

## Impact of Shallow Tube Well Irrigation Support for Nepal's Smallholder Farmers

*Investments in shallow tube wells are financially and economically viable for households with less than 1 hectare land. The project resulted in an average increase in net income per hectare of land of over 50%, with farmers earning the equivalent net value of \$580 per hectare of irrigated land, compared with \$377 for farmers of nonirrigated land. The increase, however, was not sufficient to lift beneficiary households significantly over the poverty line.*



The evaluation draws on the experience of the ADB-supported Community Groundwater Irrigation Sector Project, which was implemented during 1999–2007. The project aimed to sustainably raise agricultural productivity and incomes of smallholder farmers in the Terai region of eastern and central Nepal by installing 15,000 shallow tube wells and rehabilitating or constructing 600 kilometers of farm-to-market roads in a complementary intervention.

Providing farmers with reliable irrigation systems reduces production uncertainties caused by variable rainfall and is essential for fostering stable food prices. The share of groundwater-based irrigation is growing, with 38% of the world's irrigated areas using groundwater rather than surface water in 2010. This is a relatively cheap irrigation method that raises fewer property rights concerns than the surface irrigation systems.

Nepal has vast water resources, but its terrain allows cultivation of only 17.9% of its total land area. Of this, 47% or 1.3 million hectares is irrigated, with 19% through shallow tube wells. These are typically lined by a metal tube and drilled up to 25 meters deep to extract groundwater using a motorized pump.

### Impact Evaluation Study

Nepal has been striving to expand groundwater irrigation as a priority input in agricultural development since the mid-1990s. The Asian Development Bank (ADB) and other development partners are currently working with the Government of Nepal to draw up a new agricultural development strategy to replace the 1994-approved Agricultural Perspective Plan. The impact evaluation study, *Shallow Tubewell Irrigation in Nepal: Impacts of the Community Groundwater Irrigation Sector Project*, provides findings and lessons useful in this effort.

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The evaluation adopted a mixed-method approach that employed both qualitative and quantitative methods. The quantitative findings were based on a counterfactual analysis of data collected from a survey of 1,000 project-supported households, 1,000 households without access to irrigation, and 500 with irrigation from another program. In the absence of baseline data, propensity score matching technique was applied to minimize bias in estimation.

The evaluation holistically gauged welfare impacts, including income, health, food consumption, education, and the environment. To this end, qualitative findings complemented quantitative results for a better understanding of the development impacts of irrigation using shallow tube wells. It also assessed the sustainability of water user groups formed under the project to facilitate the installation of shallow tube wells using loans without collateral.

### Key Findings

The project significantly increased cropping intensity and yields in the project area for the two main crops, paddy and wheat—albeit nowhere near as high as anticipated levels. This reflects constraints to achieving the full potential of shallow tube wells that include low investment in fertilizer, seed, and extension services. Irregular electricity supply and rising diesel prices dampened farmer interest in using groundwater for irrigation. And the government was unable to meet the demand of farmers for timely production inputs and services to complement groundwater irrigation.

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of land of over 50%, with farmers earning the equivalent net value of \$580 per hectare of irrigated land, compared with \$377 for farmers of nonirrigated land. The increase, however, was not sufficient to lift beneficiary households significantly over the poverty line.

The project's noneconomic impacts were found to be limited. Although the share of expenditures by households provided with shallow tube wells on education and health rose significantly compared with nonirrigated households, neither the number of sick days of household members nor child absenteeism from school declined. Household use of firewood as the primary energy source for cooking did not change significantly. This lack of change resulted from the smaller-than-expected increase in project household income, as well as the relative homogeneity in access to education and health.

There was no evidence that the project had a negative environmental impact, either through overexploitation of groundwater or excessive use of fertilizer and plant protection chemicals.

Water user groups were expected to be the primary vehicle for accessing loans for shallow tube well irrigation without collateral under the project, but only 52% of water user groups were fully or partly active at the time of the evaluation in 2012.

## Key Lessons

- **Access to irrigation using a group-managed approach can reap benefits.** Water user groups can spur agricultural development, help ensure food security, and enable households to build assets against unexpected shocks.
- **Shallow tube well irrigation systems are viable without direct subsidies.** This project demonstrated this, but concrete measures are also needed to ensure that small farmers are not crowded out from access to complementary support measures.
- **Supporting a groundwater irrigation project aimed at small farmers without collateral was justified.** But continued effort is needed to make water user groups self-reliant and viable.
- **Providing irrigation infrastructure alone is not sufficient.** To generate tangible welfare impacts other interventions are needed, such as opening access to production credit, timely availability of fertilizers and improved seeds, effective extension services, regular supply of electricity or diesel for operating shallow tube wells, and emphasis on value chains.
- **Reversing a policy on not subsidizing well installation did not result in the hoped-for expansion, because the government was unable to provide adequate funding.** The subsidy policy did not benefit the poorest farmers, because of the general shortfall in funding. What subsidies were available tended to be cornered by medium- and large-sized farms.

## Recommendations

- **Improve accessibility.** Make shallow tube wells accessible to smallholder farmers through a broad approach dealing with enabling conditions in several areas. The project was only loosely connected to Nepal's overall agriculture agenda.
- **Implement a budget-friendly groundwater irrigation policy.** Develop a unified policy that builds on the project's successes in a way that causes the least fiscal stress. The impacts of the unsubsidized Community Groundwater Irrigation Sector Project model were at least as good as ones under the subsidized Agricultural Perspective Plan.
- **Connect the dots.** When ADB supports uplifting small farmers in developing countries, it needs to factor in the links between food production, water, energy availability, and marketing—and avoid fragmented approaches. The project was largely a stand-alone one connected only loosely to Nepal's overall agricultural development agenda.
- **Get good baseline data.** ADB should collect or support the collection of good baseline data for projects for which past impacts have been highly variable, so that solid impact evaluations can be conducted after project completion. Having valid counterfactual data from before an intervention starts makes impact assessments more reliable.
- **Use a mixed-method approach.** This adds richness to evaluative findings and conclusions beyond quantitative assessment estimates. Economic and financial reevaluation can strengthen impact evaluation findings—and should be encouraged on all impact evaluations.

## QUICK LINKS

**Impact Evaluation Study**  
**Shallow Tubewell Irrigation in Nepal: Impacts of the Community Groundwater Irrigation Sector Project (Main Report)**  
[www.adb.org/documents/ie-nepal-community-groundwater-irrigation-sector-project](http://www.adb.org/documents/ie-nepal-community-groundwater-irrigation-sector-project)

**Learning Lessons**  
**Participatory Irrigation Management**  
[www.adb.org/documents/learning-lessons-participatory-irrigation-management](http://www.adb.org/documents/learning-lessons-participatory-irrigation-management)

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*Learning Curves* is a two-page quick reference to provide findings and recommendations from evaluations to a broader range of clients.