

## The Impact of Transaction Costs on Agriculture in Nepal

**Nepal is famous for its Farmer Managed Irrigation Systems (FMIS) which have played a major role in the development of the country's agriculture. As farming plays such an important role in Nepal, it is vital that the FMIS work effectively. Unfortunately, the community management of the FMIS is proving difficult to organize. To shed light on this challenge, a SANDEE study looks at the transaction costs involved in the creation and running of the Water User Associations (WUAs) that manage the FMIS. This study, by Ram Chandra Bhattarai from the Department of Economics at Tribhuvan University, Nepal, looks at 60 irrigation systems in the Kathmandu valley and assesses how transaction costs impact on agricultural production.**

This study finds that the transaction costs related to FMIS management are mainly linked to the time farmers spend watching, waiting and negotiating over water use. Transaction costs are not a huge burden and only amount to about one percent of the total value of agricultural production. Although these costs are relatively low, they have a positive impact on agricultural productivity – highlighting the benefit of setting up and running effective WUAs. However, beyond a threshold, increased transaction costs alone will not lead to higher productivity. The study also finds that farmers who use irrigation water but who don't contribute to the management of the FMIS are a significant problem and get in the way of collective action. Controlling such 'free riders' would be a good way to improve institutional efficiency.

### The FMIS Challenge

In Nepal there are about 16,000 FMIS. These irrigate approximately 714,000 ha of cultivated land or 67 percent of the total irrigable area of the country. The operation and maintenance of these irrigation systems requires coordination between farmers, as there are a number of management challenges that must be addressed. In particular, it is difficult to stop farmers who have not contributed to a FMIS system from using it. What's more, each individual farmer has an economic incentive to use more water but to invest less in the system. These problems often result in

poor maintenance and conflicts when it comes to water allocation.

Since 1990, the government of Nepal has focused on transferring responsibility for the management of irrigation water to local WUAs. However, there is evidence to suggest that the development of these institutions is not progressing well. Even in the Kathmandu Valley, more than 50 percent of the area's irrigation institutions have not been officially registered.

### FMIS in the Kathmandu Valley

The study looks at three districts in the Kathmandu valley where villagers use irrigation canals. These districts are



Kathmandu, Lalitpur and Bhaktapur. The major cereal crops in the valley are paddy, wheat, maize and millet. Potato, oilseeds and vegetables are the major cash crops. Among these crops paddy, wheat and potato need irrigation water.

At the start of the study, all the irrigation systems within the three districts were categorized according to the number of Village Development Committees (VDCs) they cover. The categories were: large (3 VDC and above), medium (2 VDCs) and small (1 VDC). Twenty irrigation systems from each category were randomly selected and households using these systems were surveyed using questionnaires. Information was also gathered at a 'system level'.

The key information collected by the study team related to the size and major components of the transaction costs that villagers have to bear. In this context, transaction costs encompass the time and money that farmers spend setting up and running the WUAs that manage their FMIS. The study uses a regression model to examine the impact of transaction costs on production. It also uses this model to assess the impact of a range of other factors on production. These factors include: social cohesion, farm location, infrastructure quality, reliability of irrigation, the presence of free riders and external support.

## Estimating Transaction Costs

Transaction costs related to WUAs are incurred at both the organization/system level and at the household level. These costs are incurred during the formation of a WUA and after it has been set up. Among the costs that are incurred prior to the formation of a WUA are the time and money spent on meetings, registration and negotiations. Among the costs that are incurred after the formation of a WUA are the time costs of meetings, conflict resolutions

and communications. At the household level these costs include the cost of the watching, waiting and negotiating that takes place during irrigation management.

The study's estimation of transaction costs involves direct monetary measurement as well as the attribution of monetary value to certain activities. The costs that were directly measured included payments to hired labourers. Attributed costs included the time contributed by FMIS members to various WUA activities. The average wage rate was used to calculate the attributed costs. This was possible because households in the Kathmandu valley have the option of gaining work outside their farms throughout the year. Thus, the labor wage rate in Kathmandu could be used as a proxy to calculate the opportunity cost of any time spent on FMIS transactions.

## Comparing Total Costs with the Cost of Production

Among the costs that are assessed is the cost of WUA formation. This is a one-time fixed cost. It is calculated on the basis of the time and resources farmers devote when they set up their local WUA. To annualize the transaction cost of WUA formation the study uses the lowest bank interest rate for lending (nine percent).

Total annual transaction costs are calculated by adding the expenses incurred by households at the system level to those they incurred at the household level. In order to make these compatible, the system-level total annual transaction times are divided by the total number of households within the system.

One of the key goals of the study is to compare transaction costs with agricultural production costs. Since, detailed production costs were not collected during the study, the author calculates production costs using the government of Nepal's estimates of total human labour requirement for the cultivation of paddy (181 days), wheat (141 days) and potato (235 days).

## “Watching, Waiting and Negotiating”

The study finds that transaction costs amount to about Rs 3400 per hectare. “Watching, waiting and negotiating” costs constitute approximately 92 percent of this total, while the time spent in meetings makes up around seven percent. The remaining transaction costs are made up of “conflict resolution, formation and communication” costs. When transaction costs are compared with the total value of agricultural output, it is clear that they are relatively low: transaction costs only amount to about one percent of the total value of outputs.

Transaction time costs are higher for households cultivating land downstream of a canal than for households cultivating land upstream. The amount of time given over by 'upstream' farmers to transaction costs is only four percent of the total human labour time required for the production of food. The respective figure for 'downstream' farmers is six percent.

A comparison of transaction time costs with respect to crop seasons shows that time costs for winter crops are three times higher than those for summer crops. This is mainly because the summer crop benefits from monsoon rains and is thus less dependent on canal water. In contrast, farmers rely on canal water to irrigate their winter crops. They therefore have to devote more time for watching, waiting and negotiating during this part of the year.

The Impact of Transaction Costs

Although transaction costs are not large, they do significantly affect the total value of agricultural output per hectare. This leads to the, not unexpected, conclusion that the small expense incurred by farmers to ensure a good flow of irrigation water has a positive multiplier effect on farm output. However, the study also shows that as transaction costs rise they give ever decreasing returns. Beyond a threshold, increased transaction costs alone will not lead to higher productivity.

As expected, the reliability of irrigation systems has a positive impact on the total value of output per hectare. Similarly better quality irrigation infrastructure has a significant positive impact. The regression analysis suggests that the difference in average output between farmers with and without reliable irrigation is, on average, about NRs 64,000 per hectare (after controlling for various institutional and locational factors). In comparison with this, the transaction costs that farmers incur are minimal. This justifies farmers taking part in the set-up and management of WUAs to ensure a reliable water supply for irrigation.

With respect to free riders, it is clear that such farmers achieve higher farm revenues, as they do not bear any transaction costs with respect to WUAs. This indicates that it pays some farmers to “cheat” when they free ride on the contributions made by others. This is a key challenge because, if the proportion of free riders to non-cheating farmers is large, the reliability of irrigation can fall drastically. This, as the literature suggests, is the classic dilemma of the commons. It is therefore clear that controlling free riding would be a good way to improve institutional efficiency and reduce transaction costs.

Why Transaction Costs Make Sense

Overall, the study suggests that transaction costs related to the setting up and running of WUAs are low. This is especially true when they are compared to other sectors of the rural economy such as community forestry. Even though transaction costs are low, they seem to make a positive and significant difference to farm revenues.

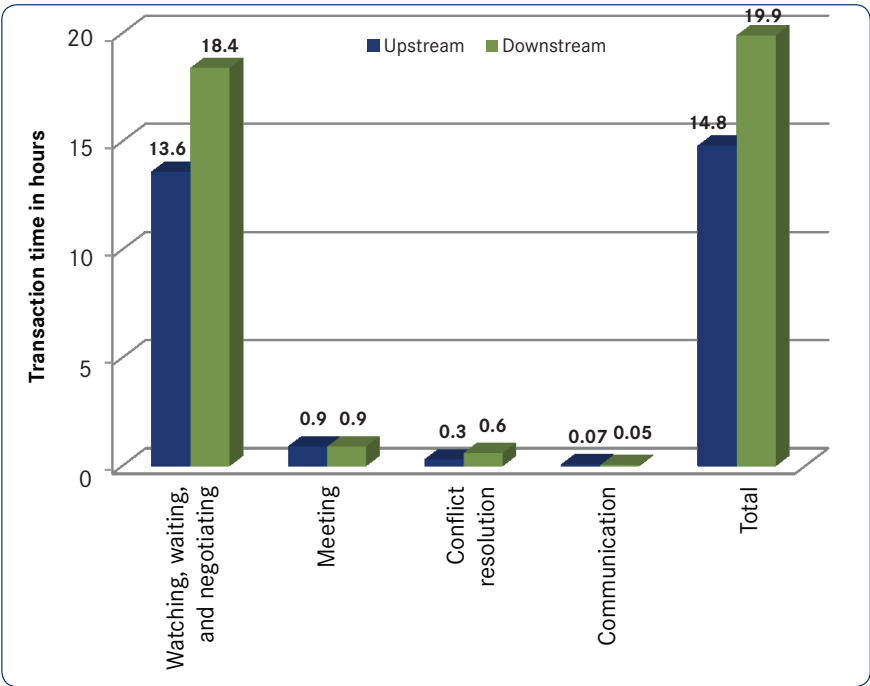


Figure 1: Different categories of transaction costs (hours)

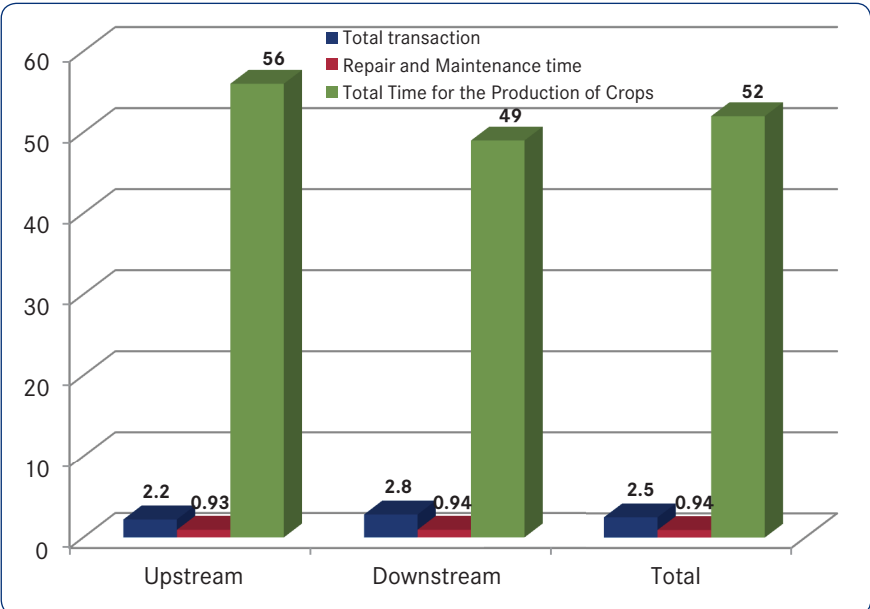


Figure 2: Transaction time versus time spent on other tasks (mandays/household)

This shows that it makes sense for farmers to invest in the setting up and management of WUAs. Another associated reason for farmers to support WUAs relates to irrigation infrastructure. The quality of this infrastructure has a significant positive impact on the value of output per hectare. Infrastructure funding is, however, dependent on the transaction efforts that farmers make to register their local WUAs and to access aid from the government or donor agencies. Thus, in Nepal’s FMIS, while



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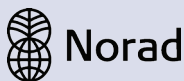
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transaction activities do not cost much but that they are a vital ingredient in the type of collective action that increases farm output.

Transaction costs refer to costs that arise when an individual or a group of individuals exercise ownership rights over economic assets and take the necessary steps to enforce their exclusive rights. They include the costs incurred in: (a) searching for information; (b) bargaining and negotiation; (c) ensuring fulfillment of contracts, and; (d) valuing compensation. They also include the legal expenses incurred gathering evidence, presenting a case, challenging opponents and awarding and collecting damages.

A number of economists have attempted to define transaction costs. North defines them as the costs of measuring the valuable attributes of what is being exchanged and the costs of protecting rights and policing and enforcing agreements. Holloway et al., define transaction costs as 'the costs of searching for a partner (or group) with whom to exchange, screening potential partners to ascertain their trustworthiness, bargaining with potential partners (and officials) to reach an agreement, transferring the products, monitoring the agreement to see that its conditions are fulfilled, and enforcing the exchange agreement'.

At the community level, the resources and social capital that community members possess can influence the transaction costs of collective action. A high level of trust and strong civic and social norms can lower transactions costs. On the other hand, uncertainty can increase transaction costs. Another factor that can affect transaction costs is the frequency of any decision making process. Research into transaction costs suggests that they can be quite varied depending on the sector and the country.

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