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Willingness to pay for improved irrigation services in Mahaweli system H

M. M. M. Aheeyar, Sri Lanka

The major features of the water supply and management policies adopted in Sri Lanka have been centralized planning through a public agency, supply augmentation, zero priced or under priced water and reliance on bureaucratic instruments for water supply. Bulk water allocation system has been implemented in Mahaweli system H as a pilot project since 2002 to find out a methodology, which can be used as a complete solution for water management problems in major irrigation schemes. The project provides a legal water right to users, but users have to actively participate and contribute for the sustainable operation and maintenance of secondary and tertiary canal system. The present study is aimed to estimate the value of current level of resource mobilization by farmers and farmers’ willingness to pay for sustainable irrigation system maintenance in order to provide improved irrigation services in the long run. The findings of the study show that the current level of resource mobilization varies from Rs 1450-2275 per/ha/annum (US$15-23) at 2005 prices. Further farmers are willing to pay Rs 599-890 (US$ 6-9) per/ha/year in addition to the current level of resource mobilization to ensure the long-term sustainability of infrastructure and to achieve improved irrigation services. The willingness to pay value is positively related to household income, farm size, location of irrigation canal and type of major crop cultivated. The willingness to pay expressed needs to be considered by policy makers for feasible policy formulations to meet the future cost escalations and to ensure sustainability of irrigation infrastructure.
active farmer participation, creating a sense of ownership and attitudinal change in farmers through fabricating volumetric impression of water use while reducing the dependency on government irrigation subsidies. In this process it was envisaged that more assured irrigation water supply results in reduced risks in crop cultivation and motivates farmers to cultivate high value commercially oriented cash crops in dry seasons. The ultimate target of BWA system is to develop a well functioning irrigation management mechanism via generating tangible benefits for farmers to manage their own resources in a sustainable manner.

The concept was seen as a strategy to achieve the expected objectives of irrigation management turnover. BWA was started as a pilot project in selected locations and now it has become a broad subject in the Mahaweli H area with the improvements made in subsequent seasons. The findings on the assessment of BWA show that, the programme has helped to increase the cropping intensity, water productivity, and farmers’ income and reduction in irrigation water duty (Aheeyar at-al, 2006).

**Objectives**

The major objective of the study is to assess the level of resources mobilization for system O&M under the BWA programme and its implications on the sustainability of irrigation infrastructure and estimate the farmers’ willingness to pay (WTP) for the improved irrigation services and to ensure sustainable management of irrigation infrastructure.

**Research methods**

**Study sites**

Mahaweli system H is one of the administrative areas of Mahaweli river diversion and settlement project and which is the first downstream area benefited by Mahaweli river diversion project. The total irrigation extent in the system H is around 31,500 ha allocated among equal number of farmers at the rate of one hectare per farmer.

The Mahaweli H system has been further divided into nine blocks for the purpose of administration, in which two blocks were selected randomly for the detailed survey, namely the Galnewa and Madatugama blocks. Two WUAs from each block were selected randomly to represent the head and tail areas of branch canals.

**Methods of data collection and analytical framework**

A multi stage stratified random sampling technique was adopted in selecting sample farmers for data collection considering the head and tail differences of the scheme. The total sample size was 120. In addition, necessary data also collected from literature, key informant interviews and focus group discussions.

Contingent Valuation Technique was adopted to estimate the farmers’ willingness to pay for improved irrigation services. The contingent valuation method (CVM) is a survey technique that elicits values people provide on increase or decrease of benefits from natural resources at the hypothetical market condition. There are substantial literatures to explain the theoretical and empirical application of CVM (Hufschmidt et-at, 1990; Randall, 1981; Upawansa & Abeygunawardana, 1993).

Direct inquiry on irrigation fee is very sensitive among farmers and farmers may resist answering such questions. However, a traditional custom, which exists in Sri Lanka, is the giving of a certain proportion of paddy to irrigation headmen after each harvest for his services, though it is not in practice in new irrigation schemes. Therefore, farmers chosen for the survey were asked about their WTP in terms of paddy harvested in each season for improved irrigation services and sustainable O&M of irrigation infrastructure. Before posing the question, it was clearly explained to the beneficiaries about the existing status of irrigation infrastructure and expected future cost escalation and institutional context in which water resources are to be provided and funding is to be done and farmers responsibilities under agreement signed under the BWA programme. Then the WTP question was stated as follows:

“... How many kg (or bushels) of paddy are you willing to provide to your WUA per hectare of cultivated land per season in addition to your current O&M fee payment and voluntary labor mobilization for maintenance and WUA activities in order to maintain the turnover irrigation infrastructure in better condition to achieve improved irrigation services”.

The approach adopted in this study to find out the WTP in terms of paddy rather than cash was very successful and all farmers responded well. The WTP in terms of paddy was converted to monetary value using 2005 paddy prices prevailed in the study areas.

The factors affecting the amount of WTP and relationship between variables were established developing a multiple regression model. The following nine independent variables were identified and information was collected from sample farmers.

- Total farming income (Inc) – Rs/year
- Total low land extent (low land) – ha
- Major dry season crop (crop) – Other field crops = 1, Rice = 0.
- Age (Age) – Years
- Education (Edu) – No. of years
- DC location (DCloc) – Tail =0, Head =1
- Type of farming (Farm) – Full time = 0, Part time= 1
- Labour contribution for meetings (Labmeet) – No. of days/season
- Labour contribution for maintenance (Labmain) – No. of days/season

The willingness to pay estimate was regressed as WTP as a function of listed ten variables.

WTP = $\beta_0 + (\beta_1 \text{Inc} + \beta_2 \text{Lowland} + \beta_3 \text{Crop} + \beta_4 \text{Age} + \beta_5 \text{Edu} + \beta_6 \text{DCloc} + \beta_7 \text{Farm} + \beta_8 \text{Labmeet} + \beta_9 \text{Labmain}$
Results and discussions
Level of resource mobilization for operation and maintenance
Sustainability of irrigation infrastructure largely depends on the proper maintenance of the system from primary level (head system) to tertiary level (farm gate). The task needs mobilization of beneficiary labour time and cash.

Table 1 shows the level of resource mobilization by farmers in kind and cash for the system O&M. The value of mobilized labour ranges from Rs 1000 to Rs 1775 per ha per annum. The amount of cash mobilized by farmers to WUAs is about Rs 500 per ha per annum. The amount of cash mobilized for system O&M is a significant feature in resources mobilization under BWA compared to various past attempts of cash collection for O&M by WUAs and government agencies for turned over irrigation channels in major irrigation schemes. Aheeyar (1997) found that, the value of cash and materials mobilization by farmers towards WUA’s for O&M is desperately low and sometimes it was recorded as zero.

Willingness to Pay (WTP)
The average annual estimated WTP is ranges from 52 kg of paddy to 77 kg of paddy /ha/annum. This is equivalent to the monetary value of Rs 599/ha to 890/ha/annum (US$ 6-9) at 2005 paddy prices. It is noteworthy to mention that the WTP values estimated is in addition to the current level of labour and O&M fee contribution. There were only 8 farmers not willing to provide anymore other than the current level of resource mobilization. Tables 2 show the WTP values obtained in selected locations (Loc). The higher values of standard deviations of WTP show the high variation in the amount willing to pay by various farmers.

Factors affecting willingness to pay for operation and maintenance
Results of the regression analysis conducted to find out the relationship between farmers‘ willingness to pay and the farmers’ socio economic features are presented in table 3. The positive and significant coefficient of total family income indicates that beneficiaries having a higher income are willing to pay more for improved irrigation services and are more concerned on sustainability of irrigation infrastructure. The similar results obtained for the total low land extent cultivated show that the farmers who cultivate a larger lowland extent have expressed greater willingness to pay. Positive and significant co-efficient for the major crop cultivated in the dry season suggests that respondents who are engaged in high return commercial cash crop cultivation are willing to pay more for improved irrigation services.

The positive relationship with total family income, farm size and cultivation of cash crops indicate the needs of strategies to commercialize small farm agriculture which will increase the capacity and willingness of farmers to mobilize more resources towards irrigation system maintenance. Therefore, intensification of land use through promotion of an appropriate cropping system and integration of different
income generating components into the farming system is more suitable for the system.

Negative co-efficient for DC location (head end or tail end) indicates that tail end farmers are willing to pay a higher amount of money for improved services. The higher value of willingness to pay by tail end farmers is mainly due to assurance and reliability of water for them under the BWA compared to past which has helped them to earn more income.

Table 3: Estimation of the regression model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Co-efficient</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>23.534</td>
<td>4.65</td>
</tr>
<tr>
<td>Income</td>
<td>0.221</td>
<td>3.34***</td>
</tr>
<tr>
<td>Dry season crop</td>
<td>3.780</td>
<td>1.80*</td>
</tr>
<tr>
<td>Low land extent</td>
<td>3.924</td>
<td>3.43***</td>
</tr>
<tr>
<td>Age</td>
<td>0.005</td>
<td>0.057</td>
</tr>
<tr>
<td>Education</td>
<td>0.213</td>
<td>0.783</td>
</tr>
<tr>
<td>DC location</td>
<td>-4.003</td>
<td>-1.924**</td>
</tr>
<tr>
<td>Type of farming</td>
<td>-3.467</td>
<td>-0.971</td>
</tr>
<tr>
<td>Labour contributions</td>
<td>-0.474</td>
<td>-2.388***</td>
</tr>
<tr>
<td>Labour (meetings)</td>
<td>-0.278</td>
<td>0.392</td>
</tr>
<tr>
<td>Labour (maintenance)</td>
<td>0.278</td>
<td>0.392</td>
</tr>
</tbody>
</table>

***Significant at 1 percent level, **significant at 5 percent level, *significant at 10 percent level

Conclusions

The irrigation sub-sector in Sri Lanka has been heavily subsidized over the years; therefore farmers have a mentality of depending on government financial allocations for the management of the irrigation system. The attempts made in the past to recover the partial cost of irrigation system maintenance through the centralized financial agency were failures.

The present study finding suggests that farmers have mobilized a substantial amount of resources for irrigation system maintenance with the implementation of the concept of BWA, which provided tangible benefits to motivate farmers for resource mobilization. The programme was implemented with the assured water supply yielding tangible benefits to the beneficiaries and the financial resources were mobilized through local farmer centered WUAs that gave the motivation and confidence over the programme.

In addition to the current level of resource mobilization, willingness to pay for the improved irrigation services is an impressive point that needs to be considered in the future policy formulation of sustainable irrigation maintenance. Willingness to pay is positively related to total family income, farm size, type of crop cultivated and location of the irrigation canal. These parameters have a direct linkage with commercialization of small farm agriculture, and therefore need to be considered in the designing, developing and maintaining irrigation infrastructure under the concept of sustainability. The willingness to pay expressed by farmers should be captured considering the future cost escalations and gradual deterioration of rehabilitated infrastructure.

The major lessons of the experiences are that comprehensive devolution policy for the irrigation sector and assured water supply can encourage farmers to invest in the long-term sustainability of their irrigation infrastructure. In addition, to realize the benefits of the devolution policy, it must provide attention to create self-reliant local organizations in terms of social, financial and technical perspectives for better local management. Economics of irrigated agriculture is a key aspect in motivating farmers in mobilizing or willing to mobilize cash and materials for irrigation system maintenance. Therefore the irrigation management transfer should widen up the focus beyond mere cost recovery but in helping and creating an environment to generate the necessary development impulses for increasing agricultural productivity, establishing marketing linkages and the appropriate scale of production in the area.

Reference


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