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A methodology for assessing impact of irrigation management transfer from farmers' perspective

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Abstract

Many countries, including India, have made efforts in irrigation management transfer. As experiences of such transfers are becoming available there is a need for a rigorous method to assess their impact. In this study we argued for stakeholders' approach and have presented a method by which impact can be assessed from farmers' perspective. This method involves the use of trade-off model often used in marketing research. The methodology is illustrated with the help of two cases of transfer located in western part of India.

1. Introduction

Major efforts have been made in several countries world wide to transfer rights and responsibilities for irrigation management activities of an irrigation system from a government agency to a private or local organization (Brewer et al., 1999; Vermillion, 1997). In India also, during the last decade, considerable emphasis has been made to transfer some irrigation management functions to water users' associations (WUAs).

Irrigation plays a major role in the Indian economy. India's agricultural production in general and food security in particular is critically dependent on the irrigation facilities created and their performance. In fact, irrigation is considered as one of the major contributors to India's green revolution. Irrigation adds a very high value to the land, increases income and employment in the rural areas. Therefore, creation of irrigation potential and its proper utilization have been given high priority in government planning. The anticipated irrigation potential created by the end of 1997–1998 is 91.24 million hectares, about 40% of the gross cropped area, comprising

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33.83 million hectares under major and medium projects and 57.41 million hectares under minor irrigation schemes. This potential, accounting for about 60% of the ultimate potential, has been created through substantial allocation of budget during each planning period. In the first Five Year Plan (FYP), allocation for irrigation and flood control was as high as 19.7% of the total budget. The second FYP onwards till the annual plan of 1989–1990, the share of irrigation and flood control has been around 10%. In more recent years (Eighth Five Year Plan), the allocation has been around 7%.

However, performance of the irrigation systems created has been far from satisfactory. It is estimated that only 85% of the irrigation potential created is actually used and the gap between the two increased during the 1980s (Svendsen & Gulati, 1995). According to the Land Use Satellite (LUS) data, only 55% of the potential created is utilized in major and medium systems. The major reason for this is high emphasis given to construction of new projects rather than efficient management and operation and maintenance of the systems created. The systems are administered rather than managed. These problems have led to (i) low productivity, (ii) low return on investment, (iii) inequities in distribution and use of water across the command area and among the beneficiary households (Mitra, 1992). While poor maintenance, low water charges and low recovery rates necessitate greater financial support, governments are increasingly finding it difficult to commit large amount of budget for irrigation. Recognizing these problems, suggestions have been made in recent years regarding more realistic pricing of water and encouraging user participation in the management of irrigation systems. While changes in water pricing have been tardy, there are several pilot studies undertaken by various state governments involving user participation in the distribution of water and management at the minor level through WUAs. An important question that arises from the viewpoint of policy is the nature of impact of user participation in the management of irrigation systems.

2. Conceptual framework for impact assessment

Despite widespread adoption, not much information is available about impact of irrigation management transfer. A number of studies conducted worldwide, adopting a variety of data collection methods have thrown up some evidence on operational and financial performance but little evidence on effects of management transfer on economic benefits and costs for various stakeholders (Vermillion, 1997).

The purpose of assessing impact of irrigation management transfer has been to determine the extent to which objectives of management transfer have been fulfilled. The most commonly cited objectives of irrigation management transfer such as increasing agricultural production, improving equity in water distribution, improving system sustainability and reducing financial burden on the government have been identified mainly from the viewpoint of the government. Environment protection is also considered a major objective in systems where there are problems such as water logging and soil salinity. Assessing impact considering these objectives alone, however, may be inadequate as these objectives do not encompass perspectives of other important groups such as farmers who are affected by an irrigation system. Although industries, urban populations, and rural communities could be important stakeholders, in most irrigation systems in India, farmers are the major users and government the provider of irrigation services. While the

perspective of government as provider has been highlighted more often than that of farmers', the concerns of latter are also equally important, if not more. For example, while all the four objectives identified above are important from the states' viewpoint, farmers are more concerned about the first two, viz., enhancing agricultural production and equity in water distribution. Farmers may also have additional concerns such as increasing net income from agriculture, which these objectives do not address.

3. Stakeholders' approach

Impact of irrigation management transfer should not therefore be assessed by examining merely the stated objectives but by using stakeholders' approach.[1] If all the stakeholders, in this case, primarily farmers and government,[2] perceive management transfer to be beneficial, then the overall conclusion will be that impact has been positive. If only one of them see it as beneficial and the other as not beneficial, then an overall conclusion is not possible unless we say that one group of stakeholders is more important than the other. The government's perspective would depend mainly on assessment of individual objectives where as farmers perspective would be only partly dependent on satisfaction of the stated objectives. Farmers as users of the system have many more costs and benefits and their perspective would depend on how these costs and benefits have changed after transfer. Impact of irrigation management transfer should, therefore, be assessed from the perspectives of both the stakeholders.

4. States' perspective

Assessing the extent to which commonly cited objectives of irrigation management transfer, namely, increasing agricultural production, improving equity in water distribution, improving system sustainability and reducing financial burden, has been achieved, would help in examining the impact from the states' perspectives. Methodology for assessing these objectives would involve a research design that requires either time series data encompassing both before and after transfer periods or cross-section data from with and without transfer matching cases. In some situations both these approaches may be used either to complement or cross check the results obtained from them.[3]

5. Farmers' perspective

From the farmers' viewpoint, impact assessment would primarily involve examining the changes in costs and benefits after transfer. The components of costs and benefits to farmers from

[1] Stakeholder concept has been in use in strategic management literature. Stakeholder approach in strategic management requires a firm to identify all its stakeholders and their stakes and take them into consideration in evolving enterprise level strategies (Freeman, 1984).

[2] Other stakeholders include the local community, urban habitations and industry.

[3] Details can be found in Naik et al. (1999).

irrigation management transfer have been reported by Kalro and Naik (1995) and Brewer et al. (1999). Costs that farmers may have to incur in irrigation management transfer are categorized into three groups: construction costs, costs relating to organization of a WUA and costs related to management. Construction cost is mainly incurred for rehabilitation of the system. This may be in cash, or kind, or both, and is incurred at the time of transfer. Cost related to organization of WUA includes tangible expenses such as contribution towards management fund and share capital, as well as intangibles such as time spent on meetings, registration of society and interacting with the agency. Cost related to management is a recurring cost which again could be in monetary terms such as water and other charges, repair and maintenance charges or the amount of time spent on meetings, collecting water charges, approaching agency, resolving conflicts, meetings with visitors and researchers.

The benefits farmers reap may also be either tangible or intangible. Tangible benefits include reduction in water charges, availability of more water, improvement in reliability of water supply, flexibility in cropping pattern, increase in area irrigated, changes in cropping intensity and cropping pattern, reduction in cost of agricultural operations, improvement in yield, better price realization through marketing arrangements or better quality of produce. Intangible benefits include timely availability of water, saving of time and hassles to pay water charges, improvement in the ability to deal with the agency, benefits from other services, environmental benefits due to proper use of water and improvement in the system, reduced conflicts, social harmony, equity in water distribution and access to other resources.

Kalro and Naik (1995) observed significant outcomes as increased availability of water, improved reliability of supply and flexibility in cropping pattern which have enabled them to make shifts in cropping pattern towards high-value crops. Some improvements in yields are also reported. Another significant benefit to farmers is the considerable saving in time to obtain water and reduction in hassles to pay for water. Water distribution has also been more equitable and, therefore, there has been reduction in conflicts. Some increase in costs has also been reported.

Precise computation of costs and benefits to farmers may not be feasible as several components are intangibles and some others need data that are extremely difficult to obtain. Therefore, assessing impact from the farmers' perspective requires approaches that are robust in different situations. A simple approach is to obtain perceptions of farmers on individual components of cost and benefits. These perceptual assessments cannot be aggregated across the components and hence it is difficult to arrive at an overall assessment of costs and benefits through aggregation. Though overall perception can be obtained through direct questioning, the validity of such data is questionable. Also, such data may provide at best the direction but not very helpful in assessing the magnitude of the impact. As overall assessment may be required to provide critical inputs for policy formulation, a rigorous method is, therefore needed for data collection and analysis.

6. A new approach

In this study, we outline a new approach that has often been used in marketing literature. In this approach an overall perception of farmers is measured through a trade-off method instead of

Table 1
An illustrative design of data collection

Water supply agency	Levels of water charges for sugarcane				Maximum charge
	Rs. 100	Rs. 125	Rs. 150	Rs. 200	
Government	5	6	7	8	
Water users' association	1	2	3	4	250
Private	9	10	11	12	

direct measurement. The trade-off method, frequently used in marketing research for assessing consumer preferences for pricing and other marketing mix decisions (Lunn, 1997; Westwood, Lunn & Beazley, 1997), is able to generate responses that have better validity than direct measurement as the responses are obtained by subjecting respondents to go through a decision-making situation. In addition, the trade-off model measures not only the directions of perceptions but also the magnitude.

6.1. Trade-off model

Trade-off model involves a choice the decision-maker has to make given a set of alternatives. It requires specification of trade-off design consisting of alternatives generated from different levels of two factors. Our objective was to find out whether farmers, on the whole, prefer transfer of irrigation management to WUAs, and if so, to what extent. For this purpose, the two factors identified are water supply agency and water charges. Levels for water supply agency consisted of possible alternative arrangements for water delivery to farmers, i.e., WUA, government agency and privately owned and managed canal irrigation.[4] Other alternative systems of canal water delivery, even if prevailing, were not considered in this study. Farmers could express their preference for any one of these alternative forms. In order to quantify the preferences, different levels of water charges were specified. For water charges prevailing in Western Indian State of Maharashtra from where data have been collected for applying the trade-off, four levels were specified around the current level to make the situation more realistic. Since water charges vary according to the crops, the water charge of the most important crop the farmer was growing, was used for obtaining the preferences. An illustrative design for sugarcane as the main crop is shown in Table 1.

6.2. Trade-off design

The price levels used in Table 1 are for sugarcane, a major crop in the commands selected for data collection for this study. Each level of water charges increases by 25% over the base level for the first two levels and by 50% for the last level. The preference is elicited by first offering all the

[4] As privately owned and managed canal irrigation system is not common in India, preference for private ownership is indicative of farmers' expectations based on closely related services available nearby such as well water market, transportation services, etc. However, preferences could change as a result of experience of such a service.

three alternatives at the first water charge level (Rs. 100 per acre in the table), asking the farmer his preference for the agency. The corresponding cell is given the rank one. In the next step, the water charge is increased to the next level for the alternative chosen currently and keeping the water charges of the other alternatives at the same level, the preference is elicited. This procedure is repeated until all the cells are completed. Table 1 contains hypothetical recording of the preferences of one respondent. The table suggests that the respondent prefers WUA first four times (until WUA alternative is exhausted) and then switches to the government. In case such high preference is indicated by respondents for any particular agency (as shown in the table), the maximum charge they are willing to pay for the agency before switching is recorded in the last column. In the table, the hypothetical respondent is ready to pay Rs. 250 before switching to government with water charge at Rs. 100.

6.3. *Information available from the trade-off table*

The trade-off table helps to generate the following information:

1. most preferred agency of water supplies for farmers;
2. extent to which individual agency is preferred;
3. extent to which higher water charges can be levied by the most preferred agency;
4. grouping of respondents according to their preferences.

6.4. *Preference data analysis*

The preference data thus collected can be analyzed in several ways. A simple examination of data for any pattern in the preference could give very useful information. For example, sequential ranking for it irrespective of price levels indicates high preference for a particular agency. If water charges are considered more important than the benefits from individual agency, we will observe frequent switching of the preferences among the agencies. Essential Rank Analysis could help in constructing *what if* scenarios. That is, if the water charges are increased differently for each agency, re-ranking the agencies at the new water charge levels can identify the most preferred agency.

6.5. *Computation of utilities*

Trade-off data also allow for computation of utilities attached by an individual for each agency and water charge level. For this purpose, it is assumed that preference of alternatives is indicated based on the total utilities for the alternative and higher ranks represent higher utility. The utility for each alternative is the sum of utilities of the agency and water charge levels. If we define U1 as utility for government, U2 as utility for WUA, U3 as utility for private agency, U4 as utility for Rs. 100, U5 as utility for Rs. 125, U6 as utility for Rs. 150 and U7 as utility for Rs. 200, then utilities for alternatives can be obtained as shown in Table 2.

Table 2
Total utilities for each alternative

Water supplying agency	Water charge level			
	Rs. 100	Rs. 125	Rs. 150	Rs. 200
Government	U1 + U4	U1 + U5	U1 + U6	U1 + U7
Water users' association	U2 + U4	U2 + U5	U2 + U6	U2 + U7
Private	U3 + U4	U3 + U5	U3 + U6	U3 + U7

From the hypothetical ranks presented in Table 1 we can write the relationship as

$$(U2 + U4) > (U2 + U5) > (U2 + U6) > (U2 + U7) > (U1 + U4) > (U1 + U5) > (U1 + U6) > (U1 + U7) > (U3 + U4) > (U3 + U5) > (U3 + U6) > (U3 + U7).$$

Relative utility values for Ui can therefore be obtained by satisfying the maximum number of inequalities. The method involves successive approximations from arbitrary initial values to reach the optimal values. These utilities can be used to assess the importance attached by the respondent to different agencies and price levels. The extent of preference can also be analyzed for any particular agency. This would help to find answers to a critical question in irrigation management, that is, whether the preferred agency can charge higher water rates.

7. Data collection[5]

Though the method outlined in this study enables impact assessment for farmers by collecting cross-section data from transferred command only, for the purpose of wider applicability, we have chosen minor commands both with and without transfer for comparisons. This was possible because the transferred units are relatively small parts of large irrigation systems. Within any one system, we could find reasonably comparable units, one of which was transferred to farmers and one which was not. We chose two minor canals whose management had been transferred to WUAs, one in the Mula Scheme and the other in the Bhima Scheme, both in Western India in the state of Maharashtra, and two similar, but not transferred, minor canals in the same schemes.

Following simple random sampling procedure we selected 50 farmers in each of the canals in Bhima Scheme where the minor command sizes were smaller and 100 farmers in each of the larger canal commands in Mula Scheme. This gave us about 50% farms survey in Bhima and 20% in Mula. The details of the samples are given in Table 9. The command of Minor-7 spreads across three villages and farmers in some parts of the command are hesitant to become members of the WUA either due to inadequate channel infrastructure or availability of adequate seepage water.

[5] This formed a part of a larger study on Irrigation Management Transfer conducted in collaboration with the International Water Management Institute, Colombo (IWMA). We thank our colleagues from IWMI — Dr. Jeffrey Brewer, Dr. R. Sakthivadivel and Dr. M. Samad.

Our sampling frame consisted of farmers in parts of command where channels were developed. As a result 81 of the 100 selected farmers were members of the WUA though WUA members constituted only 58% of the farmers in the command area. In the case of Minor-10 the proportion of members in the sample reflected that of population. Each selected farmer was interviewed using a questionnaire consisting of trade-off design.

8. Farmers' preferences

8.1. Overall preferences of farmers

Analysis of rank order of choices (Table 3) indicates that WUA is the first choice for supplying water for majority of the farmers in Minors 7 and 6 of Mula command and Minor-10 of Bhima command. In Minor-7, 82% of the farmers preferred WUAs. The percentages of farmers indicating their first choice as WUA are higher in the case of Mula command than Bhima command for both control and transferred minors. But statistically significant difference exists only in the case of non-transferred minors. The percentage of farmers preferring WUAs is higher in the transferred minors than the control minors. The *t*-statistics indicates that the difference in the percentage of farmers preferring WUA in transferred sites is significant. Significantly higher preferences are noticed even up to 1–4 continuous choice in Minor-7. In Minor-10 such preferences are noticed till 1–3 choices. Higher preference of farmers in transferred minors for WUA may be indicative of their positive experience, which may have helped them to realize higher, perceived benefits. This is supported by the fact that in Minor-6, which is located adjacent to Minor-7, the preference of farmers for WUAs is much higher than in Minor-16 located 9 km away from Minor-10. The benefits of having WUAs may not be fully perceived by the farmers and therefore they may be hesitant to opt for WUAs wherever such societies do not exist. The table also shows that a higher percentage of farmers are prepared to pay higher water charges in minors where irrigation management transfer to WUAs has taken place. If we consider a majority rule, farmers in the minors having WUAs are prepared to pay 25% higher water charges. In these minors substantially large percentage of farmers (25% in Minor-7 and 18% in Minor-10) have

Table 3
Farmers preference for water users' association[a]

Preferences	Transferred minors			Non-transferred minors			*t*-stat. for difference between minors	
	Minor-7 (%)	Minor-10 (%)	*t*-stat.	Minor-6 (%)	Minor-16 (%)	*t*-stat.	Mula command	Bhima command
1st choice	82	74	1.188	69	36	4.022*	2.207*	3.955*
1st and 2nd choice	62	56	0.718	40	24	2.026*	3.145*	3.360*
1st, 2nd and 3rd choice	45	36	1.060	22	14	1.224	3.463*	2.603*
1st, 2nd, 3rd and 4th choice	25	18	0.968	6	12	−1.238	3.719*	0.883

[a] Note: *t*-stat. is for the difference in proportions. *t* values greater than 1.96 and 1.645 indicate significance at 5% (*) and 10% (**) levels, respectively.

very high preference for WUAs as indicated by their first four choices. Therefore, there is possibility of increasing water charges with the transfer of management functions to WUAs.

Significantly higher percentage of farmers preferring water distribution by a government agency is evident only in non-transferred minors (Table 4). In Minor-16, majority of the farmers preferred government to WUAs. Significant proportion of them continues to prefer it even with increase in water charges. But in other minors not only the percentage of farmers preferring government agency is small but also this percentage reduced to negligible levels as the water charges increased. The choices of farmers in all the minors clearly indicated that supply of water through private agency is least preferred. The percentage of farmers preferring private agency was 5 or less in all the minors.

8.2. *Preference of farmers with different major crops*

Sugarcane is a major crop of farmers in all the selected minors (Table 10). Jowar (sorghum) is another important crop in Bhima command minors where as bajara (spiked millet) and wheat are important in Mula command minors. Crop-wise analyses of preferences are carried out for important crops in the minor. The analysis of preferences for WUA (Table 11) suggests that in the case of these individual crops also, the pattern is similar to the combined analysis presented above. The percentages of farmers preferring WUA are higher than for other agencies except in the case of Minor-16. Across crops there are some variations in preferences. In Bhima command minors, a slightly larger percentage of farmers with jowar as the major crop prefer WUA as compared to sugarcane farmers, though the difference in preference is not statistically significant. In Minors 6 and 7, a lower percentage of farmers having bajara as the major crop prefer WUA compared to farmers having sugarcane as the major crop. In Minor-7, larger percentage of farmers with wheat as the major crop prefer WUA compared to farmers with sugarcane as the major crop. High preference of these farmers is also reflected by the fact that a substantially large percentage (27) of farmers continue to prefer WUA for the first four choices and average of the maximum water charges farmers are ready to pay is greater than the highest price level included in the design. The preference for WUA was higher in transferred sites than the control sites for all the three major crops. The extent of preference, as measured by the first four continuous choices was also high in

Table 4
Farmers preference for government agency[a]

Preferences	Transferred minors			Non-transferred minors			*t*-stat. for difference between the minors	
	Minor-7 (%)	Minor-10 (%)	*t*-stat.	Minor-6 (%)	Minor-16 (%)	*t*-stat.	Mula command	Bhima command
1st choice	14	22	−1.241	24	60	−4.244*	−1.806**	−3.792*
1st and 2nd choice	11	12	−0.182	14	56	−5.323*	−0.642	−4.583*
1st, 2nd and 3rd choice	7	8	−0.221	8	46	−5.350*	0.414	−4.226*
1st, 2nd, 3rd and 4th choice	5	4	0.273	3	32	−4.977*	0.040	−3.600*

[a] Note: *t*-stat. is for the difference in proportions. *t* values greater than 1.96 and 1.645 indicate significance at 5% (*) and 10% (**) levels, respectively.

the case of transferred sites. This was also supported by the maximum water charges farmers are prepared to pay for WUA. In the case of both sugarcane and jowar, the average of the maximum water charges farmers are prepared to pay is higher for transferred compared to the controlled sites.

8.3. *Preferences of farmers in different location of the minor*

The percentages of selected farmers in the head region of the minors have been relatively small but more equally distributed in the middle and tail regions of all the minors except for Minor-16. In Minor-16, 64% of farmers are in the middle region and only 8% in the head region. Overall, Mula command minors have more equal distribution of selected farmers. Location wise analysis (Table 5) suggests that among the farmers having WUA as the first choice there is no significant difference in the preferences of farmers located in head, middle and tail region of the minors except in Minor-6. In Minor-6, significant difference in preferences between middle and tail farmers has been observed. However, there is no significant difference in the preferences of

Table 5
Preferences of farmers located in different regions of the minors with WUAs as first choice

Minors and location of farmers	No. of farmers in the first location	No. of farmers in the second location	No. of farmers out of col. (a) opting for WUA as their first choice	No. of farmers out of col. (b) opting for WUA as their first choice	*z*-statistic for the first choice
	(a)	(b)	(c)	(d)	(e)
Minor-7					
Head and middle	19	41	17	35	0.44
Middle and tail	41	38	35	30	0.75
Head and tail	19	38	17	30	0.98
Minor-6					
Head and middle	29	31	22	17	1.71[a]
Middle and tail	31	38	17	30	−2.14[b]
Head and tail	29	38	22	30	−0.30
Minor-10					
Head and middle	6	22	5	17	0.32
Middle and tail	22	21	17	15	0.44
Head and tail	6	21	5	15	0.59
Minor-16					
Head and middle	4	32	1	12	
Middle and tail	32	14	12	5	0.12
Head and tail	4	14	1	5	

[a] Significant at 10% level.
[b] Significant at 5% level.

Table 6
Preferences of members and non-members of WUA for WUA

Preferences	Minor-7			Minor-10		
	Members (81) (%)	Non-members (19) (%)	*t*-stat.	Members (46) (%)	Non-members (4) (%)	*t*-stat.
1st choice	85	68	1.711[a]	74	75	−0.047
1st and 2nd choice	63	58	0.409	59	50	0.252
1st, 2nd and 3rd choice	48	32	1.306	37	25	0.477
1st, 2nd, 3rd and 4th choice	27	16	1.030	20	0	0.976

[a] Significant at 10% level.

farmers located in the head and tail regions of this minor. Among those farmers who have indicated high preferences (1–4 continuous ranking for WUA), no significant differences are observed between head, middle and tail part of the minors. Similar pattern was observed for the farmers having government as first choice.

8.4. Preferences of farmers with respect to membership of WUA

Among the sampled farmers 81% in Minor-7 and 92% in Minor-10 were members. Non-members, therefore are small in number. Among the current members of the WUA, 85% in Minor-7 prefer WUA as their first choice (Table 6). In the case of Minor-10, members preferring WUA are relatively few (74). However, percentages of farmers preferring WUA are higher for members than non-members in the case of Minor-7, but the difference is not significant. In Minor-10 the percentages are more or less the same except for very high preference categories.

9. Utilities or part-worths

Utilities or the part-worths obtained from trade-off analysis for farmers of 4 minors for important crops are shown in Tables 7 and 12. From the tables we can observe that the fit is good in all the cases as indicated by C^*[6] values being close to zero and Kendall's τ close to 1. Only in the case of Minor-16 C^* is more than 0.1, however, the values of τ for this minor are more than 0.9. In Minor-10 for jowar crop the value of τ is slightly less than 0.9 but C^* is less than 0.05. Among agencies, farmers attach higher part-worths to WUA in all the minors except in the case of Minor-16. In Minor-16, sugarcane farmers prefer government where as the jowar farmers are indifferent between government and WUA. Preferences for WUA are strong in the case of all the farmers in Minor-7. The table reveals that in the transferred minors, farmers were prepared to pay one level higher price for WUA except bajara farmers in Minor-7. In the case of Minor-16, sugarcane farmers are prepared to pay one level higher price for the government.

[6] C^* is a goodness of fit measure, 0 indicating good fit and 1 poor fit.

Table 7
Computation of utilities and relative importance for all farmers

Measures	M-7	M-6	M-10	M-16
Index of fit C^*	0.077	0.046	0.075	0.125
Kendall's τ	1.00	1.00	0.955	0.939
Agency importance (%)	38.8	24.5	40.0	33.3
Price importance (%)	61.2	75.5	60.0	66.7
Utility for government	−3.25	7.1	2.27	17.8
Utility for WUA	33.3	12.7	32.2	14.4
Utility for private	−30.1	−19.8	−34.5	−32.2
Utility for price level_1	47.6	48.6	48.3	38.3
Utility for price level_2	17.5	19.0	21.8	35.0
Utility for price level_3	−12.6	−16.2	−18.4	−11.7
Utility for price level_4	−52.4	−51.4	−51.7	−61.7

Table 8

Reasons	Farmers (%)			
	M-7	M-6	M-10	M-16
(a) *Farmers citing different reasons for WUA as their first choice*				
Timely delivery of water	57	32	57	39
No disputes among farmer members	52	51	30	44
Better maintenance	35	35	30	22
Simpler official procedure	16	22	27	44
No malpractice like illegal payment for water	28	41	19	22
Cooperation	0	4	24	17
Assured supply of water	41	51	22	39
Efficient management	23	9	5	17
Others	70	57	62	20
(b) *Farmers citing different reasons for government as their first choice*				
Better service	21	25	36	17
Can irrigate more acreage	50	25	27	13
Can get more water by extra payments	36	42	27	3
Assured supply of water	29	21	18	27
No partiality	21	8	18	13
Timely delivery of water	7	13	18	20
Legal security in irrigation dept.	0	29	9	27
No chances of political interference	29	38	18	33
Others	11	10	28	34

The relative importance attached to price levels was higher than the agency in all minors and all except jowar crop in Minor-10, in which case the importance attached to price and agency is equal. In Minor-7, the relative importance of agency and price was close to 1 : 2 ratio. However, in Minor-6 the importance was highly skewed in favor of price levels. The importance attached to

Table 9
Farm survey sample details[a]

	Mula command		Bhima command	
	Minor-7	Minor-6	Minor-10	Minor-16
Farmers in minor command	418	594	116	133
WUA members	242	—	107	—
Non-members	177	—	9	—
Sample size considered	100 (81)	100	50 (46)	50

[a] Figures in parentheses are number of farmers who are members of WUA.

Table 10
Number of sample farmers taking major crops in each minor

Crop	Crop-wise number of farmers			
	M-7	M-6	M-10	M-16
Sugarcane	68	54	35	33
Jowar	1	5	13	16
Bajara	17	26	0	0
Wheat	11	7	1	0
Others	1	6	0	1
Total number of respondents	98	98	49	50

agency by the sugarcane farmers is less than 10% and that by the bajara farmers less than 5%. This indicates that for the price range used in the design the farmers are more sensitive to prices than the agency.

10. Reasons for their preferences

Major reasons indicated for WUA as first choice in all the minors are timely delivery of water, less disputes among farmers, assured supply of water, better maintenance and no corruption (Table 8a). Simpler official procedure was also a significant reason. While efficient management was given as one of the reasons for their preferences for WUA by 23% of the farmers in Minor-7, co-operation was mentioned as the major reason in Minor-10.

Farmers who have given government as their first choice have indicated that they can irrigate more area, get more water by illegal payment, better service, assured supply of water and less political interference as the major reasons for their choice in Minors 6, 7, and 10 (Table 8b). In the case of Minor-10, less political interference, assured supply of water and legal security in irrigation are mentioned as major reasons.

Table 11
Preferences of farmers[a]

(a) *Sugarcane as the major crop for WUA*[b]

Preferences	Mula command			Bhima command			*t*-stat. for difference between commands	
	Minor-7 (%)	Minor-6 (%)	*t*-stat.	Minor-10	Minor-16	*t*-stat.	Transferred	Non-transferred
1st choice	82	74	1.109	71	33	3.145*	1.281	3.743*
1st and 2nd choice	66	44	2.405*	51	21	2.582*	1.454	2.195*
1st, 2nd and 3rd choice	47	24	2.613*	37	12	2.381*	0.960	1.364
1st, 2nd, 3rd and 4th choice	25	4	3.222*	17	12	0.584	0.906	−1.503
Average of maximum water charges (Rs.)	230	200		208	200			

(b) *Jowar as the major crop for WUA*

Preferences	Bhima command			*t*-stat.[d]	
	Minor-10 (%)	Minor-16 (%)	*t*-stat.[c]	Minor-10	Minor-16
1st choice	77	38	2.123*	−0.38	−0.29
1st and 2nd choice	69	25	2.382*	−1.10	−0.30
1st, 2nd and 3rd choice	38	13	1.624	−0.08	−0.04
1st, 2nd, 3rd and 4th choice	23	13	0.749	−0.47	−0.04
Average of maximum water charges (Rs.)	130	120			

(c) *With bajara or wheat as the major crop for WUA*

Preferences	Bajara					Wheat
	Mula command			*t*-stat.[f]		
	Minor-7 (%)	Minor-6 (%)	*t*-stat.[e]	Minor-7	Minor-6	Minor-7
1st choice	71	65	0.356	1.08	0.80	100
1st and 2nd choice	41	31	0.700	1.89**	1.17	73
1st, 2nd and 3rd choice	29	15	1.105	1.31	0.89	55
1st, 2nd, 3rd and 4th choice	18	0	2.220*	0.64	0.99	27
Average of maximum water charges (Rs.)	160					183

[a] *t* values greater than 1.96 and 1.645 indicate significance at 5% (*) and 10% (**) levels, respectively.
[b] *t*-stat. is for difference in proportions.
[c] *t*-stat. is for difference in proportion between minor-10 and minor-16.
[d] *t*-stat. is for difference in proportions for sugarcane and jowar farmers.
[e] *t*-test for difference in proportion between minor-7 and minor-6.
[f] *t*-test for difference in proportions for sugarcane and bajara farmers.

Table 12
Utilities and relative importance for farmers of each minor and crop

Measures	Minor-7			Minor-6		Minor-10		Minor-16	
	Sugar cane	Bajara	Wheat	Sugar cane	Bajara	Sugar cane	Jowar	Sugar cane	Jowar
Index of fit									
C^*	0.074	0.085	0.044	0.035	0.021	0.083	0.049	0.11	0.153
Kendall's τ	0.97	0.97	0.94	1.0	0.98	0.95	0.88	0.95	0.94
Relative importance (%)									
Agency	38.8	31.3	41.2	8.8	4.6	32.6	50.0	34.8	25.6
Price	61.2	68.7	58.8	91.2	95.4	67.4	50.0	65.2	74.4
Utilities or part-worths									
Government	−3.22	0.0	−3.4	0.0	0.0	13.9	27.4	20.0	11.4
WUA	33.3	22.8	36.7	4.83	2.42	17.2	36.3	13.3	11.4
Private	−30.1	−22.8	−33.3	−4.83	−2.42	−31.1	−63.7	−33.3	−22.9
Price level_1	47.6	44.3	50.0	31.6	29.2	38.7	47.8	38.3	50.0
Price level_2	17.5	18.6	16.7	24.4	24.4	35.5	43.3	35.0	18.7
Price level_3	−12.6	−7.18	−16.7	12.3	17.1	−12.9	−38.9	−11.7	−18.7
Price level_4	−52.4	−55.7	−50.0	−68.4	−70.8	−61.3	−52.2	−61.7	−50.0

11. Conclusions

Success of irrigation management transfer should in a large measure be reflected by how farmers as users perceive it to be. If farmers see it as not beneficial then there is no need for such transfer, or even if it is attempted it is unlikely to yield any desired results. Therefore, impact assessment should have considerable emphasis on how users perceive it to be. For this purpose we used a trade-off model which is quite common in consumer research. The method elicits preference of respondents (in this study, the farmers) by offering alternative decision situations. For the purpose of policy formulation this method is useful because: (a) it can assess the extent of farmers' preferences with respect to a policy change such as irrigation management transfer; (b) it can generate information on important policy variables such as water charges to be levied and how such charges can vary with different institutions providing the service; (c) by assessing whether there are any distinct preferences across farmers groups such as of those located in head, middle and tail regions or large and small farmers, it can also assess the impact on equity.

The analysis indicates that farmers have high preference for WUA especially where such associations are already functioning. The preferences are high enough to charge higher water rates to its members. The analysis suggests that while there are some variations in the preferences according to the type of crop grown, the overall pattern is similar to the general observations. The variations in preference according to the location of the field along the channel are very small. The government is chosen as the next best agency for supplying water. The number of farmers selecting private agency as the first choice is negligible. Important reasons given for choosing WUA are timely delivery of water, less disputes, assured supply of water, better maintenance and

less dependence on the government offices. This study illustrates how trade-off model can be appropriately used for assessing impact of irrigation management transfer from farmers' viewpoint.

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Appendix

Farm survey sample details and preferences of farmers with different major crops are given in Tables 9–12.

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