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# VIABLE SWEETPOTATO TECHNOLOGIES IN AFRICA (VISTA)–MOZAMBIQUE

## END OF PROJECT FINAL REPORT

1 October 2014–30 June 2019

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1 October 2014–30 June 2019

**Contract No**: 1235-USAID

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**Project Name**: Feed the Future Mozambique: Viable Sweetpotato Technologies in Africa (VISTA)

**Reporting Period:** 1 October 2014–30 June 2019

**Project Duration**: 4 years, 9 months

**Funding Amount**: $6.25m

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**23 October 2019**

**DISCLAIMER**

This report was made possible through support provided by Feed the Future through the U.S. Agency for International Development, under the terms of Contract No. 1235-USAID. The opinions expressed herein are those of the International Potato Center and do not necessarily reflect the views of USAID or the United States Government.

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# ACRONYMS

| | |
|---|---|
| APEs | *Agentes polivalentes elementares* |
| CBOs | Community-based organizations |
| CHWs | Community health workers |
| CIP | International Potato Center |
| DVM | Decentralized vine multiplier |
| HH | Household(s) |
| HKI | Hellen Keller International |
| IIAM | Instituto de Investigação Agrária de Moçambique |
| M&E | Monitoring and evaluation |
| OFSP | Orange-fleshed sweetpotatoes |
| SDAE | District Services of Economics Activities |
| SDSMAS | District Services of Health, Women and Social Action |
| ToT | Training of trainers |
| USAID | United States Agency for International Development |
| USG | United States Government |
| VAD | Vitamin A deficiency |
| VISTA | Viable Sweetpotato Technologies in Africa |

# EXECUTIVE SUMMARY

The Feed the Future Viable Sweetpotato Technologies in Africa (VISTA) Mozambique project (2014–2019) worked to improve nutrition, food security, and incomes of smallholder farmers with children under 5 years of age and women of reproductive age in Nampula and Zambezia provinces of northern Mozambique through increased production and utilization of vitamin A-rich orange-fleshed sweetpotato (OFSP) varieties. The project had three main objectives, namely to increase:

- Production of OFSP among at least 65,000 direct and 195,000 indirect beneficiary households (HH) through use of productive, locally adapted varieties, quality planting material, and sustainable agricultural practices
- Consumption of OFSP by children under 5 and women in at least 65,000 beneficiary HH vulnerable to vitamin A deficiency (VAD) and other forms of malnutrition
- Agricultural incomes among at least 10,000 HH from sales of OFSP roots in local and urban markets, including fresh root and leaf markets, institutional markets, and commercial processing

The VISTA project was funded by the United States Agency for International Development (USAID) and was led by the International Potato Center (CIP) working in partnership with the Mozambican Agricultural Research Institute (IIAM), District Services of Economic Activities (SDAEs), and District Services of Health, Women and Social Action (SDSMAS), as well as NGOs and community-based organizations. The project was implemented in two phases: a 2-year pilot phase (October 2014–September 2016) and an expansion phase (October 2016–June 2019). In total the project covered 16 districts, 11 in Nampula district and 5 in Zambezia province.

VISTA applied an integrated agriculture-nutrition-marketing approach to introduce and scale up OFSP in the target communities within the Feed the Future's zone of influence (Table 1). During the 5-year implementation period, the project reached 161,700 HH (62% of target) with planting material of nutritious OFSP varieties, sweetpotato agronomy training, and nutrition messages. Although the project fell short of its overall target, it reached **74,000 HH with children under 5, thus exceeding that target by 14%**. However, owing to climate change-related rainfall constraints, shortage of planting material slowed farmer-to-farmer diffusion of planting material. This led to lower than expected number of indirect beneficiaries reached with planting material, which in turn contributed to underachievement on the overall number of HH reached and area under OFSP. Because of this, the project achieved **57% of its target in terms of area under OFSP**. Despite falling short of these two targets, results from project quantitative and qualitative assessments showed that **45% of the direct beneficiaries reached retained OFSP production for at least 1 more year** after receiving vines from the project. This figure is significant given that farmers in northern Mozambique have access to several preferred non-biofortified local sweetpotato varieties and competition for resources from other main crops such as cassava, maize, and beans.

**Table 1. Project achievements towards agriculture-related Feed the Future indicators**

| Feed the Future Indicator | VISTA Custom Indicator | Target | Achievement | % Achieved |
|---|---|---|---|---|
| EG.3.2-17: No. of farmers and others who have applied improved technologies or management practices as a result of USG assistance | No. of HH receiving planting material directly or indirectly (through farmer-to-farmer diffusion) | 260,000 | 161,638 (37% female-headed) | 62% |
| EG.3-1: No. of HH benefiting directly from USG assistance under Feed the Future | No. of farmers who have received OFSP planting materials directly from the project | 65,000 | 73,992 | 114% |

| Feed the Future Indicator | VISTA Custom Indicator | Target | Achievement | % Achieved |
|---|---|---|---|---|
| EG.3.2-1: No. of individuals who have received USG-supported short-term agricultural sector productivity or food security training | No. of farmers who have received sweetpotato agronomy training | 65,000 | 81,609 | 126% |
| EG.3.2-18: No. of hectares of land under improved technologies or management practices with USG assistance | No. of hectares (ha) under OFSP | 10,188 | 5,802 | 57% |

The nutrition component of the project implemented several nutrition education activities aimed at strengthening the nutrition capacity of the health system and caregivers. Accordingly, the project trained **541 health professionals (57% female), which is 91% of the target.** Through nutrition messaging to caregivers by 2,300 trained community health workers aimed at improving their capacity for OFSP utilization for HH nutrition, **94,000 children under 5** were reached. While the project achieved 84% of its target in terms of children under 5 reached, **it exceeded its target by 12%** in terms of children under 2 years reached. The project nutrition education activities resulted in improved dietary practices and increased consumption of nutritious OFSP at HH level. Project survey assessments showed that caregivers from intervention HH **consumed vitamin A-rich foods 33% more frequently** than those from control HH. During seasons of availability, caregivers and children from intervention HH on average **consumed OFSP at least 2.6 days a week, a 150% increase from the baseline.** Using the Hellen Keller International index, **VAD prevalence was 10% and 12% lower for children and caregivers from intervention HH** than their control counterparts, respectively.

**Table 2. Project achievements towards nutrition-related Feed the Future indicators**

| Feed the Future Indicator | VISTA Custom Indicator | Target | Achievement | % Achieved |
|---|---|---|---|---|
| HL.9-4 No. of individuals receiving nutrition-related professional training through USG-supported programs | No. of individuals trained in OFSP and vitamin A nutrition education and counseling skills | 594 | 541 (57% female) | 91% |
| HL.9-1: No. of children under five (0–59 months) reached by USG-supported nutrition programs | No. of children under 5 reached with OFSP | 113,010 | 94,421 (56% female) | 84% |
| HL.9-2: No. of children under two (0–23 months) reached through community-level nutrition intervention through USG-supported program | No. of children under 2 reached with nutrition interventions | 23,010 | 25,695 | 112% |

The marketing component sought to increase farmer incomes from sale of vines and fresh OFSP at least seasonally. Project surveys showed that on average **12% of the OFSP growers sold part of their fresh root produce on the market, an increase from 4% from the baseline**. This is comparable to the white-fleshed varieties for which approximately 14% of farmers who sold on the market was observed from the same surveys. Overall, income obtained from sales of OFSP vines and roots **was estimated at $485,000**, which is 51% of the target. On average, income from OFSP sales was **$128 per HH per season**. OFSP production is still limited to very small plots that meet HH subsistence requirements and limited surplus for the market.

Despite these achievements, the project encountered several challenges and adopted mitigation strategies to ensure that project targets are met. These, and the lessons the technical and management lessons learned over the course of implementation, are presented in the report.

# 1. VISTA–MOZAMBIQUE PROJECT OVERVIEW

## 1.1 Introduction

Malnutrition is a major public health concern in Mozambique. According to the 2011 Demographic Health Survey, 43% of the children aged 0–59 months are stunted due to illness and poor diets. Six out of 11 provinces have very high levels of stunting (>30%); especially the northern provinces of Nampula (55%), Cabo Delgado (53%), Niassa (47%), Zambezia (45%), Tete (44%), and Manica (42%). Deficiencies in micronutrients such as iron, zinc, and vitamin A are quite prevalent. Vitamin A deficiency (VAD) contributes significantly to human blindness, reduced immunity to diseases, and premature death in sub-Saharan Africa. Young children and pregnant or lactating women in particular are at high risk of VAD. In Mozambique approximately 69% of children aged 6–59 months and 11% of mothers suffer from VAD.[1]

The government of Mozambique is committed to addressing malnutrition through both nutrition-specific and nutrition-sensitive approaches. Among the latter approaches, promotion of production and consumption of nutritious biofortified crops is well recognized in government policies and strategies. These include the Multi-Sector Plan to Reduce Chronic Malnutrition in Mozambique, Strategic Plan for the Development of the Agricultural Sector, National Agricultural Investment Plan, and Operational Plan for Agricultural Development.

Among the nutritious biofortified crops that are recognized by the government of Mozambique, orange-fleshed sweetpotato (OFSP), which is rich in beta-carotene (a precursor of vitamin A) is specifically mentioned as one of the entry points for addressing malnutrition in 14 government policy and strategy documents.

The Feed the Future Viable Sweetpotato Technologies in Africa (VISTA) Mozambique project sought to contribute to improved nutrition, food security, and incomes of smallholder farmers through increased production and better utilization of OFSP varieties, especially by those most at risk of VAD (i.e., children under 5 and pregnant and lactating women). The project was funded by the United States Agency for International Development (USAID)–Mozambique and was implemented for 5 years by the International Potato Center (CIP) in partnership with government partners Mozambican Agrarian Research Institute (IIAM), District Services of Economic Activities (SDAEs), and District Services of Health, Women and Social Action (SDSMAS), as well as NGOs, community-based organizations (CBOs), and education and research institutions.

Implementation of the project was done in two phases: an initial 2-year pilot phase (October 2014–September 2016) covering 6 districts and an expansion phase (October 2016–June 2019) that added an additional 10 districts, bringing the total number of districts covered in the two provinces of Nampula and Zambezia to 16 (Table 3).

1. Ministerio da Saúde [MISAU]. 2006. National survey on Vitamin A deficiency, anemia and malaria in children 6–59 months and their mothers (December 2001–February 2002). Maputo, Mozambique: MISAU Nutrition Division & Instituto Nacional de Estadística.

**Table 3. Project districts for the pilot and expansion phase**

| Province | Pilot Phase (2014–2016) | Expansion Phase (2016–2019) |
|---|---|---|
| Nampula | Nampula-Rapale, Monapo, Meconta, Murrupula | |
| | | Mecuburi, Mogovolas, Moma, Larde, Malema, Angoche |
| Zambezia | Alto Molocue, Gurué | |
| | | Mocuba, Gilé, Nicoadala |

## 1.2 Project Goal and Objectives

The overall goal of VISTA–Mozambique was to contribute to improved nutrition, food security, and incomes of smallholder farming families through increased production and better utilization of OFSP varieties, especially by those most at risk of VAD: children under 5 years and pregnant and lactating women. This VISTA goal and its objectives articulated below are aligned to the two main objectives of Feed the Future in Mozambique: (1) inclusive agriculture sector growth and (2) improved nutritional status of Mozambicans, especially children under 5 and pregnant and lactating women.

Accordingly, the specific project objectives and key activities that were implemented to achieve each of them were as follows:

**Objective 1:** Increased production of OFSP among at least 65,000 direct and 195,000 indirect beneficiary households (HH) through use of productive, locally adapted varieties, quality planting material, and sustainable agricultural practices This was achieved through a number of major activities including:

- Multiplication of planting materials of five improved OFSP varieties (establishment or expansion of nurseries and training of multipliers)
- Farmer-led varietal demonstrations ("Mother–Baby trial" methodology) and selection of preferred varieties
- Marketing and distribution of quality planting materials of preferred varieties to at least 65,000 direct beneficiary HH with children under 5 and farmer-to-farmer diffusion to 195,000 indirect beneficiary HH
- Farmer training in sweetpotato agronomy and conservation of planting material
- Operational studies to determine factors affecting production of OFSP among resource-poor HH

**Objective 2:** Increased consumption of OFSP by children under five years of age and women in at least 65,000 beneficiary HH vulnerable to VAD and other forms of malnutrition. Major activities included:

- Training of nutrition staff from the government and NGOs in nutrition education and counseling with a focus on micronutrient-rich foods and utilizing OFSP as complementary food
- Implementation of nutrition education and counseling modules in at least 400 communities in target districts, reaching at least 65,000 beneficiary HH with children under 5
- Development and promotion of recipes and guidelines for HH-level OFSP utilization as a healthy food for all, with specific focus on children under 5
- Broad education campaigns on nutrient-rich foods, including OFSP, through government health sector
- Operational studies of factors affecting utilization of OFSP as complementary food for infants

**Objective 3:** Increased agricultural incomes among at least 10,000 HH from sales of OFSP roots in local and urban markets, including fresh root and leaf markets, institutional markets, and commercial processing. Major activities included:

- Training and equipping farmers and traders for improved handling, packaging, and transport of fresh roots and leaves

- Facilitation of OFSP market days in selected fresh markets to increase visibility of OFSP and other nutritious foods grown locally
- Production and promotion of OFSP puree for use in school and community demos and educational activities
- Technical and management support for utilization of OFSP puree in commercial food processing, specifically in local bakeries
- Demand creation and consumer education campaigns to promote OFSP and derived products for healthier diets

## 1.3 Project Implementation Approach

### 1.3.1 Project management structure

The VISTA project was coordinated by CIP and implemented in partnership with government partners IIAM, SDAEs, and SDSMAS, education institutions (University of Eduardo Mondhlane), NGOs (World Vision, CLUSA, LVIA), and CBOs.

During the first year of the expansion phase (Year 3, quarter 2), the project recruited additional staff to strengthen the team to match the expanded scope of the project. The staff included internationally recruited project manager and senior monitoring and evaluation (M&E) coordinator, and nationally recruited finance and administrative staff, M&E assistants, agronomists, and nutritionists. In addition to the project staff, the project team was supported by senior technical staff based at the CIP country office in Maputo. When needed we received support from senior nutritionist, food scientist, communications specialist, and project management unit based at CIP's regional office in Nairobi; the sweetpotato global leader; and CIP's Lima, Peru headquarters. Figure 1 presents the organogram of the project.

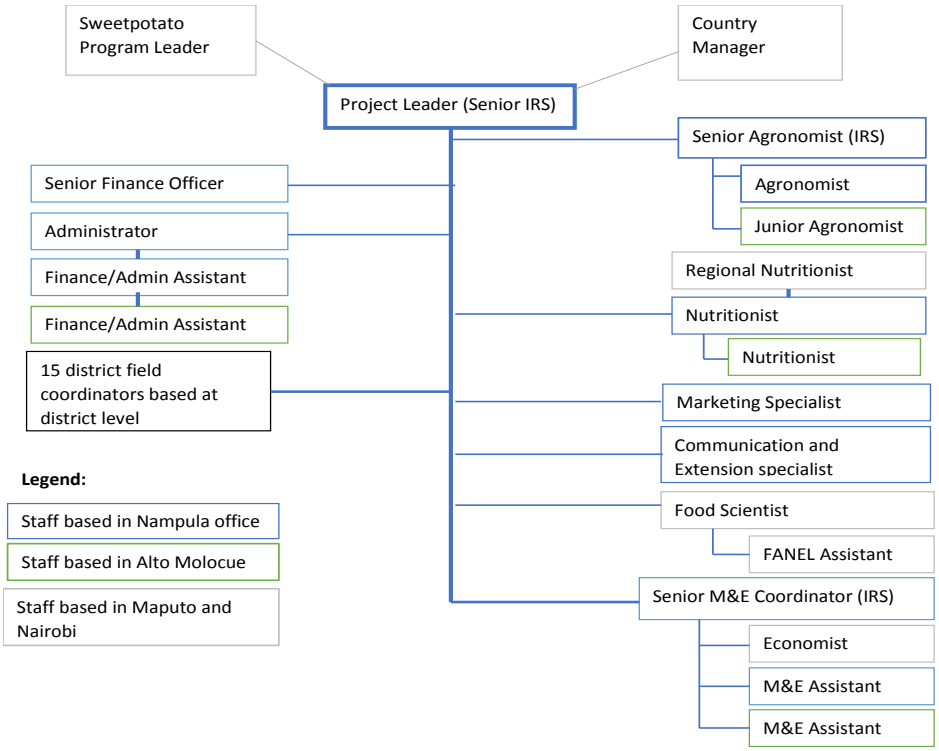



*Figure 1. VISTA project organogram.*

Overall project coordination was being conducted from the main project office, based in at the IIAM-Nampula campus. Having the VISTA office on IIAM premises not only enabled staff to better control the production of vines and facilitate irrigation of field plots and the nethouse on-station, but also provided opportunities for liaison with the key project's key partner, IIAM. A field office was established in Alto Molocue, Zambezia to coordinate activities in the five districts in Zambezia. In addition to the project staff based at the two project offices, the project hired 10 field coordinators who were based at the district SDAE offices and worked closely with government agriculture and health offices under the supervision of experienced agronomists based in Nampula and Alto Molocue. The field coordinators were responsible for leading project activities at district level; liaising with partners; supporting data collection; providing technical backstopping to decentralized vine multiplier (DVMs), OFSP growers, and extension workers; supporting training and awareness-building events; and identifying marketing and OFSP business opportunities for VISTA beneficiaries.

### 1.3.2 The integrated agriculture-nutrition-marketing approach

The implementation approach of the VISTA project was based on an integrated framework that combines agriculture, nutrition education, and marketing interventions to create demand and supply cycle for expanding the production and utilization of OFSP (Fig. 2). Proof-of-concept research has shown that such an integrated approach can have significant positive influence on vitamin A intake and status of young children. Much of this research was conducted in Mozambique.[2] This approach maximizes the utilization of OFSP as a nutritious

2. Low, J., M. Arimond, N. Osman, B. Cunguara, B. Zano, and D. Tschirley. 2007. A Food-Based Approach Introducing Orange- Fleshed Sweet Potatoes Increased Vitamin A Intake and Serum Retinol Concentrations in Young Children in Rural Mozambique. *The Journal of Nutrition* 137(5):1320–1327.

Low, J., M. Arimond, N. Osman, B. Cunguara, B. Zano, and D. Tschirley. 2007. Ensuring the supply of and creating demand for a biofortified crop with a visible trait: Lessons learned from the introduction of orange fleshed sweetpotato in drought prone areas of Mozambique. *Food and Nutrition Bulletin* 28 (2).

food source by resource-poor HH to improve their ability to provide adequate nutrition to their vulnerable members. OFSP provides an entry point for support to empower caregivers to their change dietary behavior and enable farmers to produce more nutritious foods locally.

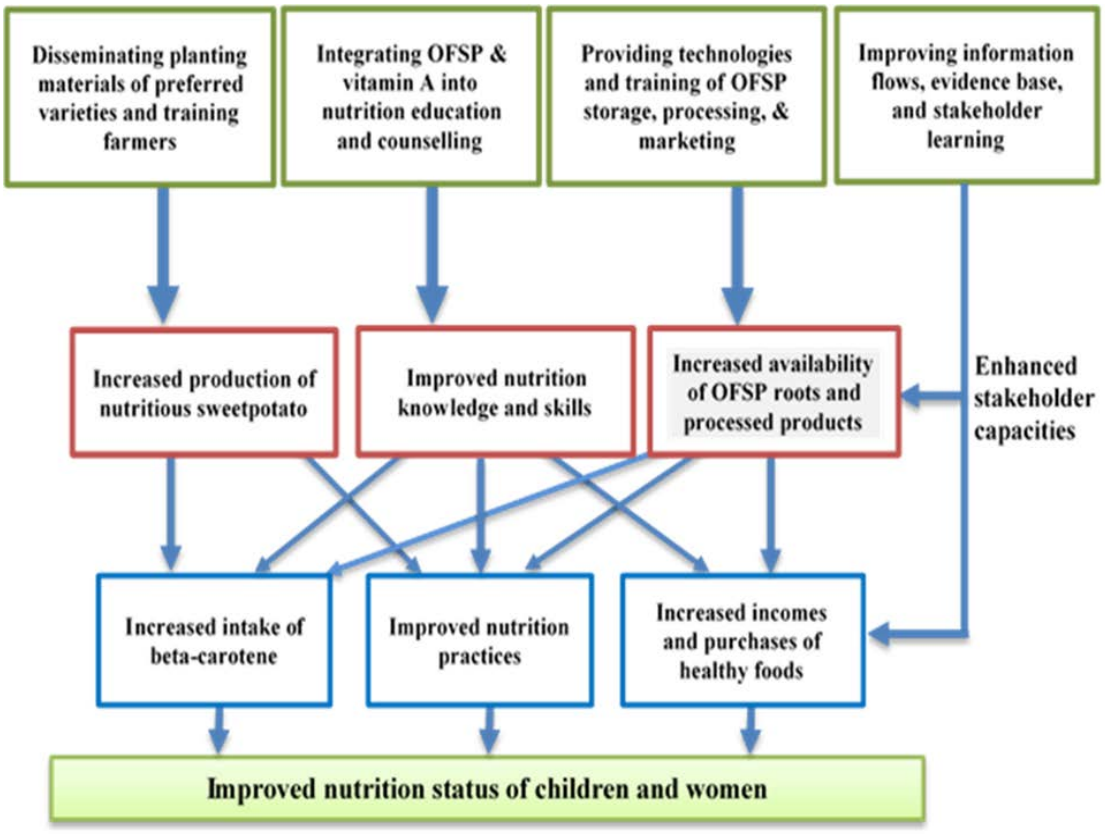



*Figure 2. The integrated agriculture-nutrition-marketing approach.*

The rationale underlying each of the three components and how they were rolled out are summarized below:

## Agriculture Component

By the beginning of the VISTA project, CIP, in collaboration with IIAM, had released and distributed 15 drought-tolerant OFSP varieties: 'Ininda', 'Tio Joe', 'Amelia', 'Bela', 'Jane', 'Cecilia', 'Gloria', 'Delvia', 'Sumaia', 'Irene', 'Melinda', 'Lourdes', 'Namanga', 'Victoria', and 'Esther'. Six of these varieties are widely adapted to multiple environments and 9 are adapted to specific environments. The focus of this component was on multiplication and distribution of these varieties to farmers.

To ensure timely access to and sufficient quantities of quality planting material, the project identified and trained DVMs who served as the primary vehicle for ensuring adequate supply of planting material at the beginning of every season for distribution to target HH. Each DVM was provided virus-free planting material and training on both rapid and conventional multiplication techniques, as well as material and logistical support for construction of on-farm net tunnels and irrigation systems to support multiplication of quality planting material.

To ensure farmers' timely access to quality planting material, the project applied the "1-2-3 multiplication system" developed by CIP and partners. The system was based on clean planting material from the research

station (IIAM) which was then multiplied in three stages from the central primary multiplication center on-station to DVMs who were the local source of quality planting material for farmers. A significant number of the DVMs had access to lowlands for vine multiplication. Those without access to lowlands but with access to water source and were interested in vine production were supported by the project with low-cost irrigation systems to support off-season multiplication of vines. Each DVM was a lead farmer with minimum conditions to establish a multiplication plot of approximately 1,500 x 2,000 $m^2$ to produce enough planting material to distribute to about 200–300 HH around him or her.

Farmer organizations and other local CBOs played a key role in the process of multiplication and dissemination of clean planting material to their members. These groups received planting material from DVMs for further multiplication and dissemination to their members and neighbors (the third tier in the system).

Besides the trainings and material support, the DVMs were given technical backstopping support by project district-level field coordinators. These field coordinators, jointly with SDAEs, DVMs, and women groups, selected and mobilized target HH with children under 5. These HH received OFSP vines sourced from the nearby DVM and were trained in sweetpotato agronomy and nutrition at the DVM field site by the VISTA project team working in collaboration with SDAEs, DVMs, women groups, and community health workers (CHWs).

In the project pilot phase, each beneficiary HH received 6 kg of 2 or 3 varieties. In the expansion phase, however, the project increased the initial distribution to 8 kg of 2 or 3 varieties from the 15 released varieties to each of the target HH. This was enough material to plant an initial average area of 0.012 ha (120 $m^2$) using conventional planting spacing of 90 cm between ridges and 30 cm within the ridge, with the possibility of further area expansion to about 300–400 $m^2$ at the end of each season using planting material conserved on-farm from the distributed material. Distribution of planting material to direct target HH was done through a voucher system. After being trained on agronomy and nutrition, the selected HH were issued vouchers by the project, which were redeemed at a nearby DVM who would in turn be paid by the project. The direct beneficiary HH were strongly encouraged to share the knowledge they acquired from the trainings and the OFSP planting materials they received with their neighbors. Each indirect beneficiary was expected to share planting material with three other farmers.

### Nutrition Component

This component focused on demand creation and empowerment through knowledge. At village level, the principal caregivers, both women and men, were provided nutrition education aimed at increasing knowledge and changing attitudes and practices on nutrition broadly and vitamin A in particular. The nutrition education activities were particularly targeted at improving infant and young child-feeding practices and increasing consumption of OFSP as part of diversified healthier diets. Demand creation efforts focused on building awareness among the broader community to create demand for the OFSP varieties and their derivatives, demand for other vitamin A-rich foods, and a supportive environment to accelerate behavior change at HH level.

The nutrition behavior change strategy that was used consists of multiple complementary strategies. One approach involved formal training of trainers' (ToT) workshops targeting nutrition professionals—mainly nurses and nutrition officers from health centers in the target districts. Participants were given a theoretical training on nutrition from the ToT manual on "Everything You Ever Wanted to Know about Sweetpotato." The training also included a practical component, in which participants were practically trained on how to prepare different OFSP-based products. The trained health professionals stepped down the training to *agentes polivalentes elementares* (APEs) who are community-based nutrition promotors under the Ministry of Health. In

turn, the agents cascaded down the training to CHWs or animators who in turn trained HH. Each APE or promotor trained 15–20 animators, who then each trained 15–20 beneficiary HH. Animators trained beneficiary HH through nutrition counseling sessions and cooking demos to teach participants how to prepare OFSP-based recipes using locally available foods.

The second approach used DVMs as learning centers for dissemination of nutrition messages. When farmers came to redeem their vouchers, they were also given information on OFSP production, processing, and nutrition. In addition to the aforementioned approaches, the project used broad nutrition education campaigns through radio and market promotion days to pass nutrition messages at large scale. During the market day promotion events, cooking demos were also conducted and participants tasted OFSP-based dishes and were issued leaflets and flyers with the recipes for reference at their homes. The recipes included OFSP juices, bread, porridge, biscuits, and leaves.

Other promotion materials that were distributed included *capulanas*, T-shirts, and caps, most of which were distributed during the aforementioned trainings and promotion events.

### Marketing Component

This component was aimed at developing markets for OFSP roots and processed products. It included operational market assessment studies on the OFSP seed, roots, and processed products value chains to characterize and map the main chain actors; linkages in the chain; and identify entry points for strengthening the OFSP chains. The findings of the studies were critical in identifying the main sweetpotato traders, vine buyers (root producers and institutional buyers), and the trends in demand for vines and roots. This was key for linking root producing farmers to traders and vine multipliers to buyers, and informing consumers on where they can purchase OFSP. Thus, generated demand combined with market development stimulates production, enhances producer income, and spreads the health benefits of OFSP to a wider population, all of which contribute to farmers' willingness to retain and expand OFSP production. Demand for OFSP is enhanced if profitable processed products using OFSP as a major ingredient are developed and farmers are linked to the processors. One of the operational market studies assessed the feasibility of processing commercially viable OFSP-based products in partnership with private sector.

Given the remoteness and relatively poor market access of several VISTA project districts, marketing activities focused on few districts where chances of commercialization were highest. Accordingly, the project's main focus districts for marketing activities were Nampula city, Rapale, Monapo, Murrupula, Meconta, Gurué, Alto Molocue, and Mocuba. In these districts, producer HH were supported to produce surplus OFSP for the market, mainly organized in associations or groups and located in high productivity areas close to the main roads and urban centers. The main activities the project implemented to expand market opportunities for OFSP include creation of broad awareness of the nutrition benefits and provision of market information on availability of OFSP roots through radio; facilitation of OFSP market days; facilitation of supply chains for OFSP processing by private sector food processors; and support to marketing of OFSP planting material by DVMs to stimulate demand for OFSP planting material through demos, field days, and community-level nutrition education.

## 1.4 Project Theory of Change

The project's theory of change (Fig. 3) assumed a broad-based partnership involving government, private sector, and development partners could be engaged in the development and delivery of OFSP.

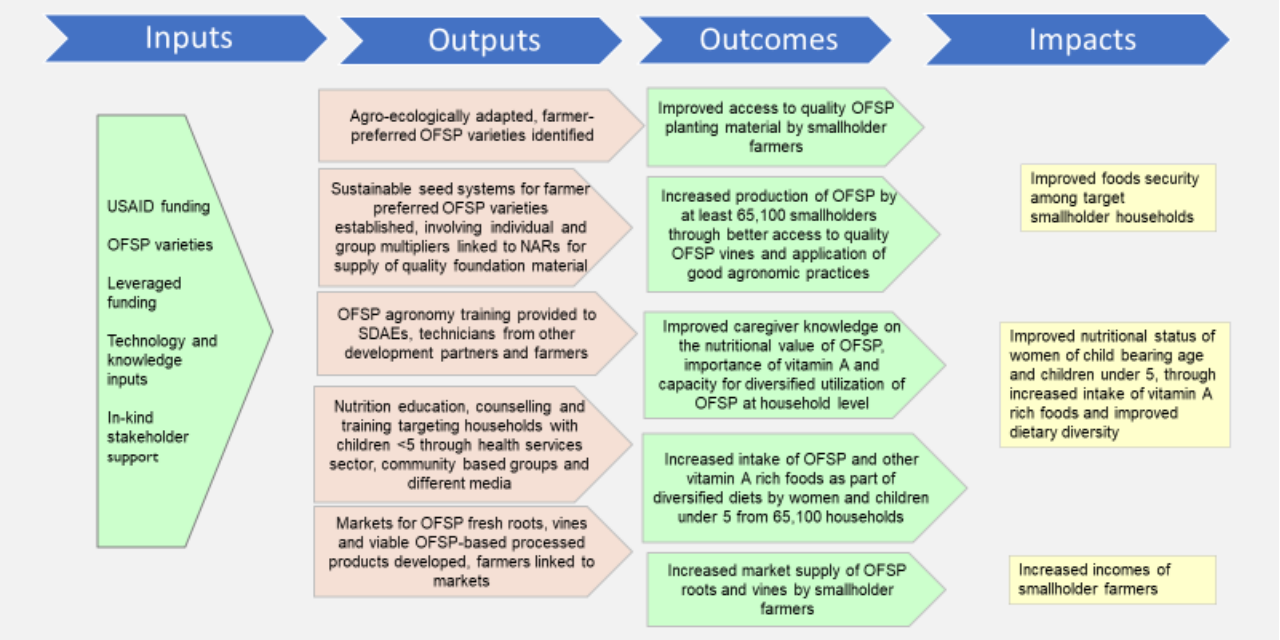



*Figure 3. VISTA project theory of change.*

The VISTA project goal was to contribute to improved nutrition status of women of child-bearing age and children under 5 from smallholder HH through increased production and consumption of vitamin A-rich OFSP varieties. The achievements of the project at the output, outcome, and impact levels were assessed through a robust M&E framework that tracked target feed the Future indicators and relevant VISTA project custom indicators. The framework included HH surveys which were conducted to generate evidence of change at the outcome and impact levels. Accordingly, the evidence of change at output and impact levels is presented in sections 2 and 3, respectively.

# 2. PROGRESS TOWARD ACHIEVEMENT OF PROJECT OBJECTIVES

The VISTA project contributed to the key Feed the Future objectives in agriculture and nutrition, including increased and equitable growth in the agriculture sector, and improved consumption of vitamin A-rich foods by young children and pregnant and lactating women. Accordingly, the project developed and implemented a rigorous monitoring, education, and learning plan to monitor the relevant Feed the Future and VISTA custom indicators for agricultural production, nutrition, incomes, and gender. In this section we report the project achievements against the targets. The initial targets were for a project duration of 7 years; but following the reduction to 5 years, the targets were adjusted to correspond to the 5-year implementation period. In this section, the project achievements are reported against these adjusted targets.

## 2.1 Objective 1: Increased production of OFSP among at least 65,000 direct and 195,000 indirect beneficiary HH through use of productive, locally adapted varieties, quality planting material, and sustainable agricultural practices

Objective 1 was the cornerstone of the VISTA project intervention. It focused on introducing and testing adaptability of OFSP varieties and establishing a strong seed system to ensure farmers' access to quality planting material of adapted varieties.

VISTA was monitoring four key agriculture-related Feed the Future indicators:

- EG: 3.2-17: No. of farmers and others who have applied improved technologies
- EG.3-1: No. of HH benefiting directly from USG assistance under the Feed the Future program
- EG: 3.2-1: No. of individuals who have received USG-supported short-term agricultural productivity or food security training
- EG.3.2-18: No. of hectares of land under improved technologies

### 2.1.1 Number of HH who received OFSP planting materials directly and indirectly

As shown in Table 4, the project directly reached 73,992 HH (55% female-headed) with quality planting material of nutritious OFSP varieties, which is 14% higher than the target. The overachievement on this indicator was due to the high demand for planting material by HH, with some unexpected HH who turned up for training events showing interest to also get vines. Planting material was distributed through a network of DVMs established by the project in all intervention districts. Each HH received 8 kg of planting material, enough to plant on 120 m$^2$. However, farmers usually multiply this initial planting material and expand the area by at least two or three times depending on availability of land, labor, and moisture.

**Table 4. Project achievements toward number of HH reached with OFSP directly and indirectly**

| Feed the Future Indicator | VISTA Custom Indicator | Target | Achievement | % Achieved |
|---|---|---|---|---|
| EG.3.2-17: No. of farmers and others who have applied improved technologies or management practices as a result of USG assistance | No. of HH receiving planting material directly and indirectly (through farmer-to-farmer diffusion) | 260,000 | 161,638 (37% female) | 62% |
| EG.3-1: No. of HH benefiting directly from USG assistance under Feed the Future | No. of farmers who received OFSP planting materials directly from the project | 65,000 | 73,992 (55% female-headed) | 114% |

Based on CIP's experience in Mozambique and other countries, the direct beneficiaries were expected to share planting material with three other farmers. Considering farmer-to-farmer diffusion of planting material and knowledge-sharing, the project expected to reach an overall target of 260,000 HH. However, as Table 4 shows, the project only reached 62% of the target, as direct beneficiaries shared with on average two HH, not the expected three HH. This could be attributed to the fact that, owing to climate change-related rainfall constraints, direct beneficiaries were not able to conserve enough material from the initial 8 kg they obtained from the project to be able to share with many other farmers. They therefore shared with fewer HH or used the conserved material to expand their own OFSP plots.

### 2.1.2 Number of farmers trained in sweetpotato agronomy

To ensure that the beneficiary farmers plant the sweetpotato crop correctly after receiving planting materials, the project delivered short-term trainings to the farmers. As shown in Table 5, like the number of HH reached with planting material, **the number of farmers who received short-term training exceeded the target due to the high demand for both planting material and training by farmers**. These trainings enabled farmers to correctly plant sweetpotatoes on ridges using the correct plant spacing, thereby increasing yields. Through these trainings farmers learned basic principles of sweetpotato agronomy, crop rotation, and soil fertility that culminated in yield improvements in the project intervention areas.

**Table 5. Project achievements toward number of HH reached with OFSP directly and indirectly**

| Feed the Future Indicator | VISTA Custom Indicator | Target | Achievement | % Achieved |
|---|---|---|---|---|
| EG.3.2-1: No. of individuals who have received USG-supported short-term agricultural sector productivity or food security training | No. of farmers who have received sweetpotato agronomy training | 65,000 | 81,609 (46% female) | 126% |

### 2.1.3 Area under OFSP

Findings from our HH survey showed that the average area under OFSP per HH was 0.036 ha. Considering both direct and indirect beneficiaries, the total area under OFSP as a **result of the project was estimated at 5,800 ha, which is 57% of the target** (Table 6). The reason for this underachievement is twofold. First, the direct beneficiary HH did not expand the area as much as expected, presumably because of challenges with conservation of planting material and competition for resources (land, labor) from other crops. Second, the project did not reach the expected number of indirect beneficiaries for reasons stated earlier.

**Table 6. Project achievements toward area under OFSP**

| Feed The Future Indicator | VISTA Custom Indicator | Target | Achievement | % Achieved |
|---|---|---|---|---|
| EG.3.2-18: No. of hectares of land under improved technologies or management practices with USG assistance | No. of hectares under OFSP | 10,188 | 5,802 | 57% |

### 2.1.4 Number of multipliers of OFSP planting material established

During the reporting period, the project established 175 DVMs with a total area of 35 ha across the project target districts (Table 7). The project aimed to establish 357 multipliers and achieved almost 50% of that target. The reason for this underachievement is that, when the target was set at the project design phase, the model was to have a network of small individual DVMs, with an area of approximately 1,500 $m^2$ and able to produce enough planting material to reach 200–300 HH in their vicinity. However, during project implementation this model was adjusted by introducing in the districts with high sweetpotato potential bigger individual multipliers and group multipliers with large areas (up to 2 ha). These DVMs were further supported with irrigation and technical backstopping from the project and were able to produce larger quantities of material to reach many HH. This meant that there was no need to establish many small DVMs to meet the demand for planting material to distribute to target HH.

**Table 7. Project achievements toward number of vine multipliers established**

| Feed the Future Indicator | VISTA Custom Indicator | Target | Achievement | % Achieved |
|---|---|---|---|---|
| EG.3.2-17: No. of farmers and others who have applied improved technologies or management practices as a result of USG assistance | No. of farmers operating as multipliers of OFSP planting material | 357 | 175 | 49% |

To ensure quality of planting material, the project collaborated with the national seed inspectorate to inspect and certify those DVMs meeting the standards. The inspection process started in year 5, and 47 DVMs were certified as sweetpotato seed multipliers. It is uncertain, however, whether the inspection process will continue beyond the project.

## 2.2 Objective 2: Increased consumption of OFSP by children under 5 and women in at least 65,000 beneficiary HH vulnerable to VAD and other forms of malnutrition

VISTA project was monitoring three key nutrition-related Feed the Future indicators:

- HL.9-4 No. of individuals receiving nutrition-related professional training through USG-supported programs
- HL.9-1: No. of children under 5 (0–59 months) reached by USG-supported nutrition programs
- HL.9-2: No. of children under 2 (0–23 months) reached through community-level nutrition intervention through USG-supported programs

The targets and achievements for these and related custom indicators are presented in Table 8 and discussed in detail in the subsequent sections.

### 2.2.1 Number of individuals reached with nutrition-related professional trainings

During the project period, the VISTA nutrition team, with technical backstopping from the CIP regional nutritionist, conducted three ToT workshops in which **541 health professionals (57% female) were trained.** As such, the project attained **almost 90% of its target on this indicator** (Table 8). The trained professionals included nurses, nutrition focal points, and health promoters (APEs). The intensive trainings focused on standardizing nutrition materials, targeting nutrition messages to particular groups, basics of counseling, training techniques, ante- and postnatal care, importance of the first 1,000 days in the life of a child, infant and young child-feeding practices, and diet diversification. In addition to the theoretical component, each training included a practical component in the form of a cooking demo in which participants were trained on how to prepare OFSP-based products such as porridge, juice, bread, biscuits, and other recipes that incorporate OFSP into local diets.

**Table 8. Project achievement on nutrition-related professional training**

| Feed the Future Indicator | VISTA Custom Indicator | Target | Achievement | % Achieved |
|---|---|---|---|---|
| HL.9-4 No. of individuals receiving nutrition-related professional training through USG-supported programs | No. of individuals trained in OFSP and vitamin A nutrition education and counseling skills | 594 | 541 (57% female) | 91% |

The trained health professionals stepped down the training to CHWs (animators). Theoretically, each trained professional was supposed to train 15–20 animators, and each animator in turn recruits and trains 15–20 HH. In reality, however, some of the trainees did not conduct the step-down trainings as expected, especially the nurses and promoters who after the training continued to focus on their routine health center programs on health and less on nutrition delivery. Accordingly, during the project period, the project trained 2,285 animators on nutrition. And although APEs are government employees of the Ministry of Health and are paid by government, animators are volunteers who received no pay from government or VISTA. The project did provide modest incentives such as VISTA-branded T-shirts, capulanas, caps, and edible oil to motivate them.

### 2.2.2 Number of children under 5 and under 2 years reached

Children under 5 years were the primary target beneficiaries of the project, which had the objective of improving their nutritional status through increased consumption of nutritious OFSP as part of healthier diets. Trained animators were quite critical in the direct delivery of nutrition messages to caregivers. Animators, with the support of promoters and project field coordinators, jointly identified, selected, and registered beneficiary HH who were provided short-term training in both agronomy and nutrition and received OFSP planting material. The animators were responsible for mobilizing HH with women of reproductive age and children under 5 for targeting with vine dissemination, agronomy, and nutrition training. In addition to leading regular nutrition education and awareness campaigns in target communities, animators, jointly with promoters and project staff, provided sweetpotato agronomy and nutrition training to selected beneficiary HH during vine dissemination at DVM sites. This strategy was employed to ensure that project beneficiary HH receive a complete intervention package that includes agronomy and nutrition training and planting materials.

The broad community-based nutrition education campaigns led by animators, with support from trained health professionals and VISTA project nutritionists, included nutrition counseling sessions, mother–baby health clubs at district health centers, and community cooking demos to train caregivers on how to integrate OFSP into locally produced and consumed foods. Approximately 1,200 counseling cards were printed and distributed to health promoters and animators to use as job aids in nutrition counseling sessions.

Through dissemination of OFSP planting materials and nutrition messaging to caregivers, 94,421 children under 5 (27% of them under 2) were reached (Table 8). The project achieved 84% of its target in terms of number of children under 5 reached and exceeded the target number of children under 2 reached by 12%. Although not consistently, the project also used radio spots for nutrition messaging using community radio stations in Portuguese and a local language, Macua.

**Table 9. Project achievement on children under 5 and under 2 years reached**

| Feed the Future Indicator | VISTA Custom Indicator | Target | Achievement | % Achieved |
|---|---|---|---|---|
| HL.9-1: No. of children under 5 (0–59 months) reached by USG-supported nutrition programs | No. of children under 5 reached with OFSP | 113,010 | 94,421 | 84% |
| HL.9-2: No. of children under 2 (0–23 months) reached through community-level nutrition intervention through USG-supported programs | No. of children under 2 reached with nutrition interventions | 23,010 | 25,695 | 112% |

## 2.3 Objective 3: Increased agricultural incomes among at least 10,000 HH from sales of OFSP roots in local and urban markets, including fresh root and leaf markets, institutional markets, and commercial processing

Increasing income from marketing of OFSP and its derivatives is critical for expanding and sustaining production of OFSP by smallholder farmers. To this end, creating demand for both OFSP fresh roots and vines was a key objective of the project. While income from OFSP marketing provides an incentive for sustaining adoption of OFSP and directly contributes to nutrition through increased HH intake of OFSP, the income from OFSP sales also allows HH to afford and access other foods needed to meet their nutrition requirements.

Under this component, several activities were conducted to create demand for OFSP, including market-level promotion events to increase the visibility of OFSP, consumer education campaigns to promote OFSP and derived products, strengthening linkages of OFSP roots and vine producers to markets, and promotion of commercial processing of OFSP puree for local bakeries.

VISTA project was monitoring two key market-related Feed the Future indicators:

- EG.3.2-19: Value of smallholder incremental sales generated with USG assistance (thousands of dollars)
- EG.3.2-20: No. of for-profit private enterprises, producer organizations, water-user associations, women's groups, trade and business associations, and CBOs that applied improved organization-level technologies or management practices with USG assistance

### 2.3.1 Value of incremental sales (collected at farm level) attributed to USG assistance

As to the indicator "value of incremental sales attributed to USG assistance," **the project achieved only about 50% of its target** (Table 10). We attribute this underachievement to the fact that most beneficiary HH produced OFSP on very small plots, which produce enough for HH consumption with no surplus production to sell on the market. Results from HH surveys conducted by the project showed that the average area under OFSP per HH was 0.036 ha and only 12% of the intervention HH sold OFSP on the market. Most of the sweetpotato marketing occurred in the districts of Nampula city, Meconta, Murrupula, and Gurué, which were high sweetpotato-producing areas with easy access to roads and urban markets. Markets were very localized, with most farmers and traders selling on roadside and local markets. On the basis of weekly monitoring data collected by the project from major sweetpotato markets in project intervention districts, farmers and traders did not differentiate the price of OFSP roots from cream- and white-fleshed varieties. Although the market share for sweetpotatoes is generally still dominated by the white-fleshed varieties, the early-maturing OFSP varieties such as 'Melinda' are widely available on the market before the white-fleshed varieties are ready for harvest.

**Table 10. Project achievement on value of incremental sales**

| Feed the Future Indicator | VISTA Custom Indicator | Target | Achievement | % Achieved |
|---|---|---|---|---|
| EG.3.2-19: Value of incremental sales (collected at farm level) attributed to USG assistance | $/year income from OFSP sales (thousand USD) | 949 | 485 | 51% |

### 2.3.2 Number of private enterprises (for profit), producer organizations, water-user associations, women's groups, trade and business associations, and CBOs that applied improved technologies or management practices as a result of USG assistance

Farmer organizations and other local CBOs played a key role in the multiplication and dissemination of clean planting material to their members. During the project period, **135 associations and CBOs engaged in OFSP vine multiplication, which is 44% above the** target (Table 11). This overachievement could be attributed to the high demand for OFSP vines by many institutional buyers, including NGOs and government programs implementing agriculture and nutrition programs. These groups received planting material from DVMs for further multiplication and dissemination to their members and neighbors. Although only 16% of the individual DVMs were women, **the group multipliers had a fair representation of women, with 56% of the members of the group multipliers being female**.

**Table 11. Project achievement on number of profit enterprises that applied improved technologies as a result of USG assistance**

| Feed the Future Indicator | VISTA Custom Indicator | Target | Achievement | % Achieved |
|---|---|---|---|---|
| EG.3.2-20: No. of private enterprises (for profit), producer organizations, water-user associations, women's groups, trade and business associations, and CBOs that applied improved technologies or management practices as a result of USG assistance | No. of associations applying OFSP | 94 | 135 | 144% |

The project trained 31 individuals representing trading enterprises and farmer organizations in postharvest and marketing skills. Topics covered in the training included the nutritional benefits, uses, and transformation of OFSP into value-added products; harvest and postharvest practices to prolong shelf life; marketing and packaging; and entrepreneurship.

The eight groups of DVMs were established in the districts of Alto Molocue, Gurué, Meconta, Monapo, Mecuburi, Mocuba, Murrupula, and Nampula city. These districts were selected for establishment of group DVMs based on potential in sweetpotato production and proximity to markets. Some of these group DVMs were linked to the market where they sold both roots and vines. Two examples were the group of DVMs in Mocuba that supplied 10 tons of planting material to an organization that distributed planting material to victims of tropical Cyclone Idai, and the group of DVMs in Monapo that was linked by the project and supplied planting material to an international NGO, Lvia, to supply OFSP planting material to their beneficiaries in three districts in the costal districts of Nampula province.

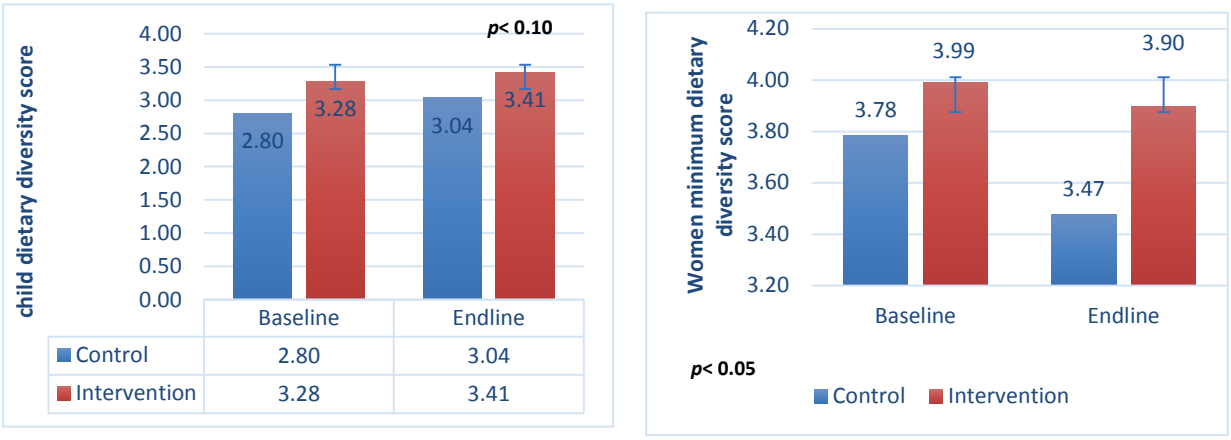
# 4. EVIDENCE OF CHANGE: FINDINGS OF VISTA HH SURVEYS

Section 2 of the report presented the project achievements against the Feed the Future indicators target. The reported indicators are at activity and output level of the impact pathway shown in Figure 3 (page 8). Data on those indicators were collected through regular project M&E activities that tracked these indicators and generated insights which informed project implementation decisions. However, as the goal of the VISTA project was to contribute to improved nutritional status of women of reproductive age and children under 5, the project also implemented surveys to generate empirical evidence on the extent to which these project activities and outputs impacted key nutrition-related outcomes along the impact pathway. Accordingly, a baseline survey of 660 HH from the six pilot districts was implemented in 2015. The survey sought to measure the baseline conditions for tracking progress and impact of the project and inform the selection of target communities for the project. Similarly, the project conducted an endline survey in June 2019 covering 450 HH to use for comparison with the baseline to verify evidence of change on the key outcome and impact indicators.

The two surveys were meant to answer the question: to what extent did the introduction of OFSP varieties along with nutrition education through the VISTA project result in improved dietary practices in terms of increased dietary diversity and intake of vitamin A-rich foods, including OFSP among caregivers and children under 5? To answer this question, both the baseline and endline survey used a structured questionnaire that was administered to the caregivers to collect data on HH socioeconomic characteristics; sweetpotato production; caregiver nutrition knowledge, attitudes, and practices; food security; caregiver and child dietary diversity; and frequency of consumption of vitamin A-rich foods. This section presents results on the evidence of impact of the project on nutrition outcomes for caregivers and children under 5, the main target groups for the project.

## 4.1 Changes in Child and Woman (Caregiver) Dietary Diversity

Using 24-hr recall data and eight food groups recommended by the World Health Organization for children and 10 food groups recommended by the UN's Food and Agriculture Organization (FAO) for adults (FAO 2014), the child and women (caregiver) dietary diversity scores were computed. The results presented in Figure 4 show that for both control and intervention HH, child dietary diversity increased between the baseline and endline periods. At the endline, however, the children from intervention HH had significantly ($p$<0.10) higher dietary diversity score than those from their control counterparts. Women's dietary diversity results showed that compared with the baseline, dietary diversity for women declined at the endline for both control and intervention HH, but the women from intervention HH still had significantly higher ($p$<0.05) dietary diversity score than those from control HH.




**(a)** **(b)**

*Figure 4. Comparison of dietary diversity score for children under 5* **(a)** *and women* **(b)** *at baseline and endline.*

## 4.2 Changes in Intake of Vitamin A-rich Foods

Total vitamin A intake for children and caregiver was computed using the Helen Keller Index.[3] Figure 5 shows that for both control and intervention HH, vitamin A intake for children increased from baseline to endline. But the endline children from intervention HH had a significantly higher ($p$<0.05) intake of vitamin A-rich foods than their control counterparts. Despite the improvement in vitamin A intake for both control and intervention groups, the results imply that VAD is still a major problem in both groups, with 80% and 70% of the control and intervention children classified as VAD, respectively.

A trend similar to that of children is observed among women (caregivers). Intake of vitamin A-rich foods increased for women from both control and intervention HH, although those from intervention HH having significantly higher ($p$<0.00) intake of vitamin A-rich foods at the endline. At the endline, women from the intervention HH consumed vitamin A-rich foods 33% more often than those from control HH. Despite the improving trend, however, women from both control and intervention groups remain at high risk of VAD,

3. The HKI food consumption frequency method is based on the counts of frequency of consumption of certain foods. The index is computed first by summing up the number of days during the previous 7-days the child (caregiver) consumed vitamin A-rich food groups from animal source. Then the sum of the number of days child (or caregiver) consumed vitamin A-rich food from plant source and divided by 6. Finally, the total vitamin A intake is computed by adding the total number of animal source plus the weighted number of days vitamin A-rich foods from plant source were consumed. According to the index, VAD is considered to be a problem if the mean frequency of consumption of animal sources of vitamin A is 4 days per week or less or the mean frequency of total consumption of vitamin A from both animal and plant sources (weighted) is 6 days per week or less.

with only 15% of the controls and 27% of the intervention women meeting the minimum vitamin A intake requirement of consuming vitamin A-rich foods at least six times in the previous 7 days. Thus, the vitamin A prevalence was 12% better among women from intervention HH than those from the control group.

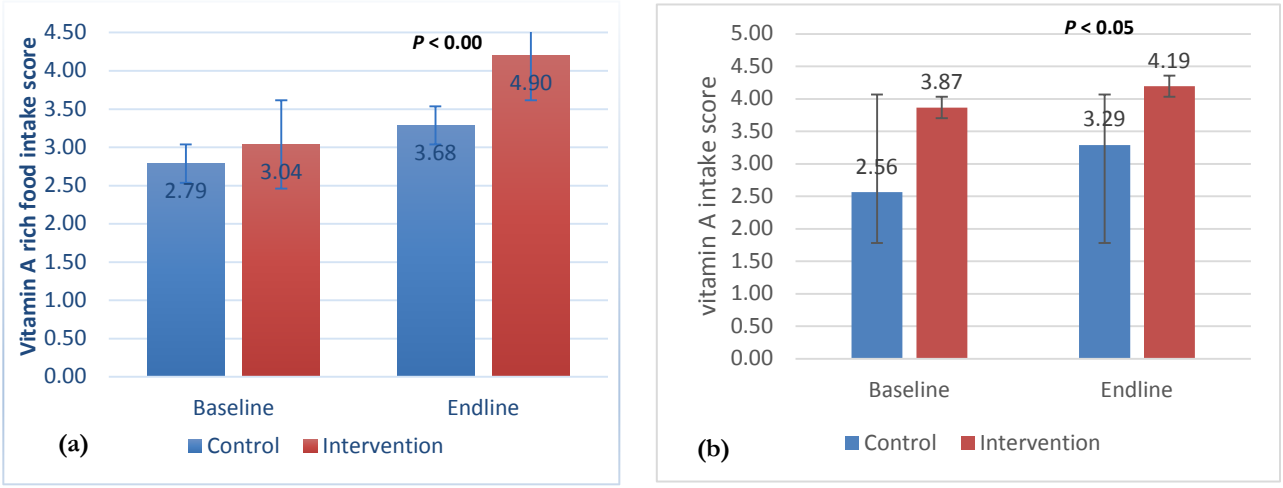



*Figure 5. Comparison of total vitamin A intake for children under 5 (a) and women (b) at baseline and endline.*

## 4.3 Changes in Consumption of Vitamin A-rich OFSP

The VISTA project specifically promoted consumption of OFSP as part of more diversified healthier diets. Table 12 shows that for both children and women, consumption of OFSP contributed significantly to increased intake of vitamin A-rich foods. On average, children under 5 from intervention HH consumed OFSP at least 2.5 days a week, which is a more than 150% increase from the baseline. Although the children from control HH also realized an increase in consumption of OFSP due to spillover effects, at the endline the children from intervention HH consumed OFSP significantly ($p$<0.00) more frequently than those from control HH. A similar trend is observed among caregivers.

**Table 12. Number of days child and woman (caregiver) consumed OFSP in the last 7 days**

| | Baseline | | *p* value | Endline | | *p* value |
|---|---|---|---|---|---|---|
| | Control | Intervention | | Control | Intervention | |
| Child | 0.26 | 0.96 | 0.00 | 0.75 | 2.55 | 0.00 |
| Woman (caregiver) | 0.35 | 1.04 | 0.00 | 0.69 | 2.64 | 0.00 |

To further verify if the observed changes in nutrition outcomes were a result of the project intervention, we ran a simple linear regression model of the two outcome variables (dietary diversity and vitamin A intake) for women and children. We controlled for different explanatory factors that affect them and included among these explanatory variables a project participation dummy (1, if a HH participated in the project and 0 if a HH is a control). The results presented in Table 13 confirm those from the foregoing analysis—that is, that participation in the project resulted in significant ($p$<0.01) increase in dietary diversity and intake of vitamin A-rich foods for both women and caregivers.

**Table 13. Regression results of the impact of participation in the project on child and caregiver nutrition outcomes**

| | Regression coefficients for the project participation variable, regression on: | |
|---|---|---|
| | Dietary diversity | Vitamin A intake |
| Child | 0.82*** (0.19) | 0.82*** (0.39) |
| Caregiver | 0.70*** (0.08) | 0.29*** (0.09) |

Standard errors in parentheses. *** = significant at 1% ($p$<0.01).

Finally, the results presented in this section provide empirical evidence that confirms the project's hypothesis that introducing OFSP along with nutrition education and market development can reinforce each other to effect behavior change toward healthier, diversified diets. As a result of the project, dietary diversity and intake of vitamin A-rich foods, including OFSP, increased significantly. Although the project did not assess the change in vitamin A status among target groups through serum retinol measurements, previous research by CIP in Mozambique showed a direct link between increased intake of OFSP and other vitamin A-rich foods and improved vitamin A status among children.[4]

# 5. CHALLENGES AND MITIGATION STRATEGIES

Although overall the VISTA project was on track on most of the targets, it encountered several challenges during the course of implementation and had to adopt mitigation measures to ensure delivery of project milestones and targets despite these challenges. Among the many technical and operational challenges encountered the following stand out:

- **Limited capacity of government and NGO staff to commit time to the project**. The project delivery strategy hinged on establishing partnerships with government research, agriculture, and health delivery systems and NGOs and co-locating project activities to build synergies and complementarity for impacts at scale. However, the main challenge in operationalizing this strategy on the ground was that staff from government and NGOs lacked the capacity to commit time to the project. For instance, the number of APEs for health center programs is very limited and their training is more on clinical health issues than nutrition. Although the project invested in training the APEs in nutrition for them to support project community nutrition education activities, they were already overloaded with their routine health center programs to be able to offer the expected support. In addition to the limited number of government agriculture and health staff, high turnover of staff presented challenges to the project. To respond, CIP strengthened the capacity of the project team at field level by hiring and strengthening field coordinators who were based at district level and continuously supported delivery of activities on the ground.
- **Agronomic and climate-related constraints that adversely affected sweetpotato production**. As most of the smallholder farmers largely rely on rainfall for their agricultural production and few have access to irrigation, the main challenge the project faced was having sufficient quantities of planting material to distribute to HH at the beginning of the agricultural season. Long and severe dry spells made it difficult for farmers—even those with access to lowlands—to conserve vines for planting at the beginning of the rain season. The uneven spatial distribution of rainfall and water resources across the intervention districts translated to uneven distribution of vine production and meant that in some years vines had to be transported over long distances from one district with vine supply to another at a very high cost. The project motivated and supported DVMs to open shallow water holes, where groundwater occurs near the surface, often as close as at 2 m depth. Also, in the dry districts in particular, DVMs who had access to ponds or water streams near their land holdings were encouraged to open up larger areas for multiplication and were prioritized for the delivery of starter vines for further multiplication and support with net tunnels and irrigation equipment for off-season multiplication of vines.

4. Low, J., M. Arimond, N. Osman, B. Cunguara, B. Zano, and D. Tschirley. 2007. A Food-Based Approach Introducing Orange-Fleshed Sweet Potatoes Increased Vitamin A Intake and Serum Retinol Concentrations in Young Children in Rural Mozambique. *The Journal of Nutrition* 137(5):1320–1327.

- **Weak market demand and the fragmented nature of markets in the two provinces**. One of the key components of the project focused on creating market demand for OFSP vines, fresh roots, and OFSP-based processed products in order to create market incentives for increased and sustained OFSP adoption. But in the two intervention provinces, markets for sweetpotato and root and tuber crops in general are weak and fragmented. This makes it slow and expensive to create the demand pull needed for adoption, market development, and investment in commercial processing. Additionally, the fragmented nature of the markets increases transaction costs and inefficiencies in the value chain.
- **Premature termination of the project**. The VISTA project was designed to run for 7 years (October 2014–September 2021). Owing to funding challenges, however, the project was terminated earlier than expected. As a result, we could not actually implement as planned, which limited the learning and conclusions we can draw from the project.

# 6. LESSONS LEARNED

The challenges and mitigation strategies presented in section 4 of the report are also lessons that VISTA learned during implementation. In addition, the project learned other technical and program management lessons over the course of implementation; the following stand out:

- **Integrated agriculture-nutrition-marketing programming**. The project's basic assumption that agriculture and nutrition interventions can reinforce each other to effect behavior change toward healthier diets in smallholder HH has been confirmed by the evidence discussed in section 3. However, in designing and implementing successful nutrition-sensitive interventions, there is need to be mindful of HH structural aspects including gender relations that connect decision-making in the (often male-dominated) production sphere and the (often female-dominated) nutrition and childcare sphere.
- **Voucher system and dissemination of nutrition messages through DVMs**. The project approach of disseminating planting materials and nutrition messages through DVMs using a voucher system proved to be effective. Nutrition messaging through DVMs during voucher redemption was a key strategy to complement other nutrition education approaches. In addition, the use of voucher system ensured that project beneficiaries obtained a full package of the interventions, including planting material and training on agronomy and nutrition.
- **Socio-cultural context and nutrition behavior change**. Behavior change for healthier diets requires a detailed understanding of drivers of food choice within HH and in society at large. The role of caregivers, but also of individuals deciding on food purchases and food production, needs to be taken into account by behavior change strategies. Likewise, wider social and cultural norms and aspirations of different consumer groups can be decisive for food choices irrespective of OFSP being available on-farm or in markets. A detailed understanding of these, and considering them in the design of the behavior change strategy, is essential to support scaling of OFSP. It is critical to convey nutrition messages through multiple community-level actors such as traditional leaders, churches, schools, and DVMs (lead farmers) who are local change agents trusted by communities
- **Integration with marketing systems**. The project focused on smallholder HH in high potential sweetpotato-growing areas where OFSP can gain a relatively quick foothold. To understand the scalability of OFSP, however, a broader and more diversified strategy will be required in future. Significantly scaling OFSP production levels among smallholders seems difficult. Yet the marketing of OFSP will remain limited until and unless larger production volumes are achieved. This will require separate starting points through larger producers who can target their production at markets, either fresh or for processing.

- **Incentives for investing in OFSP**. Investments can take longer to evolve than the project cycle can capture, yet will likely be decisive for sustained uptake and scaling of OFSP. The project was not quite successful in stimulating commercial investments in processing over the course of 5 years, mainly due to low investments in supply chains to serve the processing sector. To accelerate commercial scaling, programs will need to co-develop with their commercial partners more comprehensive business plans both at enterprise level and at overall market chain level. Otherwise, there is a risk that programs will provide unsustainable gap-filling for several years that may eventually jeopardize efficient and inclusive commercialization.
- **Integration with government systems and sustainability**. Right from the pilot phase, the project forged and strengthened partnership with the national research institute (IIAM), SDAEs and SDSMAS in each of the target districts, and NGOs and CBOs. These partnerships were instrumental to VISTA's success. Over its implementation period the project invested in strengthening the capacity of the government systems through a series of capacity-building activities. For instance, the project trained IIAM technicians in production of tissue culture OFSP planting material to support continued production of foundation material by the national program beyond the project. In addition, VISTA supported the establishment of on-station greenhouse and multiplication field for sustained production of foundation material. To further strengthen its collaboration with IIAM and build its capacity, the project directly engaged IIAM staff, a nutritionist, agronomist, and communications specialist in implementing its activities. This was a win-win situation, as the project was able to ease its staffing challenges while IIAM staff gained valuable experience that they can use in future OFSP programs. As part of its partnership with the SDAEs and SDSMAS, VISTA built the capacity of these government agriculture and health systems through trainings of SDAE extension officers, nurses, APEs, and many animators (CHWs). Building the capacity of these institutions and establishing a network of trained CHWs and DVMs are key to sustainability. Besides the strengthened government systems, the project also trained other NGOs and CBOs implementing OFSP interventions. For instance, the project trained staff from NGOs such as LVIA, SNV, and World Vision in sweetpotato agronomy and nutrition.

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