

Land Husbandry, Water Harvesting, and Hillside Irrigation Project, Rwanda

Endline Report - Executive Summary



WORLD BANK GROUP
Agriculture

The Land Husbandry, Water Harvesting and Hillside Irrigation (LWH) project is a flagship initiative aligned with Rwanda's Ministry of Agriculture and Animal Resources (MINAGRI) sector-wide strategy, and is a key pillar of the World Bank's portfolio in the region. The project emphasizes increased productivity in selected sites through investments in developing terraces, hillside irrigation, combined with the promotion of improved farming technologies and practices. The suite of LWH interventions is integral to MINAGRI's strategy under PSTA-III and PSTA-IV and the goal of transforming the rural economy.

This report presents causal estimates of the *overall* impact of the LWH program. The design, rollout and implementation of this evaluation results from a long-term partnership between the LWH project team (SPIU), MINAGRI, the World Bank's Operational Impact Evaluation (DIME) teams. Over the span of 6 years, the impact evaluation tracked a number of project-related input and outcome indicators. Aligned with the project's development objective and built around core areas of the implementing team's focus, the evaluation sheds light on the overall impact of the program.

Prior to program implementation, during pre-feasibility, the LWH, DIME and the World Bank's Task team designed a prospective impact evaluation to plausibly capture the causal impact of the program. In each phase of implementation, the project targeted a certain number of sites in which to intervene. The impact evaluation tracked outcomes across several sites that were identified during pre-feasibility, including a subset of eligible sites that were left out of program implementation due to budgetary constraints. In other words, of

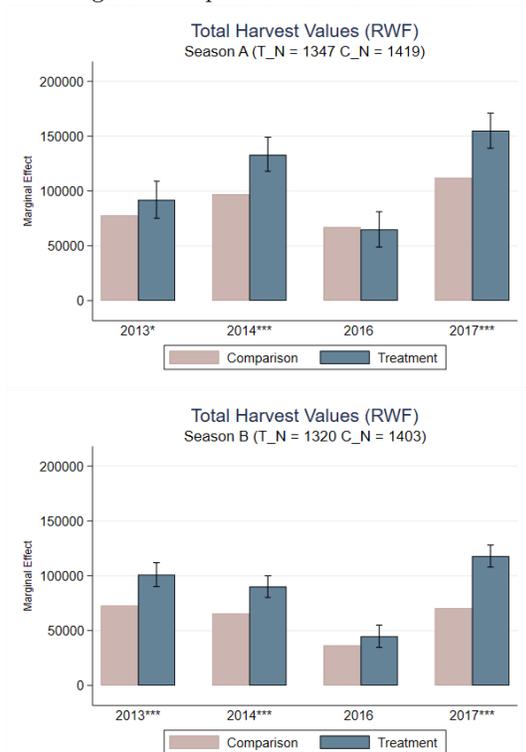
the set of sites that passed pre-feasibility, a number that were otherwise identical to the project sites were not assigned to the LWH intervention offer a good reasonable counter-factual (comparison) to the sites that received the program. This allows the impact evaluation to measure what *would have happened* in the absence of the LWH interventions. Data were collected across the intervention (*treatment*) sites and these *comparison* sites - **implementing a non-experimental matched difference-in-difference strategy to estimate project impact.**

Working together, DIME and the LWH team worked to collect data across approximately 600 households in 1B sites over 6 years, and 5 sets of agricultural seasons. This panel dataset is unique, both in its length and in the richness of demographic, agricultural and household data it brings together. A dataset of this volume is uncommon in the policy landscape and allows the research team to investigate impacts of a complex program in a way that would have been otherwise impossible. The dataset covers three key sets of indicators that form the focus of analysis: agricultural productivity - the core of LWH's focus; project inputs and delivery mechanisms that influenced agricultural outcomes; and non-agricultural indicators of household welfare.

Households in LWH project sites witness large and statistically significant impacts on agricultural production indicators that can directly be attributed to project interventions. While these these impacts started to materialize in the early phase of the project, they increased in magnitude over the course of the project. The primary indicator of pro-

duction - value of harvests - is higher for treatment households relative to comparison households across years and seasons. Predictably, the value of harvests in Season A is consistently higher than in Season B. In 2017 Season A, harvest in treatment areas is about 36 % higher than in the comparison areas. The largest effect of the program is in 2017 Season B, when the treatment households' value of harvest is about 60 % more than the comparison group, which harvests RWF 75,000 in this season.

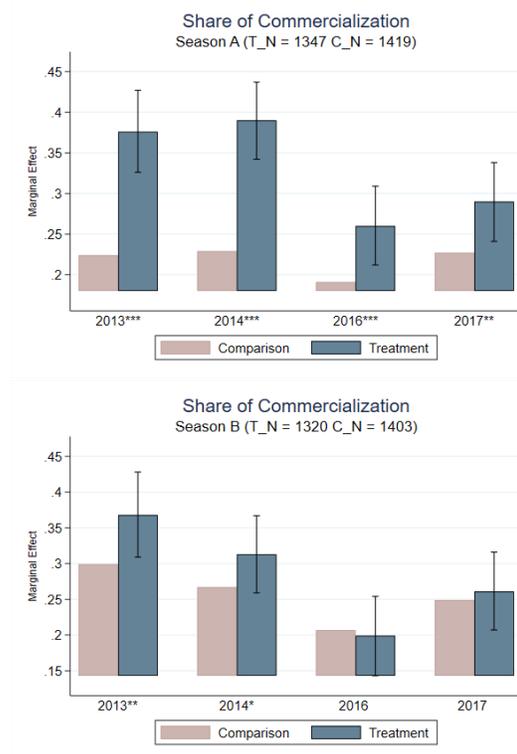
Figure 1: Impact of LWH on Harvest



In addition, the treatment group has a significantly higher share of its harvests sold in markets - with value of sales and share of agricultural production commercialized both significantly larger for the treatment group relative to the comparison. In 2017 Season A, the effect of LWH on sales value is 50 % more than a comparison group mean of approximately RWF 40,000. In addition, in 2017 Season B, LWH causes an increase in commercialization share of 7 percentage points more, relative to a comparison average of 22 %. Plot-level analy-

sis reveals that the project leads to an increase in productivity - in 2017 treatment households have about 42 % higher net yield relative to the comparison group mean of RWF 330,000. The analysis suggests that when making farming decisions, farmers tend to allocate resources across plots in an efficient way and that the plot is a more appropriate unit of analysis than the household for this set of indicators.

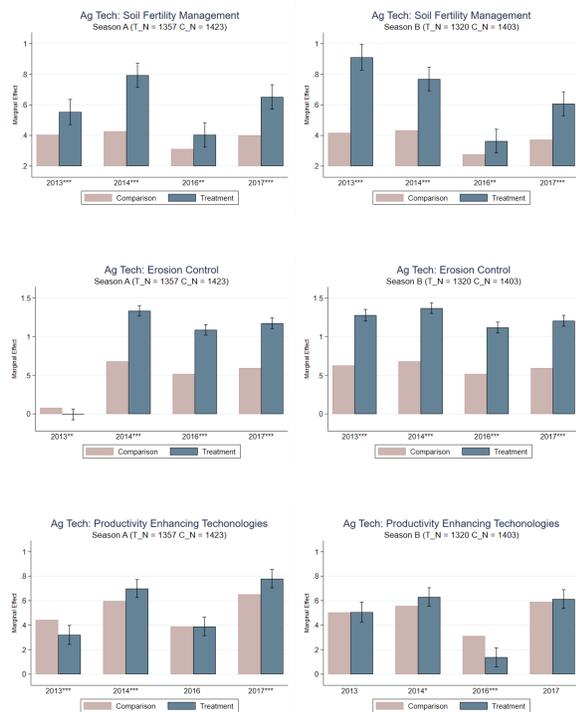
Figure 2: Impact of LWH on Commercialization Rate



Across the board, households in LWH sites report higher access to services, use of inputs and adoption of technologies. This result holds across seasons and years, as LWH causes a 26 percentage point impact on households likelihood of receiving public extension, relative to a comparison group rate of 9 %. A similar result holds true for access to Tubura services. The adoption of agricultural and land-management technologies including erosion control, fertility management and enhanced productivity is consistently and significantly higher for LWH households than their com-

parison counterparts. In the case of erosion-control, for example, LWH increases the likelihood of adopting this technology by 60 percentage points in 2018, relative to the comparison group’s adoption rate of 50 %.

Figure 3: Impact of LWH on the Use of Agricultural Technologies



In terms of non-agricultural outcomes, LWH households outperform comparison households in terms of rural finance and total income, with food security reducing dras-

tically across all surveyed households. Access to banks and savings behavior show significant positive impacts for LWH households relative to comparison households, with LWH causing a 50 % point impact on likelihood of having a bank account, relative to a comparison group mean of 80 %. Food security in 2017 shows drastic improvements over the previous year across the sample. Further analysis of this outcome points at the fact that households’ food security status is subject to drastic variation across years. Going against conventional wisdom, analysis shows that food security is a risk for a range of farmers, as many experience significant changes from one year to the next.

Overall, LWH significantly improved farmers lives primary through the channel of increased agricultural productivity. Tracked over the course of 6 years, farmer welfare - as measured both by agricultural and non-agricultural indicators - is higher at endline relative to the pre-program levels. **The Overall Impact Evaluation of the LWH program is an example of how an implementation team can work to learn lessons on program impacts through a non-experimental Impact Evaluation design that relies on natural constraints related to program design and delivery.** The multi-year, rich panel dataset that tracked almost 1000 households across 5 survey rounds points at the government team’s commitment to strong data systems and decisions grounded in evidence; and a commitment to learning and improving the program at every stage.