laid down by the Government of Gujarat in 1995, the government as well as voluntary agencies had initiated a number of Water Users'

Associations(WUAs) registered as Irrigation Cooperatives (ICs). The success of these farmers' institutions depends on various factors-social, administrative as well as financial. Though most of the ICs are still in their early stages, some can be identified as being financially strong, and some as weak. If the analysis of history of cooperatives is done, it is likely that most of the failed co-operatives are weak in their financial position. Thus, financial viability and self-sufficiency is a must for a cooperative to be sustainable and meet the regular Operation & Maintenance expense (including administrative expenses, salary of secretary, salary of operator, and maintenance & repairs of canals) and ensure proper maintenance & repairs of the canal. It thus becomes imperative to find out the various critical factors that ensure financial strength of the ICs, and the various steps taken by the co-operatives to increase their revenue and control costs for better financial management. This exercise gains more importance in view of the proposed legislation of the Government of Gujarat, which proposes to form ICs (WUAs) by legal mandate throughout the state of Gujarat. The role of subsidies and grant by the government in ensuring the financial soundness of the IC also has to be analyzed. The analysis can provide valuable inputs to the policy makers to enhance proper environment for successfully promoting the ICs by Government Organizations and Non-Government Organizations (NGOs).

The objective of this study is to use an approach to help investigating on the sustainability of irrigation cooperatives with special reference to small holding and cropping pattern and ability of the farmers to pay the water fees determined by Irrigation cooperatives/water users' associations in a context of IMT, and to accompany and support decisions and actions undertaken by development operators. It promotes collective solution seeking through scenario testing. The study limits itself to use of the approach, its principles, the model's conceptual framework as suggested by Perret et all (2002). The approach was developed in a case study scheme.

Through a collaborative effort of Gujarat Water Resource Department and Development Support Centre Ahmedabad, supported by National Dairy Development Board (NDDB), Irrigation projects covering 56,700 hectare are being developed as models of Participatory Irrigation Management. The NGO Development Support Centre is planning to form a total of 216 ICs in the three schemes of Dharoi (45,000 ha.), Guhai (7200 ha.) and Mazam (4500ha.) covering 56,700 hectares of command area by March 2008.

The schemes display a number of features that are common to other irrigation schemes e.g., a diversity of practices and performance among irrigation farmers, yet generally little productive and subsistence-oriented, a simple conception of infrastructures (a gravity-fed system with dam, canals and furrows), yet deteriorating, a lack of support services, a weak agri-business environment, and missing markets, water allocation and water availability problems, especially in winter. Ever since, there has been intense sharing of experience and ideas between the NGO groups that have direct experience of working with the farmers and officers of the Water Resources Department both at the field level and at the policy level. This has resulted into developing packages of incentives for the farmers in the canal command like retaining 50% of their water fee collection and carrying rehabilitation work with financial help from government to organize themselves into Irrigation Cooperatives(IC) and take responsibilities for maintenance of the canal network transferred to them as well as for management of the irrigation water made available to them for distribution to farmer members.

1.2 Objectives

The main objective of this study was to test, through pilot efforts, to understand the rationale for the Irrigation Cooperatives and to help investigating on the sustainability of IC in a context of Irrigation Management Transfer, so that more efficient and equitable use of water can be achieved in a hierarchical society. In the given context of large-size canal systems, and the deep-rooted social perceptions regarding the role of the state as a benefactor and that of the water users as the beneficiaries, the strategy of working towards shared management was found to be very productive. To both the state agencies and the water users, the idea of a complete management transfer to the user organizations at this stage was not readily acceptable. The objective of the study is to understand the rationale for the Irrigation Cooperatives and to help investigating on the sustainability of IC in a context of Irrigation Management Transfer. The specific objectives of the study are

1. Identify and analyze the critical factors for financial success/ failure of canal irrigation co-operatives in the context of agro climatic conditions.

2. Assess the capacity of the farmers in terms of water productivity to pay and get benefit of Irrigation Cooperatives in the context of irrigation scheme and agro climatic conditions using scenario testing model.

3. Elicit the conscious steps taken by the supporting agency and farmers for ensuring the financial strength of these I Cs

4. Develop recommendations for enhancing financial viability of the Irrigation Co-operatives while simultaneously taking adequate care of Maintenance & Repair of canals.

2.0. Study Methods

For identifying the critical factors determining the success of irrigation cooperatives a detailed study dealing with financial aspect of the selected co-operatives was carried out.

2.1 Sampling

In the light of some studies on financial viability (Vaibhav Chaturved, 2004) of irrigation cooperatives without taking the agro climatic conditions, choice of cropping pattern for the farmers and size of land holding and income generating capacity of the farmers into consideration, it was considered useful to make qualitative study by taking such a sample that will bring out the factors that impact the financial viability of WUAs and what policy measures may be appropriate for ensuring it when the law is enacted and a large number of WUAs/ICs are established.

The financial data of various cooperatives available with Development Support Centre was used for the study. The details on financial performance of ICs are based on consolidated financial results for 4-6 years based on the availability of data. The

financially strong and weak co-operatives were identified after discussion with the senior staff of Development Support Centre (DSC), and the Water and Land Management Institute, Gujarat (WALMI). Five irrigation co-operatives were studied.

Apart from the details of performance of selected Irrigation Cooperatives the information on land type, agro climatic conditions of the command, cropping pattern, yield levels of various crops during different seasons, cost of cultivation and gross margin of profit to the farmers were collected based on discussion with Department of Agriculture, officials of Development Support centre and interaction with the farmers of the command area.

2.2 Data Collection

The data collection is on pilot basis and data relevant to Water productivity like water procurement by each IC, gross production/value in the farm, water productivity of both farm and non farm activity is in progress. Secondary data was collected through the record of Development Support Centre, Ahmedabad. The Income-Expenditure Account and Balance Sheets of the various ICs were collected from the records of Development Support Centre and discussion with Officials of Irrigation cooperatives in Dharoi Irrigation Project. Primary data was collected through focus group discussions (FGDs) with the Executive Committee (EC) of IC, and with the field implementation unit staff of DSC and various policy level actors

2.3 Data Analysis

The account books of the various ICs were analyzed for assessing the trend of revenue generated, operation & maintenance costs, and reserves & surpluses. As well as the various steps taken for improving its financial strength were studied. Finally, the factor s affecting the financial viability were elicited through discussion with the member s of ICs, supporting agency and policy level actors.

2.4 Findings and Analysis

I. The study findings are presented as following

Present status of financial viability

Analysis of Expenditure

Analysis of Income

Comparison of water charges

Scope of diversification

a) Analysis of Expenditure

Maintenance & Repairs expenditure

Salary of secretary, operator and other staff

Administrative expenditure

Minimizing expenditure through voluntary lab our

b) Analysis of Income

• Government assistance for

--Maintenance

--Management

• Additional water rate collection

• Interest from balance at bank Income from additional services

• Others-such as penalty

Other factors which affect income are

• Quantum of water available

• Area irrigated

• Recovery

2.5. Analysis of Major Issues

The topic of discussion is what the most important elements of financial viability are. Its main features involve apart from the performance of irrigation cooperatives in terms of their costs and income, simulations and scenario-testing on the costs incurred by scheme management, the possible contributions by farmers to cover these costs, the possible charging system to be set up, and finally the impact of certain measures or decisions, or certain farmers' strategies on the financial viability of the scheme. The paper discussion

mainly involves principles of the approach, especially the need for a sustained and multi-disciplinary partnership during scenario development and discussion, including farmers and transfer operators (NGOs and Irrigation Agency). Such an approach shows huge potential for information and decision-making support towards transfer operators, for training, and for farmers' participation.

First, focus of discussion is on the approach acknowledging that there are costs incurred by supplying water and water-related services to farmers, and that an objective of financial viability is pursued at scheme level (involving partial or total cost recovery). In an IMT context, this means that

The management entity (WUA) provides irrigation water and related services to farmers,

Such services generate costs (capital, maintenance and operation costs, and personnel-related costs),

The management entity charges the farmers according to a system to be established, an

The farmers tap into their monetary resources (generated by irrigated or rain-fed cropping systems, by off-farm income-earning systems) to pay these water service fees.

Smallholders' agricultural and resource-management systems face a quickly changing economic, legal and social environment.

2.51. Implementation features

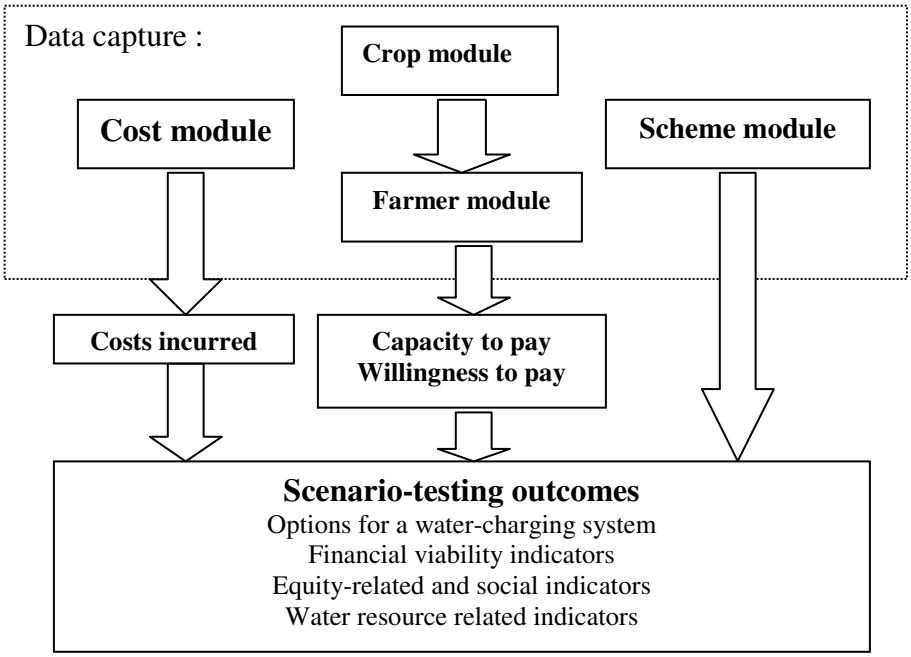
The approach implies three phases: (1) Information at household and scheme level, on one given scheme, (2) information analysis and information-system development, which requires a typology of farmers, and (3) running the model on a scenario-testing basis, evaluating the impact of certain measures or decisions, or certain farmers' strategies on agricultural and production features, land allocation, costs and cost recovery, and sustainability-related indicators. Developing a farmers' typology is a prerequisite, as one can neither address all farmers individually nor consider them all similar. Different farmers' strategies and practices co-exist within a scheme. Grouping irrigation farmers into several types helps representing this reality,

2.52. Conceptual Framework for analysis

The analysis of the case as a whole takes root in the principles mentioned above. The model's conceptual framework (S**.** R. Perret, 2002) takes into considerations the economic and financial aspects of scheme's management, and addresses some technical indicators in order to check out that scenarios are realistic (e.g. water resource availability). Five input modules form the basis of the information system, as interfaces for data capturing by the user as mentioned in the figure below.

Farmer Module: A "farmer" module captures the different farmers' types, with their cropping systems (combination of crops that have been documented in the "crop" module), average farm size, percentage of scheme's size, willingness to pay for irrigation water services. This module generates type-related output variables (e.g. aggregated income per type, crop calendar) and scheme-related output variables (e.g. number of farmers, aggregated water demand) when combined with the "scheme" module.

Cost Module: Each cost-generating item is listed in the "cost" module. This module generates output variables that reckon the costs incurred by the scheme and its management (i.e. capital costs, maintenance costs, operation costs, personnel costs). Such information answers the question as to how much do it cost to operate the scheme in a sustainable manner, regardless of who is going to pay for it.



The conceptual framework for Scenario Testing of Irrigation Cooperatives.

Crop Module: In the "crop" module, each irrigated crop is listed with its technical and economic features (e.g. management style, cropping calendar, water demand, yield, production costs). This module generates micro-economic output variables (e.g. gross and net margins) that allow comparative evaluation of crops in terms of profitability, land productivity, and water productivity.

Scheme Module: A "scheme" module lists the scheme's characteristics (e.g. size, rainfall and resource-availability patterns, and tariff structure). This module is combined with the "farmer" and "cost" modules, and generates output variables on water pricing, tariff, cost recovery rate, contribution per type. This allows answering the question as to who may pay, and how much, for water services. It also generates some social and equity-related indicators, and resource-related indicators (e.g. total number of farmers, area per type, number of farmers per type, type net income, scheme total net income, total water consumption, overall weekly water balance).

The initial inputs (real data) form the base scenario. Additional scenarios may be tested through the capture of non-real / prospective data, especially when the given scheme has not yet been rehabilitated or transferred (e.g. alternative crops and cropping systems, emerging farmers' types, changes in scheme's management patterns, options for a charging system, new infrastructures.)

3.0 Results and Analysis

The command area under study where the Irrigation Cooperatives are being formed (Dharoi Irrigation Project) was of mainly sandy loam and almost all area was being cultivated. The average land holding in the command is 1.1 hectare. The area receives 625 to 825 mm annual rainfall indicating that if rain fall is normal and evenly distributed,

the farmer can have a better crop during the season **(Annexure IV).** In the scheme the farmers receive water from canal only from October that too only when the reservoir is having sufficient water. During Kharif the farmers use water from tube well cooperatives. There are number of tube well cooperatives where each cooperative cater to the needs of 10-12 hectares. Each farmer pays about Rs. 60/ hour and needs about 6-7 hours of irrigation for one acre. Each canal branch has about 350 hectares of command indicating cultivable command area under each can be minimum of 350 hectares according to topography of the land. There are number of operatives with command area as less as 16 hectare with a maximum of 890 hectares.

The cotton is predominant crop **(Annexure- II)** covering 40% of the total area followed by castor (20%), bajra (15%), green gram(10%) and fodder(10%) during Kharif. The area under cotton is on increase after Bt cotton was introduced because of higher yields. Even though the cotton is sown during Kharif it is harvested during Feb- March almost covering Rabi season as well. So the farmers have to pay to both tube well cooperatives and canal cooperatives increasing the cost of water. The Rabi is dominated by wheat (40%), followed by mustard (20%, jeera (20%), hybrid bajra (10%) and fodder and vegetable (10%).Normally the farmers will not get water from canal cooperatives during summer.

During normal years of monsoon the farmers will get better yields because of relatively fertile soils. The average net income of the farmers works out to be in the range of Rs. 20,000 to 30,000 per year/ hectare through all seasons.(**Annexure-II -2).** As per the official Meteorological records the area has the history of drought once in 4 years. As the farmers are paying for water to both tube well cooperatives and canal cooperatives the cost of water is significant.(Rs 2000 to 4000 per acre depending on rain and crop).

If the farmers are able to generate income in the range of Rs 20,000 to 30,000 per hectare the canal irrigation cooperatives have to be extra careful in fixing the water fees over and above the government rates. There is a need to look for alternative sources of income through diversification as ahs happened with Thalota IC

Minimum Canal Command under each Irrigation Cooperative

In the Dharoi Irrigation Project there are number of cooperatives with command of as less as 16 hectares, 18 hectare with significant number with less than 75 hectares. Based on the fixed cost and average variable cost of the cooperatives the minimum command area (break even area) for each works our to be 100 hectares assuming there is no drought. But with drought every fourth year and need for extra income the command area should be any where around 150 hectare. The fixed cost includes the salary to secretary and minimum administrative expenses which has been in the range of 20- more than 50% of total expenses as against the norms of not more than 20% 30 %. **(Annexure-III (A)-2)**

3.1 Factors affecting Financial Viability: Some of the factors influencing the viability of Irrigation Cooperatives are

Command area per unit length of canal- As all the canal irrigation schemes are based on the principle of gravity flow, the ratio of command area per unit length of canal is different in all the cases. Since income is directly proportional to the command area and expenditure is directly proportional to the canal length, the difference in this ratio affects the financial viability. e.g. total length of canals in

Canal section & structure (no. of minors etc.) If the canal structure is complex, then the number of operators required during water distribution will be higher (increasing the

amount spent in salary considerably). Where as this expenditure will be substantially lower in case of a simpler network having a low number of minors or sub-minors. Similarly greater section implies higher expenditure as the surface area increases substantially and the expenditure on jungle cutting, etc increases.

Water availability-Scarcity of water means less area irrigated and hence less revenue for the I C.

Efficient water distribution-Since the additional water charge gained is on per hectare basis, efficient water distribution will mean higher command irrigated, and hence higher total profit.

Subsidy / Rebate-The M & R of canal is very important and necessary for the interest of the farmers as well as the I C. Subsidy or rebate on water charges is hence very necessary for the IC to carry out its responsibilities.

Average additional water charges gained per hectare-Water charge being the only reliable and substantial source of revenue, is the single most important component for increasing the revenue of the I C. The farmers are capable of paying the fees as the fees at 30- 40% higher than government charges are still cheaper compared to the fees they are paying for tube well cooperatives.

Voluntary Labour-Annual voluntary labour by the farmer members of IC can save a high amount of annual expenditure incurred by the IC, and at the same time ensure better and sustained M & R of canals. In Dharoi irrigation project the voluntary labour is engaged only after the canal is rehabilitated. Even though no payment is made to voluntary labour it is included in the income and expenditure section for the purpose of showing the value of labour wages that ICs benefited.

Diversification Activity-Diversification activity has the potential of negative as well as positive effects. If the activity is chosen after proper planning and managed effectively, it can definitely give good returns. But the risks associated may also be high. Thalota IC has a positive experience with respect to diversification and the activity of input supply under taken by the co-operative has yielded substantial returns to member s , while on the other hand, Chopadvav IC has faced losses due to diversification in the marketing of cotton. Similarly Kakdiamba IC has also suffered some losses due to non-recovery of money from diversification activity like input supply.

Administrative Expenditure-Minimizing administrative expenditure is very necessary. Salary of secretary constitutes a major component of the administrative expenditure. **(Annexure III(A)-2)**. The ICs pay the secretaries even in the drought years . In the months when no water distribution takes place, the secretary has little work to do. Salary is not related to the work actually done and hence this leads to heavy expenditure. Other adminis trative expenditure also has to be curbed for efficient financial management.

3.3 Discussions regarding factors affecting financial viability

The factors affecting financial viability **(Annexure-VI)** fall under different categories technical, institutional/social or managerial. There are different ways to deal with these factors for ensuring better financial viability. Maintenance of canals is a very important responsibility transferred to irrigation cooperatives. They must attend to proper maintenance of the systems transferred to them; otherwise the system would deteriorate, reducing the area irrigated and consequent fall in water charges collection leading to downhill of the working of entire cooperative.

Thus for the regular and proper repair of the canals, the IC has to incur expenditure on regular basis. If the IC ignores this necessary expenditure on maintenance and repairs of the canal, it can lead to inefficient and inequitable water supply, conflicts, loss of income to farmers as a result of decrease in yield, opposition to the Water Users' Association (WUA), and increasing and continuous loss of income to the WUA.

If the IC incurs necessary expenditure on this item, it will in lead to better service delivery, which will in turn ensure better management, member satisfaction and improved finances for the IC. Better financial health of the institution will again ensure that more money is being allocated for continuous M & R and higher reserves are being built up for maintaining reserves for meeting emergency expenses and fixed expenses during the drought years.

Better financial health of the institution will lead to improved maintenance & repairs as well as higher incomes for the member farmers, leading to an increase in the standard of living of the farmers and labour community living in the rural areas and dependent on agriculture for their livelihoods.

Margin on water charge should be higher for high value crops than that of low value crops and charges on per watering basis can be levied for ensuring that farmers using higher quantity of water should pay higher.

The experts of Supporting centre are of the view that better management of irrigation system should be ensured to increase the command area irrigated. Some portion of yearly surplus of the IC should be deposited as fixed deposit to earn a fixed stream of money. As of now, of the rebate of 30% on the timely payment of water charge is for O & M [which includes Operators' salary as well as M & R grant for the canals]. From this rebate of 30% of water charges offered by the government, some proportion should be reserved exclusively for maintenance & repairs. Norms should be evolved for ensuring adequate investment in M & R. Even if a good irrigation cooperative attends to routine and major (annual) repairs, it may suddenly need funds for meeting emergency needs. Like any other well managed organization, irrigation cooperatives should regularly save funds that they can access in emergency.

The report of an exploratory study by SC on Financial Viability says that rule conformance should be ensured for avoiding grave problem of non-recovery, and diversification should be undertaken only after long-term planning. Separate entry should be made in the book of accounts for the secretary and the operator instead of one entry under salaries for better analysis and monitoring of the expenditure. Secretary's salary should be linked with the amount of work done. During drought years, no salary should be paid to the staff. The IC should monitor its administrative expenses.

Apart from the diversification activities, those benefits of I C can be increased by increased utilization of irrigation potential (which is very important for the success of participatory irrigation management). The irrigation potential created can be optimally utilized if the O & M activities are adequately financed. The costs incurred by I Cs can be classified into two types Capital costs and O & M costs. (**Annexure III A and B**). The PIM policy of the Government of Gujarat, India (Development Support Centre, 1999) mentions that for meeting the major capital expenditure on rehabilitation of canals prior to transfer, the government will pay 90% of the cost and the farmers have to pay the remaining portion. The arrangement under PIM is the ICs collect the water charges and retain 20% for their administrative expenses, 30% for the maintenance of canals

transferred, and the remaining 50% transferred to the government. If the cost of administration & maintenance exceeds the government grant the O & M cost has to be met by the I C themselves. The Task Force on PIM also recommends using the space available along the canals for plantation raising and hence augmenting the financial resources of the IC. Thus generating enough finances for covering the O & M costs is imperative for the viability of these canal WUAs.

In Karnataka Malaprabha Irrigation Project even though the Water Users' Associations are formed they are not functioning properly. The recovery rate is less than 25% of total to be collected and the entire collection is being paid to the government as government share WUAs are left with no money even for day to day function. Even though the farmers are growing sugarcane, maize, soybean crops and are paying nothing so assessing the willingness to pay vis a vis WUAs will be unrealistic.

4.0 Conclusion

There are number of cooperatives which are functioning well with enough income generated and are going to be self-sufficient. This may be attributed to the reasonable command area and better control on expenses especially administrative and salary component. In case of the cooperatives, which are struggling to become viable, there is a need to spend substantial amount on maintenance and repair cutting down the other expenses. Looking into the capacity of the farmers to generate more income it seems it has to do with higher income generated by Bt. Cotton cultivation in recent past. With the present water rates being collected by ICs and income level of the farmers there is a need to look into this whole exercise of water rates. Based on the study the following suggestions can be made on financial viability of canal irrigation cooperatives.

Emphasis should be laid by the Irrigation Cooperative on increasing the command area irrigated by minimizing the distributional efficiency losses.

As the there is lot of variation on the proportion of expenses on maintenance and repair (M&R), of the 30% rebate given by the government on timely payment of water charges (for M & R expenses including Operators' salary), the government must fix some portion specifically for M & R of canals (excluding operators' salary) and the ICs should ensure that this is strictly followed.

Especially during the years of water shortage or drought voluntary labour should be institutionalized. Either member farmers should contribute physically or pay equivalent labour wage at the time of annual M & R of the canal and channels.

Margin on water charge should be higher for high value crops than that of low value crops. The charging of water fees over and above government rates should take the income generating capacity of the farmers based on their cropping pattern. Charging on per watering basis should be done for ensuring that users of higher quantity of water should pay higher.

Diversification should be undertaken only after long-term planning. This in view of presence of number of cooperatives operating in the villages led by Milk cooperatives as there is a possibility of duplication of the operation of these cooperatives especially in case of income generating activities like input supply. However there is a lot of scope for the Irrigation Cooperatives to diversify in the activities like Vermi compost production and marketing.

As the smaller cooperatives have less official work through out the year the Secretary's salary should be linked with the amount of work done. During drought years, no salary should be paid to the staff. The IC should monitor its administrative expenses.

The farmers know that there is no alternative to irrigation cooperative and want to be part of cooperative. But it is up to cooperatives to make farmers realize the importance of raising commercial crops and diversification. It is easier said than done as it depends more on agro climatic physical condition of the soils. Here the diversification plays important role to make farmers sustainable and hence irrigation cooperatives. The data relating to water productivity based on the quantum of water the ICs are getting from I irrigation Cooperative federations are being collected to calculate the water productivity at farmers and system level (federations level)

References

Anil C. Shah (1997): Administrative Processes in Operationalising the Policy of Participatory Irrigation Management," paper presented at the Third International Participatory Irrigation Management Seminar, Tokyo, Japan, May 26-June 1, 1997, (12pp)

Asar-ul-Haq; Shahid, B. A. 1997. Public, private or participatory?: Reforming irrigation management in Pakistan. ICID Journal, 46(1):37-48.

Dinesh Kumar, M., Singh, O.P., Madar Samad, Chaitali Purohit and Malkit Singh Didyala (2004): Water Productivity of Irrigated Agriculture in India: Potential Areas for Improvement

Development Support Centre, Bopal, Ahmedabad

International Network on Participatory Irrigation Management Website www.inpim.org

IWMI (2001): Can poor farmers in South Africa shoulder the burden of irrigation management? IWMI website document: www.cgiar.org/iwmi/home/IMTSAf.htm Ministry of Water Resources, website www.wrmin.nic.in, Government of India

Garima Srivastava, 2007: Cost Benefit Analysis of Participatory Irrigation Management: A case study of Dharoi Irrigation Project, Gujarat, Development Study Centre, Bopal, Ahmedabad

Gulati, A., Ruth Meinzen and Raju, K.V. (2005): Institutional Reforms in Indian Canal Irrigation, International Food Policy Research Institute, New Delhi, and Sage Publications.

Johnson III, Sam H (1997): 'Irrigation Management Transfer in Mexico: A Strategy to Achieve Irrigation District Sustainability', IIMI Research Report.

Ostrom Elinar,1990; Governing the Commons The Evolution of Institutions for Collective Action, Cambridge University Press, Cambridge

Parthasarathy, 2000: Participatory Irrigation Management in Gujarat: Institutional and Financial Issues, *Economic and Political Weekly,* August 26-September 2, 2000

Perret, S., (2002); Testing scenarios on the viability of smallholding irrigation schemes in South Africa: a participatory and information-based approach, University of Pretoria & CIRAD, Department of Agricultural Economics, Extension and Rural Development,

Pretoria, South Africa

Perret, S and Touchain, E. (2002) A simulation-based approach to access the economic viability of smallholding irrigation schemes in South Africa. University of Pretoria, CIRAD-Tera, research report num. 02/02, Pretoria, SA

Perry, C.J. (2001): Charging for irrigation water: the issues and options with a case study from India. IWMI research report num. 52, Colombo, Sri Lanka

Planning commission of India, 2006, Irrigation, The Steering Committee Report on 10th Five Year Plan,

Shah, Tushaar (1993): Groundwater Markets and Irrigation Development: Political Economy and Practical Policy, Oxford University Press, Mumbai.

Small, Leslie (1987): 'Irrigation Service Fees in Asia', ODI – IIMI Irrigation Management Network Paper 87/1C, April.

Svendsen M. (1997): "Second Generation Problems of Privatized Irrigation Paper prepared for 18th Europe Regional Conference on Irrigation and Drainage, 9-11, September, Oxford, England

Vaibhav Chaturved (2004); Financial Viability of Irrigation Cooperatives –An exploratory Study in Gujarat, Development Support Centre, Ahmedabad

Vermillion, D.L. (1997). Impacts of Irrigation Management Transfer: A Review of Evidence. IWMI research report num. 11, Colombo, Sri Lanka

Annexure I (A):

Packages of Incentives for Farmers to take responsibility of Irrigation Cooperatives

Some of the important orders of the Gujarat Irrigation Department creating an encouraging environment for formation of WUAs/ICs and their satisfactory functioning are

- Canals to be rehabilitated prior to transfer, irrigation cooperatives contributing 10% of estimated cost of rehabilitation.
- General order for such construction to be offered for execution to farmers organization, then to NGO and if both decline then by the Department.
- When entrusted to irrigation cooperative 1/3rd of the estimated cost given as advance.
- Simplified procedures for the purchase of material and quality control when works entrusted to irrigation cooperatives.
- After completion of the repair work the system is handed over to ICs after signing of MoU. The ICs, which come forward to contribute Rs. 60 per hectare, are provided Rs. 540 per ha. (State and Central Government contributing Rs. 270 each) as functional grant. The functional grant is placed in a fixed deposit and interest accrued is used for running the society.
- Each farmer has to pay a membership fee to become member of the society.
- Water charges decided by Government but collected by ICs. They retain 50% of collection for maintenance and management of canals and deposit 50% with Government.
- There is a rebate of 30% on the timely payment of water charge.
- ICs are empowered to decide water charges over and above the Government rate and retain 100% of collection of excess charges.

Annexure I (B): Progress of Irrigation Cooperatives Registered IN Dharoi Irrigation Project as on 31-03-2007

Cultivable Command Area	No. of ICs
Less than 50 hectare	17
50- 150 hectare	39
More than 150 hectare	68
Total	124
Area	**25141 hectare**

Source: DSC, Ahmedabad

Annexure-II

1. Cropping Pattern in the Dharoi Irrigation Project

Kharif Crops	Rabi crop after kharif	Hot weather crop after Rabi	Hot weather crop after kharif crop.
Hy.Bajri	Wheat/Mustard	Cowpea, Mug	Bajra
Hy.Castor	Cumin	Jowar, Bajra.	Bajra/Pulses
Cotton	Isabgol/Cumin	-	Hy.Bajra
Jowar	Wheat, Lucerne	Cowpea	Pulses
Pulses/Fennel			

Kharif: Cotton (40%), Green gram (10%), Castor (20%) Hybrid Bajra (20%), Fodder (10%)
Rabi: Wheat (40%), Mustard/isabagol/jeera (40%), fodder (10%)
Summer: Bajra (40%), fodder /vegetables (10-15%)

2. Yield levels of Different Crops in Dharoi Irrigation Command

Crop	Average Yield (Qtl/ha)	Cost of Cultivation (Rs/ha)	Gross income @market prices(Rs.)	Net Income (Rs)	Weightage (%)	Income to farmer/ha
Cotton	25	25,000	50,000	25,000	40	10,000
Castor	20	15,000	30,000	15,000	20	3,000
Wheat	50	15,000	35,000	20,000	40	8,000
Bajra	50	15,000	30,000	15,000	20	3,000
Green gram	10/2*	10,000	20,000	10,000/4000	10	1,000
Tobacco	10	15,000	30,000	15,000	10	1,500
Mustard	10	10,000	15,000	10,000	20	2,000
Jeera/Isabgol	10	20,000	30,000	10,000	20	2,000
Fodder/Veg	**	5,000/	-			
Total						**30,500**

* **Kharif**-3q/acre and **Rabi Summer**-1 q/acre

****** Varies according to the crop and varieties

<u>Annexure</u>-III (A)

1. Water Fees Charged by Government and ICs in Dharoi Irrigation Project

Crop	Water Rate(Rs/ha) (Govt. Rates)	Rates Charged by some of ICs*
Cotton	1000	1200
Castor	750	1000
Wheat	556	900
Bajra	499	900
Green gram	499	900
Groundnut	499	900
Tobacco	750	1000
Mustard	556	900
Jeera/Isabgol	1000	1200
Fodder/Veg	499	1200

* **The water fees vary from IC to IC**

In addition to the water fees being paid to canal cooperatives the farmers are paying to tube well cooperatives for water during Kharif and possibly summer at the rate of Rs. 70/hour for 6-7 hours per acre. Which works out to be Rs. In the range of Rs 2000 to 4000 /acre depending upon crop and rainfall during Kharif.

2. Financial Performance

Cost to ICs
Fixed cost: Secretary salary and Administrative expenses
Variable Cost: Operation and Maintenance expenses, Operator salary, voluntary lab our, desiltation etc.

Cost component of Irrigation Cooperatives.

Component	Extent of expenditure by ICs(% of Total expenses)
Secretary's Salary	10- 22% (Rs 500 to 2000/month)
Operator's Salary	Highest component with 20-40 %(Rs. 500 to 1500/month) **(1 to 3 and more operators depending on the command area.)**
Administrative expenditure	5-45% (Rs 9 to Rs 116/ha)
Maintenance and Repair of the canal	Less than 50%

Source: DSC, Bopal, Ahmedabad

Annexure IV (A)-Profile of the studied Irrigation Cooperatives

Profile of the studied ICs (By DSC, Ahmedabad)

S. no	Name of I C	Type of Scheme	CCA (Ha) of IC	District	Year of Start	No. of Watering years	No. of Share holders	Supporting Agency
1.	Kakdiamba	Minor	891	Narmada	1995	5	550	AKRSP
2.	Chopadvav	Minor	1460	Narmada	1993	8	444	AKRSP
5.	Rangpur	Major	617	Mehsana	1997	9	248	DSC
6.	Thalota	Major	251	Mehsana	1994	4	212	DSC
7.	Bhetasi	Major	1000	Nadiad	1993	6	789	Irrigation Department

Source: DSC, Ahmedabad

Annexure IV (B): Irrigation Cooperative Rangpur (promoted by DSC)

		97-98	**98-99**	**20012002**	**Average**
1.	Area Irrigated-(Ha)	201	170	320	230.33
Income					
2. Water Charge Income (Rs.)		39812 (198.07)	24308 (142.99)	86182 (269.33)	50101 (203.46)
a)	*Government Subsidy for Administrative expenses (Rs.)*	*8129 (40.44)*	*5702 (33.54)*	*18284 (57.14)*	*10705 (43.70)*
b)	*Government Subsidy for M & R (Rs.)*	*12169 (60.54)*	*8553 (50.31)*	*27426 (85.71)*	*16049 (65.52)*
c)	*Additional water charges (Rs.)*	*19514 (97.08)*	*10053 (59.13)*	*40472 (126.47)*	*23346 (94.22)*
3.	Bank Interest (Rs.)	2541 (12.64)	3321 (19.53)	12975 (40.55)	6279 (24.24)
4.	Income from diversification activity (Rs.)	0	0	0	0
5.	Voluntary Labour (Rs.)	10000 (49.75)	10000 (58.82)	20000 (62.5)	13333 (57.02)
Total Income (2+3+4+5) (Rs.)		52353 (260.46)	37629 (221.34)	119157 (372.26)	69713 (284.68)
Expenditure					
6. Administrative Expenses (Rs.)		1556 (7.74)	1965 (11.56)	14302 (44.69)	5941 (21.33)
i.	*Administrative cost (Rs.)*	*1556 (7.74)*	*1965 (11.56)*	*2302 (7.19)*	*1941 (8.83)*
ii.	*Secretary's salary (Rs.)*	*0*	*0*	*12000 (37.5)*	*4000 (12.5)*
7. Maintenance & Repairs Expenses (Rs.)		23960 (119.20)	21540 (126.7)	52480 (164)	32660 (136.63)
i.	*Canal Maintenance & Repairs (Rs.)*	*0*	*4550 (26.76)*	*5680 (17.75)*	*3410 (14.83)*
ii.	*Voluntary Labour* (Rs.)	*10000 (49.75)*	*10000 (58.82)*	*20000 (62.5)*	*13333 (57.02)*
iii.	*Operators' Salary (Rs.)*	*13960 (69.45)*	*6990 (41.12)*	*26800 (83.75)*	*15917 (69.77)*
Total Expenditure (Rs.) [6 + 7]		25516 (126.94)	23505 (138.26)	66782 (208.69)	38601 (157.96)
Annual Surplus/ Deficit [Income-Expenditure] (Rs.)		26837 (133.52)	14124 (83.08)	52375 (163.67)	31112 (126.75)

Source: DSC, Ahmedabad,

Note: The figures in bracket are per hectare of irrigated area equivalents of the corresponding figures outside the bracket

Annexure IVC. Irrigation Cooperative Thalota (promoted by DSC)

		96-97	97-98	98-99	2001-02	Average
1.	Area Irrigated-(Ha)	109	163	168	170	152.5
Income						
2. Water Charge Income (Rs.)		11172 (102.49)	44923 (275.6)	30261 (180.12)	44852 (263.83)	32802 (164.4)
a)	*Government Subsidy for Administrative expenses* (Rs.)	*627 (5.75)*	*8171 (50.13)*	*4630 (27.56)*	*10134 (59.61)*	*5890 (35.76)*
b)	*Government Subsidy for M & R (Rs.)*	*939 (.61)*	*12258 (75.2)*	*6945 (41.34)*	*14434 (84.9)*	*8644 (52.51)*
c)	*Additional water charges* (Rs.)	*9606 (88.13)*	*24494 (150.27)*	*18686 (111.23)*	*20284 (119.32)*	*18267 (117.23)*
3.	Bank Interest (Rs.)	636 (5.83)	6849 (42.09)	7272 (43.28)	4087 (24.04)	4711 (28.81)
4.	Income from diversification activity (Rs.)	-115 (-1.05)	7975 (48.93)	15079 (89.75)	16113 (94.78)	9763 (58.10)
5.	Voluntary Labour (Rs.)	0	0	0	0	0
Total Income (2+3+4+5) (Rs.)		11693 (107.27)	59747 (366.55)	52612 (313.17)	65052 (382.66)	47276 (292.41)
Expenditure						
6. Administrative Expenses (Rs.)		5005 (45.92)	8755 (57.71)	17078 (101.65)	15157 (89.16)	11499 (73.61)
i.	*Administrative cost*	*5005 (45.92)*	*3355 (20.58)*	*7878 (46.89)*	*5557 (32.69)*	*5448.75 (36.52)*
ii.	*Secretary's salary*	*0*	*5400 (33.13)*	*9200 (54.76)*	*9600 (56.47)*	*6050 (36.09)*
7. Maintenance & Repairs Expenses		1265 (11.6)	22409 (137.48)	8460 (50.36)	31216 (183.62)	15838 (95.76)
i.	*Canal Maintenance & Repairs (Rs.)*	*25 (.23)*	*12259 (75.21)*	*0*	*14436 (84.92)*	*6680 (40.09)*
ii.	*Voluntary Labour* (Rs.)	*0*	*0*	*0*	*0*	*0*
iii.	*Operators' Salary (Rs.)*	*1240 (11.38)*	*10150 (62.27)*	*8460 (50.36)*	*16780 (98.70)*	*9158 (55.67)*
Total Expenditure (Rs.) [6 + 7]		6270 (57.52)	31164 (191.19)	25538 (152.01)	46373 (272.78)	27336 (168.37)
Annual Surplus/ Deficit [Income-Expenditure] (Rs.)		5423 (49.75)	28583 (175.35)	27074(161.15)	18679 (109.88)	19940 (124.03)

Source: DSC,Ahmedabad

Note: The figures in bracket are per hectare of area irrigated

Annexure-V

Agro climatic Features of Dharoi Irrigation Project

Rainfall (mm)	625-875
Type of soil	Sandy loam to sandy soils.
Soil Characteristics & Land use classification	Most of the area is cultivated.
Surface color	Dark brown, dark, yellowish, brown to Yellowish brown.
Depth of the soil	Deep to very deep more than 90 cm.
Predominant Texture	Sandy loam to loam.
Soil Slope	1 to 3 %.
General fertility	Nitrogen-poor, Phosphorus medium, Potash medium.
Cat Ion Exchange Capacity	Less than 20 me / 100 gms of soil.
Electrical conductivity	Less than 1 mmhos/cm.
Exchangeable Sodium %	Traces.
Order	Inceptisols, Entisols, Aridisols.
Crops	Paddy, Bajra, Pulse, Cotton, Groundnut. Tobacco, Wheat, Jowar, Minor Millet, Vegetables. Spices and condiments, Oil Seeds, Cotton

Source: Department of Agriculture, GoG, 2007

Annexure-VI

Factors Affecting Financial viability of ICs

Factor	Component Type	Comments
Command area per unit length of canal	Technical Component	Cannot be altered
Canal section & structure	Technical Component	Cannot be altered
Lined and unlined canals	Technical Component	Lining the unlined canals is the obvious option as it will greatly reduce the running costs as well as huge seepage losses and other environmental costs.
Water availability	Technical Component	Not in ICs control
Interest from cash at bank	Financial Component	The ICs can deposit some portion of money (e.g.) share capital as fixed deposit to ensure a higher interest
Subsidy for Maintenance and Repairs	Financial Component	As the water rates levied by the government will increase, the subsidy will automatically increase. But a major portion of the subsidy is spent on operators' salary and the issue of proper and adequate maintenance & repairs is neglected. Hence norms should be evolved for ensuring adequate investment specifically for M & R of canals.
Avg. Additional Water Charges gained/Ha	Financial Component	Margin should be higher for high value crops and lower for low value crops. For ensuring that farmers using higher quantity of water pay higher, charges should be on per watering basis.
Number of shareholders	Social Component	Cannot be altered
Voluntary Labour	Institutional / Social Component	Should be institutionalized. Either member farmers should contribute physically or pay equivalent labour wage at the time of annual M & R of the canal and channels. Its value should be entered in the books of accounts.
Recovery Problems	Institutional/ Social Component	This problem can only be addressed by making the institution strong and strictly ensuring rule conformance.
Efficient water distribution	Managerial Component	Better management of irrigation water to ensure effective and efficient service delivery and hence increasing the command area irrigated.
Diversification Activity	Managerial Component	If the diversification activity undertaken is technical or the risk involved is high, then either the activity should be promoted by federation if it is capable of hiring technical expert, or it should not be taken up at all.