4.2 Mohini Water Cooperative Society-Ukai Kakrapar Project (Major)

4.2.1 Background

4.2.1.1 Mohini village which fell within the command area of Ukai dam, was situated in Choryasi taluka of Surat district. Mohini was a big village. The farming condition of the village about 20-25 years ago was quite deplorable. Rainfall in the area was uncertain and irregular. Farm production, therefore, was very low. Farmers cultivated the land only in kharif season and that too for home consumption. Although land was suitable for cultivating sugarcane, banana and some other crops, due to lack of irrigation facilities these were not grown. After the construction of the Ukai dam in 1972 and subsequent introduction of Water Users Association a green revolution ushered in and had transformed the area from a dry region to a rich and prosperous one.

4.2.1.2 Irrigation in the command area of the Ukai dam started on the basis of the conventional water management system which encountered the following limitations.

i) Water stored in reservoir was conveyed to individual fields in the command area through an intricate network of canal system and field channels. Farmers received water individually in accordance with predetermined rules and procedures which took for granted cooperation between farmers receiving irrigation water from the same outlet of the canal system. In the absence of such cooperation, equitable water distribution or distribution according to the needs of each farmer became difficult. In particular the farmers located in the tail end of the command area had to suffer.

ii) It was not easy to measure volume of water supplied to each farmer. Water rates, therefore, were based on crop area and season. This very often resulted in farmers using more water than required by crops. This not only wasted the scarce water but also had adverse effect on quality of land in the long run.

4.2.2 Formation of WUA

4.2.2.1 It was realisation of these limitations that prompted farmers of Mohini village to form a water users association so as to overcome the limitations. For example, the measuring

devices could be installed at the head of canal and water rate levied on the basis of volume and water measured at the supply point to a farmers' association. The state government also encouraged the formation of the association by providing the following assistance.

i) The government offered to bear the losses in the first three years.

ii) Government undertook to give a grant of Rs. 26000/- per year for two years.

iii) government offered to supply water on volumetric basis at the rate of 25 paise per 10,000 litres. The society would, however, charge the members on crop area basis.

iv) Government also strengthened and streamlined the physical and administrative system. Thus during the period around 1978-79 when Mohini Co-operative society started functioning the distribution network of canals was renovated and additional outlets were added, the vulnerable reaches of water courses were lined, and all preliminary procedures were set up for smooth interaction with local irrigation officers on all matters.

4.2.2.2 It was in 1978 that the Mohini Water Co-operative society was registered in Mohini village located about 25 kms. from Surat in Choryasi Taluka. The society covered 6 villages i.e. Kharbhasi, Mohini, Gangva, Khambhasala, Goja and Deladava. The society started functioning from March 1979. But the memorandum of understanding (MOU) was signed in June 1997 after the concept of MOU came into being in Gujarat in 1995.

4.2.2.3 The distributaries, i.e., 3LWC, 4LWC, 5LWC, 5LX, 4LAAWL and direct outlet RD 11.6 and outlet RD 16.4 took off from Bhestan Minor. The total area was 3600 hectares. The length of canal / distributaries in Mohini was 7.5 kms and its command area was 487.31 hectares . It had 4 sub distributaries, 6 off take points for releasing water through 51 outlets.

4.2.3 Selection of Sample Households

4.2.3.1 During the course of the study, an attempt was made to obtain primary data to study the impact on farming economy. For this purpose a sample of 50 farmers was selected from head, middle and tail end of the irrigation system of the area under study. Of these 18 were from head, and 16 each from middle and tail end. Impacts on crop area and yield under

irrigation and value of produce were assessed.

4.2.3.2 15 farmers were also selected as a control group from a nearby Bhagumara village who were getting irrigation from the Bhestan Minor from where water was released to Mohini water users society. These farmers were getting irrigation since 1975-76.

4.2.4 Functioning of WUA

4.2.4.1 In the first year of its functioning i.e. in the year 1978-79, the Mohini Water Co-operative Society started with 145 members only. The total membership of the WUA had grown to 282 by the time of our study in 1998. 102 (36%) households out of 282 were having land upto one hectare, 108 (38.30%) between 1-2 hectares, 53 (18.79%) between 2-4 hectares and 19 (6.74%) households were having above four hectare of land each. As regards social profile, there were 19 (6.74%) scheduled caste families and the rest 263 (93.26%) were others including 6 muslim households.

Water Charges

4.2.4.2 The society was being supplied water on volumetric basis but it was charging its members on area and crop basis. The rates charged by the Irrigation Department were Rs. 0.25 per 10,000 litres. The water rates fixed in 1981 were continuing. These obviously required revision.

The prevalent water rates charged for the main crops from members were as under.

Season	Crop	Rate per hectare
Kharif	Paddy	Rs.110/-
Rabi	Paddy	—
Summer	Paddy	—
Kharif	Sugarcane	Rs.170/-
Rabi	,,	Rs. 290/-
Summer	,,	Rs. 370/-

4.2.4.3 If the society paid 100 percent water charge bill within the stipulated date, then the society

was entitled to receive 20 percent concession for its management. The stipulated dates for payment of water charges were as under.

	Description	Kharif	Rabi	Hot
1.	Date of giving bill to society from department	30th November	15th April	15th July
2.	Date of making payment to department	Ist February	Ist May	15th September
2.	Last date of payment of bill	30th February	31st July	30th November

4.2.4.4 The following table gives the details of water charges paid to Irrigation Department and the amount charged by society from its members on area / crop basis for the last three years. The data showed that the society saved substantial amounts after meeting its obligation to the government.

Year	Total amount (Rs.)	Total Irrigation charges paid to Govt. (Rs.)	Saving of Society (Rs.)	Percentage of saving
1995-96	2,65,603	1,60,721	1,04,882	(65.28)
1996-97	2,78,204	1,49,861	1,28,343	(85.64)
1997-98	3,25,479	1,01,991	2,23,488	(219.12)

Water Scheduling

4.2.4.5 In the beginning of each season, the rotation for running and closing of canal system was prepared at Divisional level and published in the newspapers. In turn, the concerned Deputy Engineer and Sectio n Officer of the society prepared the water schedule for each rotation in consultation with farmers and the same was communicated to all members of the society. The adequacy of water supply and its effectiveness were checked through standing water flame (SWF) and day to day gauge and discharge register was maintained at society's office.

4.2.4.6 Water was released to farmers in accordance with a scheme of priority. Vegetable crops were accorded top most priority. Priority was also given for planting sugarcane. Water was released to the farmers who were in the middle followed by the farmers who were in the tail end and lastly to those farmers who were at the head reach.

Management

4.2.4.7 The Mohini Society affairs were managed by a managing committee elected by the annual general body meeting. Elections were held every year. There were 10 members including President in the executive committee. Three members retired every year, but being eligible, might offer themselves for election. The Managing Committee on an average met 9-10 times in a year. The major agenda items discussed in these meetings were collection of water charges, distribution of water etc. Decisions were generally by consensus.

4.2.4.8 All the 50 respondents reported that they had adequate voice in decision making and decisions were taken through consensus. All of them also stated that there was no group dominance in the managing committee. All the respondents stated that the functions of distributary level committee in the Mohini WUA was to oversee the distribution of water to the farmers. There was also a village service area committee whose main functions were :

i) To implement RWS in each chack

ii) To solve disputes between the chack holders.

iii) To motivate the farmers for formation of WUA or farmers' group.

iv) To give suggestions on distribution of water and OFD works.

v) To help in irrigation recovery.

4.2.4.9 Regarding views on facilities provided, all of respondents of the command area stated that management by farmers was more satisfactory. Regarding consideration for accepting the new system all of them stated that FPIM ensured adequacy and timeliness and, equitable distribution of water, saved time and money in running after official agency. It eliminated or minimised corrupt practices and also caused less tension among the users.

All the fifty respondents reported that after the formation of WUA productivity had gone up and more area had also been brought under irrigation.

4.2.4.10 Out of 50 respondents, 40 (80%) gave their views on water management. The main problem reported by respondents was that the distributary was not being maintained properly. They wanted that proper cleaning of the minors and repair works be undertaken by the Irrigation Department on a regular basis. Here it would be worthwhile to mention that the entire canal and minors were unlined. This resulted in haphazard growth of weeds, which was quite a serious problem.

4.2.4.11 Field enquiries revealed that farmers in the upper reaches of the canal had not yet overcome the usual tendency of drawing more water. This generated resentment among farmers of lower reaches. There were also reports that farmers were not paying water charges within the stipulated dates of payment. One reason for this was that they waited for concession or relaxation to be offered by the government. As a result there were reports of social tension in the area.

Training

4.2.4.12 During the last five years 5 members of the executive committee and three officials of state-govt were deputed for training in PIM. After receiving the training some improvement in water control and assured water supply, increase in crop produce, and discipline in enforcing equitable distribution of water among all types of farmers were ensured.

4.2.4.13 Out of 50 respondents 12 attended training programmes at WALMI Aurangabad. Drip, irrigation, sprinkler irrigation and formation of WUA and judicious distribution of water were the subjects covered in the training. Farmers who attended training programmes stated that they got more technical knowledge about irrigation system. Regarding suggestion for better training the respondents stated that more training programmes should be arranged.

4.2.5 Impact of the Programme

(A) Before and After Approach

Change in Irrigated Area

4.2.5.1 Data obtained from Mohini water co operative society indicate increase in area under irrigated agriculture after the formation of the WUA. Irrigated area in the command as a whole was reported to have increased by about 150 percent as can be seen from a comparative picture of actual irrigation done before the formation of WUA and last three years, given in the table below. Much of this increase took place in the early years after the formation of WUA. Thus by 1988-89 the irrigated area increased to 934.63 hect. Increase since then was modest and a saturation point seemed to have reached since 1994.

Table 4.2.1 : Growth of Irrigated Area (hect.)

	Season (hect.)				
Year	Kharif	Rabi	Hot weather	Total	
1978	134.00	163.00	139.00	436.00	
1994	357.39	359.00	350.00	1066.00	(144.5)
1995	360.00	371.00	350.00	1081.00	(147.9)
1996	360.00	371.00	350.00	1081.07	(147.9)

Figs. in brackets are indices of growth over 1978-79

4.2.5.2 Data on per respondent average area under irrigation as obtained from our household survey are given below :

Table 4.2.2 : Average Irrigated Area per Respondent

	Before (1978-79)		After 1996-97		
Crops	No. reported	Average irrigated area per respondent	No. reported	Average irrigated area per respondent	Index of Growth
1	2	3	4	5	6
Cotton	10	2.1	—	—	(—)
Sugarcane	29	2.1	50	3.31	(57.62)
Paddy	—	—	12	2.1	(—)
Fruits (Chikoo)	—	—	3	2.08	(—)
Total	36	2.28	50	3.93	(72.37)

Paddy and fruits were introduced as a new crops while cotton cultivation was discontinued. Number of farmers under sugarcane increased from 29 to 50. It was revealed in course of the study that the irrigation management by farmers impacted more or less in the same manner on the respondents irrespective of location of their plots. Hence, reachwise analysis was not considered useful. Out of 50 respondents, 46 reported increase in irrigated area from 81.9 hectares before the formation of WUA to 196.94 hectares after the formation of WUA. Ten of them had no irrigatoin in the 'before' period. For the rest four respondents, there was no change in irrigated area during the same period.

The above table shows that average irrigated area per respondent which was 2.28 hectares before the association period increased to 3.93 hectares by 1996-97 an increase of 72.32 percent. Taking both the primary and secondary sets of data into account, we notice a substantial expansion of area under irrigation from the given canal system. The extent of increase at 72 percent indicated by primary data was, however, much lower than that of 150 percent indicated by secondary sources.

Quality of Irrigation

4.2.5.3 Table 4.2.3 below reveals that only 6 (72%) respondents were having some irrigated holding before project period i.e. 1978-79. Out of 36 only 29 (80.56%) were having adequate irrigation, while 7 (19.44%) reported inadequate irrigation. During 1996-97 i.e. after project came into being, all the respondents were getting irrigation which was considered adequate and timely.

Table 4.2.3 - Quality of Irrigation

Before					After				
	Adequacy		Timeliness			Adequacy		Timeliness	
No. of respondent	Adequate	Inadequate	Timely	Untimely	No. of respondent	Adequate	Inadequate	Timely	Untimely
1	2	3	4	5	6	7	8	9	10
34	29 (80.56%)	7 (19.44%)	29 (80.56%)	7 (19.44%)	50	50 (100%)	NIL	50 (100%)	NIL

Yield per Hectare

4.2.5.4 Yield per hect (Qtl./hect.) of major crops grown with irrigation is given below.

Table 4.2.4 : Average Yield per Hect (in quintals)

Crop	Before the project Average yield per hect.	After the Project Average yield per hect.	Index of growth
Cotton	10.3	—	
Sugarcane	617.3	924.2	(49.72)
Paddy	—	24.2	

Before the formation of the association farmers were mainly sowing cotton and sugarcane. The average yield per hectare was 10.3 quintals for cotton and 617.3 quintals for sugarcane Later on, cotton was replaced by sugarcane and paddy. Per hectare yield of sugarcane which was 617.3 quintals before increased to 924.4 quintals per hectare, growth of about 50 percent. This reflected the effect of better quality of irrigation provided.

Value of Produce

4.2.5.5 Value of produce at constant prices based on current year's prices per respondent is given below. This takes into account value from both irrigated and non-irrigated crops.

Table 4.2.5 : Average Value of Produce per Respondent (Rs.)

(at constant prices)

Crops	Before formation of WUA		After formation of WUA		Index of growth
	No. reported	Value of produce	No. reported	Value of produce	
Cotton	10	47,285	—	—	—
Jowar	42	9,000	—	—	—
Sugarcane	29	1,41,173	50	2,49,317	(76.60)
Paddy	—	—	12	24,120	(NIL)
Orchard	—	—	3	40,000	(NIL)
Total	50	1,26,337	50	2,46,569	(95.11)

Jowar was only grown without irrigation 'before' the formation of WUA. Total average value of produce per respondent for cotton was Rs.47285/-. For jowar it was Rs.9000/- and for sugarcane it was Rs. 1,41,173. However after the project period the value of produce for sugarcane increased to Rs. 2,49,317/- and for paddy (grown after) it was Rs. 24120/-. Besides the food crops, three selected respondents also had income from orchards. The average value of produce varied between Rs. 30,000/- to Rs. 45,000/- per respondent with an average of Rs. 40,000/-. The net increase in value of produce per respondent was about 95 percent. This reflected the combined effect of total cropped area as well as increase in yield per hectare.

4.2.6 Impact of the Programme

(B) With and Without Approach

Irrigated Area

4.2.6.1 Table 4.2.6 gives information on average area irrigated per respondent. The main crops grown in the area were paddy and sugarcane and information on irrigated area is given cropwise.

Table 4.2.6 : Average Irrigated Area per Respondent (0.00 hect.)

Crop	Before		After (1996-97)		
	Number reported	Average Irrigated Area	Number reported	Average Irrigated Area	Index of Growth
Paddy	9	1.78	9	2.31	(29.781)
Sugarcane	10	3.55	11	2.79	(–21.41)
Total	15	3.43	15	3.43	(0.00)

The above table shows that average irrigated area under paddy before the formation of WUA at Mohini was 1.78 hectare per respondent which increased to 2.31 (30%) hectares during 1997-98. As regards sugarcane the average area per respondent was 3.55 hectares before the formation of WUA at Mohini and it decreased to 2.79 hectares a decrease of 21 percent per respondent during 1997-98. The decrease in sugarcane area was due to paddy being taken as a crop in between two sugarcane crops. Overall there was no change in average irrigated area per respondent for non-members whereas this figure for beneficiaries had increased by 72 percent.

Quality of Irrigation

4.2.6.2 Out of 15, six respondents reported that they were getting adequate water before the project, while nine respondents reported inadequate supply. Regarding timeliness all fifteen respondents reported that they were not getting irrigation water timely. The situation remained the same during 1997-98.

Yield per Hectare

Table 4.2.7 : Average Yields per Hectare (Qtls.)

Crop	Before 1978-79	After 1996-97	
Paddy	27.63	31.10	(12.5)
Sugarcane	837.86	964.66	(15.1)

4.2.6.3 Average yield per hectare for paddy was 27.63 quintals before the Project and it increased to 31.10 quintals during 1997-98, an increase of 12.5 percent. Similarly for sugarcane the average yield was 837.86 quintals and 964.66 quintals for before and after respectively, an increase of 15.13 pecent. The yield rates of both paddy and sugarcane in 1996-97 were higher for non - members as compared to the beneficiaries.

Value of Produce

4.2.6.4 Value of produce at constant prices based on current year's prices were also worked out for the selected non-members.

Table 4.2.8 Average Value of Produce Per Respondents (Rs.)

(at constant prices)

Crop	Before		After	
	No. Reported	(1978-79)	No. Reported	(1996-97)
Paddy	9	28,844	9	43,133 (49.54)
Sugarcane	10	2,48,009	11	2,57,170 (3.69)
Total per respondent	15	1,82,646	15	2,14,479 (17.42)

Figs. in brackets are indices of growth

The above table shows that value of produce for paddy was Rs. 28844 'before' and Rs. 43133 'after' with a growth of 49.54 percent whereas the growth of value of produce in case of sugarcane crop was just 3.69 percent. However the total value of produce per respondent before was Rs. 1,82,646 which increased to Rs. 2,14,471 an increase of 17.47 over the 'before' period. Average value of produce per selected beneficiary of Rs. 2,46,569/- in 1996-97 was about 15 percent more than the average value of produce of Rs. 2,14,479 per selected non - member in the same year. The difference was marginal and was mainly due to larger area under irrigation in the Mohini Command area.

Awareness

4.2.6.5 All the 15 respondents reported awareness of farmers participation in irrigation management, 12 (5%) of them having come to know about it through Irrigation Department, while the remaining three (25%) from fellow cultivators. All the 15 respondents reported that FPIM system was working well and was better than the management done through Irrigation Department. There was no shortage of water in the irrigation system earlier and most of the farmers were getting water in adequate quantity. Hence it was not considered necessary for them to form WUA.

4.2.7 Views on Water Loss

4.2.7.1 All the 50 respondents of the command area reported that there was water loss in the system. All the 15 farmers of the control area reported that there was water loss in the distributary. Out of them two-thirds felt that water loss was due to breach in canal and distributary. Nine (60%) respondents reported that water loss was also due to non-provision of gauge measuring device and 13 (87%) respondents reported that water loss was due to siltation and damaged structures. The responses were multiple.

4.2.8 Willingness to form WUA by Non - Members in Control Area

4.2.8.1 All the 15 respondents of the control area reported that they were willing to form WUA as it would be easier to get water for irrigation and internal disputes with other farmers could be resolved quickly. It was learnt during the field visit that the farmers had initiated a move to form WUA and were approaching the appropriate authorities for this work. Irrigation

Department would also be helping them in completing the formalities i.e., filling up forms and taking up the registration of the cooperative society etc. As suggestion to improve the efficiency of the present system, the respondents stated that all the field channels should be properly maintained. Broken gates be also replaced.

4.2.9 Suggestions

i) All the fifty beneficiary respondents stated that in order to make the new management system more effective field channels be lined. Approach roads be provided from head reach to tail end. Drainage system be also provided for draining out excess water. The farmers also reported that since the water table had risen sharply in the last few years ways should be evolved to stabilise the water table. The rise in water table had also posed environmental problems.

ii) The present water rates in the state were in vogue since 1981 and needed upward revision.

iii) Use of tubewells be propagated as water table was very high in this area.

iv) Alternate irrigation system be developed so that time would be available for repair and maintenance of the main canal, minors and sub minors.

v) Farmers should be sent for training to different successful experiments / WALMI periodically.

4.2.10 Overview

4.2.10.1 Mohini was the first experiment in water users association in Gujarat state. The society was registered in 1978 and covered six villages in Choryasi taluka of Surat District. The irrigated area per respondent increased from 2.28 hects. before the formation of WUA to 3.93 hectares in1996-97 registering an increase of 73 percent. Yield of sugarcane which was about 617 quintals percent before the formation of WUA increase to 924 quintals per hectare after the formation of WUA. Value of produce from all the major crops increased

from Rs. 1,26,337/- to Rs. 2,46,569/- during the same period registering an increase of 95 percent.

4.2.10.2 There was, however, a long time gap of 18 years between 'before' and 'after' periods so that the comparison could not be treated as very reliable. Moreover, the impact becomes less impressive when we deflate the absolute figures with the number of years over which the change took place. Thus the value of produce increased by 5 percent on an average. A 'with' and 'without' comparison of the impact which is more appropriate in this case did not show much difference. Both categories of farmers had more or less the same agro-economic status. Even then, the non-member control farmers were in favour of forming a WUA since it would be easier to get water for irrigation and internal disputes with other farmers caould be resolved quickly. They did not feel the need for it earlier because of the abundant supply of water that they had been receiving. Overall the Mohini experiment was a grand success in the initial years, but the same tempo of progress could not be sustained later on.

4.3 Shri Krishi Mangal Piyat Sahakari Mandli,-Karjan Project (Major)

4.3.1 Background

4.3.1.1 Shri Krishi Mangal Piyat Sahakari Mandli, a water users' association under the command of Karjan project was selected for the study. This was a major irrigation project having a reservoir on the river Karjan near village Jitgarh in Nandod Taluka of Bharuch district. Two main canals viz. Right Bank Main canal and Left Bank Main canal having lengths of 12.80 kms. and 51.00 kms. off took from the dam. The Karjan project provided irrigation facilities to 56,200 hectares in 209 villages of four talukas.

4.3.1.2 The Krishi Mangal Piyat Sahakari Mandli covered three villages of Chitrawadi minor of this project. This minor offtook from the Right Bank Main canal 54 metres downstream. Background information about this minor and the WUA is given below:

i) Length of the Chitrawadi minor canal	-	2850 metres
ii) Number of sub distributaries	-	10
iii) Number of villages covered 3 i.e. Vadia, Rajpipla & Chitrawadi		
iv) Command area of the minor	-	413.00 hectares
v) Area managed by WUA	-	413.00 hectares
vi) Year and month of formation of the WUA	-	June, 1994
vii) Total number of farmers in the command area	-	499
viii) Year and month of signing of MOU with Govt.	-	MOU not yet signed

4.3.2 Socio-Economic Profile of the Members of WUA

4.3.2.1 There were 79 members of the chitrawadi irrigation society as on date of visit. The details of land holdings are given below :

(A)	i) Upto one hect.	36	(45.6)
	ii) One to two hect.	28	(35.4)
	iii) Two to five hect.	12	(15.2)
	iv) 5 to 10 hect.	3	(3.8)
		79	
(B)	**Caste Groups**	**No.**	**%age**
	a) Scheduled Castes	1	(1.3)

b) Scheduled Tribes	10	(12.6)
c) OBC	68	(86.1)
	79	

4.3.3 Water Charges

4.3.3.1 The memorandum of understanding (MOU) had not been signed. So the Irrigation Department was collecting water charges from the farmers. Water charges collected for the last three years were as under :

Year	**Rs.**
1996	1.30,552/-
1997	2,14,793/-
1998	4,4,122/ upto March 1998

4.3.3.2 Cropwise water charges for some of the important crops were as under :

Season	**Crop**	**Water charges Per hectare**
i) Kharif	Paddy	Rs. 110/-
	Jowar, Bajra	Rs. 40/-
	Groundnut, Castor	Rs. 100/-
	Sugarcane, Banana	Rs. 170/-
	Arhar, Mung	Rs. 60/-
	Vegetables, Till	Rs. 60/-
	Cotton	Rs. 60/-
ii) Rabi	Wheat	Rs. 110/-
	Mustard	Rs. 110/-
	Gram	Rs. 40/-
	Paddy, Jowar etc.	Rs. 100/-
	Groundnut, Castor	Rs. 100/-
	Desi Tobacco	Rs. 125/-
	Sugarcane, Banana	Rs. 290/-
	Isabgol, Zeera, Saunf	Rs. 200/-
iii) Summer	Paddy	Rs. 250/-
	Jowar Bajra	Rs. 140/-
	Vegetables	Rs. 140/-
	Groundnut	Rs. 140/-
	Tobaco	Rs. 200/-
	Sugarcane, Banana	Rs. 370/-

4.3.4 Formation and Status of WUA

4.3.4.1 Initially irrigation had started with conventional system without any Rotational Water Supply (RWS) pattern even though the Chitrawadi minor had RWS structures, proportional flow divider, turnout etc. throughout its command area of 413 hects. Some farmers, mainly in the head reaches, had started irrigating their fields even before the construction of field channels. Government officials had, of course, framed a detailed programme of irrigation schedule including designed supply of water to different reaches of the Chtrawadi minor. But there was lack of adequate machinery for a strict control over the irrigation system. Farmers in the upper reach, therefore, got water supply more than designed.

4.3.4.2 The resulting problems faced by others mostly tail end farmers, induced the farmers themselves to realise the need for a farmers body to regulate the canal system and implement RWS so that each farmer could get water at the right time. Accordingly, a general meeting of farmers decided to form farmer groups at the (i) minor, (ii) water course and (iii) turnout levels along with a group leader at each level. The farmers' groups were to regulate irrigation management system efficiently. The responsibilities of the group leaders were also worked out. Each farmers' group was to be formed consisting of two representatives each from head, middle and tail reaches. But only a farmers' group was formed at the water course level only. By October 1998, the number of households joining the WUA was only 79 out of 499.

4.3.4.3 Thus the progress achieved in forming WUA had been quite modest. Farmers were getting adequate water from the existing system. Hence most of them could not be easily persuaded to become member of the WUA and take the trouble of managing the irrigation system and collecting water charges. One more factor was absence of any NGO who could persuade the farmers to joining the WUA.

4.3.4.4 Almost all the respondent farmers stated that the considerations for acceptance of the new system were their expectations of adequacy and timeliness of irrigation, equitable distribution of irrigation water, reasonable irrigation charges, saving of time and money in running after officials, elimination or minimisation of corrupt practices and proper maintenance of irrigation channels.

4.3.5 Selection of Sample Households

4.3.5.1 For studying the impact of farmers participation in irrigation management, a sample of 50 farmers from amongst members of WUA were selected from head, middle and tail of the Chitrawadi Minor. Of them 18 were from head and 16 each from middle and tail end.

4.3.5.2 15 farmers were randomly selected as a control group from a nearby Bhagumara village who were getting water from the Left Bank Main canal (LBMC). These farmers were getting adequate irrigation from Irrigation Department during 1997-98.

4.3.6 Functioning of WUA

4.3.6.1 As indicated earlier, the Shri Krishi Mangal Piyat Sahkari Mandali of the Karzan project performed limited functions only. No MOU had been signed. As a result, the asociation was not collecting water charges from the members.The WUA, therefore, was not involved in repair and maintenance of the canal. This was being looked after by Irrigation Department. The main work of the association related to distribution of water among the members.

Training

4.3.6.2 According to official agencies, officers and staff members of the Irrigation Department were sent to WALMI, Anand, for training on farmers participation in irrigation management, optimum use of water etc. A very small number of farmers (3) were also reported to have been deputed for training at WALMI, Anand, in 1995 for two days. Subjects taught included, farm irrigation management and warabandi system. Besides, some of the farmers were also reported to have been imparted training by the officials of ID in judicious use of water, including RWS. Our field survey, however, found that none of the respondents were sent for training. Training to farmers helped in implementing Water Users Association programme, and in knowing about optimum use of water. It also helped the farmers in decision making and transfer of technology.

Management

4.3.6.3 Six (12%) of the respondents reported that they got adequate chance to participate in the deliberations and decision making in the management committee. According to them decisions were taken through consensus. All the respondents were of the view that there was no group dominance.

4.3.6.4 49 (98%) respondents were satisfied with management by farmers while only one who belonged to the middle reach was not satisfied since he was not getting adequate and timely

supply of water as his field was slightly on the higher side.

Maintenance

4.3.6.5 41 (82%) of the sample farmers from the association area stated that the conditions of the distributaries / field channels etc. were better as compared to situation prevailing before the formation of the water user association. Only 9 (18%) stated that there was no change. Here it may be worth while to mention that after the formation of WUA some of the farmers who become active members of the association took keen interest in the maintenance of the distributaries / channels and were pursuing the matter with the officials of the Irrigation Department.

4.3.7 Impact of the Programme

(A) Before and After Approach

4.3.7.1 Household data on all relevant aspects were obtained from sample members of the WUA with the help of a schedule - cum - questionnaire. Data were obtained for the period 'before' as well as 'after' the formation of WUA. The former was represented by the year 1992-1993 and the latter by 1996-97. Findings are discussed below.

Change in Area Irrigated

4.3.7.2 The entire area under cultivation oXD0f 50 samples households was irrigated in both 'before' and 'after' periods. Average irrigated area per sample farmer was 2.44 hectares. Crop-wise details are given in the table below.

Table 4.3.1 : Average Area Irrigated per Respondent (0.00 hect.)

	Before (1992-93)		After (1996-97)	
Crop	No. reported	Average irrigated area (hect.)	No. reported	Average irrigated area (hect.)
Banana	49	1.55	48	1.59
Groundnut	3	1.57	3	1.57
Wheat	31	0.93	32	0.92
Jowar	21	0.59	19	0.60
Total	50	2.44	50	2.44

The above table shows that average irrigated area under banana increased from 1.55 hectares

to 1.59 hectares per respondent. There was no increase for groundnut, which remained static at 1.57 per respondent. For wheat there was slight decrease from 0.93 to 0.92 hectares. For Jowar, the increase was from 0.59 to 0.60 hectares. Overall there was no increase in irrigated area. It was also observed that the programme impacted more or less in the same manner on all respondents. Hence location wise analysis was not considered useful. There was no increase in irrigated area after the formation of WUA.

Quality of Irrigation

4.3.7.3 The formation of WUA improved the quality of irrigation in terms of adequacy and timeliness of supply of water to the fields. The impact was more pronounced with respect to timeliness as can be seen from the table below :

Table : 4.3.2 Adequacy and Timeliness of Irrigation

Quality of Irrigation	No. reported Before (1992-1993)	No. reported After (1996-97)
Adequacy	43	50
Timeliness	7	50

Yield per Hectare in Quintals

4.3.7.4 All the respondents felt that there was an increase in yield rate after the formation of farmers association. This is clearly borne out by the field data given below :

Table 4.3.3 : Average Yield per Hectare (Quintals)

Crop	Before (1992-93)	After (1996-97)	Index of growth
1	2	3	4
Banana	511.84	664.41	29.81
Groundnut	20.81	29.94	43.87
Wheat	22.36	27.64	23.83
Jowar	24.48	34.41	40.56

Indices of growth for Groundnut in 1996-97 was 43.87 percent over the pre association year of 1992-93. Similarly growth was 29.81 percent for banana, 23.83 percent for wheat

and 40.56 percent for Jowar. The main reason for increase in yield was availability of irrigation in adequate quantity, and that too timely. This enabled farmers to have better management of other inputs.

Value of Produce

4.3.7.5 The average value of produce per respondent measured at constant prices (using 1996-97 prices as the base) from Rs. 1,65,918 in 1992-93 to Rs. 2,13,581 in 1996-97. This reflected the increase in yield that had taken place during the period. This increase was attributed mostly by banana which was grown by almost all respondents. Cropwise details are given in the table below :

Table 4.3.4 : Average Value of Produce per Respondent (Rs.)
(at constant prices)

Crop	Before (1992-93)		After (1996-97)		Index of growth of produce
	No. reported	Average value of produce (Rs.)	No. reported	Average value of produce (Rs.)	
Banana	43	1,55,496	48	2,00,200	(28.75)
Groundnut	3	30,750	3	42,375	(37.80)
Wheat	31	10,161	32	13,129	(29.20)
Jowar	20	6,600	19	8,443	(27.92)
Total per respondent	50	1,65,918	50	2,13,581	(28.73)

Average value of produce for banana which was Rs. 1,55,496/- 'before', increased to Rs. 2,00,200/- 'after' an increase of 28.75 percent. For groundnut the value of produce which was Rs. 30,750/- increased to Rs. 42,375/- an increase of 37.80 percent. For Jowar value of produce increased from Rs. 6,600/- to Rs. 8,443/- an increase of 27.92 percent. Average value of wheat increase by 29.20 percent over the same period.

Views on Water Loss

4.3.7.6 All the fifty farmers stated that the area suffered from water loss which was more during the last three years. This was due to siltation, unauthorised outlets in some of the distrbutaries and seepage of water or leakage of water through damaged parts of the water channels. It was also noticed that water flowed to the low lying field from the fields at higher levels.

4.3.8 Impact of the Programme

(B) With and Without Approach

Irrigated Area

4.3.8.1 The main crops of the area before the formation of WUA in Chitrawadi were cotton, jowar and arhar. However, the farmers shifted to banana after they started getting irrigation water from the ID.

Table 4.3.5 : Average Irrigated Area per Respondent. (0.00 hect.)

	Before		After (1996-97)		
Grown crops	No. reported	Av. irrigated area (hect.)	No. reported	Av. irrigated area (hect.)	Index of growth
Cotton	10	1.24	–	–	
Jowar	12	0.97	–	–	
Arhar	14	1.03	–	–	
Caster	3	0.93	1	1.8	(93.54)
Banana	–	–	14	1.34	
Sugarcane			1	1.2	
Total	15	1.20	15	1.43	(19.16)

The above table shows that banana had been introduced as a new crop in the area. It had taken the place of cotton, jowar and arhar.

4.3.8.2 Yield per Hectare

Table 4.3.6 : Average Yield per Hectare (Qtls.)

	Before	After	
Crop	Yield per hect.	Yield per hect.	Index of growth
Cotton	9.05	–	–
Jowar	12.7	–	–
Arhar	4.1	–	–
Caster	15.45	17.78	(15.08)
Banana	–	730.80	–
Sugarcane	–	800.00	–

Average yield per hectare for cotton was 9.05 quintals per hectare for Jowar it was 12.7

quintals per hectare and for arhar it was 4.1 quintals. Banana which was introduced as a new crop in the area had an yield of 730.8 qunitals per hectare and that of sugarcane it was 800 quintals per hectare.

Value of Produce

4.3.8.3 Average value of produce per respondent was computed at 1997-98 prices for both the periods to take care of effects of temporal fluctuations in the price level. Cropwise data are given in table below :

Table 4.3.7 : Average Value of Produce per Respondent (Rs.) (at constant prices)

Crop	Before		After	
	No. reported	Average value of produce (Rs.)	No. reported	Average value of produce (Rs.)
Cotton	10	23760	–	–
Jowar	12	6760	–	–
Arhar	14	8344	–	–
Banana	–	–	14	1,51,090
Caster	3	11,333	1	32,000
Sugarcane	–	–	1	91,200
Total per respondent	15	31,302	15	1,49,230 (376.74)

Taking all crops into account the value of produce increased from Rs. 31,302/- in 1992-93 (i.e. before the WUA) to Rs. 1,49,230/- in 1997-98 (i.e. after the WUA), indicating a growth of 377 percent.Average value of produce per selected beneficiary at Rs. 2,13,581/- was about 43 percent more than the average value of produce of Rs. 1,49,230/- per respondent computed for the selected non beneficiaries. This was mainly due to banana being grown by the selected beneficiaries on more irrigated area.

Awareness of New Experiment

4.3.8.4 All the selected respondents reported awareness of the new experiment of irrigation management with farmers. They also considered the new system better than the management of irrigation system by Irrigation Department. As reason as to why new experiment was better, it was reported that under the new experiment it would be easier to get water for

irrigation and internal disputes with other farmers could be resolved quickly. Under the present system such internal disputes continued to linger on as there was practically no grievance redressal forum. All the 15 respondents were willing to form water users association. All of them reported that it would be easier to get water for irrigation and internal disputes with other farmers could be resolved quickly. However, apathy on the part of respondents and plenty of irrigation were the reasons for not forming the WUA so far.

4.3.9 Overview

4.3.9.1 Chitrawadi minor which was formed in the year 1994 had not been able to mobilise the support of all its farmers. Out of 499 farmers only 79 farmers were members of the WUA as in October 1998. The main reason for this situation was apathy on the part of the farmers to become members of the WUA - most of whom were getting adequate and timely supply of water. There was no change in irrigated area over the year. Banana had been introduced as a new crop in the area. The increase in yield of almost all the major crops varied between 24 percent (wheat) to 44 percent (groundnut). Value of produce also increased by 28.7 percent over the years.

4.3.9.2 As regards non - users, all of them were of the view that though they were getting adequate irrigation they wanted to form WUA as it would help them in getting water in proper quantity and that too timely. They were also in the process of forming WUA in consultation with the officials of Irrigation Department.

4.4 Baldeva Cooperative Society - Baldeva Project (Medium)

4.4.1 Background

4.4.1.1 Baldeva Piyat Vistaram Pani Vahechni Karnari Sahakari Mandali Ltd. Baldeva, briefly known as Baldeva Cooperative Society was a Water Users Association in Bharuch district of Gujarat. It was located near village Baldeva in Valia taluka of Bharuch district. The reservoir feeding the canal had a gross capacity of 8.15 MCM and net capacity of 7.84 MCM. This was a medium canal irrigation project having a command area of 2240 hectares of which 1155 hectares were on the left bank and 1085 on the right bank. It was completed in 1992.

4.4.1.2 Baldeva Cooperative Society which was registered on 22 March 1993 (i.e. soon after completion of the canal) covered all the six villages on the left bank command of the Baldeva irrigation scheme. Names of the villages and corresponding CCA are given below.

	Name of village	CCA in hect
i)	Baldeva	93
ii)	Kamboida	481
iii)	Atkhol	32
iv)	Chasvad	255
v)	Zarma	234
vi)	Panchim	60
	Total	1155

4.4.2 Formation of WUA

4.4.2.1 The formation of the society owes a great deal to Aga Khan Rural Support Project (AKRSP) an established NGO working in that area. It was this agency which motivated the farmers of the Baldeva command area to form an association. It had entrusted the work relating to formation of WUA and allied activities to one of its Community Organisers working in the area. The attitude of the Irrigation Department was also favourable. In addition, there was the example of a nearby Pigut Irrigation scheme where a farmers association had already been formed and functioned successfully resulting in better utilisation of water.

4.4.2.2 AKRSP in collaboration with Irrigation Department held a meeting in April 1992 with the villagers of the command area of Baldeva Irrigation Scheme. At the meeting, the AKRSP staff explained to the farmers the modalities involved in participatory irrigation management (PIM). This was followed by other meetings including small group meetings as well as individual contacts with farmers of the area. Pigut canal which had started functioning in 1991 was often cited as an example. These efforts not only generated awareness among the farmers but also created a favourable climate for PIM. The positive response of the people helped the authorities take up the formation of the irrigation society. These efforts succeeded when the society was registered in March 1993 and MOU was signed in July 1996.

4.4.2.3 Farmers of the area were also taken by AKRSP to Bamanhore canal area in district Surrendernagar and Junagarh where farmers were already managing irrigation through cooperative societies supported by AKRSP. The main objective of such visits was to educate the farmers through exposure on different aspects of irrigation management, the responsibilities involved in that and also to make them aware of rules and regulations. The above visits also helped in persuading the reluctant farmers to become members of WUA. These steps served as a launching pad for the smooth functioning of the society.

4.42.4 There were 381 members in the Baldeva Society out of whom 177 (46.5%) were having land holding upto 2 hectares each and 204 (53.5%) had land from 2 to 10 hectares each. 131 (34.4%) farmers were Scheduled Tribes while the rest 250 (65.6%) were from other castes. None of the farmers belonged to either Scheduled Castes or other backward castes.

4.4.3 Growth of Irrigated Area

4.4.3.1 Irrigation was initiated in 1993 by the WUA. The yearwise position of irrigation was as

under :

Year and Season		Area Irrigated in Hectares
1993-1994	Hot weather	288.50
1994-1995	Hot weather	286.00
1995-1996	Kharif	134.00
1995-1996	Rabi	219.00
1995-1996	Hot weather	237.50
1996-1997	Rabi	122.00
1996-1997	Hot weather	363.00
1997-1998	Rabi	199.00
1997-1998	Hot weather	434.00

The area irrigated in each season was, however, much smaller than CCA of 1155 hectares. The main reason cited for this by the authorities as well as association members was inadequacy of water in the reservoir. In view of the paucity of water in the reservoir, the WUA decided to provide irrigation only during rabi season and hot weather. This decision was strictly followed by members of the society.

4.4.4 Selection of Sample Households

4.4.4.1 For obtaining additional data and information on the functioning and impact of the farmers participation in irrigation management in Baldeva area, a sample of 40 farmers were selected at random. Information from them was obtained through a schedule - cum questionnaire for both 'before' and 'after' periods.

4.4.4.2 For studying the impact of FPIM in Baldeva area, 15 farmers from control areas of the project who were not members of the water users association were selected at random. While selecting the farmers care was taken to select, those who were in the same socio economic groups as those of the selected beneficiaries.

4.4.5 Functioning of WUA

4.4.5.1 In Baldeva, WUA allowed irrigation from the canal during rabi and hot seasons only. Kharif crops were grown from own source i.e. wells or under rainfed conditions. Irrigation was allowed during kharif season of 1995 only.

Water Charges

4.4.5.2 In Baldeva, water charges from members were realised by the Water Users Association in advance on the basis of their demand of water for various crops. Water charges realised were generally 50 percent higher than the government rates while the amounts paid to Irrigation Department were at the prescribed rates. Water charges were levied on the basis of crop area.

4.4.5.3 The society was paying water charges to government before the stipulated time limit. Water charges collected and actually paid to Govt. are given below. As per government resolution dated 22 November 1995, a rebate of 20 percent was paid to the society. Water charges collected and paid therefrom to ID during last three years were as follows.

	Total collection	Paid to Govt.	Balance with WUA
1995	Rs. 1, 97, 120	1, 31, 452	65, 728
1996	Rs. 2, 65, 200	1, 76, 808	88, 392
1997	Rs. 1, 79, 180	1, 19, 455	59, 725

Rates of water charges for rabi and hot weather were as below

	Rabi		**Hot Weather**		
Crops	**Govt. rates**	**Mandli rates**	**Crops**	**Govt. rates**	**Mandli rate**
Wheat	110	160	Sugarcane	444	666
Vegetable	100	150	Groundnut	240	360
Gram	50	75	Green Gram	168	240
			Paddy	300	450

Training

4.4.5.4 Training programme for skill development was taken up for the Secretary, Water Operators and other staff. The Secretary was imparted training in accounts and records keeping. The three areas which were dealt with in the Water Operators training module were (a) water distribution (b) canal cleaning, and (c) measurement of the irrigated area.

4.4.5.5 35 farmers of the command area offered their views on training, 18 (51%) out of them favoured imparting knowledge about the crops which required less water. 10 (28.6) wanted to be taken on extension visit to new areas, while 7 (20%) wanted an increase in duration of training.

Management

4.4.5.6 All the 40 respondents reported that they got adequate chance to participate in the decision making through the managing committee. They also reported that almost all the decisions were taken through consensus. There was no group dominance in the managing committee which looked after the interests of all..

4.4.5.7 22 (55%) out of 40 respondents gave their views on performance of village committee and distributery committee. 17 (77%) of the 22 respondents felt that water charges were collected before the actual release of water on yearly basis which caused difficulties, while 13 (59%) held the view that field channels and distributaries were not repaired in time which resulted in water loss. Twenty (90%) respondents were of the view that distributory committees gave water to all by their turn while 5 (23%) reported that gate keepers of the distributory at times released water to unauthorised farmers during night which should be stopped.

4.4.5.8 Almost all the farmers considered that WUA had insured adequacy and timeliness of irrigation, equitable distribution, reasonable irrigation charges, saving of time and money in running after officials, elimination or minimisation of corruption, proper maintenance of irrigation channels and minimisation of tension among water users. All the 40 respondents stated that they were happy with the new system. About 50 percent of the respondents regarded the new system much better than the earlier one while the remaining 50 percent considered it somewhat better.

4.4.6 Impact of the Programme

(A) Before and After Approach

Change in Irrigated Area

4.4.6.1 Average area irrigated per respondent for groundnut was 1.66 before the formation of WUA in 1991-92. It increased to 1.70 in 1996-97. For wheat, it was 2.15 before formation of WUA but subsequently decreased to 0.93 1996-97. For sugarcane it was 4.50 but decreased to 3.41 for 1996-97. About one-fourth of the respondents grew sugarcane "before" with own wells irrigation. With availability of more irrigation "after" they switched over to canal irrigation for growing sugarcane. Taking all crops together there was a decrease in average irrigated area per respondent by about 8 percent, from 5.41 to 5.0 hect. But the number of respondents availing canal irrigation facilities increased from 30 to 40. As a result the gross irrigated area increased from 134.42 to 201.2 hectares, showing a growth rate of 49.65%. This enabled farmers to provide irrigation to new crops like arhar and cotton. In Baldeva 17 selected beneficiaries who were not having irrigated holding earlier reported irrigation on 80.28 hectares 'after'. For the rest 23 there was no change in irrigated area.

Table 4.4.1 Average Area Irrigated per Respondent

(Area in hectares)

Crop	Before 1991-92		After 1996-97	
	No. reported	Average area irrigated	No. reported	Average area irrigated
1	2	3	4	5
Groundnut	22	1.66	37	1.70 (2.40)
Wheat	2	2.15	3	0.93 (– 056.75)
Sugarcane	27	4.50	29	3.41 (– 24.22)
Arhar	—	—	18	0.99
Cotton	—	—	11	1.59
Total per respondent	30	5.41	40	5.0 (– 7.58)

Figs in brackets are indices of growth

Quality of Irrigation

4.4.6.2 The formation of the society led to improvement in quality of irrigation. Before the formation of the society, only 27 (67.5%) farmers reported that irrigation was both adequate and timely. The remaining 13 respondents reporting inadequate and untimely supplies were evenly distributed at Head, Middle and Tail end. After the formation of WUA, the percentage of the farmers reporting adequate and timely supply of irrigation water went upto 90 percent. The reason mentioned for not getting adequate and timely water was that the field channels were not properly developed and their farms were also on undulating lands.

Yield Rates

4.4.6.3 The extension of cultivated area under irrigation as well as improvement in quality of irrigation along with better input management resulted in increase in yields in irrigated area as can be seen from crop wise information given in the table below.

Table 4.4.2 : Average Yield per Hectare Major Crops (Qunitals)

	Before (1991-92)	After (1996-97)
Crop	Average yield	Average yield
Groundnut	18.6	26.7 (43.5)
Wheat	19.7	28.1 (42.6)
Sugarcane	607.7	905.0 (48.9)
Arhar	—	6.0 (–)
Cotton	—	22.5 (–)

Figs in brackets are indices of growth.

Value of Produce

4.4.6.4 Information on value of produce per respondent for both the periods (before and after) was worked out at constant prices based on 1996-97 prices so as to take care of price fluctuations. The data are given below. It can be seen that there was a hundred percent growth in the value of produce. This was the combined result of increase in area under irrigation, substitution of non-irrigated agriculture by irrigated agriculture which included

more emphasis on water intensive more valuable crops and higher crops yields. Jowar was being cultivated without irrigation by the three selected respondents. They were also included to assess the total value of produce.

Table 4.4.3 : Average Value of Produce per Respondent (Rs.)
(at constant prices)

Crop	Before (1991-92)		After (1996-97)		
	No. reported	Average value of produce	No. reported	Average value of produce	Index of growth
Groundnut	27	20,940	36	37,071	(77.0)
Wheat	2	14,750	3	21,833	(48.0)
Sugarcane	27	1,41,193	29	2,50,707	(77.5)
Arhar	11	7,691	9	10,170	(32.2)
Cotton	15	20,000	12	36,000	(80.0)
Jowar	3	3,900	3	6,000	(53.8)
Total	40	1,08,508	40	2,19,221	(102.0)

Value of produce per respondent for groundnut which was Rs. 20,940/- before the project increased to Rs. 37,071/- an increase of 77.0 percent. For wheat the increase was from Rs. 14,750/- to Rs. 21,833/- an increase of 48 percent. For sugarcane it increased from Rs. 1,41,193 to 2,50,707 an increase of 77.5 percent. Similarly arhar, cotton and Jowar recorded an increase of 32.2 percent, 80 percent and 53.8 perent respectively. The overall value of produce increased for Rs. 1,08,508 to Rs. 2,19,221/- indicating an increase of 102 percent.

Water Loss

4.4.6.5 While all the 40 households selected for the study regarded the condition of the distributaries as better than before, 24 (60%) of them, reported problem of water loss due to silting and damaged structures and paucity of water in the distributaries. Five respondents (12%), however, reported unauthorised outlets in the distributaries as another cause of water loss.

All the 24 respondents were of the view that water loss had become less after the handing over of the management to the farmers.

4.4.7 Impact of the Programme

(B) With and Without Approach

Area Irrigated

4.4.7.1 Information on cropswise irrigated area for both the periods are given below : This shows that there was no change in number of persons availing irrigation facility as well as in average irrigated area per respondent. Even crop-wise irrigated area had remained more or less the same. This was in contrast to the experience of the area covered by the Baldeva society, as discussed earlier.

Table 4.4.4 : Average Irrigated Area per Respondent (0.00 hectares)

	Before formation		After formation	
Crop	No. reported	Average area irrigated	No reported	Average area irrigated
1	2	3	4	5
Paddy	6	2.60	6	2.62
Groundnut	2	2.50	2	2.50
Sugarcane	8	5.40	8	5.40
Wheat	3	1.20	3	1.20
Total	15	5.20	15	5.20

Quality of Irrigation

4.4.7.2 Regarding quality of irrigation almost all the farmers stated that they were getting irrigation from the Left Bank Main canal (LBMC). However, all of them stated that the irrigation was inadequate and untimely before the formation of WUA at Beldeva. After the formation of WUA seven farmers (47%) stated that they were getting adequate irrigation. However all, of them also stated that they were not getting timely supply due to dearth of water in the reservoir and their fields being away from the main canal. A redeeming features was the opening of the Right Bank Main canal (RBMC) for which all the formalities had been

completed by the Irrigation Department. All the 15 farmers then would be getting adequate water and that too timely.

Average Yield (Qtl.)

4.4.7.3 Information on per hectare yield on irrigated area for different crops are given in the table below.

Table 4.4.5 : Average Yield of Major Crops per Hectare (Qtls.)

Crop	Before	After	
	Average yield per hectare	Average yield per hectare	Index of growth
Paddy	22.2	32.2	(45.0)
Groundnut	21.0	26.0	(23.8)
Sugarcane	546.6	735.4	(34.5)
Wheat	24.2	30.0	(24.0)

The above table reveals that there was 45.0% growth in yield in case of paddy, 23.8% in case of groundnut, 34.5 percent in case of sugarcane and and 24.0 percent in case of wheat. This was due to better input management even though the quantum of irrigation remained the same.

Value of Produce

4.4.7.4 Value of produce at constant prices based on current year's, prices was estimated for all the selected respondents. Figures are given in the table below

Table 4.4.6 : Average Value of Produce per Respondent (Rs.)

(at constant prices)

Crop	Before		After		
	No. reported	Average value of produce	No. reported	Average value of produce	
Paddy	6	23,006	6	38,100	(65.61)
Groundnut	2	39,375	2	48,750	(23.80)
Sugarcane	8	2,21,906	8	2,98,547	(34.53)
Wheat	3	15,333	3	19,000	(23.91)
Total per respondent	15	1,38,937	15	1,89,765	(36.58)

Note : Figures in bracket are indices of growth

The above table reveals that there was increase in value of produce by 65.61 percent in case of paddy, by 23.80 percent in case of groundnut, 34.54 percent incase of sugarcane and 23.91 percent in case of wheat. The main reason for increase in value of produce was better yield reported by farmers over the pre-project period. Average value of produce per selected beneficiary at Rs. 2,19,221 was about 15.52 percent more than the average value of produce of Rs. 1,89,765 per respondent computed for the selected non-users. This was mainly due to sugar crop grown by beneficiaries.

Awareness

4.4.7.5 All the 15 respondents were aware of WUA since it was functioning in their own villages. The source of information was Aga Khan Rural support Project and also ID. All of them also stated that FPIM in their area was working quite satisfactorly and it was better than the working of ID. These farmers, however, could not join WUA because their land fell under Right Bank Main canal where WUA had not been formed so far.

4.4.7.6 All the non-members were willing to form WUA. Since it would then be easier for them to get better irrigation and internal disputes with other farmers could be resolved quickly. It was also learnt that the canal authorities were making efforts to open Right Bank Main canal by early next year or so. When this canal became operational, the remaining farmers whose land fell under the canal, would like to form another WUA.

4.4.7.7 Regarding repairs and maintenance, all the farmers stated that the canal was being maintained by ID. But the maintenance was not good. All of them also stated that there was water loss in the system which was due to siltation and damaged structures.

4.4.8 Overview

4.4.8.1 Baldeva was also one of the better managed societies of Gujarat Experiment. Aga Khan Rural Support Project (AKRSP) had done pioneering work in this area in the formation of WUA with the help of one of its community organisers. The Irrigation Department also did not lag behind in this respect. The head quarter of AKRSP was also situated in a nearby

town. This helped in the movement of community organisers in visiting the field and having proper coverage of all the villages in the project area. The average irrigated area in this association, however, did not increase rather it decreased marginally. The reason for this was the increase in the number of farmers irrigating their fields. There was increase in yield of sugarcane by 49 percent followed by groundnut 44 percent. Average value of produce per respondent increased from Rs. 108,508 'before' to Rs. 2,19,221 'after', an increase of about 102 percent.

4.4.9.2 As regards non members, all of them were aware of Water Users Association in their area as they belonged to the same villages. They were, however, getting irrigation either from their own sources or from the Canal. The farmers were of the view that as soon as another RBMC (main canal) with become operative within a few months than they will be able to form WUA of their own.

4.5 Left Bank Piyat Sahakari Mandali Ltd. Lakhigam Project (Minor)

4.5.1 Background

4.5.1.1 Left Bank Piyat Sahakari Mandali Ltd. in Lakhigam Project (Minor) was the fourth WUA in Gujarat selected for the study. The construction of Lakhigam dam near village Lakhigam in Mandvi Taluka of Surat district was taken up in 1977 and the dam was completed in 1982. The work of left bank canal system started in 1983. Most of the main canal work upto 40 hectares was completed in 1990. The delay in completion of the canal was mainly due to forest land falling in the route of the canal for which clearance from forest department was necessary. Irrigation from the system started since 1992-93.

4.5.1.2 Lakhigam Irrigation Scheme was a minor irrigation project. The main features of the WUA were as under.

i)	Length of the canal	-	6.20 Kms.
ii)	Command area (ha)	-	400 hectares
iii)	Year and formation of WUA	-	September 1994
iv)	Year and month of signing of Memorandum of Understanding (MOU)	-	30.5.1998
v)	System of water supply	-	on time basis
vi)	Procedure followed for distribution of water among members of WUA	-	Rotational water supply (RWS)
vii)	Type of canal	-	Partially lined.

There were 5 water courses of which 3 had been lined while the other 2 were under process of being lined.

4.5.2 Formation of WUA

4.5.2.1 Like Baldeva, in Lakhigam also, the Aga Khan Rural Support Projects (AKRSP) played an important part in formation of the WUA. It organised several rounds of meetings with the villagers in collaboration with Irrigation Department. At such meetings AKRSP generated awareness and helped them embark upon formation of WUA. AKRSP had entrusted the

work relating to formation of water users association to one of its community organisers working in the area. The community organiser had been able to form the Association in collaboration with the officials of Irrigation Department and some willing farmers.

4.5.2.2 All the thirty respondents agreed to join the WUA in the hope that the new system would ensure adequacy and timeliness of irrigation, provide for equitable distribution of irrigation water, levy reasonable irrigation charges, save time and money in running after officials, eliminate or minimise corrupt practices, maintain irrigation channels properly and eliminate or minimise tension among water users.

4.5.2.3 The break up of 129 members of WUA by size group of their holdings was as under :-

Below 1 hectares	-	107	(82.95)
1 to 2 hectares	-	17	(13.18)
2 hectares and above	-	5	(3.87)
		129	

All the households belonged to Scheduled Tribes community.

4.5.3 Selection of Sample Households

4.5.3.1 For studying the impact of the farmers participation in irrigation management 10 farmers each were selected randomly from head, middle and tail ends of the canal. 15 farmers from the Lakhigam dam system who were not members of the WUA were also contacted to ascertain their economic situation and views on WUA. They were from villages falling under the command of the right bank main canal off taking from the Lakhigam dam. This canal became operational from 1995-96.

4.5.4 Functioning of WUA

Water Charges

4.5.4.1 Water charges were collected by the WUA from the farmers. Water charges collected by WUA and paid to government for the latest three years were as under.

Year	Amount collected (Rs.)	Paid to Govt. (Rs.)
1994-95	29, 831	21, 028
1995-96	16, 516	14, 392
1996-97	13, 581	9, 216

Water rates were based on crop and area. Rates charged from farmers by WUA were 50 percent higher than the rates prescribed by the government as can be seen from the table below.

Crop	Mandli Charges Per hectare (Rs.)	Govt. charges Per hectare (Rs.)
Paddy	360	240
Wheat	450	300
Jowar	240	168

Training

4.5.4.2 34 farmers from the project area were taken to Junagarh for 4 days in April 1997 for showing the working of lift irrigation, 6 farmers taken to Ojhar, Maharashtra during November 1997 for 2 days. 37 farmers were taken for exposure visits to Pigut and Baldeva projects each having successful WUA for one day. None of the selected respondents, however, attended any training course in water management. Hence they were not able to spell out any problem nor could they give any suggestion in this regard.

Management

4.5.4.3 Twenty three (76.7%) respondents reported that they got adequate chance to participate in decision making and all of them stated that the decisions were taken through consensus. All the 30 respondents stated that there was no group dominance in the management committee. Eighteen (60%) respondents indicated their views on the performance of village committees and distributary committee functioning in the water users asociation. As regards village committees, all of them stated that field channels and distributaries were not repaired in time while distributary committees was functioning well in distributing the water judiciously to all the farmers.

4.5.4.4 All the respondents stated that they were happy with new system which was performing much better than the earlier system.

4.5.5 Impact of the Programme

(A) Before and After Approach

Area Irrigated

4.5.5.1 There was no change in area irrigated after the formation of the association since all farmers in the command were already getting irrigation. Cropwise data are given below.

Table 4.5.1 : Average Area Irrigated per Respondent (0.00 hectare)

	Before (1993-94)		After (1996-97)	
Crop	No. reported	Average	No. reported	Average
Groundnut	26	1.87	26	1.87
Wheat	5	0.48	5	0.48
Jowar	29	0.54	29	0.54
Total	30	1.11	30	1.11

Quality of Irrigation

4.5.5.2 Out of thirty farmers only 4 (13%) farmers stated that they got adequate and timely supply of water before the formation of the water users association. However, after formation of water users association, the position improved since 28 (93%) farmers stated that they were getting timely and adequate supply of water. All the respondents also stated that the facilities provided were more satisfactory after the formation of WUA. There was no change in irrigated at both the points of time. There was no change in Irrigated area at both the point of time.

Yield

4.5.5.3 Figures on yields of principal crops grown on irrigated area for 'before' and 'after' periods are given below.

Table 4.5.2 : Average Yield per Hectare in Quintals

Crop	Before Average Yield per hectare	After Average Yield per hectare	Index of Growth
Groundnut	18.7	27.3	(46.0)
Wheat	13.95	21.8	(56.8)
Jowar	8.4	9.8	(16.7)

From the above table it may be seen that average yield per hectare increased in case of all the three crops namely groundnut, jowar and wheat. This was the result of better quality of irrigation provided by the WUA alongwith better input management.

Value of Produce

4.5.5.4 For calculating value of produce at two points of time, before the formation of the WUA and after, i.e. 1996-97 constant prices at which the produce were sold during 1996-97 were applied. Value of produce per respondent is given below.

Average value of produce per hectare for groundnut increased from Rs. 8218/- to Rs. 12000/- an increase of 46 percent. Similarly for wheat value of produce increased from Rs. 3329/- to Rs. 5220/- an increase of 56.3 percent. For Jowar the value of produce increased from Rs. 2082/- to Rs. 2385/- an increase of 14.5 percent.

Average value of produce per respondent in Lakhigam was Rs. 9659 before the formation of WUA. This increase to Rs. 13575 after the formation of WUA, an increased of 40.5 percent. This increase was attributed to farmers using better inputs including optimum use of irrigation water.

Table 4.5.3 : Average Value of Produce per Respondent (Rs.)

(at constant prices)

Crop	Before		After		
	No. reported	Average value per respondent	No. reported	Average value per respondent	Index of Growth
Groundnut	26	8218	26	12000	(46.0)
Wheat	5	3339	5	5220	(56.3)
Jowar	29	2082	29	2385	(14.5)
Total per respondent	**30**	**9659**	**30**	**13575**	**(40.5)**

Introduction of New Crop

4.5.5.5 Though in the Lakhigam irrigation Project area some well to do farmers had introduced sugarcane as a new crop but none of the farmers who were selected for the study grew sugarcane in their fields.

Views on Condition of Distributaries.

4.5.5.6 All the thirty respondents reported that the condition of the sub-distributary was better after the formation of WUA and the Irrigation Department was lining sub-distributaries.

Views on Water Loss

4.5.5.7 Twenty eight (93.3%) respondents reported that there was water loss during the last three years. All of them cited siltation, seepage and paucity of water in the sub-distributaries as reasons for the same. Three persons (10%) from the middle reported that waterloss was also due to unauthorised outlets in the distribuatries. (50%) respondents reported that water loss was more before the formation of WUA, while the remaining 50 percent stated that water loss was more after the formation of the WUA.

4.5.6 Impact of the Programme

(B) With and Without Approach

Irrigated Area

4.5.6.1 Average irrigated areas per respondent are given in the table below.

Table 4.5.9 Average Area Irrigated per Respondent (0.00 hectares)

	Before WUA	After (1997-98)	
Crop		No. reported	Irrigated area
Paddy		10	1.76
Groundnut		3	0.93
Sugarcane	Unirrigated	7	1.40
Jowar		2	0.75
Pulses		2	1.40
Total		15	2.29

4.5.6.2 Before formation of WUA, the area in the command of Right Bank Main canal was unirrigated. The farmers who were growing paddy and other crops were doing the same either with their own wells or were depending on rains. After the Right Bank Main canal became operational, people started growing crops under irrigation provided by this canal. Sugarcane which was not being grown earlier because of non availability of assured irrigation had since been taken up by the farmers.

Quality of Irrigation

4.5.6.3 10. (66.7%) respondents stated that they were getting water in adequate quantity and that too timely while only five (33.3%) reported that they were not getting water adequately or timely.

Yield per Hectare

4.5.6.4 Before the formation of WUA the yield per hectare was quite low. The following table gives details of yield per hectare of main crops in irrigated areas only. Yield rates were either similar or somewhat batter than those in the association areas.

Table 4.5.5 Average Yield Per Hectare in Quintals

	After (1997-98)	
Crop	No. reported	Average yield
Paddy	10	25.7
Groundnut	3	27.4
Sugarcane	7	618.3
Jowar	2	10.0
Pulses	2	10.0

Yields during 'before' period are not mentioned because there was no irrigated area.

Value of Produce

4.5.6.5 The non members were also asked about the value of their produce at constant prices of 1996-97 level. The value of produce had been taken for both irrigated and unirrigated crops which were being grown by the selected respondents.

Table : 4.5.6 Average Value of Produce per Respondent (Rs.) (at constant prices)

	Before 1993-94	After (1997-98)	
Crop	Value of produce	Value of produce	
Paddy	9096	7656	(–15.8)
Groundnut	16500	26000	(57.6)
Sugarcane		60943	
Jowar	6730	2250	(-66.6)
Pulses	9480	9000	(– 5.1)
Total	24816	40240	(62.1)

Average value of produce per respondent which was Rs. 24816 before the programme increased to Rs. 40240 i.e.'after' an increase of 62.1 percent. The increase in value of produce is attributed to sugarcane which was introduced in the area largely at the cost of other crops. Average value of produce per selected beneficiary at Rs. 13575 was less by 66.26 percent as compared to average value of produce of Rs. 40,240 per selected non user. This was mainly due to sugarcane crop grown by the selected non users.

Awareness

4.5.6.6 All the farmers were aware of FPIM and its achievements in the area. In fact some of the farmers were residing in the same villages where FPIM had already been formed in the Left Bank Main canal. All of them were willing to form WUA. The reason being by forming FPIM they would be getting adequate irrigation and that too timely. The disputes arising out of water distributary system would be resolved through consensus.

4.5.7 Overview

4.5.7.1 Lakhigam was another WUA formed with the help of Aga Khan Rural Support Project. The society was formed in 1994. There was no increase in irrigated area at the two points of time. However, the yield of main crops per hectare increased by 46 percent (groundnut) and 57 percent (wheat) and the value of produce increased from Rs. 9,660/- 'before' to Rs.13,575/- 'after', an increase of 46.5 percent.

4.5.7.2 15 non-members were also selected for the control study. These farmers were also residents of the same villages. However, they were getting irrigation from the another canal of the Lakhgam dam. They were somewhat better off with respect to average value of produce per respondent. Even then all of them wanted to form WUA in the hope of further improving their situation.

4.6 Overview of the Selected Projects in the State (Gujarat)

4.6.1 The findings of the research study of the selected Water Users Associations in Gujarat is a mix bag. On the one hand the Association received abundant irrigation after formation, such as in Mohini Cooperative Society, resulting in increase in total gross irrigated area by two and a half times, vis-a-vis the earlier position, there are other projects like Baldeva where for want of adequate water only about 50 percent of the total command area could be irrigated after the Association came into being. However, in this project about 50 percent of the selected members who did not get irrigation for want of adequate water before Association. About two-thirds of them received adequate and timely irrigation after formation, although availability of water was inadequate to irrigate the whole command area. In between lies Karjan project where membership of the Association failed to reach 50 percent mark of total farmers in the whole command area, the reason being that the formation of the Association did not appreciably improve availability of water which was otherwise available without any difficulty before the Association was formed and therefore, failed to motivate farmers to become members of the Association

4.6.2 The formation of the association and participatory management of irrigation system by farmers themselves impacted appreciably on the members in terms of substantial increase in crop productivity almost in all the selected projects as far as the selected beneficiaries were concerned. Assured availability of water promoted them to introduce new hybrid varieties of cash crops like banana, sugarcane etc. leading to sizable increase in the value agricultural produce grown after the Association came into being.

4.6.3 The non-members selected from the control areas of the selected projects for a comparative study of agricultural status of both groups of respondents showed that over the period of the non-members' condition also improved i.e. from no irrigation status 'before' to adequate irrigation 'after' for majority of them, good impact in terms of introduction of new crops in a few cases and increase in yield of produce consequent on availability of irrigation facility over years. This also resulted in growth of value of agricultural produce grown. The range of increase was, however, less, vis-a-vis the growth in case of the selected beneficiary members.