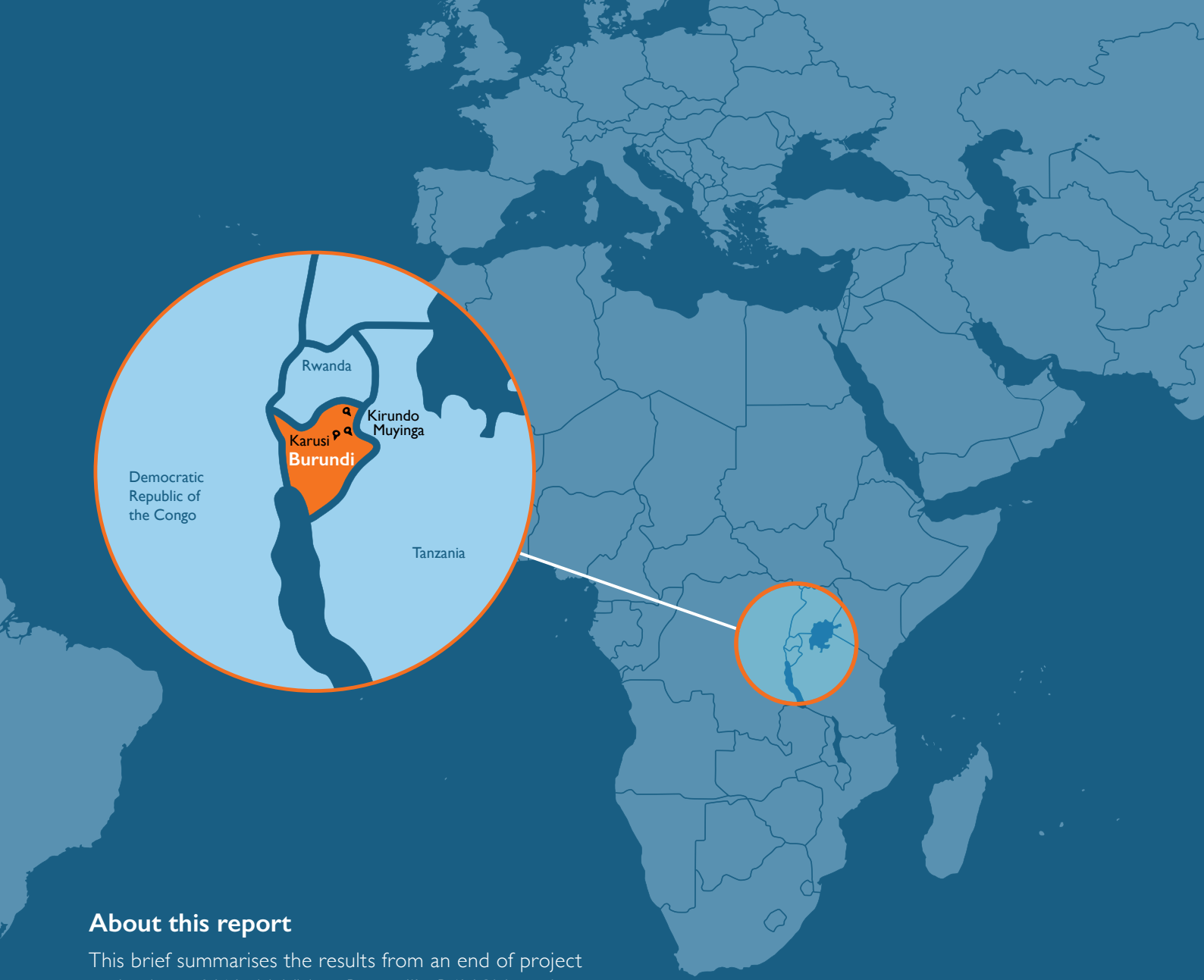
Bio-fortified Value Chains for Improved Maternal and Child Nutrition in Burundi (B4MCN) Project

Impact Brief: 2017-2021



About this report

This brief summarises the results from an end of project evaluation of World Vision Burundi's B4MCN project (2017-2021), completed independently by Research PLUS Africa, between April and June 2021. Data analysis was supported by Saba Mebrahtu Habte, Evidence Building Advisor, World Vision Australia; it was reviewed by Rob Kelly, Senior Advisor, Food Security & Resilience; Tamam Noor: Senior Economic Development, Inclusive Markets; Gayatri Jayadevan, Women's Economic Empowerment Technical Advisor; Rachel Ferdinands, Country Impact Manager for Burundi; and Alexis Irakoze, Design Monitoring and Evaluation Officer, B4MCN Project, World Vision International, Burundi Program.

Bio-fortified Value Chains for Improved Maternal and Child Nutrition in Burundi (B4MCN) Project was supported by the Australian Government through the Australian NGO Cooperation Program.

Cover photo: Cooperative members celebrating a good orange fleshed sweet potato harvest.

Australian Aid | World Vision

Context

With 435 persons/km^2, Burundi has the second highest population density of countries in sub-Saharan Africa.[1] On average, households have only 0.5 hectares of land. Agricultural productivity is often low, a result of land degradation and soil infertility (especially in Burundi's highlands), limited access to farm equipment, technical and financial capacity, and inputs such as quality seeds and fertilizers. Over 60% of Burundians cannot produce adequate food, which then contributes to low income and high levels of macro and micronutrient malnutrition. More than 90% of Burundian women rely on agriculture as their primary source of food and income, and their lack of access to productive resources contribute to compounding effects on poverty.[2] Climatic changes, such as prolonged droughts, have further increased rural poverty and food insecurity, and over half (54%) of children under five years of age are chronically malnourished or stunted.[3]

Farmers applying improved agricultural techniques.

1 https://data.worldbank.org/indicator/EN.POP.DNST (Accessed 3 September 2021).

2 Where we are : Eastern and Southern Africa : Burundi | UN Women – Africa (Accessed 14 September 2021)

3 Home - Global Nutrition Report (Accessed 14 September 2021)

Project overview

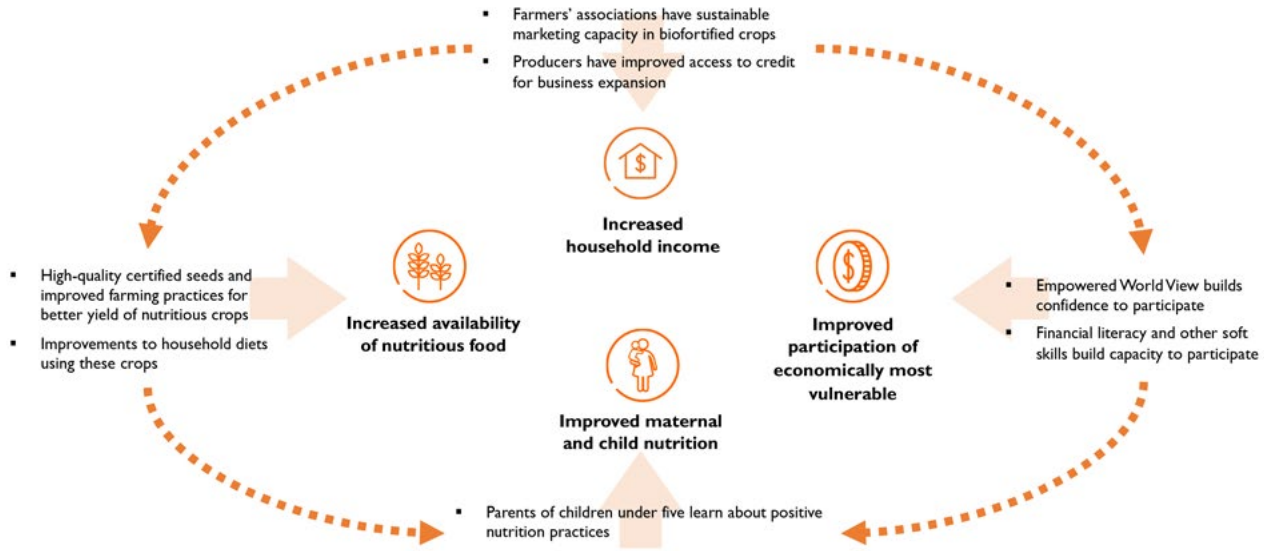
World Vision's Bio-fortified Value Chains for Improved Maternal and Child Nutrition (B4MCN) Project in Burundi aimed to address child malnutrition by tackling its root causes - lack of foods rich in micronutrients, poverty, and poor dietary diversity. The project expanded on a previous ANCP-funded Burundi Economic Development and Value Chain Project (2014-2017) in Muyinga Province, adding communities in Kirundo and Karusi Provinces.

B4MCN GOAL: Improved food and nutrition security for children under five in Muyinga, Kirundo and Karusi provinces

B4MCN was a nutrition sensitive agriculture (NSA) project, an approach that seeks to maximize the impact of nutrition outcomes when conducting agricultural interventions, especially for women and young children during the window of opportunity from pregnancy until two years of age. Food and nutrition insecurity are not only about food consumption but B4MCN also recognised the role of water sanitation and hygiene (WASH), women's empowerment, health, and care practices. The project specifically aimed to tackle high levels of chronic malnutrition in 9,000 families over a four-year period (July 2017-June 2021). The project worked with 48,520 people (11,323 women, 12,351 girls and 927 people with a disability), including two of the most vulnerable groups in Burundian society: the indigenous Batwa people, and extremely poor women-headed households.

The Local Value Chain Development (LVCD) model[4] was used to increase production of two biofortified foods: high-iron beans (HIB), proven to increase levels of iron in women with anaemia; and orange fleshed sweet potatoes (OFSP), with high levels of beta-carotene and known to increase Vitamin A intake in children.[5] Marketing assistance for both HIB and OFSP was provided to enable farmers' groups to capitalise and capture the improved value of the project products. Farmers also took part in Savings for Transformation (S4T) groups, to increase their access to credit. To address poor dietary diversity, parents of young children took part in Infant Young Child Feeding (IYCF) sessions, while improved and inclusive screening of acute malnutrition during monthly Growth Monitoring and Promotion (GMP) helped with timely referral of children with signs of undernutrition. The project used the Positive Deviance (PD) Hearth approach, where mothers taught each other about nutrient dense foods to help children recover from malnutrition, including the nutrient-dense beans and sweet potato grown locally. To support social change and empowerment, Ultra-Poor Graduation (UPG)[6] and Empowered World View (EWV) models worked with vulnerable groups, Batwa and female-headed households, to improve their own situation as well as community confidence in achieving long-term equality, ultimately enhancing food security, dietary diversity, and nutritional outcomes.

Figure 1: How the B4MCN Project Achieves Change



4 The Local Value Chain Development (LVCD) project model aims to help producers generate a sustainable income to provide for the needs of their families and children. Producers increase their incomes by working together in groups to have stronger understanding and connection to markets and by better matching their production to market demand to improve their profitability.

5 Improving nutrition through biofortification: A review of evidence from HarvestPlus, 2003 through 2016 - ScienceDirect (accessed 3 September 2021).

6 Ultra-Poor Graduation model provide extremely poor households with a pathway out of poverty by helping families engage in a productive and resilient livelihood. It gradually builds household capacity and empowers families to become involved with the local economy and community in productive and positive ways. Further information: https://www.wvi.org/economic-development/ultra-poor-graduation.

About the evaluation

The evaluation used a quasi-experimental mixed quantitative and qualitative method, with two comparison points available: by time (baseline to endline statistical measures) and by intervention and comparison/control. The Household Caregiver Survey was the primary questionnaire used with 1,896 households (1,250 households in intervention sites, 646 in comparison sites). Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs) provided triangulation of views to understand the quantitative findings. A diverse range of people took part, including smallholder farmers/members of producer groups, Batwa community representatives, women of childbearing age, community leaders, government representatives in agriculture, health and nutrition sectors, as well as program staff.

Limitations

Harvests in any year are not strictly comparable as seasonal and weather-related differences apply; additionally, the final year faced economic disruptions, market closures and health service delays due to COVID-19. Triangulation through community discussion helped to address this limitation as the qualitative evidence gave insight into reasons behind trends.

Private sector viewpoints could not be included, as relevant experts could not be available within the timeframe allocated.

Some nutrition-related projects and activities had been conducted in the comparison site since baseline. While this is good news for nutrition outcomes and for project theory of change, which aimed to make high-nutrient food more available for all, it affects comparability with the control sample. The baseline/endline comparison, in both intervention and comparison, was used to show whether improvements were heightened in areas of direct participation.

Demonstration of MUAC assessment during monthly GMP in the community using M-Health mobile application.

Findings

Outcome 1: Increased availability of nutritious food

Production of High Iron Beans (HIB) and Orange Fleshed Sweet Potato (OFSP) increased markedly between baseline and endline measures. Both at baseline and end evaluation, farmers in project intervention sites were more likely to have grown OFSP and HIB than elsewhere. Female-headed households were also slightly more likely to be growing these target crops than male-headed (85.4% compared to 78.3%). This indicates successful engagement of female-headed households as priority participants in the project.

	End Evaluation		Baseline	
	Intervention Sites	**Comparison Site**	**Intervention Sites**	**Comparison Site**
Percentage of households who report producing either HIBs or OFSP	82.2% (N=1250)	74.1% (N=646)	37.3% (N=1240)	23.4% (N=653)

"We raise awareness amongst community members under the support of World Vision International because it was them who started giving us biofortified beans and orange fleshed sweet potatoes… we have learned that they are of great benefit for children, pregnant women, and we also encourage other community members to cultivate them."

Agricultural Extension Worker Key Informant (End Evaluation)

Discussions with farmers, extension workers and community nutritionists confirmed that biofortified seeds had been made available and well promoted, though a few communities reported they had not yet received OFSP cuttings. Yields of OFSP in project sites averaged 4.94 tons/ha, which was well above the average yields of 1.23 tons/ha at baseline.[7] Similarly, HIB yields also increased in project sites, averaging 3.96 tons/ha at endline compared to baseline (0.49 tons/ha). Of the two crops, OFSP was considered more successful than HIB, with many farmers reporting they had faced challenges growing the beans. Households were mainly using HIB for their own consumption with limited sales (16% of all growers). Though OFSP production and consumption had increased, again only a small proportion of farmers had produced sufficient surplus for sales. However, the goal to influence and improve diets through biofortified crops was met, with a significant increase in the consumption of HIB or OFSP among young children (16.3% compared to 1.8% at baseline) and among pregnant women and mothers (19.6% compared to 4.2%). In contrast, intake of these nutritious foods remained relatively low in the comparison sites suggesting that increased production contributed to improved diet of these mothers and children.

Mrs Acqueline, President of Cooperative of farmers in Vumbi.

7 Yield computations for comparison sites were not included due to the extremely low proportion of those cultivating which would bias/skew the findings.

"Yes, some farmers cultivate High Iron Beans but others lack the courage."

FGD with Women Smallholder Farmers in Gashoho (End Evaluation)

Outcome 2: Increase in Household Income

Average annual household income rose both in project areas and comparison sites, but not to the same extent. Participating households increased their average annual income from US$142 at baseline to US$271 by endline, an increase of 91%, while comparison sites registered a 64% increase. Some of this increase was attributed to production and sale of OFSP. The project's contribution to Village Savings and Loans Associations (VSLA), especially for economically vulnerable participants, also supported economic engagement and access to income. The evaluation found that most farmers (67.1%) had taken some form of credit in the last 12 months, a stark contrast to the baseline where most farmers (74.3%) had not taken any credit in the last 12 months.

The proportion of female-headed households that had taken some form of credit was higher than in male-headed households, 73% and 66% respectively. Of those taking credit, most had used VSLAs (57%, up from 17.9% at baseline).

Child eating nutrient-dense porridge.

Average Household Income	End Evaluation		Baseline	
	Intervention Sites	Comparison Site	Intervention Sites	Comparison Site
Average household income in the past 12 months in US$	US$271 (N=1250)	US$190 (N=646)	US$142 (N=890)	US$116 (N=492)

"We sell when the harvest is good and those who have a good harvest with the orange-fleshed sweet potatoes and high-iron beans have improved their living conditions."

FGD with Smallholder Women Farmers in Gashoho

"I belong to a VSLA and have benefited from it because we get loans which we use in paying bills and taking children to hospital, we also buy seeds and buy school materials."

FGD with Women in Gitaramuka

The joy of a good harvest of orange fleshed sweet potatoes.

Outcome 3: Improved Nutritional Practices of Pregnant Women and Caregivers of children under five

	End Evaluation		Baseline	
	Intervention Sites	Comparison Site	Intervention Sites	Comparison Site
Percent of infants aged 0–5 months who were fed exclusively with breast milk during the entire day prior to interview	83% (N=101)	75% (N=76)	77.9% (N=140)	78.9% (N=57)
Percent of children aged 6-23 months who received food from at least four food groups during the previous day (minimum dietary diversity)	65% (N=1182)	53% (N=894)	60.2% (N=527)	50.7% (N=229)
Percent of pregnant women who received food from at least five food groups during the previous day (minimum dietary diversity)	35% (N=658)	21% (N=493)	24.1% (N=251)	13.6% (N=81)

As the table above shows, infant and young child feeding practices and dietary diversity improved in project sites, while the proportion of children with minimum dietary diversity remained relatively low in the comparison site. Pregnant women in project sites were also eating a more diverse diet. Minimum Dietary Diversity for Women was met in 35% of pregnant women surveyed, up from 24.1% at baseline. But, as dietary diversity supports maternal and child survival, this rate is still unacceptably low. Sustained effort is needed to increase this further during the next project phase.

Knowledge, attitudes, and practices for infant feedings were also assessed. In both comparison and project intervention groups, a large proportion of survey participants expressed knowledge of the correct duration of exclusive breastfeeding, for instance (99% and 96% at end evaluation; and 84.7% and 88.3% at baseline respectively). Qualitative findings similarly revealed that women of childbearing age had a fair understanding of what dietary diversity means. In FGDs, Women in Muyinga and Gaswore highlighted importance of diversified diet, and mentioned three food groups.

"We understand by diversified foods for food composed with builder, protectors, and mineral salts food. Foods are composed of 3 main food groups and eaten at the appropriate time."

FGD with Child Bearing Women in Muyinga (End Evaluation)

"By dietary diversity, we understand a diet is made of those three groups (carbohydrates, proteins and lipids). When the child is fed with them, his health is improved and when the community uses these foods, then there is no cases of children with malnutrition."

FGD with Child Bearing Women in Gasorwe (End Evaluation)

However, focused attention is needed to further expand and strengthen nutrition education messages during the second phase of the project. Though these food groups are good sources of macro-nutrients, evaluation findings suggest that other essential micro-nutrients could be missing from major food groups (such as eggs, dairy products, vitamin-rich vegetables and fruits).[8]

8 UNICEF definition of the 8 food groups, out of which at the minimum 5 are required: 1) breastmilk, 2) grains, roots and tubers, 3) legumes and nuts, 4) dairy products (milk, infant formula, yogurt, cheese), 5) flesh foods (meat, fish, poultry and liver/organ meats), 6) eggs, 7) vitamin-A rich fruits and vegetables, and 8) other fruits and vegetables.

mHealth app effective in helping identify children with acute malnutrition

Wasting levels for children under five declined slightly between baseline and endline (standing at 3.9%), but severe wasting practically disappeared for younger children under 40 months of age by endline. This indicates that the project's uptake of a digital tool, the mHealth app, to screen, based on Mid-Upper Arm Circumference (MUAC) assessments during monthly Growth Monitoring Promotion (GMP) sessions, and refer malnourished children for the appropriate treatment, was effective. The mHealth app not only reduced paperwork, but also improved timeliness and tracked referrals. The unexpected effect of using the app was that severe malnutrition could be more accurately identified, resulting in more children presenting with malnutrition; however, more could be done to prevent acute malnutrition through better hygiene and feeding practices.

Outcome 4: Improved Economic Capacities of Batwa people and extremely poor women headed households

The project successfully supported most vulnerable households, including those from the marginalised Batwa population, to connect productively with economic opportunities. The proportion of Batwa households earning an income exceeded that of non-Batwa by the end of the project (36.1% compared to 31.9% at baseline), while the opposite applied in control areas. The proportion participating in farming dramatically increased from 5.5% to 58.3%, as challenges of land access and skills (including confidence) were overcome. In terms of food security, the proportion of Batwa households experiencing severe hunger dropped from 27.1% to 11%. In comparison, non-Batwa households reported just 3.2% severe hunger at baseline but rose to 9% at endline. By endline, the disparity had reduced significantly (Batwa households 11%; non-Batwa households 9%).

However, interviews with Batwa people showed they still felt they were not on par with other Burundians in terms of income, health or social status.

Female-headed households increased average income by nearly three-fold compared to baseline figures (US$58 to US$165), in comparison average income among male-headed households increased by only 50% (US$197 to US$296). Yet, this did not achieve the same inroads to financial parity as the Batwa target group. In fact, female-headed households had a significantly lower average income than male-headed (US$296) at the project's end. It is clear that more is needed to improve both income and opportunity for vulnerable female-headed households.

Farmers sorting quality high-iron bean seeds.

Conclusion and Recommendations

Evidence shows that long-term work of at least 10 years is needed to significantly reduce stunting, as it is irreversible beyond two years of age.[9] B4MCN results match this evidence. Stunting under five remains extremely high at over 60%, but severe stunting declined by over 30% among children under two years of age. World Vision's commitment to further strengthen and expand the project during the next phase two, again with the support of the Australian Government through ANCP, should see this trend continue.

Even though the yields of both OFSP and HIB improved by endline, they were still quite low. Further emphasis on dealing with external factors such as climate change needs to be anticipated for future programming, such as using drought resistant varieties of seeds and adhering to cultivation techniques, as taught under the project. Additionally, it is time to introduce other nutrient-dense foods to address existing dietary gaps such as, for instance, eggs and dairy products or nutrient-rich indigenous crops. Ultra-Poor Graduation and Empowered World View proved valuable in contributing to a significant increase in agricultural participation and average income of Batwa and female headed households, though not achieving equality. During the second phase, the project should identify and meet remaining gaps and challenges in maternal and child diets, including better access to more diverse foods, a greater emphasis on children's care, clean water and hygiene, and a strengthened gender focus to put vulnerable women's economic empowerment at the top of the nutrition agenda.

The last 18 months of B4MCN were subject to the volatility of COVID-19 and its effects, including: additional health and workload vulnerabilities for women as primary carers in their household; economic disruptions, as reduced spending and trade limited opportunities to sell surplus produce; and economic resilience as families needed savings and loans not to improve farming or micro-enterprise, but to survive. Project staff also noted COVID-19 led to out-migration from urban to rural areas as jobs and business opportunities reduced. Households affected by these factors modified their diet by consuming less food, reducing food variety or consuming less costly foods that are carbohydrate-rich but nutrient-poor. This posed a risk to project goals as nutrient deficiencies would contribute to chronic malnutrition and a variety of health problems and illness across all age groups. However, project participants appeared to absorb and adapt well to COVID-19 related constraints. Survey respondents were asked to rate on a scale from 1 to 5 the effectiveness of the project in responding to the COVID-19 crisis, and returned an average score of 3.74. Seasonal variations in food availability, and not the COVID-19 economic downturn, remained the primary driver of food insecurity, resulting in undernutrition or children's wasting at particular times of the year. Efforts are needed going forward to create year-round food production and consumption through diversifying income-generating sources and supporting climate-smart agriculture while continuing to monitor the effects of Covid-19.

> **"January, February, March they eat bad because they prepare the agriculture season. July, and August, they focus on the selling the harvest without eating well. During the month of February and March they are preoccupied with seeds and in the month of July and August, they are preoccupied with the search for school materials…"**
>
> Community Nutritionist Key Informant (End Evaluation)

Promising shifts were noted, with the proportion of farmers using some sort of climate-smart practice now at 84%, up from 57% at baseline. Farmers confirmed they had learned these practices through the B4MCN project and associated agricultural extension worker engagement. But more is needed, especially to combat drought, by applying multiple and compatible water conservation and climate-smart techniques.

9 Available at: Nutrition-sensitive agriculture: What have we learned so far? - ScienceDirect (Accessed 14 September 2021)

Table 1: Summary Indicator Table

	End Evaluation			Baseline		
Indicator	**Treatment sites**	**Comparison site**	**Comparison / difference**	**Treatment site**	**Comparison site**	**Comparison / difference**
Prevalence of stunting in children under five years of age	63.8%	59.8%	Not Significantly different, p = 0.079 X2 value= 3.077	61.2%	57.7%	p = 0.11 X2 value= 2.49
Prevalence of wasting in children under five years of age in the targeted areas	3.9%	3.4%	Not Significantly different, p = 0.581 X2 value= 0.305	4.0%	3.8%	p = 0.80 X2 value= 0.063
Prevalence of underweight children under five years of age	30.9%	25.7%	Significantly different, p = 0.013 X2 value= 6.133	30.8%	27.2%	p = 0.073 X2 value= 3.22
Prevalence of wasting in Pregnant Women	19.0%	15.8%	Not Significantly different, p=0.149; X2 value=3.805	8.5%	11.8%	p=0.316 X2=2.30
Prevalence of severe and moderate food insecurity based on the household hunger score	32.1%	41.0%	Not significantly different F = 2.49, p=0.114	10.7%	10.9%	F = 3.55 p=0.061
HH asset index scores	46.82%	41.79%	Significantly different F = 62.295, p<0.001	55.2%	51.7%	F = 27.645 p<0.001
HH income in US$ in the past 12 months	US$271	US$190	Significantly different F = 46.512, p<0.001	US$142	US$116	p=0.6 X2=3.3
Proportion of households where one or more adults are earning an income	38%	41%	Not Significantly different p=0.280 X2=1.166	43.3%	35.7%	p=0.001 X2=10.18
Access to Village Savings Groups	65%	41%	Significantly different P<0.001, X2=79.408	21%	12%	p=0.59 X2=0.30
Proportion of children exclusively breastfed until 6 months of age	83%	75%	Not Significantly different p=0.181 X2=1.786	77.9%	78.9%	p=0.867 X2=0.028
Proportion of children receiving MDD	65%	53%	Not Significantly different p=0.186, X2=1.749	60.2%	50.7%	p=0.015 X2=5.83
Proportion of children receiving Vitamin A capsules	73%	73%	Not Significantly different p=0.812, X2=0.416	39.8%	40.9%	P=0.609 X2=0.261
Proportion of pregnant women receiving MDD-W	35%	21%	Significantly different p<0.001 X2=29.598	24.1%	13.6%	P=0.054 X2=3.71
Consumption of HIB and OFSP-Children	22%	0%	Significantly different p<0.001 X2=126.41	1.8%	0.4%	p=0.003 X2=8.86
Batwa people income in the past 12 months in US$	US$285.5	US$132.1	Not Significantly different F=3.446, p=0.072	57.00	50.80	F=0.736 p=0.306

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For more information, contact:

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