Technology Adoption for Water Systems and the Access to Credit

A multiple use water project has been in the field in a very small scale since October 2007. It is being conducted in Central Kenya with a group of dairy farmers that all supply milk to a small rural dairy. This dairy also has a SACCO (savings and credit cooperative) attached to it that a lot of the dairy farmers are members of. We are working with this dairy and it's SACCO for this part of the MUWS project. The project involved offering farmers loan contracts on water tanks that allow them to store water for some part of the dry season. The water tanks are also sometimes used to provide cows with a regular source of water. One early treatment group was offered a loan to purchase a 5000 liter water tank; a second a loan to purchase a 2500 liter water tank. A third, late-phase in group became eligible for the 5000 liter tanks in July (see more below). Take up in all three groups has been very high, 84% on average.

There are two main aims of this overall project. We have started the project on a very small scale, focusing mostly on take up of the credit contracts and the impacts of the technology. We plan to slowly scale this up to about 1000 households, if possible. The exact structure of this scale up is yet to be determined. The first main aim of this project is to understand this multiple use water technology and its impacts on various aspects of households' livelihoods, such as time use productivity, assets, wealth, child health, child education, labor supply, etc.

Second, we would like to better understand the structure of credit markets in the area, and in particular credit contracts that allow broader access to credit and at the same time hopefully do not compromise on default rates. So, in the scaling up of this project, we would like to analyze different structures of credit contracts to understand why there is not very much credit in this area. We would therefore plan to have treatments with not just different tank sizes, but also with different loan contracts. Not only are we interested in the roles of moral hazard and adverse selection, but also in the role played by the dairy in contracting with these farmers over their output.

In addition, we could combine the credit contracts with some version of insurance. This could be achieved by, for example, having farmers not pay a fixed sum each month, but a constant percentage of their sales to the dairy in payments. The former contract is what the dairy currently uses and what the small scale project in the field also currently uses. However, the latter contract would account for seasonality and shocks to cow health such that when milk production is low and sales to the dairy are low, farmers are expected to pay off less of their loans as opposed to when milk production is high when they will pay off relatively more of the loans.

A second part of the current credit contract used by the dairy is a system of having guarantors who have enough savings in the dairy to cover the entire amount of the loan. In our scale up, we would like to better understand the role of these guarantors – do they provide a monitoring device (to encourage borrowers to work hard to pay off their loans) or are they basically a screening device (to separate out the good (low risk) and bad (high risk) borrowers)? Finally, we are hoping this set up would also allow us to look at the role of reputation with the dairy and how the probability of farmers' default in these types of contracts (where the dairy provides a market for the farmers' milk) varies with the availability of outside options for the sale of their milk.

Water supply is seasonal in this part of Kenya. There are two main seasons of rain each year, known as the long-rains and the short-rains with dry periods in between. The tanks allow households to store water from the times when there is rain. During dry spells, farmers typically spend many hours a day, sometimes virtually all daylight hours, taking cattle to places where water is available. This is typically done by children, by the elderly, and by women. Based on conversations with farmers we

expect that one major impact of tanks will be on time use. We may find effects of increased water availability during dry periods on school attendance. In addition to direct effects on human health, improved water availability may lead to more hygienic behavior with dairy cows, and production of higher quality, more hygienic milk, as well as of greater quantities of milk.

Data collection for a very small scale version of this project (with 55 farmers) started in October 2007 with baseline data and this was followed by monthly data collection. There was a break in the data collection during the period of violence following the elections in late December 2008, after which data collection on the project farmers resumed in March 2008. So far, we have collected 7 rounds of data, the last round is currently being cleaned. The first round was baseline data before the households become eligible for the tanks. See Table 1 for a description of the sample size for the project and the number of rounds of data collection (completed and planned) and when the data in each round was collected. Over the period since the start of data collection, there was some refusal/attrition leaving us with a final sample of 51 farmers for whom we have six operational rounds of data.

The data collected covers a wide range of issues affecting farmers in these areas, including production, sales and consumption of milk, livestock (stocks, sales, purchases, etc.), cow health, water access (including water quantity), time use for all household members (including school attendance for children), household demographics, main occupations of household members, a number of child health variables (diarrhea, coughing, vomiting, scabies, trachoma), household wealth (assets and quality of the household structure). Finally, there is a large amount of data collected by the dairy itself that will be complementing our own data collection. For example, the dairy collects daily sales data from each farmer. The dairy serves approximately 4000 farmers.

We have some preliminary results from analysis of the data collected so far. There are, however, two important caveats to remember. First, a lot of the data was collected after the election crisis (rounds 3 onwards). There is anecdotal evidence that some of our households were affected by the violence in that family members for other parts of the country came to join their households for a period of time following the crisis. Second, this has been an extremely poor year for the dairy farmers in this part of Kenya. They expected the long rains earlier this year (between February and June mostly). These rains were severely delayed and were in fact almost absent for a large number of households this year. There has been almost a complete failure of rainfall during the main rainfall season in this part of Kenya. Tanks are useful during periods of minimal rain that follow periods of adequate rain needed to fill the tank, but in fact this year there has not been enough rain to fill the tanks. The dairy as a whole was producing about 35,000 liters of milk before the crisis. More recently, after the failure of the rains, this has fallen to about a current rate of 20,000 liters of milk a day.

Given these two issues, from preliminary data analysis it is clear that the treatment farmers have been unable to take full advantage of these water tanks over this period. We have data on how full the water tanks were in each round, keeping in mind that some of the households opted to fill these tanks with water from rivers when there was little rain. The tanks should all have basically been close to full during a regular long rains season (though not during the short rains), even if households are using the water, given how much it rains during this period. During the period of the project so far, the tanks were about as full after the short rains as in the middle of the long rains.

So far the results we have can be summarized as follows. There are effects on time use – less time is spent collecting water for both domestic uses and for getting cows water in treatment households. We expect this to be one of the most important outcomes (it may even lead to further employment). The treatment group has better child health outcomes when looking at diarrhea and

vomiting (though not significantly so). The treatment group actually has a significantly lower number of cows milked on average. In addition, the productivity is not affected by the treatment. However, the milk sales per cow to the dairy are lower as are household consumption of milk.

There was a change to the project in July, with an aim of expanding the project slowly over time. In July, the control group (from the earlier rounds) was offered the same loans as the treatment group (for the 5000 liter tanks). From this point onwards, it will be possible to compare the early and later phase in groups to see possible effects of the treatment. We also added a randomly-drawn set of 100 comparable farmers who have not been eligible to create a new control group. We plan to follow these 150 odd farmers for the next few months to better understand the impacts of these tanks. If this sample shows interesting results, then we would probably like to expand the project further to test some of the hypotheses on access to credit. We also plan to collect higher frequency data on time use since we expect such large effects there. We would be hoping to add a third phase of treatment households in 2009.

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