

FARMER-MANAGED NATURAL REGENERATION

Cost-Benefit Analysis



NOTE

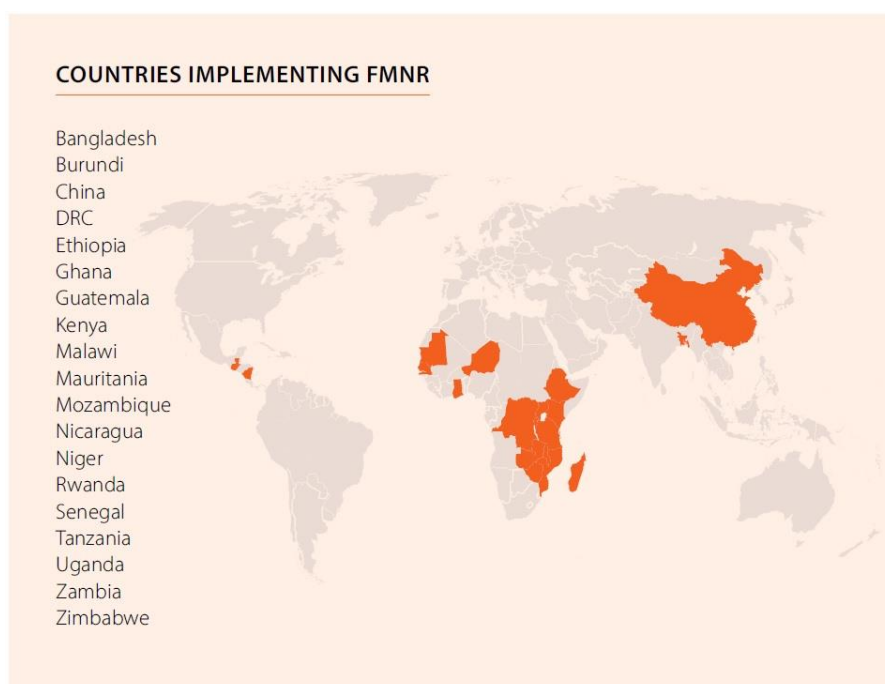
This technical summary presents the Farmer-Managed Natural Regeneration approach for applicable projects funded by World Vision Canada from 2019 to 2023. The cost-benefit analysis was conducted by Limestone Analytics. Updates to this analysis will occur as additional projects adopt this model and new evidence is continuously collected. Consequently, figures may change to reflect a more accurate understanding of the pathways through which the model achieves its effectiveness and efficiency. All dollar values are reported in 2023 USD with a discount rate of 9 per cent.

Highlights (2019-2023)

- **\$2.06** in economic and social benefits for participants for every dollar spent
- **\$23.95** million in benefits to participating households, in the form of increases in timber, food and other crop income
- **224** lives saved among children under five, and **3,193** disability-adjusted life years (mortality and morbidity) averted over 20 years
- **\$8.82** million in benefits to children from time saved from fuelwood collection
- **291,448** tons of CO2 emissions sequestered over 20 years

Introduction

Sitting under the Regreening Communities core program model, the Farmer-Managed Natural Regeneration (FMNR) approach works to improve farmers' sustainable management of desired tree species. This can result in improved vegetation, land and soil fertility, which in turn can help households increase and diversify both food and income. To assess the effectiveness and efficiency of the approach, a cost-benefit analysis was conducted for World Vision Canada by the consulting firm Limestone Analytics. It covers 40 WVC-funded FMNR implementations across 19 countries from 2019 to 2023, with a forecast period of 20 years for the benefits and costs accrued.



The Farmer-Managed Natural Regeneration Approach

Sustainable management of trees is the defining characteristic of FMNR. Rather than planting trees, farmers manage and cultivate the natural regrowth of trees. Notably, FMNR requires no specialized equipment.

While FMNR has been practiced in various forms around the world for centuries, World Vision first began exploring the technique in the early 1980s in Niger. World Vision Canada's support for FMNR spans numerous projects, the earliest of which began in Ethiopia during the 1990s.

The diagram below illustrates how the approach works. Improved vegetation, land and soil quality increases crop yields and livestock fodder. This in turn generates more products for consumption and sale, increasing household income, health and resilience.

Methodology

The scope of the analysis is limited to the period 2019–2023. The cost-benefit analysis (CBA) does not include all FMNR implementations because outlier projects (e.g., those with mismatched or missing data) were excluded from the final analysis. As a result, the CBA accounts for 40 WVC-funded implementations. Additionally, analysis indicates a range of 45 per cent to 95 per cent for the adoption rate of FMNR programs. Based on that range, this CBA makes a conservative assumption that 50 per cent of participants will adopt FMNR practices.

The CBA has a 20-year analysis period, meaning that the benefits and costs are projected over 20 years starting from the period participants receive training on FMNR practices.

The analysis examines the benefits and costs of FMNR adoption in WVC-funded projects, using status quo farming practices in the targeted communities as a counterfactual. In this way the CBA measures the incremental outcomes from the perspective of different stakeholders compared to the likely outcomes in the absence of the project.

There are numerous potential benefits to FMNR. However, sufficient, rigorous and quantitative evidence exists to justify the inclusion of only a limited number of those benefits within this CBA. Therefore, this CBA focuses only on well-documented FMNR benefits. These include:

- Reduction in CO₂ emissions due to carbon sequestration
- Net increase in participating households' income from the sale of timber, non-timber forest products (NTFP), and crops
- Time savings from fuelwood collection
- Averted mortality and morbidity of children under five due to improved nutrition

On the cost side, WVC incurs implementation costs, and participating households experience an incremental cost in the form of the opportunity cost of the time they spend on FMNR practices.

Portfolio-Level Results

The portfolio of 40 WVC-funded implementations of FMNR across 19 countries between 2019 and 2023 reached **13,315** participating households.

These projects collectively resulted in **\$32.87 million** in benefits to participating households and society at a cost of **\$15.94 million**. This portfolio's net present value (NPV)¹ thus amounted to **\$16.92 million**, with a benefit-cost ratio (BCR) of **2.06** (the present value of the benefits divided by the present value of the costs). The FMNR-regenerated trees under this portfolio should reduce **291,448 tons** of CO₂ emissions from the atmosphere over the intervention's 20-year lifespan.

Figure 1 represents the estimated impacts by type of benefits and costs across the portfolio. Increased crop income constitutes **51 per cent** of total benefits, followed by increased timber and NTFP income and time savings from fuelwood collection, contributing **27 per cent** and **21 per cent** to total benefits, respectively. Compared to other benefit categories, the dollar value of the CO₂ emission reduction is an insignificant share of total benefits, less than **1 per cent**. On the cost side, the portfolio had a financial implementation cost of **\$1.94 million**. The participating households also had a burden of **\$14 million** in the form of the opportunity cost of time spent on FMNR practices.

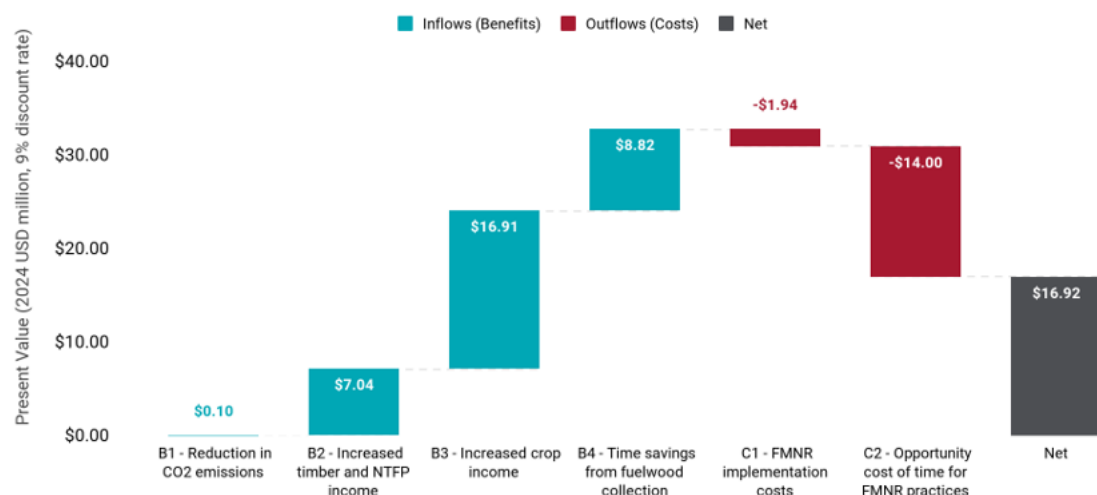


Figure 1. Benefits and costs breakdown for WVC-funded FMNR portfolio

Figure 2 illustrates the allocation of estimated benefits and costs by stakeholder. The members of households participating in FMNR enjoy benefits equivalent to **\$23.95 million**, of which **\$7.04 million** is from increases in timber and NTFP income and **\$16.91 million** is from increases in crop income. The children of participating households benefit from time savings from fuelwood collection, equivalent to **\$8.82 million**. WVC incurs the financial costs of FMNR implementation,

¹ Net present value is a way to determine how much money something will make or cost in the future by accounting for the time value of money. It is calculated by subtracting the present value of the costs from the present value of the benefits.

equivalent to **\$1.94 million**. Lastly, the adult members of households adopting FMNR practices incur an opportunity cost of the time to apply these practices, equivalent to **\$14 million**. The net impact sums to **\$16.92 million**.

At a portfolio level, the NPV calculation is adjusted to avoid double-counting benefits due to income increases and health benefits to children under five. Nevertheless, we report the averted mortality and morbidity associated with the FMNR interventions separately because these health impacts are realized even if they are part of and not additional to the monetary benefits included in the NPV. The WVC-funded FMNR portfolio is estimated to save the lives of **224** children under five and avert **3,193** disability-adjusted life years (DALYs)² over the 20-year forecast period.

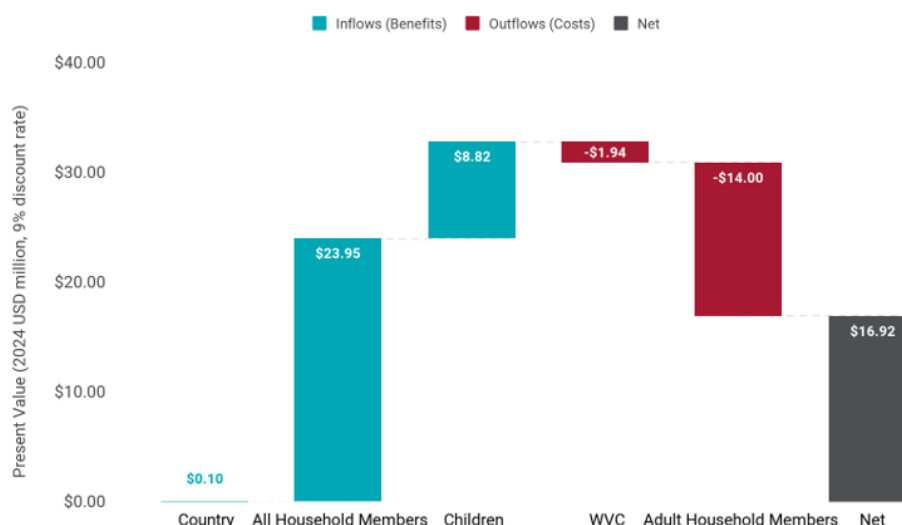


Figure 2. Benefits and costs breakdown by perspective (stakeholder) for WVC-funded FMNR portfolio

Country-Level Results

Figure 3 illustrates the BCR for WVC-funded FMNR projects aggregated at the country level. The investments in FMNR yield BCRs greater than 1.0 for 12 countries and less than 1.0 for seven countries. BCRs range from a low of 0.30 in Niger to a high of 3.92 in Uganda. BCRs tend to be lower in countries where the number of projects and participants in each project is lower. (The BCRs are conversely higher where the number of participants and projects is higher.) For instance, only one FMNR project was implemented in Niger with 50 households adopting FMNR practices, whereas seven FMNR projects were implemented in Uganda, reaching 7,775 households.

² Disability-adjusted life year (DALY) measures the total burden of disease. One DALY represents one year of healthy life lost due to illness, disability or early death. It combines years of life lost and years lived with disability to estimate the total impact on population health.

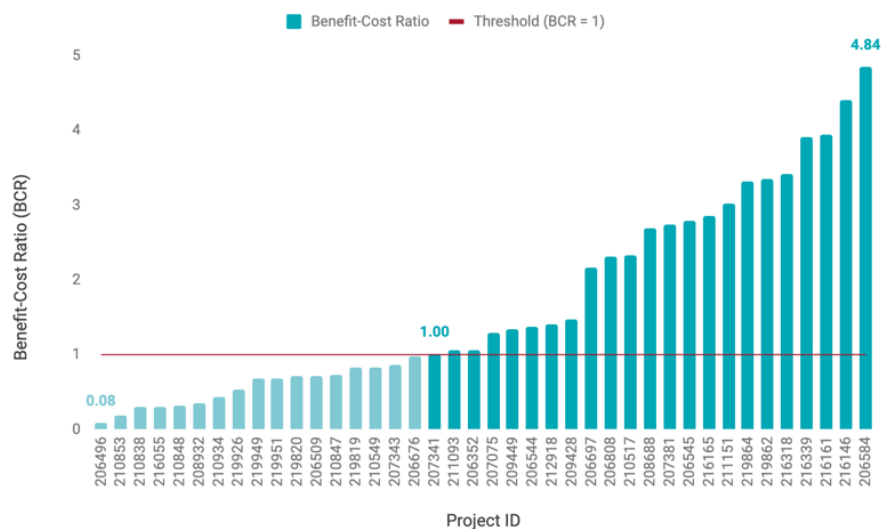


Figure 3. Benefit-cost ratio for FMNR interventions by country

Figure 4 depicts a cross-country comparison of the total benefits breakdown, highlighting significant variation in the share of each benefit category. While benefits from increased crop income contribute the most to total benefits in some countries (e.g., Kenya and Burundi), time savings from fuelwood collection contribute the most to others (e.g., Bangladesh and Mozambique). This variation underscores the role of country-specific socioeconomic characteristics in determining the net impact of FMNR practices. Additionally, these results emphasize the importance of employing a country-specific approach in designing, implementing, monitoring and evaluating FMNR interventions.

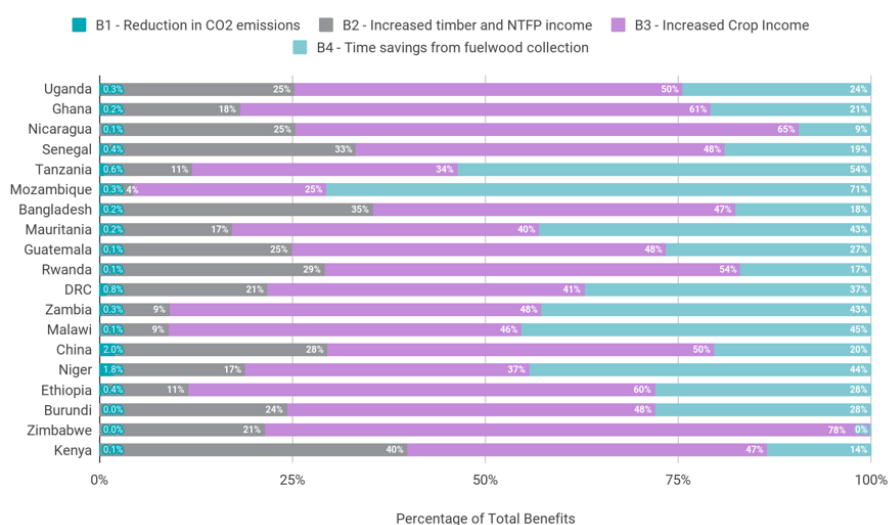


Figure 4. Cross-country comparison of total benefits breakdown

Project-Level Results

Figure 5 illustrates the benefit-cost ratio for each of the 40 WVC-funded FMNR projects. These project-level BCRs range from a minimum of **0.08** to a maximum of **4.84**. Of the 40 projects analyzed, the model reports a BCR of less than 1.0 (meaning a negative NPV) for 17 projects. This means that in 42.5 per cent of all projects, the benefits did not outweigh the costs.

There are two potential reasons. First, 10 of the 17 projects have relatively few participating households (50 or less). Second, the remaining seven projects report relatively higher participation but incur a higher-than-average opportunity cost of time for adults engaging in FMNR practices based on national-level wage data. These seven projects are clustered in Tanzania, Mauritania and Zambia.

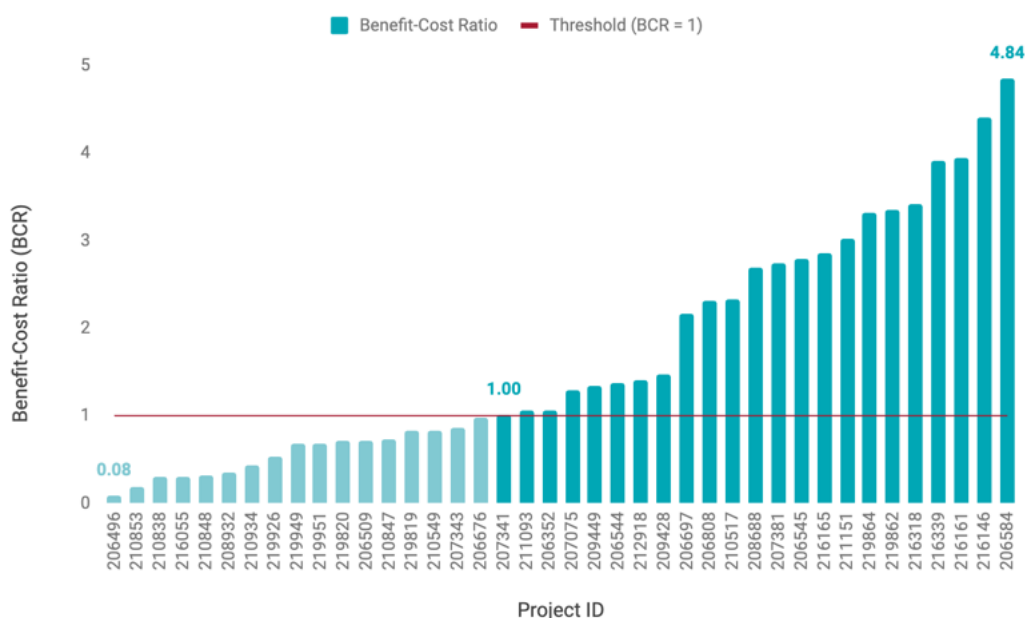


Figure 5. Benefit-cost ratio of FMNR interventions by project

Learnings

The CBA findings highlighted five areas for further investigation, follow-up or expansion of activity.

1. **FMNR practices help save children's lives and prevent illnesses that can negatively impact their growth.**

The FMNR investment is projected to save the lives of 224 children under five. When crop yields rise, more food is available for consumption and more income is available to

buy food. As a result, children's diets diversify and improve, which helps them fight infections and prevent illnesses that can cause death.

2. For every \$1 spent on FMNR practices, \$2.06 in combined economic and social benefits were generated for participants.

FMNR is a cost-effective means of improving nutrition and health outcomes, especially among children, and for increasing incomes that result in sustainable livelihoods.

3. Smaller projects or those with high opportunity costs for labour tend to be less cost-effective.

Of the 40 projects, 17 have a BCR below one. The most likely explanation is that the number of participants is low (below 50), which is the case in 10 of the 17 underperforming projects. This suggests there may be a minimum participation count below which the FMNR-generated costs outweigh the benefits.

4. Improved data collection, especially that which considers gender, can better define the benefits of FMNR.

Much of the data used in the analysis relies on national surveys. However, project-specific data collection can enable more accurate estimation of the impacts of FMNR interventions. Additionally, breaking down income data by gender can help identify how FMNR interventions are being distributed among household members. This is an important consideration for World Vision as we continue to strive for gender equity as a driver of sustainable development in the programs we support.

5. Mechanisms for compensating farmers for CO₂ reduction could improve the effectiveness of FMNR.

As measured in these projects, the impact of FMNR in reducing carbon emissions is vital but modest. This is partly because the benefits from reduced CO₂ emissions accrue to society but are not directly captured by farmers participating in FMNR. Compensating farmers with carbon credits might help incentivize continued adherence to FMNR practices.

Conclusions and Recommendations

The cost-benefit analysis reveals that, overall, the investments in FMNR have been a cost-effective use of Canadian funds. The benefits to participants reach \$23.95 million and a positive benefit-cost ratio of 2.06. This means that for every dollar invested participants receive \$2.06 in benefits.

Based on our learnings to date, we will be taking six specific actions going forward to continue to drive positive change and expand to more countries and communities. The World Vision Partnership has set a 2024-2027 target for FMNR to restore one billion hectares of degraded land globally. World Vision Canada will contribute to this effort. This will be facilitated by:

1. **Implementing long-term, sustainable FMNR interventions that build on traditional knowledge.** This is accomplished through a farmer-driven approach that empowers them to experiment and adapt FMNR practices to meet individual and community needs.
2. **Considering a range of environmental, social and economic factors when first determining whether to include FMNR in a project.** This is done through a needs assessment for the area.
3. **Encouraging FMNR as a valuable starting point for addressing land degradation issues,** especially in areas where food insecurity, drought, conflict and other symptoms of poor environmental resilience to climate and environmental shocks are the results.
4. **Acknowledging that FMNR is a foundational intervention.** Therefore, it can be implemented with any programming that can benefit from healthy, functioning ecosystems, functional water cycles, increased and more secure access to food and income, or reduced climate impacts.
5. **Strengthening the land's resilience and long-term family livelihoods by using FMNR as a disaster mitigation strategy.** Following a disaster, FMNR activities can provide valuable assistance in helping the land recover. If associated with cash-for-work programs, it can contribute toward short-term emergency relief while also supporting the re-establishment of livelihood systems.
6. **Increasing tree cover by integrating FMNR into farmland and restoring degraded forests.** More trees allow for the sequestration of greater volumes of carbon. This can mitigate the impact of climate change and allow new opportunities for added income sources such as carbon credits that can be "traded" in a carbon market for carbon offsetting.