# Basarahiya Water Co-operative Society - A Case Study in Northern India

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## HISTORICAL OVERVIEW

ANCIENT INDIAN HISTORY tells many examples of farmers' managed irrigation systems. In rainfall-scanty southern states, traditional community-managed tanks and wells have survived for centuries. In Northern states with perennial snowfed rivers like Ganga and Indus, small canals in the upper valley of rivers were constructed to divert flood flows for irrigation even before the beginning of the Christian era. Besides, the wells managed by an individual farmer or a family also studded the fields in Northern India due to easy groundwater availability.

The small canals and wells could no longer meet the ever-increasing demand for irrigation and famine-like situations often developed. In early and middle 19th Century, the British Rulers,disturbed and forced by frequent droughts, built a few large canal systems in Northern India to provide protective irrigation and also introduced the concept of full government control over irrigation systems. These supply-based, bureaucratic and paternalistic canal systems have shaped the psyche of farmers in the Northern India for the last 150 years.

## THE STATE OF UTTAR PRADESH (UP)

The state of Uttar Pradesh, located in the northern central part of India, is quite rich in water resources with perennial rivers like Ganga, Yamuna, Ghaghra and Sharda (Figure 1).

The area of UP, 29.44 million hectares (m ha), ranks fourth whereas its population 139.1 million (1991), is the largest among Indian states. The population density is extremely high at 473 persons per square kilometre (sq km).

UP has a vast network of canals (74,000 km) and deep tubewells (30,000) which are owned and run by the State Irrigation Department (ID). The gross cropped area of UP is 25.48 m ha. About 58% of this area is provided with irrigation facility. Out of the total gross irrigated area (14.77 m ha), 38.3% is irrigated through state canals, 62.2% through state and private tubewells and the rest 7.5% through private tanks, wells and other resources. However, crop-productivity level under irrigated agriculture is quite low compared to many other states in India.

The economy of UP is predominantly agrarian. More than 80% people live in villages and their main occupation is agriculture. There are around 19 million operational landholdings. The average size of landholding is 0.9 ha. Most of the farmers (88%) have small (1 - 2 ha) and marginal (less than 1 ha) land holdings.

Rice, wheat and sugarcane are the main crops grown in UP. The three crop seasons are the *zaid* (hot) season (roughly from mid March to the end of June), the *kharif* (wet) season (July-October), and the *rabi* (dry) season (November - March).

The ultimate irrigation potential of UP has been estimated to be 31.7 m ha, comprising 12.5 m ha from major and medium irrigation projects, 1.2 m ha from surface minor irrigation schemes and 18.0 m ha from groundwater exploitation. The Government of UP apportioned huge sums and accorded high priority to development of irrigation but it has been observed that the gap between irrigation potential created and utilized on major and medium surface irrigation schemes is gradually widening (0.66 m ha in 1979-80 to 1.03 m ha in 1990-91).

Separate Command Area Development Authorities (CADA) were set up on three major irrigation projects in UP including Sharda Sahayak Project (to be discussed later) with the specific object of ensuring faster and better utilization of irrigation potential. The Command Area Development Programme broadly covers the execution of On-Farm Development works, preparing *warabandi* (turn scheduling of water, specifying the day,time and duration of supply to each irrigator in proportion to his area in an outlet command), setting up better communication facilities, organising farmers, etc., in order to achieve the ultimate objective of optimal agricultural production in the command area.

The canal systems under ID are supply-based and are run with pre-set rules. The beneficiary farmers have no say in the planning, design, construction and operation schedule of the system. The farmers' participation is limited to implementation of the warabandi. As the government budget for maintenance work is dwindling, the irrigation systems spread into large countryside areas are in a state of deep disrepair and are not amenable to operation as per schedule and design discharge. This has encouraged unauthorized withdrawal of water and it is becoming

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increasingly difficult and expensive for the ID to maintain and operate the systems, and to provide solutions to day to day conflicts among the farmers in the water distribution process.

There is near consensus that effective and functional participation of farmers in the irrigation management process is necessary to ensure optimal utilization of irrigation potential and to realize the objectives of irrigated agriculture. In 1985, the Government of Uttar Pradesh decided to initiate a pilot project in farmer participation in the command of the Sharda Sahayak Project.

## BASARAHIYA WATER CO-OPERATIVE SOCIETY - A PILOT PROJECT IN IRRIGATION MANAGEMENT TRANSFER

### The Sharda Sahayak Project

In 1928, Sharda Canal System was constructed by diverting water from the Sharda River to provide protective irrigation to 2.55 m ha area lying between Ganga and Ghaghra rivers (Figure 1). The original capacity of the main canal was 270 cubic meter per second ($m^3/s$) which was later increased to 350 $m^3/s$. Yet the Sharda Canal System could not cope with the ever-increasing demand for irrigation. The Sharda Sahayak Project was envisaged to cater to the increased demand on the Sharda Canal System. Under Sharda Sahayak Project which started in 1968, the water of the Ghaghra River was diverted into Sharda River through the construction of a 28.4 km long link channel and barrages across both the rivers. Below the Sharda River, a 258.8 km long feeder channel of 650 $m^3/s$ delivers water to various subsystems (Figure 2). Sharda Sahayak Project serves a command area of 2 m ha covering 14 districts in UP through a vast distribution network of canals (16,000 km).

### The Background of the Pilot Project Area

The situation of the pilot project area on the Sharda Sahayak System is shown (Figure 2). Earlier, the pilot project area was situated near the tail end of the Sharda Canal System and could hardly achieve 20% annual irrigation intensity. The introduction of the Sharda Sahayak Project resulted in increased supplies to the pilot project area since 1977 but the supplies did not get stabilized even till 1985 due to many teething troubles. In the absence of adequate and dependable supplies the development of irrigation and agricultural practices in the pilot project area remained slow.

During mid-March to mid-June, the entire Sharda Sahayak Canal System remains closed for lining work of feeder channel and water is not available for zaid (hot season) crop and paddy nursery.

By 1985-86, an irrigation potential of 1.35 m ha was created on the Sharda Sahayak System but the total utilization was only 0.804 m ha. A large disparity in irrigation intensity at head and tail reach was also noticed. It was observed that the prime reason for these maladies was wasteful and unauthorised irrigation by the farmers.

Since On-Farm Development works in the pilot project area were completed by CADA and the water deliveries from the Sharda Sahayak Project were sufficiently stabilised till 1985-86, it was considered an ideal area to initiate a pilot project in Irrigation Management Transfer when Ministry of Water Resources, Government of India requested all states to experiment with farmers' participation models with a view to study their replaceability and scaling up.

### Formation of the Society

The Basarahiya Water Co-operative Society (BWCS) was formed through a government notification on March 9, 1987. The main objects of the society are to improve the efficiency of water utilisation in the outlet command by measured volumetric supply of water based on water requirement, to train the farmers in scientific water use, to increase agricultural productivity through improved irrigation and agricultural practices, to encourage the spirit of cooperation among beneficiaries, to supply the inputs and custom services, to inculcate the spirit of disciplined water use, to maintain the On-Farm Development works and to promote the concept of conjunctive use of water amongst the farmers.

It was envisaged in the pilot project that the activities of the society would be limited to water distribution in the first phase and once the society stabilises it shall also undertake complementary activities like providing agricultural inputs, custom services and improving credit and marketing facilities.

The society started functioning in 1989-90 after another government notification on October 12, 1988 sanctioning volumetric supply of water to the society from the Irrigation Department. The management of the society is entrusted to a management committee consisting of eleven elected members. The elected members include three members of the scheduled/backward castes from head,middle and tail reaches of the water course, one representative from each of the five *chak samiti* (outlet committee) falling in the area and three others. The ID charges the society for

water on a volumetric basis at the head of outlets at the rate of Rs. 17.00 per million litres (Rs 31.00 = US $ 1.00). The society then distribute the water amongst the farmers in the command area. In turn, the society recovers irrigation charges from the farmers on the usual irrigation rates fixed by the ID on the basis of the crop area irrigated. The difference between volumetric charges and area based charges is the profit that accrues to the society. The water taken by the society is measured, twice a day, through Parshall Flumes constructed at each outlet in the presence of the representatives of BWCS and ID.

## Geographical, Physical and Agricultural Settings

### *Location*

The pilot project area is located in Lucknow District (the capital of UP) in Gosain-ganj Block, about 27 km from Lucknow City (Figure 1). The command area of BWCS is situated on outlet Nos. 20, 22, 23, 26 and 28 on the right bank of Amethi-Gosainganj Distributary offtaking at 160.62 km on the left bank of Sharda Sahayak Feeder Channel (Figure 2). The total culturable command area (CCA) under the society (274 ha) is spread into four villages, namely, Basarahiya, Shekhanapur, Amethi and Saidapur-Daudpur.

### *Climate*

The climate of the pilot project area is quite variable over different months of the year. The average annual rainfall is around 100 centimetres (Figure 1) but 90% of total precipitation occurs from June to September. These months are hot and wet (average relative humidity 72%). May is the hottest (24-45$^0$C) and the driest month of the year with an average hot wind velocity of 6.25 km/ha. December and January are the coldest (6-22$^0$C) months when the wind is almost calm (velocity 3 km/hr).

### *Soil*

The soils under the pilot project area are an under-developed mode of alluvium. About 20% area is covered with loam type soil. These soils are well suited for intensive crop production. About 30% area is covered with sandy loam type which need good management for satisfactory crop production. About 24% area is covered with loamy sand soils which need proper levelling for their efficient use under agriculture. The rest of the area is covered with soil of silty texture. These are poorly drained and have shallow hard clay - Kankar layer.

### *Groundwater Status*

It is difficult to ascertain the trend of groundwater balance and level variations with the limited observed data. However, the depth of water table in the pilot project area ranges from 3.00 to 6.00 m in June and from 1.00 to 2.50 m in September.

### *Water Availability from Canal*

As per pilot project report, surplus water was available in the canal (Table 1). It was suggested in the report that the surplus water would be utilized in extending the area under irrigation.

### *Major Crops*

The major crops grown in the command of BWCS are wheat in rabi season (October to March) and paddy in kharif season (July to September). The other important crops include sugarcane, pulses, oilseeds and potato. As already mentioned under the background of the Pilot Project Area no water is available for zaid crops due to closure of the canal from mid March to mid June.

### *Cropping Pattern*

The area under different crops in the beginning of the Sharda Sahayak Project (1978-79), at the time of initiation of the pilot project (1985-86) and as proposed in the pilot project are given in Table 2. The proposed cropping pattern for the pilot project was decided in consultation with the farmers. The area of crops like sugarcane, pulses, oilseeds and potato which could fetch better economic returns was increased.

### *Other Facilities*

The project area is well-connected by road. Market, banks, seed and fertiliser depots are located within 8 km of the project area. The nearest sugarmill is 80 km away but a collection centre for sugarcane has been provided at the Maghauwa village, 3 km from the project area. There are 71 borings existing in the project area with matching pump sets. A few tractors of 25 HP are also available. The villages have electricity facility and drinking water besides primary schools, public health centres, etc.

### Socio-economic Setting

There are 479 farmers under the jurisdiction of the society including 45 women landholders. Most of the farmers belong to scheduled and backward castes and have marginal (less than 1 ha) land holdings. Average landholding size is 0.44 ha. The small landholdings tend to destroy incentives on individual efforts to adopt modern innovations in the field of agriculture and irrigation management. The farmers are engaged in traditional agriculture and have very low income. The farmers are gradually realising the importance of group action. A milk co-operative has also been set up by the farmers in the area which is functioning well.

## PERFORMANCE OF THE SOCIETY

### Financial Achievements

The society has consistently earned profits since its inception (Figure 4). The society intends to declare a 9% bonus this year amongst its 479 members (owner of at least one 'Rs.50 face-value share').

### Cropping Pattern and Irrigated Area

Although the cropping pattern proposed by the society could not be achieved and it remains more or less the same as in 1985-86, yet the irrigated area is on the rise. The actual irrigated area in rabi and kharif seasons before and after IMT is shown (Table 3). Potential utilised (based on maximum irrigation figures) before and after IMT is also given (Figure 3).

### Productivity

The productivity of wheat has increased from 2.6 tonne(t)/ha (1989-90) to 3.3 t/ha (1993-94). Paddy-productivity also increased from 2.65 t/ha (1989-90) to 3.53 t/ha (1993-94).

### Other Customised Services

The society has made an office-building and a seeds and fertilizer godown. It sells fertilizers, seeds and, also, consumer goods to the farmers. It has acquired a few agricultural equipments like duster, sprayer, tensio-meter, etc., which are given to farmers on nominal rent.

### Revenue Recoveries

The society has an impeccable record of paying water charges to ID in time. The recovery of irrigation charges by the society is nearly cent per cent. The society offers 10% rebate on timely payment of irrigation charges (Table 4).

## ANALYSIS OF PERFORMANCE OF THE SOCIETY

### Methodology

The analysis of performance of the society is based upon data collected during action research, many field visits, interviews and interaction with a number of beneficiaries and government officials. During a field survey in May, 1994, more than half of the members of the society (242) were interviewed on many issues to assess the society's impact and farmers' perception of the society and line agencies.

## Analysis of Financial Performance

The profits of the society are impressive but it was found in a case study that the profits have been earned through activities other than the efficient use of water. The main sources of societys' profit are given below:

### *Low Fixation of Volumetric Water Rates*

In the pilot project, the volume of water available through outlet Nos. 20, 22, 23, 26 and 28 during 1985-86 is calculated on the presumption that the channel (Amethi-Gosainganj distributary) did run with the design discharge (at head 2.5 $m^3/s$) and scheduled roster. This is not tenable as the Sharda Sahayak System was a new project in 1985-86 and the channels did not run as per design discharge and roster during that year or before that. No measuring devices (such as Parshall Flume) were installed to verify the actual discharges drawn by the outlets. Hence volumetric water rate, fixed on the basis of ideal water availability in the system, average area irrigated and average revenue earned during last 5 years, was very low.

### *Tampering in with Water Measurement*

The society did not maintain a correct account of water taken from the canal. During rabi 1989-90, the water depth calculated on the basis of records of the society, is 12.6 cm only (Table 4) against the normal water depth of 55.0 cm. The records of the society indicate that water has not run in the outlets water course throughout the day when the distributary was running and there was keen demand. It is improbable and points out to manipulative recording of water measurements.

### *Subsidies by the State Government*

The co-operative sector in the state is entitled to many subsidies. The state government has granted a sum of Rs. 272,000 comprising managerial grants and low interest loans to construct an office/godown and to procure seeds, fertilizers, etc., including investment of Rs. 10,000 in its share capital.

### *Other customised services*

About 85-89% farmers purchase fertilizers from the societys' depot. Besides, sale of consumer goods has also yielded profits to the society.

## Analysis of Increase in Irrigated Area

Although there is substantial increase in the irrigated area under the society, its comparison with upstream and downstream irrigation (under ID) reveals that (except in Rabi 1991-92) the trend of variation in irrigated area is uniform in the society and beyond society commands. It suggests that the increase in irrigated area may be a function of increasing stabilisation of the main irrigation system.

## Analysis of Productivity

It was found that only 1.5% farmers in the command were aware of scientific methods of soil moisture determination and all farmers (100%) use empirical methods for starting and stopping irrigation and for deciding irrigation intervals. Many cases of unauthorized withdrawal, overuse and wastage of water were also found. Obviously, optimal use of water has yet to contribute to productivity. On the other hand, the easy availability of fertilizers, improved seed varieties, pesticides and insecticides from the society and other nearby sources have encouraged the farmers to use these inputs increasingly. The society, sometimes, offer credit facility for the purchase of the fertilizers. It is found that 89% of the farmers use improved variety seeds, 94% farmers use pesticides and all of them (100%) use fertilizers in their fields. This may be the reason for the gradual increase in the productivity.

**Other Findings of the Fields Survey**

* The use of groundwater is increasing in the command. There were 25-30 borings in the command before the formation of the society which have now gone up to 71. Around 17.5% farmers use ground water to supplement irrigation from the canal (26% farmers complained of not getting water as per warabandi).

* Training to farmers on improved water application techniques and agriculture extension work has not been adequately carried out. Only 17.5% of the farmers listened to a few lectures arranged by line agencies.

* Loaning facilities for the farmers have not been developed and only 5% farmers have been able to get loans from nationalized banks nearby.

* All the farmers (100%) reparted that they did not receive any worthwhile help in their agricultural work from line agencies like the Agriculture Department, the Irrigation Department, or the Command Area Development Authority, etc.

* Ninety four pecent of the farmers, including all women landholders (10%), want the water management to be in the hands of the Society. Only 5% farmers favoured ID and 1% preferred CADA.

**Government Officials' Perception**

* The Basarahiya Water Co-operative Society was initiated by CADA and it was stipulated in the pilot project report that the functioning of the society would be regularly monitored by the CADA and the programme would be suitably altered on the basis of feedback/results but it did not happen, presumably, because the importance of the pilot project and its bearing on future of irrigated agriculture in the state was not well-communicated and appreciated.

* The ID officials are not perceptive to the desirability and indispensability of the farmers' involvement in water management. They are also highly sceptical of the farmers' ability to manage water distribution themselves. The ID has not yet deliberated upon the issue and no procedural and organizational changes are contemplated to accommodate and promote the concept of farmers' participation in the management of irrigation systems.

* The Agriculture Department was not associated with the pilot project and adaptive trials in agriculture and concentrated agriculture extension work were not undertaken in the pilot porject area.

* There is no co-ordination between line agencies and a tendency to shift responsibility on other departments is found everywhere. There is also no clearcut perception of objectives to be achieved by the society and action to be taken by the line agencies in consonance with the objectives.

* Irrigation Management Transfer is a state subject. In Uttar Pradesh, a clear policy statement in tune with National Water Policy is yet to be made. The ID and the state government have yet to amend the existing act, viz., Northern India Canal and Drainage Act' 1873 which is silent on supplying canal water to water co-operatives.

**CONCLUSIONS**

The case study leads to the conclusion that a large communication gap exists between line agencies and the farmers. While the Irrigation Department officials complained that the farmers resort to canal cuttings, unauthorised withdrawal of water and mobbing the government officials against *Tawan* (penalty), the farmers complained of the total indifference of the ID to their needs, poor system maintenance and irregular running of the canal.

ID officials are not susceptible to the idea of Irrigation Management Transfer (IMT). In the maiden effort of IMT in UP, the Irrigation Department practically forgot the societys' command as soon as the society was registered. No monitoring of water supplied and area irrigated was done by the ID, with the result that volumetric water measurements were tampered with in the initial years. It was desirable for the Irrigation Department to have checked the basis of water rate sanctioned for the pilot project more thoroughly and to have assigned a task force of committed officials to give technical guidance and support to the society. The documentation of trials and errors,

successes and failures of the society at every stage was also to be taken up by the line agencies. It would have helped a great deal in the formulation of general policy regarding Water User Co-operatives. Basarahiya Water Co-operative Society was simply formed through a government notification and no 'Memo of Understanding' delineating the powers and responsibilities of each party was ever signed.

The advantage of improvement in water distribution should always be matched with the adoption of appropriate advanced techniques in agriculture for optimising crop production. In the case of Basarahiya Water Co-operative Society, the Agriculture Department was not particularly involved and CADA did not intervene and monitored the programme to evolve a dynamic correction mechanism.

This apathy of line agencies weakened the IMT process and has left the society with modest gains in terms of set objectives. Yet the most notable achievement of the society is the satisfaction-level of the farmers with the society. Ninety two percent of the farmers believe that the society helps in resolving their disputes and 94% farmers favour the irrigation water management to be in the hands of the society. These farmers are pleased that they don't have to deal with indifferent and inaccessible government agencies to settle their grievances. Many agricultural inputs are also available at their door through the society without bureaucratic delays. The case study shows that the water co-operatives are viable alternatives for a state like UP provided the line agencies develop proper orientation to support the water co-operatives which, in turn, will depend upon the political will to expedite the IMT process.

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*Table 1. Availability of water on five outlets of the society (in million litres).*

| Sl No | Water Availability/ Demand | Rabi Season | Kharif Season | Total |
|---|---|---|---|---|
| 1. | Total water available in canal | 901.5 | 1068.6 | 1969.5 |
| 2. | Crop water requirement | 609.9 | 433.5 | 1043.4 |
| 3. | Water available through rainfall. | 54.0 | 231.5 | 285.5 |
| 4. | Water required from canal | 555.9 | 202.0 | 757.9 |
| 5. | Surplus water available in canal | 345.6 | 866.6 | 1211.6 |

*Table 2. Growth of cropped area in ha (% of CCA).*

Total CCA = 274 ha

| Name of Crop | Cropped Area | | |
|---|---|---|---|
| | 1979-80 | 1985-86 | Proposed by the Society |
| **Rabi Season** | | | |
| 1)Wheat | 122.73 (45%) | 170.29 (62%) | 104.97 (38%) |
| 2)Sugarcane | 10.55 (04%) | 13.99 (05%) | 30.86 (11%) |
| 3)Other Rabi | 40.07 (14%) | 29.34 (11%) | 93.12 (34%) |
| **Total** | 173.35 (63%) | 213.62 (78%) | 228.95 (83%) |
| **Kharif Season** | | | |
| 1)Paddy | 91.36 (33%) | 158.00 (58%) | 118.31 (43%) |
| 2)Sugarcane | 10.55 (04%) | 13.99 (05%) | 30.86 (11%) |
| 3)Other Kharif | 78.00 (28%) | 29.38 (11%) | 78.42 (29%) |
| **Total** | 179.91 (65%) | 201.87 (74%) | 227.59 (83%) |

*Table 3. Actual irrigation achieved before and after Irrigation Management Transfer (IMT).*

(in ha)

| Actual Irrigaion | | Kharif Season | Rabi Season | Annual Total |
|---|---|---|---|---|
| (i) | Average of five years irrigation before IMT | 84 | 125 | 209 |
| (ii) | Maximum irrigation achieved before IMT | 100 | 147 | 247 |
| (iii) | Yearwise irrigation after IMT | | | |
| | a. Year 1989-90 | 100 | 110 | 210 |
| | b. Year 1990-91 | 101 | 144 | 245 |
| | c. Year 1991-92 | 107 | 151 | 258 |
| | d. Year 1992-93 | 128 | 160 | 288 |
| | e. Year 1993-94 | 119 | 145 | 264 |

*Table 4. Water utilised and revenue recoveries.*

| Year | Water Utilised (million litre) | Water Depth (centimeter) | Water Charges (in Rs.) | |
|---|---|---|---|---|
| | | | Collected by BWCS | Paid to ID |
| (A) KHARIF SEASON | | | | |
| 1989-90 | 305 | 30.5 | 13500 | 5179 |
| 1990-91 | 282 | 28.1 | 12479 | 4795 |
| 1991-92 | 354 | 33.4 | 15547 | 6024 |
| 1992-93 | 664 | 51.9 | 16187 | 11282 |
| 1993-94 | 581 | 48.8 | 16899 | 9877 |
| (B) RABI SEASON | | | | |
| 1989-90 | 138 | 12.6 | 14853 | 2349 |
| 1990-91 | 345 | 24.0 | 16370 | 5859 |
| 1991-92 | 476 | 31.7 | 17622 | 8095 |
| 1992-93 | 364 | 22.8 | 19115 | 6187 |
| 1993-94 | 482 | 33.2 | 17861 | 8189 |

*Figure 1. Location of Basaraiya Water Co-operative Society.*

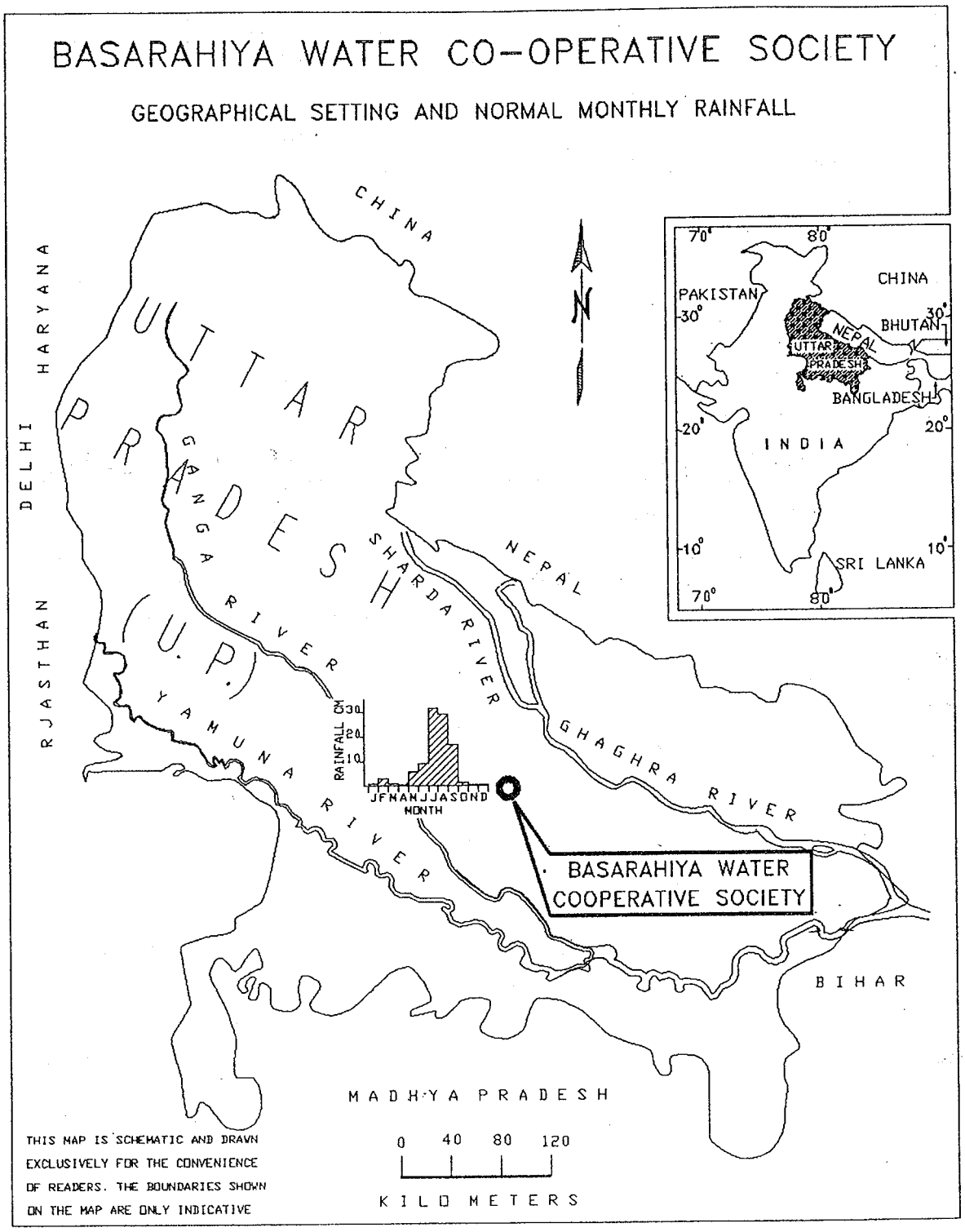

*Figure 2. Schemtic diagram of Sharda Sahayak Systems.*

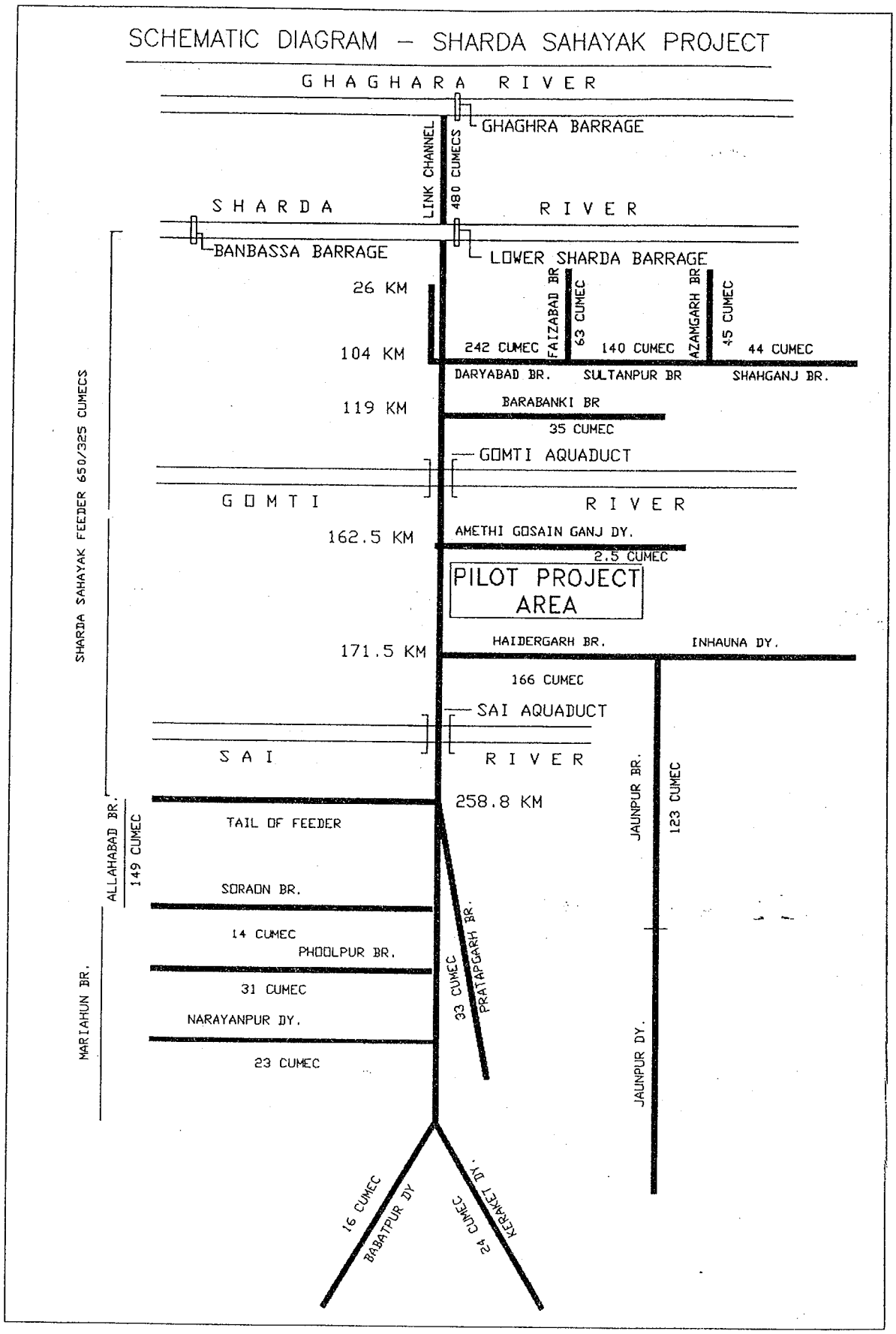

*Figure 3. Potential utilised before and after IMT.*

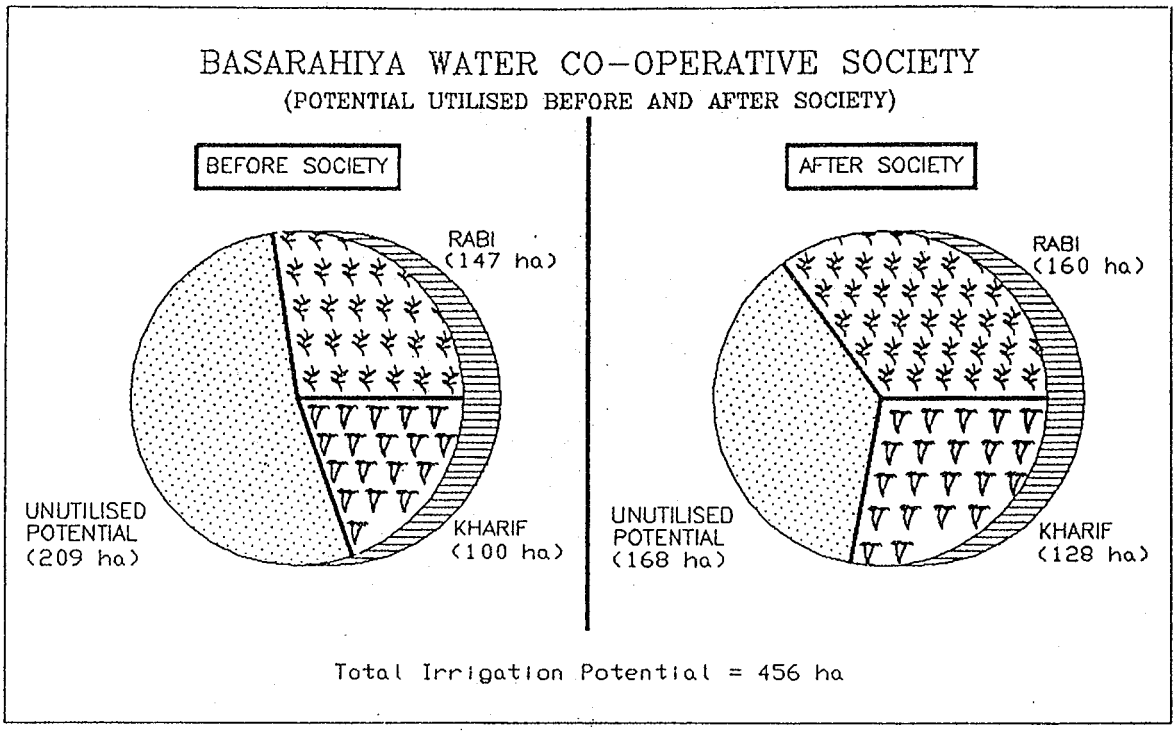


*Figure 4. Cumulative profit earned by the society.*