Innovations for Poverty Action

AGRICULTURE, EDUCATION

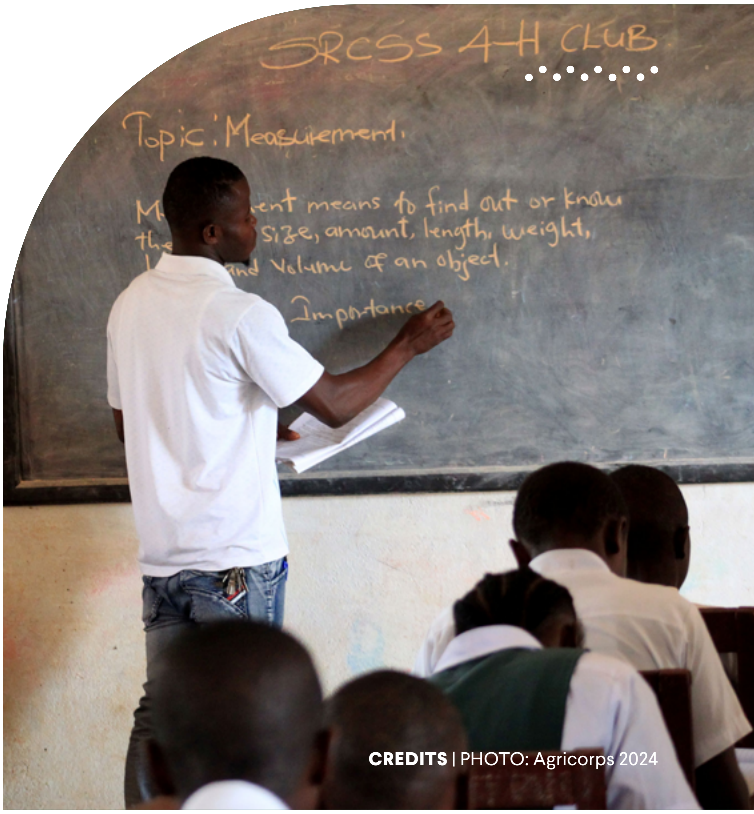
COST-EFFECTIVENESS BRIEF

Transforming Agricultural Production and Rural Education through Schools

Evidence from Liberia

This brief explores the cost-effectiveness of a school-based agricultural education program implemented by the NGO 4-H Liberia, the local branch of a global youth development network. Motivated by the intertwined challenges of declining soil fertility and high rates of student dropouts at junior high, the 4-H Liberia program integrates experiential science education with the introduction of improved agricultural technologies, offering the promise to transform rural livelihoods and motivate school attendance. Specifically, the program trains agriculture and science teachers to implement a system of four components: experiential instruction of scientific knowledge, student-led school farms, student home projects, and extra-curricular activities to cultivate leadership and agribusiness skills. This system is then supported by regular visits from extension officers.

A three-year randomized evaluation provides proof of concept for establishing a cost-effective system. Under the optimized version of the program, researchers found that effective agricultural training for students translated into significant improvements amongst agricultural households. These include substantial increases in both students' and parents' adoption of agricultural technologies, reductions in student dropouts and absenteeism over consecutive school years, and improvements in students' aspirations for higher education and savings. The cost per student participant was USD 40 (in 2025 currency). Every USD 100 spent on the program led to an additional **0.31 parents adopting promoted techniques, 0.18 additional years of education** for students, and an increase of **USD 4 in students' annual savings** — making the program relatively cost effective compared to other agricultural extension programs in Sub-Saharan Africa and more than twice as cost-effective as a highly cited conditional cash transfers program in Malawi in increasing days of school attendance.



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KEY TAKEAWAYS

- The program increased students' adoption of the promoted mix of soil management techniques by 15.7 percentage points and parents' adoption by 13.6 percentage points relative to comparison schools. At a cost of USD 137-255 per additional household adopting soil management techniques, the program compares favorably to other rigorously evaluated agricultural extension interventions in Sub-Saharan Africa, such as farmer field days in Uganda (Fabregas et al. 2022) and incentivized peer farmer training in Malawi (BenYishay and Mobarak 2019).
- The program had a combined effect on school attendance through a reduction in both student dropouts and absenteeism that was reflected in an increase of an estimated 17.6 additional school days attended over the 2021/22 and 2022/23 school years.[1] For every USD 100 invested in the program, students gain 0.18 additional years of education, making it more than twice as cost-effective as a highly cited conditional cash transfers program in Malawi (Baird, 2011).
- Students experienced an increase of USD 4 in their annual savings.
- The program costs USD 40 per student — this could be reduced to USD 6 per student after the first three years, when the program minimizes external support for schools.

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Assessing the Program's Costs

The school-based agricultural training program was implemented over three years between January 2021 and December 2023. The total cost of the intervention, adjusted for inflation to 2025 USD, was USD 788,767. Costs were relatively evenly distributed over three years, with USD 284,347 in Year 1, USD 260,184 in Year 2, and USD 244,236 in Year 3. With an estimated total of 19,500 targeted participants in 100 schools, this corresponds to a cost of USD 40 per student, or USD 7,888 per school.

COST COMPONENTS

These costs include:

Program administration and staff costs: 4-H staff time for management and monitoring of the intervention, as well as field staff time to visit schools and organize field days

Training: training for project staff, including quarterly training for teachers and biannual" training for field staff

Implementation and program material costs: expenses associated with the promotional sessions with parents, farmer field days, student events, and program launch

Transportation: purchase of vehicles and motorcycles

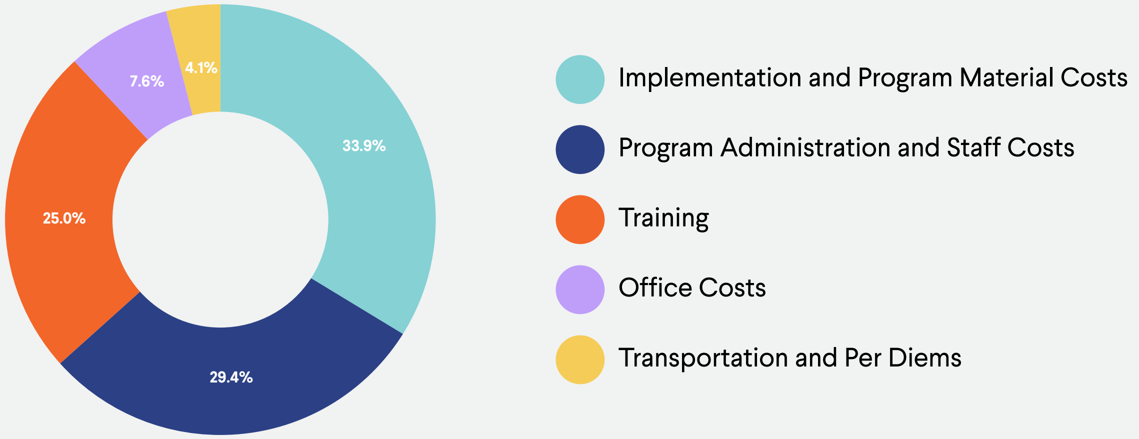
Office costs: overhead

[1] Days attended is calculated across two school years (2021/22 to 2022/23) by subtracting reported absences from 200 school days per year, with dropouts assigned zero days and school switchers assigned the average absence rate of control group respondents.

The main individual cost drivers are the training sessions for agriculture teachers and the promotional sessions with parents, each comprising around 20 percent of the budget. Staff time is also an important part of the cost, with monitoring and field staff accounting for 16 percent of the total cost, and national staff salaries accounting for 14 percent.

COST NOT INCLUDED: These estimates do not include the value of any of the participants' time. They also do not include the management and coordination support 4-H received from Agricorps.

FIGURE 1



Cost-Effectiveness: A relatively cost-effective way to increase technology adoption and improve rural education

This cost-effectiveness analysis (CEA) focuses on the **100 schools** that received the program, assuming that they also received the parental engagement components. In each of these schools, the program reached 65 students per year on average over 3 years, for a total of 19,500 households directly participating in the program.

The program increased adoption of the promoted soil management techniques aimed at tackling soil erosion (mixing bed preparation with lower-density cropping and more attentive farm management methods, such as composting) on both parcels used by students and parents. For comparison with other interventions that seek to improve agricultural practices, this analysis focuses on the effects on parents' parcels.

The combination of the program with the two parental engagement components (promotional video sessions and annual farmer field days) increased parents' use of promoted techniques by 13.6 percentage points. Over a group of 100 schools or 19,500 households, the 13.6 percentage point increase is equivalent to 2,652 additional parent households adopting bed preparation methods.

Dividing the total cost of the intervention by the total increase in the use of promoted techniques equals a cost of **USD 326 per additional household adopting promoted techniques**. This means that for **every USD 100 invested in the intervention, an additional 0.31 households** are adopting bed preparation methods in combination with either lower-density cropping or one of the more attentive farm management methods.

However, focusing only on parents might underestimate the true impact of the program. As discussed in Beaman et al. 2021, research on technology diffusion shows that social relationships serve as important vectors through which individuals learn about and adopt new technologies. When parents learn and adopt new agricultural techniques, this knowledge can spread through conversations with neighbors, relatives, and other farmers in their community.

To account for these ripple effects, the study assumes that **one to five percent of non-parent households within two kilometers of schools** will also adopt one of the recommended combinations of techniques. This essentially estimates how information diffuses beyond the direct participants to create broader community impact through social learning. Incorporating these indirect individuals leads to a cost of USD 137-255 per household adopting promoted techniques, or equivalently, to 0.39-0.73 households adopting promoted techniques per USD 100 invested.

Comparison to other programs: Other examples of interventions that promote agricultural practices in Sub-Saharan Africa can be seen in Figure 2. The effects of the program on parent households were comparable to those of farmer field days in Uganda (Fabregas et al. 2022), where the intervention increased the number of households using fertilizer by 0.15-0.46 households per USD 100 spent, and larger than those observed in other interventions like farmer field days in Kenya (Fabregas et al. 2017) or central training for contact farmers in Mozambique (Kondylis et al. 2017).

When considering indirect benefits on non-parent households, the program is comparable to an intervention in Malawi that trained peer farmers and provided them with an incentive (BenYishay & Mobarak 2014). That intervention increased the adoption of pit planting by 0.6 households per USD 100 spent—a figure comparable to this program's effects—but achieved larger impacts on the adoption of composting, which reached 1.53 additional households for the same investment.

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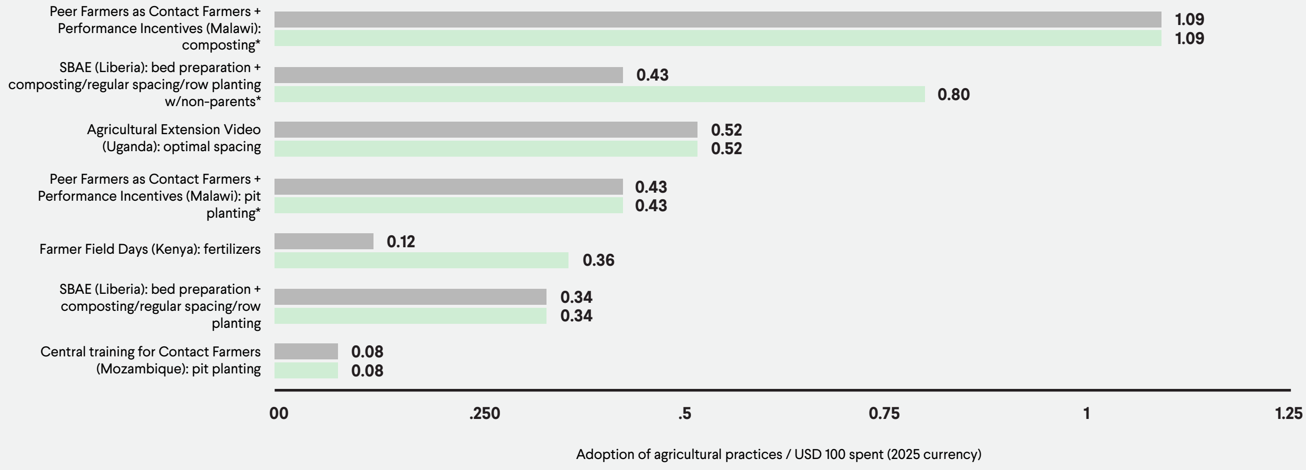
FIGURE 2

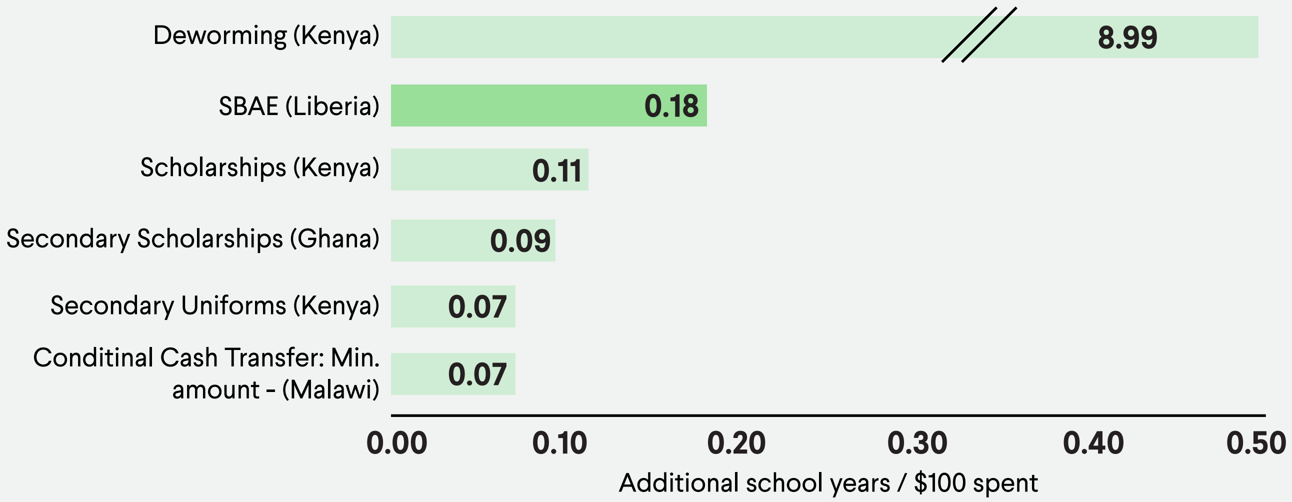


Attendance improved. The full version of the program—which included the agricultural training program, the videos for parents, and the farmer field days—increased student attendance by 18 days on average over the 2021/22 and 2022/23 school years, which is equivalent to 0.09 years of additional education. That in turn means that for each USD 100 invested in the program, students gain 0.18 additional years of education.

Comparison to other programs: This approach is more cost-effective than most of the interventions focusing on Sub-Saharan Africa analyzed by J-PAL in "Roll call: getting children into school" (Figure 3), with the exception of deworming in Kenya. This makes the intervention a comparatively cost-effective alternative to increase student participation in school.

Savings Increased. The combination of the school-based agricultural training with the parental engagement components increased students' savings in the second year by 21 percent on average, which is equivalent to USD 4 per student in annual savings. This represents an increase of USD 8 in savings per USD 100 invested in the program.

FIGURE 3



Source: J-PAL Conducting cost-effectiveness analysis (CEA)

Cost Considerations for Policy and Scale

Some program costs could be reduced from the outset when replicating the intervention. The costs of parental and community engagement, two significant cost drivers (as a share of the total cost) during the evaluation, could be significantly reduced at scale when it is conducted by schools rather than enumerators outside the communities, but more testing is needed to find the optimal approach.

Other costs per school are unlikely to change much as the program expands to new schools, but after three years in the program, participant schools are "graduated" and continue independently with only minimal external support, reducing costs to just biannual monitoring, teacher refresher training, and 4-H events (such as the national agriculture fair).

Once schools start running the program independently, training activities can be reduced to two refresher sessions at a total cost of USD 50 per school per year; three monitoring visits at a total of USD 50 per school per year; USD 300 per school per year for participation in regional and national events. This would reduce the annual cost to close to **USD 400 per school, or USD 6 per student, before parental engagement.**

Another potential way to reduce costs could be to leverage existing government programs, such as enrolling country and district level agricultural extension officers to handle school visits or farmer field days, which would enable more efficient use of existing staff time.

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Methodology

Cost-effectiveness analysis calculates the ratio of program costs to measured impacts, enabling decision-makers to compare the relative cost-effectiveness of interventions targeting similar outcomes. CEA is most appropriately applied when interventions have completed rigorous impact evaluations, providing decision-makers with greater certainty about intervention effects.

Conducting robust cost-effectiveness analysis requires two essential data inputs: comprehensive actual cost data and credible impact estimates from research methods that establish causal attribution, such as randomized evaluations. We have outlined IPA's cost collection and CEA process for the school-based agricultural training program in more detail below:

- Met with key personnel to explain the costing activities and expectations for cost data sharing, which included specifying how the data that was being requested would be used and what level of detail was required for the retrospective analysis of costs.
- Collected costs using our automated CEA tool, where we:
    - Used a slightly adapted version of the "ingredients method of costing" outlined by Levins and McEwan (2001) and Dhaliwal et al. (2013) to collect program costs, in which we gathered

detailed information on the cost and quantity of all the ingredients required to implement the program;

- Inputted line item costs retrospectively, with the corresponding date and description for these costs, and chose the cost ingredient category
- Documented assumptions:
  - Since the original cost data covers 150 schools, but only 100 are in the intervention group, variable costs were proportionally adjusted (66.7 percent), while fixed costs like national staff salaries and office overhead remained unchanged.
  - Parent sessions and farmer field day costs were specifically projected for the 100 intervention schools.
  - "Days of school attendance" is based on a 200-day school year, accounting for enrollment status and absence rates. Dropouts are assigned zero school days, and students who transfer schools receive the same attendance count as the average for comparison schools.
  - Since savings effects only apply to students who remain in school, the effect is first adjusted by the intervention group's dropout rate before being applied to the full student population.
  - To estimate the number of non-parent households indirectly affected, we assume there are 735 non-parent households in a 2 km ratio around each school.
  - For each non-parent household, we assume a one to five percent increase in bed preparation methods as a result of the intervention.
  - We do not include the opportunity cost of the participating teachers' time.
- Calculated the CEA based on the inputted costs and impact measures, using the methodology outlined by Dhaliwal et al. (2013). This included adjusting costs for inflation to our year of analysis (in this case, 2025), after bringing all the costs to a base year using a ten percent discount rate.
- Ensured results were reported in a way that is easily understandable for partners and policymakers, with comparisons to interventions measuring the same outcomes in similar contexts (e.g., cost per additional year of education, which can also be expressed as the impact per USD 100 invested in the program for comparison with other alternative approaches).
- Developed estimates of costs at scale.

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SECTOR: Education, Agriculture

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