CIP
INTERNATIONAL POTATO CENTER
A CGIAR RESEARCH CENTER

Scaling up Sweetpotato through Agriculture and Nutrition (SUSTAIN)

Annual Report

1 April 2016–31 March 2017

Submitted to:
Department for International Development (DFID)

Submitted by:
International Potato Center (CIP)

UKaid
from the British people

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FIGURES

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ACRONYMS

A4NH	Agriculture for Nutrition and Health
BARI	Bangladesh Agricultural Research Institute
BecA	Biosciences eastern and central Africa
CHW	Community health worker
CNS	Community nutrition scholars
CRP	CGIAR Research Program
CUs	Community units
DFID	Department for International Development
DVM	Decentralised vine multiplier
EQ	Evaluation question
FANEL	Food and Nutrition Evaluation Lab
FGD	Focus group discussion
HH	Household(s)
IEC	Information, education, and communications
ILRI	International Livestock Research Institute
KAP	Knowledge, attitude, and practices
M&E	Monitoring and evaluation
MIYCN	Maternal, infant young child nutrition
MoA	Ministry of Agriculture
MoH	Ministry of Health
MSU	Michigan State University
NARS	National agricultural research systems
NGO	Non-governmental organisation
ODK	Open Data Kit
OFSP	Orange-fleshed sweetpotato
OR	Operational research
RAB	Rwanda Agricultural Board
RCT	Randomised controlled trial
RTB	Roots, Tubers and Bananas (a CRP)
RTCDT	Root and Tuber Crops Development Trust
SBCC	Social and behaviour change communication
SSA	sub-Saharan Africa
SUSTAIN	Scaling Up Sweetpotato Through Agriculture and Nutrition
UIL	Universal Industries Ltd
USAID	U.S. Agency for International Development
VAD	Vitamin A deficiency
VfM	Value for Money

EXECUTIVE SUMMARY

Scaling Up Sweetpotato Through Agriculture and Nutrition (SUSTAIN) is a 5-year programme led by the International Potato Center (CIP) to improve intake of vitamin A-rich orange-fleshed sweetpotato (OFSP) by women and small children in Kenya, Malawi, Mozambique, Rwanda, and Bangladesh. The overall programme goal is to scale up OFSP technologies and delivery mechanisms developed by CIP and its partners to reach 1.2m farming households (HH), of which at least 210,000 HH will be direct project beneficiaries. Underpinning this development objective, SUSTAIN aims to generate new evidence on the scalability of technologies and delivery mechanisms that can guide future investments in nutrition-sensitive agriculture approaches. The four specific programme objectives are to:

1. Improve access to planting material of nutritious OFSP varieties for smallholder HH with children under 5 in participating countries.
2. Improve nutrition awareness, knowledge, and skills for improved utilisation and consumption of OFSP and other nutritious food amongst women and children under 5.
3. Develop partnerships with at least one major agro-processor in each country to produce a commercially processed product that uses OFSP as a major ingredient.
4. Develop and implement robust metrics and monitoring processes to assess outcomes, gender impacts, cost-effectiveness, and sustainability of OFSP delivery systems.

During the reporting period (1 Apr. 2016–31 Mar. 2017), the SUSTAIN programme made further strong progress towards its four objectives. Most programme milestones set for 31 August 2017 have already been achieved or exceeded, while the others are on track to be achieved. As of 31 March 2017, the programme has:

- Reached 271,707 direct beneficiary HH with OFSP planting material (151% of target)
- Reached 324,860 direct beneficiary HH with nutrition education (180% of target)
- Exceeded the milestones for development of OFSP value chains in Kenya and Rwanda, while making accelerated progress in Malawi and Mozambique
- Adjusted its approaches to increase opportunities for women as OFSP planting material multipliers
- Started implementation of improved, gender disaggregated monitoring and evaluation (M&E) tools and systems to document outputs and outcomes more efficiently
- Generated and published new evidence on OFSP adoption, behaviour change, and benefit flows.

The programme has made progress on several strategic issues in the past year that are important for increasing the effectiveness, efficiency, and sustainability of programme interventions. Amongst these are:

1. CIP's role in developing seed systems for OFSP is critical in the initial stages of introducing new varieties, but needs to be consolidated and transitioned into a sustainable mechanism, supported through information technologies (seed tracker), institutional innovation (associations of sweetpotato multipliers), and policies (certification). CIP has invested in these tools, as well as in farmer capacities to become planting material suppliers, and in institutional mechanisms for coordination of planting material markets dominated by institutional buyers (non-governmental organisations or UN programmes) to facilitate this transition. We have also observed that markets for quality planting material are picking up where OFSP root markets are also strengthening.

2. The programme has worked with local government authorities to incorporate food-based approaches into mainstream nutrition extension, thereby increasing nutrition knowledge and demand for nutritious crop varieties. This has been particularly successful in Kenya, Rwanda, and Mozambique and has helped to reinforce cross-sectoral linkages, specifically between agriculture and health departments at central and decentralised government levels. In addition, the programme has intensified its collaboration with health centres, schools, and community groups as platforms for nutrition education to diversify contact points and support for behaviour change communication.
3. Private sector investments in OFSP processing have increased in response to the programme's continued technical support. One of the limiting factors continues to be the supply of quality OFSP roots from smallholder farmers, and the programme's initial assumptions about the number of farmers that can be engaged at this piloting stage need to be corrected. More management and technology research is required to strengthen supply chain management and, in locations with pronounced seasonality of sweetpotato production, investments in storage (of roots or intermediary products). The OFSP puree as an intermediary product has proven to be a major technology breakthrough, particularly for the bakery sector at this stage. However, much broader commercial interest has emerged in the use of OFSP puree to support a wider range of final products, including commercially manufactured and traded nutritious and affordable infant foods. CIP is following up with potential new commercial partners, and intends to bring in value chain development and entrepreneurship research expertise to help support an inclusive growth trajectory of the OFSP puree value chain.
4. During the past year, the programme could leverage additional new investments in OFSP programming in several countries (Ethiopia, Malawi, and Mozambique) that will utilise technologies, approaches, methodologies, and tools developed and adapted by SUSTAIN.
5. The programme has also been able to improve its value-for-money by making efficiency gains through partnering more effectively with government and civil society nutrition and agriculture programmes, improved M&E systems, and better linkages with related CIP programmes.

As the programme moves into the final year of this 5-year phase, the outlook is positive and the programme is expected to meet or exceed almost all of its logframe targets. The emphasis in the final year will be on analysis of results and approaches, additional evaluation and review activities with communities and other stakeholders, and publication of findings. During this time, the external evaluator will also implement and analyse the endline survey of the randomised controlled trial in Rwanda that will contribute to the learning on scalability and effectiveness of SUSTAIN's main approaches.

1. INTRODUCTION

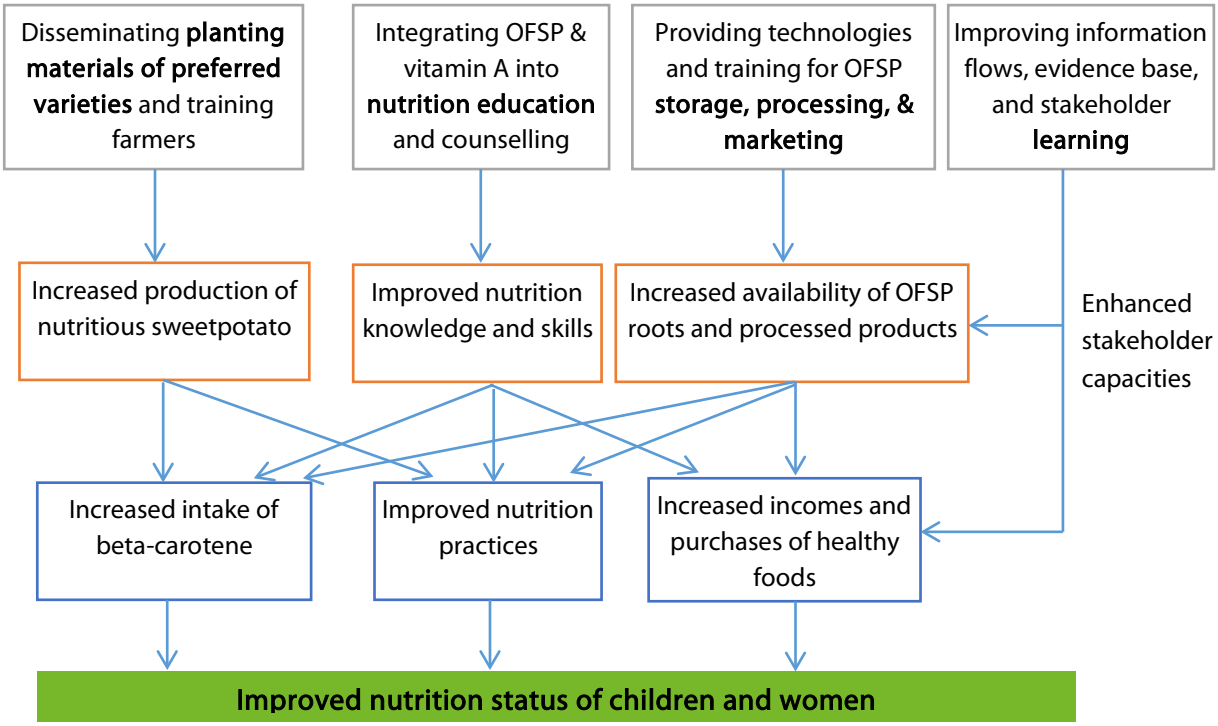
Scaling Up Sweetpotato Through Agriculture and Nutrition (SUSTAIN) is a 5-year programme led by the International Potato Center (CIP) to improve production, utilisation, and consumption of vitamin A-rich orange-fleshed sweetpotato (OFSP) by households (HH) with children under 5 years of age. SUSTAIN is funded by the Department for International Development (DFID) (ARIES Code 204022) from 1 July 2013 to 30 June 2018. It has been operating in Kenya, Malawi, Mozambique, Rwanda, Bangladesh, Tanzania, and Zambia. This annual report covers activities implemented from1 April 2016 to 31 March 2017. Support to Tanzania and Zambia has ended and all activities were reported in the 2015/16 annual report; thus the present report focuses on Kenya, Malawi, Mozambique, Rwanda, and Bangladesh only. The report provides an account of progress against objectives and targets as laid out in the SUSTAIN logframe, specifically reports on CIP's actions in response to the recommendations from the 2016 Programme Review, presents updates on implementation in each of the five countries, and reflects on major results from operational research and lessons learned during the reporting period.

The overall programme goal is to scale up OFSP technologies and delivery mechanisms developed by CIP and its partners to reach at least 1.2m farming HH as well as urban consumers. The four specific programme objectives are to:

1. Improve access to planting material of nutritious OFSP varieties for smallholder HH with children under 5 in participating countries.
2. Improve nutrition awareness, knowledge, and skills for improved utilisation and consumption of OFSP and other nutritious food amongst women and children under 5.
3. Develop partnerships with at least one major agro-processor in each country to produce a commercially processed product that uses OFSP as a major ingredient.
4. Develop and implement robust metrics and monitoring processes to assess outcomes, gender impacts, cost-effectiveness, and sustainability of OFSP delivery systems.

SUSTAIN applies an integrated agriculture-nutrition-market approach that has been developed by CIP and partners through proof-of-concept research and local implementation projects in several African countries over the past 10 years (see Fig. 1).

Figure 1. CIP Integrated Agriculture-Nutrition-Market Approach



Proof-of-concept research has shown that this integrated agriculture-nutrition-marketing approach can have a significant positive influence on vitamin A intakes and status in young children. The rationale underlying each of the three pathways—agriculture, nutrition, and marketing—can be summarised as follows:

- *Pathway 1.* Agriculture: *Introduction of a new source of vitamin A and energy: biofortified OFSP.* Intervention farmers receive (principally through groups) planting material of high-yielding OFSP varieties and are directly involved in varietal evaluation. Improved agronomic and vine multiplication practices and out-of-ground storage techniques are promoted to maximise the availability of OFSP in the diet throughout the year.
- *Pathway 2.* Nutrition: *Demand creation and empowerment through knowledge.* At the village level, the principal caregivers, both women and men, are encouraged and enabled to improve infant and young child-feeding practices and hygiene practices, and to diversify the HH diet. Demand creation efforts focus on building awareness among the broader community to create demand for the new OFSP cultivars and its derivatives, demand for other vitamin A-rich foods, and a supportive environment to accelerate behaviour change at the HH level.
- *Pathway 3.* Market Access: *Market development for OFSP roots and processed products.* This component aims to link farmers to traders and to inform consumers about where they can purchase OFSP. Farmers knowing to whom or where they can sell their crop are more likely to expand areas under production. 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 OFSP and expand production. Earned cash can be spent on foods to improve family well-being. Demand for OFSP is enhanced if profitable processed products using OFSP as a major ingredient are developed.

Underpinning these three pathways, CIP emphasises the importance of *rigorous monitoring and evaluation (M&E), information sharing, capacity strengthening, and learning*. The approach therefore includes regular participatory review sessions at community and district levels to

exchange experiences and adjust implementation methodologies where needed based on emerging evidence. This is an important supporting arm to empower and enable stakeholders to take OFSP forward and continue to invest and innovate.

The primary question the SUSTAIN programme addresses is how to implement this approach at large scale to enable millions of vulnerable HH to improve their nutrition and well-being. While interventions are defined regarding this basic framework, the specific activities, technologies, and delivery methodologies are context specific in each country and are evolving over time based on increased evidence and learning. To support this learning process further, SUSTAIN integrates operational research on key aspects of the scaling process with the development and delivery of OFSP technologies, knowledge, and skills. This dual "doing-and-learning" approach is designed to generate robust new knowledge on the scalability of delivery mechanisms for OFSP that can have potential relevance for other biofortified crops globally. The present report summarises insights into lessons learnt and information resulting from some of these questions.

Michigan State University (MSU) has been contracted to provide independent evaluation services to ensure objective assessment of this approach using quantitative (randomised controlled trial [RCT]) and qualitative methodologies. This evaluation work complements the programme's internal monitoring of all main programme indicators through CIP and implementing partners.

SUSTAIN plays a pivotal role within CIP's global programme on nutritious, resilient sweetpotato. It utilises the latest proven technologies and results from a wide portfolio of sweetpotato research projects and applies them to the implementation of delivery interventions in SUSTAIN countries. Examples include the dissemination of newly released OFSP varieties, application of accelerated breeding methods, practical community nutrition education modules, OFSP processing (puree) and transformation technologies, and process models for linking undernourished women and young children to OFSP planting material distribution for improved dietary outcomes. In turn, the learning generated through SUSTAIN guides the development and design of a growing number of collaborative projects aimed at scaling up OFSP within CIP and other partner institutions. Since the start of SUSTAIN in 2013, CIP has initiated about 10 new projects applying lessons from SUSTAIN to reach over 2.5m HH with OFSP. The CGIAR Research Programmes (CRP) on Roots, Tubers and Bananas (RTB) and on Agriculture for Nutrition and Health (A4NH) provide further strategic platforms for integrating OFSP with related efforts for other biofortified and nutritious crops. As RTB's lead institution and partner in A4NH, CIP contributed actively, during the reporting period, to the design of the Phase II CRPs (2017–2021), drawing on the results and learning from SUSTAIN amongst others.

2. KEY ISSUES AND LESSONS LEARNT OVER THE LAST YEAR

In the course of implementing programme activities and interacting with partners and stakeholders, several critical issues and lessons have emerged during 2016–2017. Table 1 summarises those most important for continued learning and future application, and presents these by programme objective.

Table 1. Key issues and lessons learnt by SUSTAIN in 2016–2017

Issues and Lessons		Evidence to Support Lessons
Objective 1: Access to OFSP planting material		
1.	Through SUSTAIN, CIP took on a coordinating role for enhancing OFSP seed systems, and ensuring availability of planting material in several project countries. This role needs to be consolidated and transitioned into a sustainable mechanism, supported through information technologies (seed tracker), institutional innovation (associations of sweetpotato multipliers), and policies (certification). To increase efficiency of programme support to OFSP seed systems, CIP is investing in farmer capacities to become planting material suppliers and in institutional mechanisms for coordination of planting material "markets" dominated by institutional buyers, such as non-governmental organisations (NGOs) or UN programmes, such as the Root and Tuber Crops Development Trust (RTCDT) in Malawi. One lesson is that real markets for planting material emerge only after root markets have strengthened. As a result, the initial "hands-on" role for CIP and public sector partners (e.g. national agricultural research systems [NARS]) remains important for longer than expected.	Meetings held; project records. RTCDT Malawi.
2.	Linkages along the OFSP planting material value chain from research (starter material in vitro) to multipliers (farmers and commercial multipliers) to producers are now operational in all countries and **result in increased OFSP yields** (as compared with national sweetpotato averages and local checks).	Data from crop cut surveys and demo plots
3.	Markets for OFSP planting material are driven by institutional buyers (NGOs and government programmes, etc.). Institutional buyers have provided the incentives for local OFSP multipliers to establish and maintain multiplication fields. Through SUSTAIN, CIP strengthened the recognition of clean planting material by institutional buyers, which improves the foundation for policy development at national level. This recognition needs to be translated into standards and quality assurance, supported through continued trainings. This has started in Rwanda and in Malawi, and requires support in other countries as well. CIP has prioritised women multipliers for procurement of vines to counteract male bias by institutional buyers. A further question that is not yet evident, is whether and how local farmers can over time sustain or further expand demand for OFSP planting material without institutional intermediaries. There are indications that in areas with increased demand for OFSP *roots*, local farmers will purchase planting materials of specific OFSP varieties in demand in the market.	Names and records of institutional buyers; multiplier sales figures from M&E data; paper on gender (https://link.springer.com/article/10.1007%2Fs12571-017-0651-9)
4.	Some OFSP planting material multipliers have started to invest in multiplication infrastructure, such as irrigation, and inputs (fertilizers, chemicals/pesticides) to support the productivity of their multiplication plots. In many countries, irrigation for year-round access to water is a critical requirement for market-oriented OFSP multiplication. In Rwanda, Kenya, and Malawi, CIP has supported farmers who have access to suitable land and are willing and able to co-invest in irrigation. In Mozambique, the project did not provide material support but trained farmers who invested in irrigation. In Kenya, small-scale irrigation is not feasible in all locations where there is demand for OFSP planting material. To support the participation of women	Project support to multipliers ($, number of farmers); records of own investments by multipliers

Issues and Lessons		Evidence to Support Lessons
	in irrigation, it is important to work with women groups.	
Objective 2: Access to nutrition education		
5.	Policy support is critical for integration of nutrition activities related to biofortification into national programmes. In different countries, initial entry points occur at different levels of government (in Malawi, it is the central government; in other countries, decentralised levels of government). Through SUSTAIN, local government programmes have incorporated food-based approaches into nutrition extension, thereby increasing nutrition knowledge at community level. In Rwanda, the Ministry of Health (MoH) and Ministry of Agriculture (MoA) are supporting SUSTAIN nutrition approaches and tools, and actively involve SUSTAIN staff in some policy-related discussions. In Malawi, dialogue with MoH and Ministry of Education has been slower, given the central government's entry point. The programme's dialogue with different ministries has reinforced cross-sectoral linkages, specifically between agriculture and health.	Programme country updates;
6.	To reinforce behaviour change towards nutritious diets at HH level, the programme has adapted its implementation approaches to include: • Small community-based voluntary groups and clubs that provide several contact points for beneficiaries (care groups, mother clubs, other youth groups) • Targeting men to improve their understanding of nutrition and their role for ensuring HH-level benefits • Use of school curriculum, school gardens, and school meals to raise awareness among children and through them increase HH nutrition awareness	M&E data of activities implemented; Nigeria study results (lesson from SUSTAIN used during implementation)
7.	There is need for continued communication, advocacy, and branding of OFSP for nutrition in order to support public awareness and policy change. SUSTAIN continues to support communication, advocacy, and awareness campaigns in the four countries.	M&E data on consumer awareness; policy documents;
8.	Direct collaboration with health centres (Kenya, Rwanda) and schools (Rwanda) as institutional platforms for nutrition education has proven effective and efficient for reaching large numbers of beneficiaries. In addition, the programme has worked with community-based health events and health workers.	M&E data on nutrition activities
Objective 3: Value Chain Development		
9.	In all four countries, commercial food processors have partnered with SUSTAIN for OFSP utilisation. Initial co-investments by the programme have been instrumental for establishing pilots and demonstrations. Private sector partners are ready to fully finance developed products once the initial product has been established in the market.	M&E data on piloting; records of commercial partners
10.	The OFSP puree has proven to be both technically feasible and economically viable as a strategic "intermediary" product and platform for diversified final processing. However, farmers and puree manufacturers require continued support through technical training at this stage to establish sustainable, profitable supply chains for processing.	Project country reports
11.	Value addition has proven important to reinforce policy support for biofortified sweetpotato. Public perception of OFSP as a profitable and nutritious crop has been critical, and has been a driver for OFSP adoption by farmers in areas where processing is emerging.	M&E data
12.	OFSP bread has been shown to offer a more nutritious option for consumers, and sales are increasing due to consumer perceptions of nutritious value.	Consumer surveys

Issues and Lessons		Evidence to Support Lessons
Objective 4: Evidence base for scaling up		
13.	SUSTAIN has acted as a catalyst for other related programmes in the four project countries, including projects by CIP and other organisations. Country-level and regional platforms are important for influencing government and other stakeholders to include OFSP approaches into their programmes.	Projects initiated since SUSTAIN started
14.	SUSTAIN has enabled several programmes in the four countries to scale out OFSP production and nutrition education. Leveraging SUSTAIN outputs, infrastructure, and capacities has resulted in an estimated 210,496 additional beneficiary HH in 2016–2017, outside the SUSTAIN-funded activities and targets.	M&E data from OFSP projects
15.	Continued gender analysis is needed to identify and promote opportunities for women in the process of technology change (planting material value chain, variety selection) and increased market engagement (processing). Without such a detailed understanding, technological and administrative changes risk marginalising women.	Gender study
16.	There is growing evidence of the effect of increased nutrition knowledge on improved child-feeding practices.	Studies in Kenya; M&E data in Rwanda
17.	SUSTAIN has informed the design of the second phase of the RTB CRP, and to some extent the A4NH CRP.	CRP proposals

3. ACTIONS TAKEN ON RECOMMENDATIONS FROM THE 2016 ANNUAL PROGRAMME REVIEW

In its 2016 review DFID shared several recommendations with CIP for implementation. Table 2 summarises the actions CIP has taken to address these recommendations.

Table 2. Actions on recommendations from the 2016 annual review

Recommendation from Annual Review	Action Taken by the Programme	Status
#1. CIP needs to improve the reporting on indicator 2 to clarify the size of the sites and districts and the number of districts per country so that DFID can better see the scale of the interventions in each country. This should be reported in the quarterly reports in 2016–2017.	SUSTAIN works in four different countries. In each country, the programme has identified administrative divisions for implementation. These divisions vary in name (county, district, etc.), level of administration, and size. A detailed breakdown was provided in the August–October 2016 quarterly report. Additional details on country coverage are shown in the country update sections in the present (annual) report.	Completed
#2a. CIP to report gender-disaggregated data on household heads receiving planting material, vine multipliers trained and supported, farmers trained, people receiving nutrition information, people receiving nutrition training and farmers selling OFSP in the next quarterly report following this annual review. All remaining gender disaggregated data will be reported on by the beginning of 2017. For a programme that is specifically targeting women and children, the lack of gender disaggregated data to date has been a serious omission.	SUSTAIN targets HH with pregnant women and/ or children under 5 years old, based on the programme's nutrition objective. Data on individual beneficieries and HH composition have been gender-disaggregated as a standard practice, including data on: • Head of HH receiving planting material • HH member trained in sweetpotato agronomy • HH member responsible for multiplication sites • HH member receiving payment for planting material • Person receiving nutrition training • Person attending cooking demonstrations • Persons participating in OFSP sales.	Completed

Recommendation from Annual Review	Action Taken by the Programme	Status
	An update on these data can be found in the country sections of the present report. These changes are further supported by the RTB CRP M&E and gender strategies and tools.	
#2b. In addition, CIP has already raised the issue that most production of OFSP planting material is undertaken by men. They need to renew efforts to target women and to prioritise this in their forthcoming technical report on gender analysis (due Jan. 2017). This should also be a topic for discussion at the workshop with HarvestPlus in November 2016 (see recommendation #7). A key output for the meeting will be an agreed way forward on gender disaggregation.	In several countries, the programme has analysed constraints to the participation of women in planting material multiplication. As a result, the programme adjusted its approach and the ration of women as multipliers, as well as the percentage of revenues accruing to women in HH that are engaged in multiplication, have increased. These increases are reflected in the country progress tables. SUSTAIN's gender specialist has carried out an in-depth case study for Tanzania.	Completed
#3. DFID to review with CIP how information on attitudes towards OFSP can be captured over the coming year. This could be through small-scale, qualitative exercises rather than a survey, building on the existing focus group reports (still to be received); however, it is important that this information is gathered. CIP needs to develop and present evidence that attitudes to sweetpotato are changing in a favourable direction, and that this is resulting in more sweetpotato and sweetpotato products being consumed. CIP to develop and present this evidence by the beginning of 2017.	In Kenya, Mozambique, and Rwanda, baseline surveys have been carried out showing the current state of consumption practices, knowledge, and attitudes towards OFSP. Follow-up surveys in Mozambique and Kenya have shown positive changes and increased recognition of OFSP as a nutritious food. In Rwanda, the RCT endline survey will provide further robust evidence on attitudes as well as consumption (including child feeding). Focus group discussions (FGD) have been carried out by both CIP and MSU; programme M&E has captured changes in consumer awareness.	Completed
#4. The current programme logframe has no milestones for 2017. CIP has proposed the inclusion of milestones for this year to help track progress before this programme phase enters the last year. DFID should work with CIP to update the logframe by December 2016.	Intermediate milestones for 2017 have been formulated and included in the revised agreed logframe.	Completed
#5. Developing new commercial products is proving a very challenging objective. CIP's expertise is in the breeding, production, and multiplication of plants but less on taking a new manufactured product to market. CIP should review ways to bring in additional expertise for working with commercial delivery partners, either directly or through partnerships. CIP to explore ways to increase skills and expertise in this area and report back to DFID by October 2016.	Since the last annual review, several more products are now on the market. All countries have commercially available products in urban and rural markets: • Kenya: Bread, buns and other bakery products (Tuskys Ltd, Organi Ltd) • Malawi: Beta Crisps and bread (UIL Ltd) • Mozambique: Bread and juice (Zebra Farms) • Rwanda: Bread, biscuits, doughnuts (Urwibutso Enterprises). CIP has worked with the food technology firm Euro Ingredients Limited to provide technical support to commercial partners. CIP has also explored collaboration with DFID-funded initiatives such as AgDevCo and GAIN in Mozambique. More recently (April 2017), CIP has started to consult with agri-business researchers at MSU and the U.S. Agency for International Development (USAID) *Partnership for Innovation*	In progress

Recommendation from Annual Review	Action Taken by the Programme	Status
	programme with the view to develop strategic partnerships with commercial food innovations.	
#6. Output 4 on 'Evidence of achieving outcomes and disseminating findings' needs to be assigned an impact weighting of 10% (with the first output reduced from 50% to 40%). 2018 targets are not currently quantified. DFID and CIP should update the logframe and quantify the targets for 2018 by October 2016. For 2016/17, CIP should provide a quarterly update on the progress it has made in each area. By October 2016, CIP should agree on key activities with DFID in a short summary table and ensure this is reported quarterly.	Logframe has been updated and quarterly reports are being submitted on progress in all output areas (coverage started Aug. 2016).	Completed
#7. DFID, CIP, and HarvestPlus should hold a half-day workshop together, involving other key partners to share experience and establish a joint strategy on how best to improve working with commercial partners in delivery. DFID advisers in target countries should be invited to attend. The Agriculture Research team will publicise the workshop to the livelihoods cadre, private sector cadre, and health care, to support recommendation #8 (below). CIP should develop an outline agenda in agreement with HarvestPlus by November 2016 with a view to holding the workshop in November 2016. This workshop should help plan workshops in each of the 5 target countries in 2017.	DFID, CIP, and Harvest Plus are still considering whether to hold this workshop. Actions taken: CIP and HarvestPlus met on 26 October 2016, to discuss this recommendation and agreed on the way forward, including: • Importance of joint-up approaches and synergies between our efforts to promote utilisation of biofortified crops. • Noting that CIP and HarvestPlus are interacting frequently and exchanging technical information on a continuous basis. • Joint implementation of the (CIP-led) Building Nutritious Food Baskets project in Nigeria and Tanzania; and the (HarvestPlus-led) Developing and Delivering Biofortified Crops in Uganda project (ongoing). • Joint demonstration fields and awareness creation between SUSTAIN and HarvestPlus in Rwanda to promote biofortified crops. • Nutritional Analysis of Harvest Plus biofortified cassava and Gari at the DFID supported Food and Nutrition Evaluation Lab (FANEL) managed by CIP in Nairobi.	Deferred
#8. DFID should do more to promote the work on biofortification (in conjunction with Harvest Plus) to the livelihoods, the private sector and health cadres, as well as the nutrition and agriculture hubs, to expand support across DFID beyond those advisers working in target countries. DFID should outline a plan of actions by the end of November 2016.	Action by DFID	No comment
#9. CIP and MSU to review the feasibility of conducting smaller scale cost-effectiveness studies earlier in the evaluation than 2018, within the current budget. CIP to present a proposed way forward to DFID by the end of December 2016, for DFID's approval.	CIP has submitted to DFID an updated work plan and list of deliverables for the external evaluation.	Completed

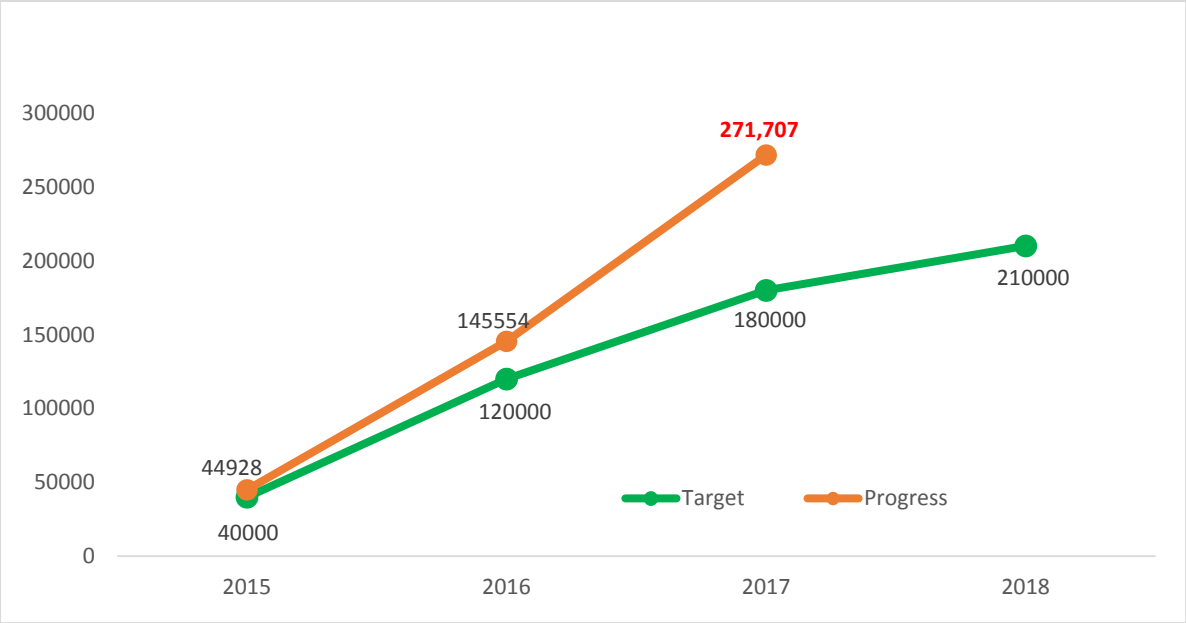
4. ACHIEVEMENTS AGAINST LOGFRAME TARGETS FOR THIS YEAR

This section summarises the progress against milestones for Outputs 1–4 in the programme logframe for the reporting year 2016–2017, as well as the cumulative progress since the start of the project.

Overall, the SUSTAIN programme made further strong progress against its four objectives as stated in the logframe. Most programme milestones set for 31 August 2017 have already been achieved or exceeded, while the others are on track to be achieved. As of 31 March 2017, the programme has reached 271,707 direct beneficiary HH with OFSP planting material (Fig. 2), and 324,860 HH with nutrition education.

In the case of the number of beneficiary HH receiving planting material, the cumulative total has already surpassed end-of-project targets in all countries. Nutrition activities are also on target in all countries. The development of value chains has improved as well, and progress in Malawi and Mozambique is catching up with targets; Kenya and Rwanda are already meeting their milestones. Under Objective 4, CIP and MSU have updated their research and evaluation work plans and tools and the evidence base, including gender disaggregated data sets, has considerably strengthened for key questions concerning adoption, behaviour change, and benefit flows.

Figure 2. Cumulative progress against programme targets (Objective 1: Households accessing OFSP planting material).



Tables 3–6 provide an overview of progress against logframe targets for each output area.

Table 3. Output 1: Access to OFSP planting material by smallholder HH with children <5

Indicators		Kenya	Malawi	Mozambique	Rwanda	Bangladesh	Total
HH with children <5 receiving OFSP vines	Milestone (31 Aug. 2017)	30,000	60,000	35,000	50,000	5,000	180,000
	Progress in reporting period (1 Apr. 2016–31 Mar. 2017)	**15,097**	**32,040**	**24,356**	**58, 863**	**1,843**	**132,199**

Indicators		Kenya	Malawi	Mozambique	Rwanda	Bangladesh	Total
	Cumulative progress to 31 March 2017	30,968 (103%)	86,895 (144%)	44,963 (128%)	102,038 (204%)	6,843 (137%)	271,707 (151%)
Vine multipliers operational	Milestone (31 Aug. 2017)	7/district	7/district	7/district	7/district	n/a	n/a
	Progress in reporting period (1 Apr. 2016–31 Mar. 2017)	4	2	36	39	223	304
	Cumulative progress to 31 March 2017	66 (5 counties), 50% male and 50% female	3 commercial 100% male	96 (15 districts), 75% male, 25% female	39 (8 districts), 46% male, 54% female	343 21% male, 79% female	547 36% male, 64% female
Yield assessment	Milestone (31 Aug. 2017)	Yield assessment updated	Yield assessment updated	Yield assessment updated	Yield assessment updated	n/a	Yield assessment updated
		13.7 t/ha	Data collection under way (harvest period); available in August	Data collection under way (harvest period); available in August	12.1 t/ha	n/a	n/a

Table 4. Output 2: Access to improved nutritional knowledge and diversified use of OFSP by both female and male caregivers

Indicators		Kenya	Malawi	Mozambique	Rwanda	Bangladesh	Total
Caregivers reached through training	Milestone (31 Aug. 2017)	30,000	60,000	35,000	50,000	5,000	180,000
	Progress in reporting period (1 Apr. 2016–31 Mar. 2017)	6,649	23, 631	22,971	48,615 (46% male, 54% female)	No change	101,866
	Cumulative progress to 31 March 2017	32,071 (107%)	43,631 (74.7%)	35,174 (100%)	102,038 (204%)	10,080 (202%)	324,860 (180%)
No. of training events	Progress in reporting period (1 Apr. 2016–31 Mar. 2017)	240	17	555 Manica 174 Sofala 104 Maputo	11 nutrition training events	109 with 3,500 participants	1,210
No. of other events	Progress in reporting period (1 Apr. 2016–31 Mar. 2017)	3	13 field visits and 10 field days	12 radio broadcasts, 10 fairs, 2 TV programmes, 2 journal articles	5—998 caregivers (566 female, 432 male) participated	None	57
Reports of FGD and other qualitative data to assess current	Milestone (31 Aug. 2017)	At least 1 case study in each country on behaviour change, based on evidence from FGD and/or other methodologies					

Indicators		Kenya	Malawi	Mozambique	Rwanda	Bangladesh	Total
practice and ability to change behaviours	Progress in reporting period (1 Apr. 2016–31 Mar. 2017)	FGD to be completed by August 31 with mothers in training groups and mother clubs; 1 case study undertaken	1 FGD completed	1 FGD done; results under review	FGD are planned for June/July 2017 in several project districts 2 indicator surveys		

Table 5. Output 3: Commercially marketed processed products utilising OFSP

Indicators		Kenya	Malawi	Mozambique	Rwanda
Potential product options	Milestone (31 Aug. 2017)	At least 1 product under commercial development	At least 1 product under commercial development	At least 1 product under commercial development	At least 1 product under commercial development
	Progress in reporting period (1 Apr. 2016–31 Mar. 2017)	Puree and bakery products: bread and buns	Two products are currently being marketed: OFSP Beta crisps and OFSP bread.	Juice, biscuits, and bread produced by ZebraFarm, bread by Papú, Nautilus, Bico Dourado, Minhota, Elisabete, and Tambara 2 in Manica, Sofala, Maputo Province and Maputo City since July 2016	OFSP products produced by SINA and 2 cooperatives processing units are doughnuts (Mandazi), Akarabo golden biscuits (with improved formulation), breads, chips, cakes
Farmers linked to supply chains	Milestone (31 Aug. 2017)	At least 400 smallholder farmers supplying commercial processor	At least 400 smallholder farmers supplying commercial processor	At least 400 smallholder farmers supplying commercial processor	At least 400 smallholder farmers supplying commercial processor
	Progress in reporting period (1 Apr. 2016–31 Mar. 2017)	In total 180 (50% female) smallholder farmers supplied OFSP for making puree	50 additional smallholder farmers in Mulanje and Thyolo started to produce as a group to supply roots to Universal Industries Ltd (UIL)	Estimated number of suppliers between 45 and 130 in two provinces	Existing 20 farmer groups (about 400 farmers) continued to supply roots to processors
	Cumulative progress to 31 March 2017	573 (143%)	300 (75%)	50 (12.5%)	400 (100%)
Sales volume of each product	Milestone (31 Aug. 2017)	$80,000/yr	$80,000/yr	$80,000/yr	$80,000/yr
	Progress in reporting period (1 Apr. 2016–31 Mar. 2017)	Total puree sales $36,624/yr Total bread sales: $136,400/yr	$14,865/yr	Total sales: $11,858/yr	$212,809/yr (reported by Uributwso Enterprises)

Table 6. Output 4: Evidence of achieving outcomes and disseminating findings

Indicators		Kenya	Malawi	Mozambique	Rwanda
Monitoring and assessment tools and surveys	Milestone (31 Aug. 2017)	Assessment tools and methods implemented, reviewed, and published Qualitative gender tool implemented for mid-term assessment Exit strategies for sustained access to quality planting material and nutrition advice developed			
	Progress in reporting period (1 Apr. 2016–31 Mar. 2017)	• RCT (Rwanda) ongoing by MSU • Draft qualitative evaluation reports submitted by MSU in Malawi and Kenya; final version in progress after initial review. • Report on diffusion study (to measure indirect beneficiaries through farmer-to-farmer diffusion) in Malawi completed • Beneficiary surveys to assess acceptance, production, consumption, and sales in Mozambique completed • Second midline survey in Mozambique completed; report drafted • CIP M&E tools and processes updated • Open Data Kit (ODK) tools in use in Rwanda to estimate vine yield production and consumption indicators; translated for use in Mozambique; staff trained in use of some of the modules.			
	Milestone (31 Aug. 2017)	Preliminary cost-effectiveness assessment of SUSTAIN intervention approaches in each country			
	Progress in reporting period	Rwanda and Kenya analysing data on cost-effectiveness.			
Conference contributions and publications	Milestone (31 Aug. 2017)	SUSTAIN staff participated and presented in at least 2 regional and 2 global conferences and community of practice events, presenting project findings; at least 5 technical publications widely available online			
	Progress in reporting period (1 Apr. 2016–31 Mar. 2017)	• Peer-reviewed publications transferred to open access as per CGIAR policy and other technical publications and tools shared through Sweetpotato Knowledge Portal and CIP website. • Programme information, education, and communications (IEC) materials continue to be published and are distributed widely among target beneficiaries and members of their communities • Malawi: In February 2017, an inter-ministerial and NGO meeting to revise and update IEC materials that include OFSP utilisation messages conducted in Dedza and draft IEC materials under production • Community-of-practice meetings: breeding and seed systems, marketing, processing and utilisation; monitoring, learning, and evaluation.			

5. COUNTRY STATUS REPORTS

5.1 KENYA

5.1.1 Main issues and achievements

Planting material

SUSTAIN-Kenya is promoting an integrated agriculture–nutrition–market approach to scaling up production, consumption, and marketing of OFSP. Owing to the bulky and perishable nature of sweetpotato planting material, production has been promoted through "decentralised vine multipliers" (DVMs). DVMs are farmers located within OFSP-producing areas to ensure access to planting material while reducing transport costs. Sixty-six DVMs (50% female) have been trained by the project and provided with the necessary support to conduct vine multiplication as a business. In addition to being located close to sweetpotato growers, DVMs are also near a health facility. Health facilities provide the first contact point between beneficiaries (pregnant women and lactating mothers) and the project during ante- and post-natal visits. Figures 3 and 4 show the location of health facilities and DVMs by gender, respectively.

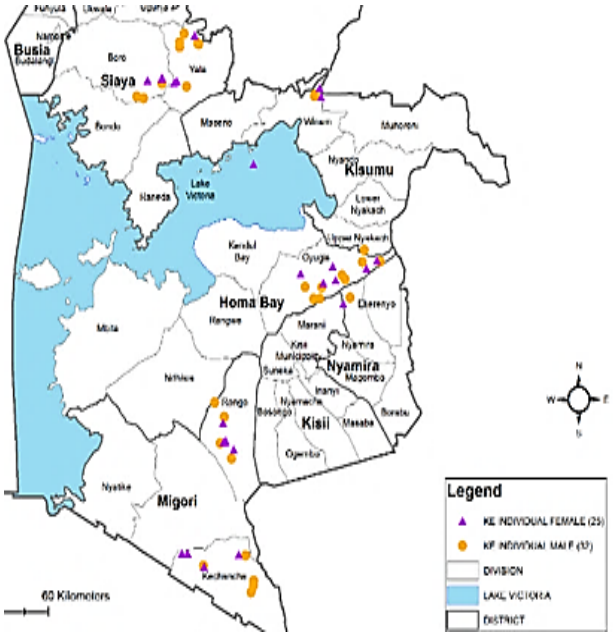
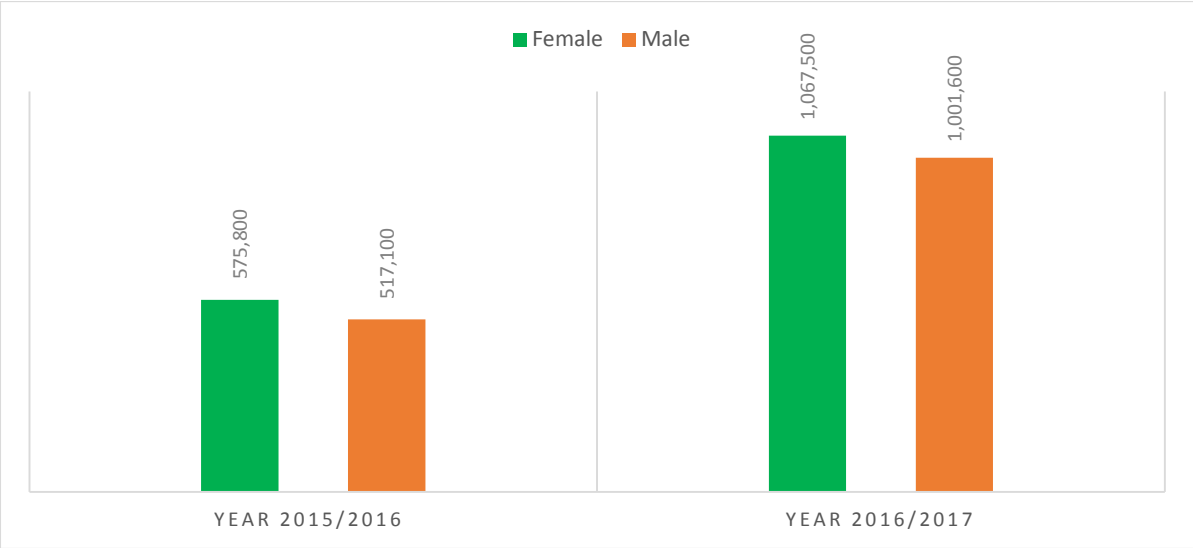


Figure 3. Location of DVMs in Kenya. *Figure 4. Location of health facilities partnering with SUSTAIN in Kenya.*

Vine multiplication has been a source of income for both male and female farmers, with a slightly higher income generated by female vine multipliers. Figure 5 shows the distribution of income created by male and female DVMs. The data also show an increasing trend in sales of vines between 2015–2016 and 2016–2017, an indication of the growing demand for OFSP vines. Against a background of average smallholder HH incomes of about US $2,600/yr, the income of about $1,000 from sweetpotato multiplication in 2016–2017 provides a significant increase.

Figure 5. Income (in KSH) generated by DVMs by gender.

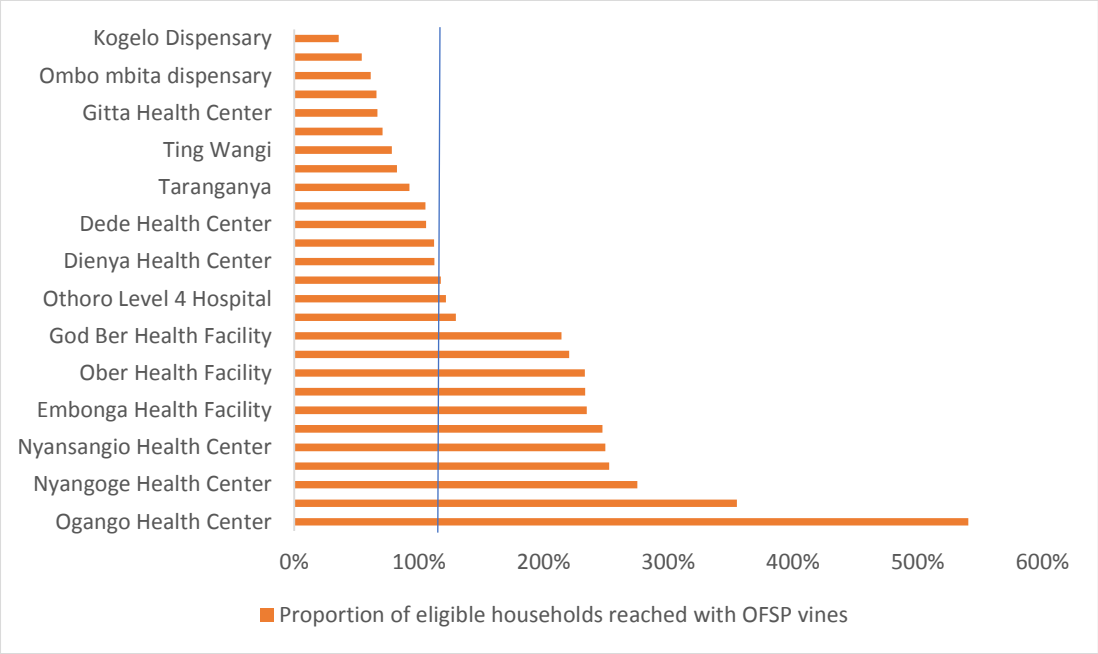


Nutrition

As the project approaches the final year of implementation, 70% of the health facilities have reached or exceeded the total eligible number of HH (those with at least one child under 5 years). Some health facilities have provided vines to ante- and post- natal clients who are not regular residents in the villages that were targeted for the intervention. This has increased the numbers reached and explains why more than 100% of targets were achieved. The demand created for

OFSP vines within and outside the intervention villages will be a critical market for the vine multipliers beyond the project life. Figure 6 shows progress towards reaching the target population per health facility. A similar number has been reached with various nutrition education messages. SUSTAIN–Kenya is on track to reaching 35,000 HH by June 2018. To date, 30,968 HH have been reached. An additional observation in this past year was that the presence of OFSP vine distribution and nutrition education have increased clinic attendance by women and their young children in participating clinics. CIP is currently analysing the data from these clinics to understand whether significant changes in access to health services have occurred as a result of the programme.

Figure 6. Progress against targets per health facility.



The programme's strong emphasis on promoting agriculture–health linkages has been greatly appreciated by county governments. SUSTAIN–Kenya often holds fora that bring together the departments of agriculture and nutrition. Such fora are an innovation within county governments despite their evident importance for addressing nutrition challenges in these counties. The county governments of Siaya and Homa Bay have embraced a strong multi-sectoral approach in their new country nutrition strategies, in part due to the lessons generated by SUSTAIN–Kenya.

Value chains

The project is also on track regarding commercialisation of at least one product that utilises substantial amounts of OFSP as an ingredient. Although Kenya experienced unusual shortages in rainfall in 2016, farmers supplied sufficient roots and the puree processor (Organi Ltd) was able to produce to full capacity. Owing to CIP's backstopping, OFSP farmers adapted to the changing rainfall by planting sweetpotato in moist low lands. In addition, the resilience of OFSP showed once again; and when most other crops such as maize and beans performed poorly, sweetpotato still yielded reasonably well. At the start of the project, OFSP was not regarded as a major commercial crop and was not preferred by farmers for commercial production. This attitude is changing as puree processing provides a local market; fresh root markets for orange varieties are also expanding. It is a milestone for the project to document that an estimated 20 ha of OFSP have been cultivated at the start of the 2017 rainy season. This is a major shift as farmers in Western Kenya would normally cultivate sweetpotato towards the end of the rainy season and after other short-maturing crops (e.g. beans and maize) have been harvested. In other words, it is possible that perceptions of OFSP have changed and the crop has started to move up the priority list of farmers.

5.1.2 Key emerging issues

1. ***Irrigation facilities have diversified HH income.*** In recognition of the need to irrigate fields for vine multiplication, the project has supplied 41 vine multipliers with irrigation facilities. Follow-up spot checks have shown that 81.2% of vine multipliers utilise the irrigation facilities. In addition, 65% of vine multipliers use the irrigation facilities to also produce other horticultural crops, thus creating an additional family income and additional spill-overs from OFSP adoption and production. Furthermore, vine multipliers use stored rain water from tanks acquired with project support for other domestic use. This reduces the time and effort women require to fetch water, thus freeing up their time.
2. ***Use of Open Data Kit (ODK) has improved the efficiency in project delivery and allowed for learning.*** To enhance efficiency of M&E data collection and accelerate adjustments of implementation schedules, efforts were made to have county government staff collect continuous monitoring data using an ODK M&E application. Eighteen county staff (10 female, 8 male) were trained. There were successes and failures with this approach. A key success is that field staff, especially agriculture extension agents, could provide real-time images for immediate attention of the project agronomist for incidences such as pest and disease infestation. On the basis of the images and discussion with agriculture staff, the project agronomist has been responding to field conditions without having to travel as project counties are very diverse. Use of ODK has, however, been slowed by frequent transfers of trained staff. It has also been more challenging than expected to work with older extension staff on these new technologies.
3. ***Collaboration has led to skills development for county government staff.*** In addition to ODK, the project has built the capacity of county staff in the five counties of operation. Capacity and skill transferred were in the areas of community nutrition (79 male, 227 female), agronomy (9 male, 5 female), and M&E. Strong partnerships with the counties have contributed to an active community presence of community health workers who, in addition to promoting OFSP, also deliver other government services. Furthermore, training content and modules from the SUSTAIN programme are being used in county-led nutrition-sensitive trainings.

5.1.3 New initiatives

1. **Partners in commercialisation of OFSP have adapted their approach to engage producers.** Developing a new value chain, as is the case with puree processing, comes with learning and adaptation. SUSTAIN, together with its partners, have learnt quickly that promotion of other sweetpotato varieties, yellow- and white-fleshed, provide a good rider for OFSP. Thus in 2016–2017, project partners are promoting these varieties alongside OFSP, in part to maintain the promotional message that sweetpotato is a viable commercial crop, but also that OFSP provides essential nutrition. The puree processor, on the other hand, has consolidated production of OFSP within short distances to reduce transport costs.
2. **New collaborations and initiatives have been developed**. New collaborations have started to emerge since the SUSTAIN-led collaboration with Tuskys Supermarket. Other collaborations now include Naivas Supermarket, which has a chain of 38 supermarkets across the country producing bakery products (mainly bread and buns) that use substantial amounts of OFSP. Thus, Kenya's two largest supermarket chains are commercialising OFSP-derived products. Efforts by SUSTAIN–Kenya have also informed the development of the accelerated value chain project, which started in 2016. SUSTAIN identified the need for root storage for processors to have year-round supply of raw material; this activity has been taken up in the new project. Synergies within the two projects will help to strengthen the platform for commercialising OFSP.

5.2 MALAWI

5.2.1 Main issues and achievements

SUSTAIN continues to collaborate closely with the Ministry of Agriculture and Food Security in Malawi, specifically the Department of Agriculture Research Services for sweetpotato breeding and seed systems, and the Department of Agricultural Extension Services for dissemination of OFSP varieties and farmer training. Second, the programme maintained and further expanded its partnerships with NGOs throughout the country, with an increased focus on Northern Malawi. Complementing other CIP projects in Malawi, SUSTAIN contributes to the country-wide coverage of OFSP in all districts of Malawi (Fig. 7). One of the key strengths of the programme is the diversity of partners from government, NGOs, and farmers organisations that have taken on OFSP technical interventions, notably planting material dissemination and nutrition training, in extension planning areas where they have particular opportunities from ongoing programmes (Fig. 8). In the past year, SUSTAIN focussed specifically on building the technical skills of partners working in nutrition and OFSP for better targeting and reaching out to vulnerable beneficiaries. As a result, the project caught up with nutrition targets whilst also maintaining strong momentum for OFSP adoption. Districts that received particular attention in the reporting period included Chitipa, Karonga, Rumphi, Mzimba, Nkhatabay, Nkhotakota, Salima, Ntchisi, Kasungu, and Dowa (see Table 7).

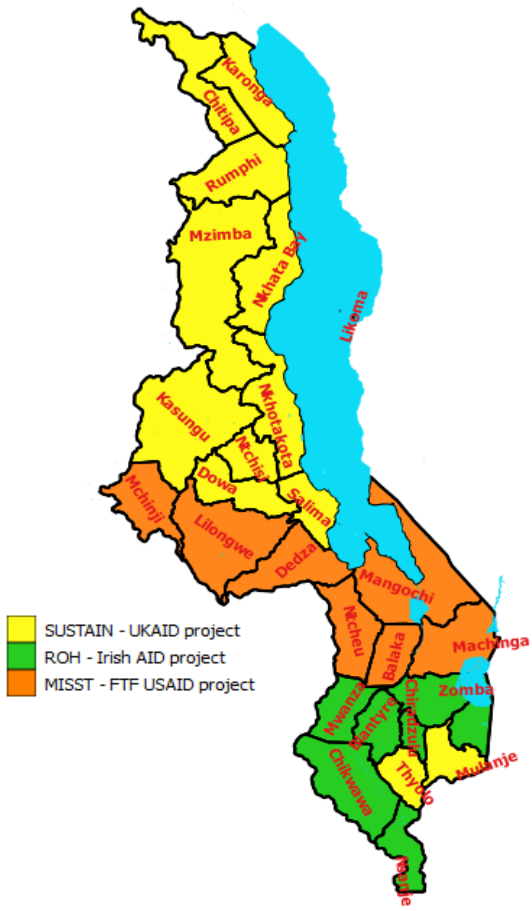


Figure 7. CIP OFSP activities in Malawi districts.

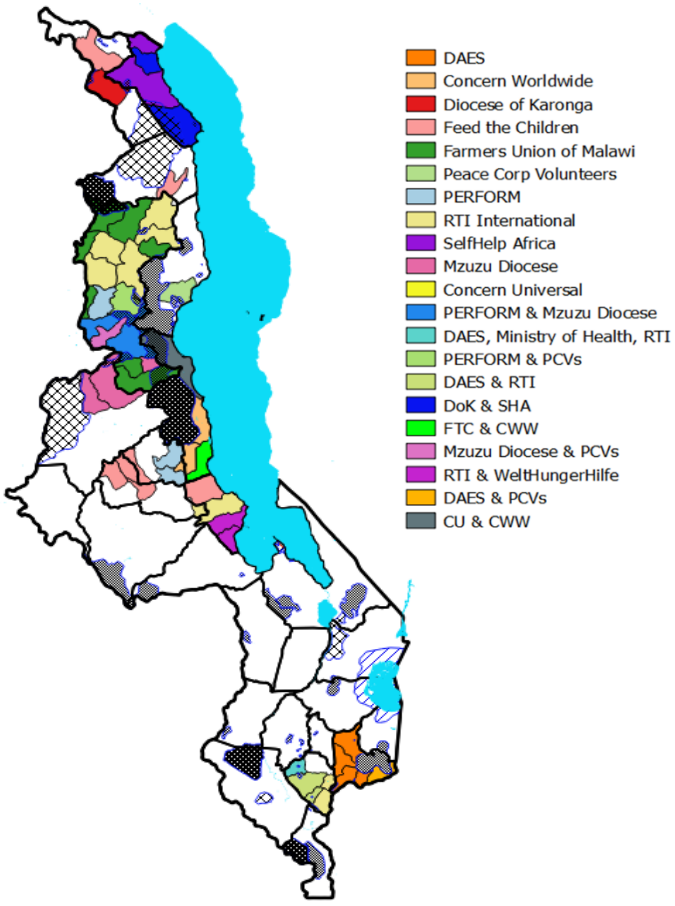


Figure 8. SUSTAIN partners EPA coverage.

Table 7. List of partners and their districts of operation in Malawi (2016–2017) season

Partner	Districts											HH Reached
	Salima	Nkhotakota	Nkhatabay	Dowa	Ntchisi	Kasungu	Mzimba	Rumphi	Karonga	Chitipa	Thyolo	
Feed the Children		x	x				x	x	x	x		4,000
World Vision International				x	x							6,000
Farmers world	x			x	x	x						3,000
CADECOM Mzuzu						x	x					2,000
PERFORM	x				x		x					3,000
CARE Salima	x											2,000
WHH	x											2,000
Diocese of Karonga									x	x		2,000
Ripple Africa			x									2,000
US Peace Corps			x	x	x	x	x	x	x	x	x	810
Bliss of the Elderly		x										230
Total												**32,040**

SUSTAIN–Malawi renewed agreements with 12 partners between October and December 2016, to train beneficiary farmers on production, processing, and consumption and to supply vines from five of the released OFSP varieties to these beneficiaries in the 2016–2017 season. Delivery of services at beneficiary level is done by partners, government staff, and other interested groups using skills acquired from CIP-led training. We see this as strengthening the capacity of partners to be able to continue to provide the required support to additional communities even after the programme ends. Further, this creates additional leverage power to DFID funding.

Planting material

SUSTAIN–Malawi worked with partners in the 10 target districts in the north and used three commercial vine multipliers and private partnerships to achieve its objectives. The results in the reporting period showed that 32,040 HH beneficiaries received improved OFSP vines in addition to 52,855 reported in the previous years for a cumulative total of 86,895, against a 2017 project target of 60,000. Gender-disaggregated data show that 75% of the beneficiaries receiving vines were women. The following OFSP varieties were multiplied and disseminated: 'Chipika', 'Kaphukira', 'Zondeni', 'Mathuthu', 'Kadyaubwerere', and 'Anaakwanire'. The project continues to implement Mother and Baby Trials allowing beneficiaries to be involved in evaluation of OFSP varieties. This methodology has also been adopted by other institutions and projects that visited pilot activities of the SUSTAIN programme and participated in training provided to CIP partners.

Nutrition

SUSTAIN reached 23,631 beneficiaries/caregivers with nutritional messages during the reporting period in addition to 20,000 reported in the previous period, for a total of 43,631. Although nutrition messages initially were mostly targeted at women, current figures indicate a more balanced approach: 56% of participants are female and 44% are male.

Value chain

The project continued to facilitate supply chain development and food technology services at UIL in support of the production and marketing of two commercial OFSP products: Beta crisps and OFSP bread using puree as a major ingredient. The change in ownership and management at UIL

resulted in further delays of activities in the second half of 2016, but progress has picked up since then and smallholder farmers sold roots worth $14,865 to UIL during the reporting period. As production and sales of these products are expected to increase, we expect increased demand for OFSP roots, leading to greater income opportunities for smallholder OFSP farmers and thus increased interest to keep growing OFSP.

5.2.2 Key issues emerging

It has become increasingly clear that partnerships with NGOs and donor-funded programmes need to be complemented with close collaboration with local government institutions such as the Agricultural Development Divisions and District Development Committees. A programme like SUSTAIN can help strengthen the operations and accountability of these public institutions by involving them in coordination, planning, and review meetings in their areas of jurisdiction.

The need to involve MoH and the Ministry of Education as key stakeholders in addition to the MoA is critical in enhancing the scaling up of OFSP nutrition and its benefits to vulnerable populations. The commitment by these ministries to combine nutrition-sensitive and nutrition-specific interventions provides opportunities for SUSTAIN to fully integrate OFSP into government IEC materials.

Collaboration with NGO partners with similar interest and working in the same target areas accelerated the rate of success in reaching more beneficiary HH within a short time using limited resources. This was provided value for money for DFID, and can be scaled out in the coming years and to additional countries and projects.

The drought conditions and floods during 2015–2016 have increased the interest in OFSP by institutions working on disaster risk reduction and hunger alleviation. Through national fora such as the RTCDT and participation in government and donor meetings, CIP has provided information and facilitated linkages for drought/flood relief programmes with OFSP planting material sources. Though these are unfortunate circumstances, they have reinforced the value of OFSP amongst producers (and supporting organisations) to withstand harsh, stressful conditions and still sustain acceptable productivity. On the other hand, other traditional crops such as maize have suffered substantial yield reductions.

Interactions with DFID and other institutions

Interactions with the DFID country office usually occurs during visits by CIP management team to DFID offices. Updates and briefs related to the projects are shared during these visits. Also, SUSTAIN–Malawi has a strong working relationship with other CGIAR institutions working in the country. Recently, the project was involved in hosting demonstrations related to biofortified crops together with the International Center for Tropical Agriculture (CIAT), the International Maize and Wheat Improvement Center, and the International Institute of Tropical Agriculture in Jenda in Mzimba and Champhira in Dowa districts. In the same vein, the project played a leading role in a day-long workshop organised by HarvestPlus through CIAT to promote biofortified crops in Malawi. Guests included government ministries, NGOs, the University of Lilongwe, farmers, and entrepreneurs in Lilongwe. SUSTAIN continues to strengthen its relations with government institutions and, as mentioned earlier, currently contributes to the development and integration of OFSP materials into the governments' IEC material on nutrition-sensitive agriculture to be used by extension workers and caregivers for training beneficiaries throughout the country.

5.2.3 New initiatives

The implementation model used by SUSTAIN–Malawi for scaling up OFSP is being used by other institutions such as Concern Universal (now called United Purpose) in the new European Union-

funded DIVERSIFY project in Balaka, Chiradzulu, and Thyolo districts, and by Ripple Africa in Nkhatabay District. Both institutions have partnered with SUSTAIN–Malawi to have a better understanding of the implementation modalities, and are engaged for capacity development and skills transfer.

5.3 MOZAMBIQUE

5.3.1 Main issue and achievements

In Mozambique, the programme experienced ups and downs in 2016–2017. First, the economic and political crisis that began in 2015 worsened during this year, leading to a withdrawal of donor support to the state budget and added stress to the country's public finances. The ensuing collapse of the exchange rate of the Metical against foreign currencies resulted in the rise of prices of basic goods and services, hence reduced consumer's buying power and at the same time increasing cost of production. Despite these challenges , SUSTAIN registered significant achievements in Mozambique.

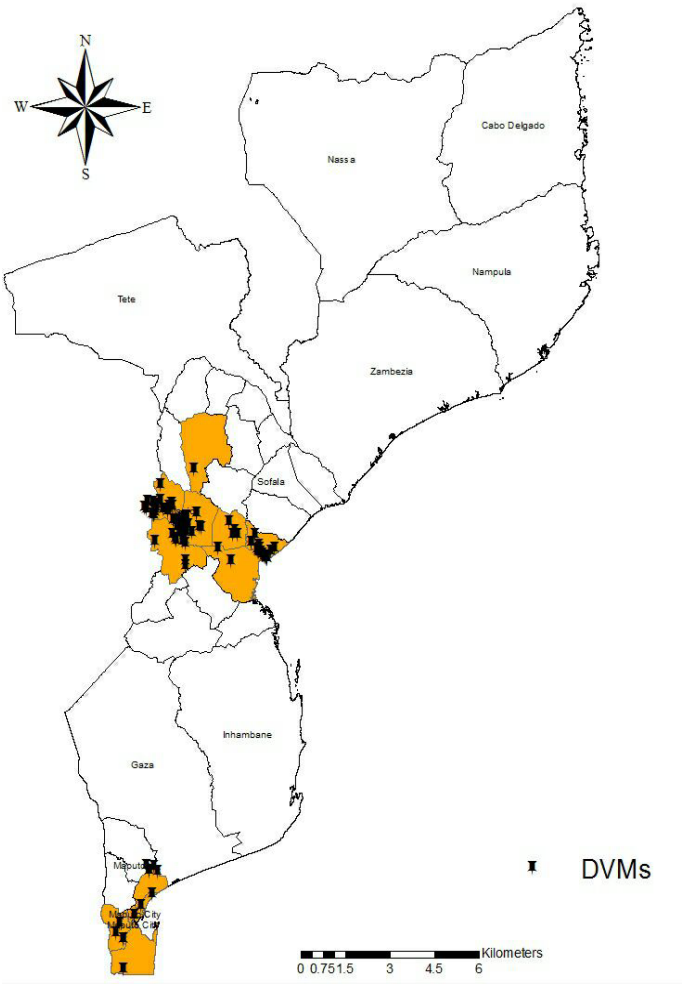


Figure 9. SUSTAIN intervention areas and DVM location in Mozambique.

Planting material

SUSTAIN has supported 96 multipliers (30% female) through training and technical assistance in 2016–2017, in 15 districts: Báruè, Chimoio, Gondola, Macate, Manica, Vanduzi, Susundenga, Beira, Dondo, Nhamatanda (in the Beira corridor), Manhica, Maracuene, Boane, Namaacha, and Matutuine (in Maputo province) (Fig. 9).

Note that activities in Báruè were suspended in 2015 due to security concerns. Only 24 multipliers were female in the 2016–2017 reporting year. The number of multipliers is slightly below the target of 7/district, mainly because of the difficulty of establishing and maintaining multipliers in the Maputo area. In the Beira corridor, there were 86 multipliers in current reporting period. Compared with the previous 2014–2015 report, the number of female multipliers increased from 14% to 30%. This increase is the result of two factors: a better assessment of the intra-household relations in the sense that money is paid to the person who is responsible for the plot instead of to the HH head; and a more conscious attempt to recruit female multipliers. In the Maputo area, the number of multipliers increased from 1 to 10 between 2014–2015 and 2016–2017. Overall, the number of multipliers per district in the Maputo area is below target (2 instead of 7), and those who supply vines are even fewer: only 3 produced vines until April 30—1 female in Matutuíne and 2 males in Marracuene and Namaacha districts

respectively. Almost 50% of all vines was produced by CIP itself as the other multipliers failed to deliver. During the distribution in May, vines will be obtained from the two remaining (male) multipliers in Manhiça as well as from the multipliers in Namaacha. Hence, out of all 10 multipliers only 5 proved sustainable. It is likely that in the urban environment the OFSP vine and root business cannot compete against faster-producing and higher-priced vegetables such as carrots. In Beira city, a similar situation occurred. Data on income earned from multiplier payments in Manica will be available in June.

Vine dissemination against targets. In Mozambique, SUSTAIN aims to reach 35,000 direct beneficiary HH with fortified OFSP varieties by the end of the programme. During this reporting year, 17,007 HH received vines with 16,446 having either a pregnant woman and/or at least one child under 5 years. Cumulatively, the project reached 44,963 HH, which is 9,963 above the original 2018 target of 35,000. Vine distribution in Beira and Dondo occurs normally around May–June, hence timing depends on when the rice is harvested. In Manhiça and Marracuene, distribution was delayed due to locally heavy rainfall. Fields were too wet to plant and it was necessary to wait until the soils had dried sufficiently. In both areas vine dissemination is now ongoing. In terms of vine retention, Mozambique had a target of 70% of the HH who farmed OFSP in 1 year still farm it in the following year. The monitoring survey for Manica province shows that 83% continued growing OFSP, setting retention well above the 70% target established in the programme's logframe.

Nutrition

Nutrition training and cooking demonstrations. Nutrition information is disseminated through leaflets and through informative meetings and cooking demonstrations. During the reporting period, 22,971 caregivers were reached through 833 training events in the intervention districts (555 in Manica, 174 in Sofala, and 104 in Maputo training events). There have also been 12 radio broadcasts, 10 fairs, 2 TV programmes, and 2 journal articles. SUSTAIN–Mozambique is likely to exceed its target for this indicator.

Value chain

Processed OFSP products. During the current reporting period, OFSP juice, puree, and bread were processed in Mozambique. ZebraFarm produced OFSP puree and is supplying this to three bakeries in the Beira corridor (two in Manica and one in Sofala provinces). OFSP bread has also become popular in Solafa to the extent that some consumers travelling long distances to purchase them (about 12 km to Minhota in Manga, the only bakery in Beira processing this type of bread) because they consider the associated nutritional benefits based on information they have received through a broad array of channels, including a SUSTAIN-managed facebook page. ZebraFarm's OFSP juice and sweetpotato-soy biscuits production has been less regular from December 2016 onward. Three bakeries (Papú, Nautilus, and Bico Dourado) are producing OFSP bread in Maputo province, bringing the number of bakeries processing bread in SUSTAIN–Mozambique to six. The production of processed OFSP products was started only in July 2016. Over an 8-month period, $26,983 worth of sales of processed OFSP products has been realised during the reporting period. Even though this is less than the $80,000 target for the reporting period, it is a strong indication that value chain development is commercially viable and likely to continue.

Smallholders engaged in the value chain. The programme's logframe foresees that SUSTAIN will engage 300 smallholders in the value chain for processed products. It is unlikely that this target is met, as only 50 smallholder farmers (46 women, 4 men; 5 in Manica and 45 in Maputo provinces) are currently supplying the processors.

5.3.2 Key issues emerging

1. ***Collaboration with government and local NGOs.*** It was a worthwhile investment to work with both central and local government as well as local NGOs. Collaboration with central government created a favourable biofortified (especially with OFSP) policy environment for easy project implementation. In addition, working with government at local level ensured trust under circumstance where the political environment was unstable, especially in the Beira corridor. Important are also the partnerships with the national agricultural research institute (Instituto de Investigação Agrária de Moçambique) and with universities. In addition, collaboration with NGOs facilitated capacity building for the local partners and made project implementation easier and helped to meet the targets. SUSTAIN has a strong working relationship with other CGIAR institutions working in the country.
2. ***The political situation and dynamics.*** Mozambique´s post-independence history has been marred by 18 years of armed conflict between the Frelimo government and the Renamo opposition and which ended with the 1992 peace agreement. However, in mid-2015, relations between both parties deteriorated and tensions escalated after several armed attacks in central Mozambique. The Beira corridor, one of the two intervention areas of SUSTAIN in Mozambique, became one of the most insecure areas in the country. Báruè, Chimoio, Nhamatanda, and Beira were high-risk flashpoints as well. In Báruè activities were entirely suspended due to security risks. In Mavonde activities were not suspended as the local facilitator was able to move around freely, but CIP staff could no longer visit that region. The partnership with a bakery in Báruè identified as a potential processor during a 2016 feasibility study was not developed due to security concerns. However, just before Christmas 2016, a truce was announced. In May 2017, the government withdrew its troops from the Gorongosa area and the situation is returning to normal.
3. ***Climate.*** On top of the economic and political crises, Mozambique also suffered from adverse weather conditions. El Niño had severely affected the entire region during the 2015–2016 season. It was widely expected that that season would be better, and perhaps even amount to an El Niña event, which would imply heavy rainfall and wide-spread flooding:

   > El Niño brought below-average rainfall resulting in drought in the south and parts of the central region of the country. Poor households in these areas are having increasing difficulties meeting their basic food needs due to inadequate supplies and high staple food prices. 1.5 million People are facing severe food insecurity (Crisis and Emergency), and this number is expected to rise to 2 million during the peak of the lean season (October 2016–March 2017). 850,000 children are affected by the drought. La Niña will likely lead to above-normal rainfall between January and March 2017, increasing the chance of moderate to severe flooding in some river basins in the south and central regions. Vulnerable displaced households in these flood prone areas are expected to need humanitarian assistance, particularly related to food, shelter, WASH and provision of health services. The impact of the current effects of the El Niño as well as the potential flood risks on vulnerable populations is exacerbated by ongoing conflict, which has displaced an unspecified number of people and disrupted food supplies from the north to the south.[1]

   The SUSTAIN–Mozambique team tried to adapt to this forecast by getting multiplication on track as soon as possible. It gradually became clear, however, that the heavy rainfalls that were predicted would not materialise. Instead, precipitation showed a very mixed pattern, with excessive rainfall in some areas and below-average rains in others. Besides, rains would frequently start late, thus the planting season was delayed and protracted. Consequently, the

[1] http://reliefweb.int/report/malawi/la-ni-events-impacts-eastern-and-southern-africa

dissemination of planting material was late as well. It is still ongoing in some parts of the intervention area, notably the districts of Dondo and Beira in the Beira corridor and the districts Manhiça and Marracuene in the Maputo corridor. In general, however, the Ministry of Agriculture and Food Security considers the 2016–2017 season cropping season "one of the best."

Interactions with DFID and other institutions

There was limited interaction with the DFID country office in Mozambique. One meeting was held at the country office, but it was not possible to have joint field visits, in part for security reasons. There was, however, active interaction with DFID-funded programmes such as AgDevCo[2] and GAIN for technical assistance and to share experience in value chain development and learn from each other.

5.3.3 New initiatives/collaborations

As a result of SUSTAIN work, some international NGOs are now using OFSP as an entry point to their nutrition and food security interventions, and they buy vines from multipliers established by SUSTAIN, thereby increasing HH income. In the current reporting period, FAO in central Mozambique bought 57,000 vines from multipliers established through SUSTAIN for distribution in their primary school-feeding programme. Other organisations have had new initiatives and developed nutrition-based proposals to different donors. The aim is to use OFSP as a crop to improve nutrition, and these organisations have approached CIP for capacity building in seed systems in the event of receiving funding. New collaborations with other organisations in Mozambique are likely to occur, especially in sweetpotato seed systems capacity building and provision of clean planting material.

5.4 RWANDA

5.4.1 Main issues and achievements

SUSTAIN–Rwanda is implemented through partnership with the Government of Rwanda and local NGOs. The Rwanda Agricultural Board (RAB) is the government institution responsible for multiplying and disseminating high-quality planting material to vine multipliers and implementing partners' multiplication plots. The first local partner is Young Women Christian Association working in Ruhango, Muhanga, Kamonyi, Rwamagana, and Kayonza districts. The second partner is Imbaraga Farmers Organisation which implements in Gicumbi, Rulindo, and Gakenke (Fig. 10).

Planting material

Basic seed is provided by RAB to farmer multipliers (DVMs), partners' multiplication sites, and CIP-managed multiplication sites. The initial material comes from the tissue culture laboratory at the RAB station in Rubona. They are then put into screen houses for hardening and rapid multiplication before being transferred to regular multiplication plots as basic seed for multiplication and dissemination. Each multiplier is also provided with a small net tunnel, where the clean planting material is protected from insects and pests. This way DVMs can keep the material clean for a longer period than when it is in open fields. The programme established 48 DVMs by the second year of it operation. However, there are currently 39 active DVMs in the SUSTAIN operating districts. Of these DVMs, 18 (46%) are males and 21 (54%) females.

[2] http://www.agdevco.com/our-investments/by-investment/S%C3%93-SOJA

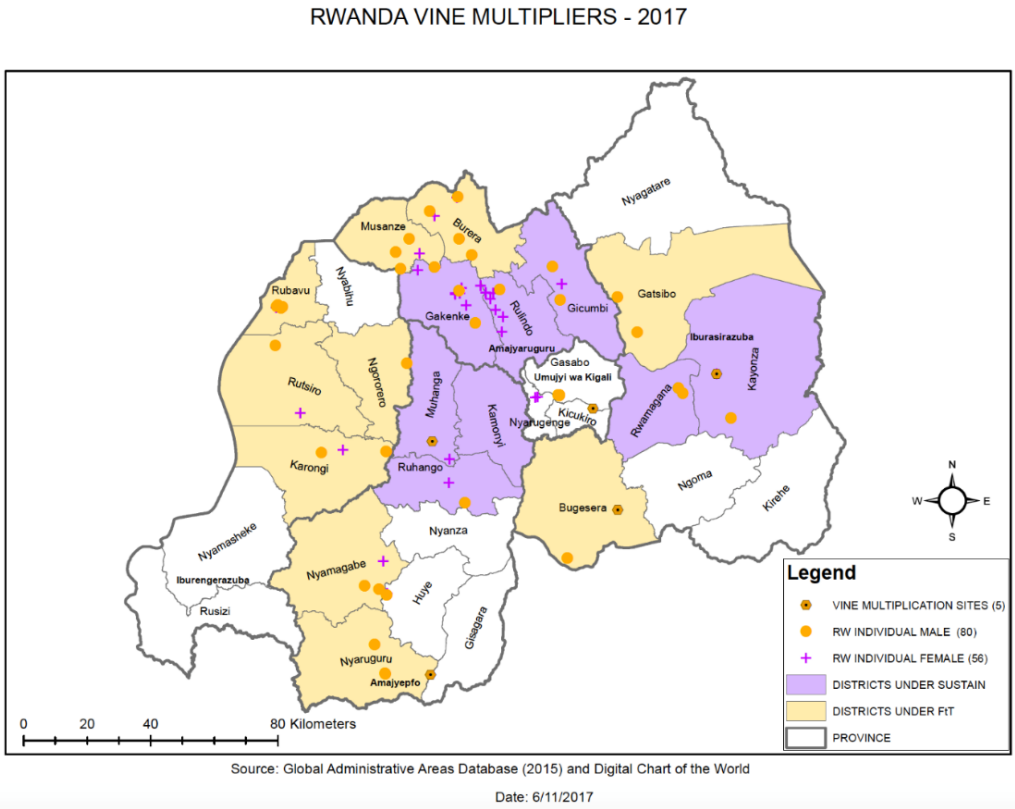


Figure 10. Map of Rwanda showing gender-disaggregated DVM by location.

Access to OFSP planting material (vine distribution). The project used two methods to get vines to the beneficiaries. The first strategy was to give vines to eligible beneficiaries in the RCT areas (selected implementation sites for evaluation study by MSU), and the second strategy was to give vines to beneficiaries identified by community health workers (CHWs) and the implementing partners. At the distribution site, the beneficiaries are given a short training on agronomic practices and nutrition benefits of OFSP and how to cook each variety. Each selected HH received a bundle of 150 cuttings of one variety accompanied by three communication brochures. The project in the reporting period gave OFSP vines and trainings to 58,863 HH cumulatively, resulting in 102,038 HH receiving vines since the start of the programme. For agronomic trainings, 4,156 male-headed HH and 2,392 female-headed HH were trained through home visits. A total of 8,557 participated in community training sessions. In a monitoring survey conducted, farmers who got vines were asked whether they have used the knowledge acquired during vine distribution. The preliminary results show that 93% confirmed they used the crop management practices acquired. And 80% confirmed having received communication material on agriculture. The information was useful in their sweetpotato production.

Demo plots and yields assessment. Initial results of 28 farm demo plots established in the second planting season of 2016 show that yields from farmer plots ranged from 7.91 t/ha to 16.27 t/ha. In general, the mean yield was 12.09 t/ha across locations. 'Kabode' and 'Terimbere' were the best performing varieties with high yields of 14.19 and 13.36 t/ha respectively, across locations. These yields are very good considering that this was the time the country witnessed low and unreliable rainfall, leading to a short-term drought from May 2016 to end of November. Remarkably, even though this drought spell resulted in a failure of most crops in the intervention areas, OFSP was able to sustain normal yields. Therefore, HH used OFSP harvested for their home consumption.

OFSP variety adoption. For the programme it is very important to go back and find out if the farmers who received planting material were still growing the varieties they received. The

programme conducted a short survey in March 2017 that interviewed 404 HH. One of the questions asked was if they were still growing the varieties they had received during mass distribution in the previous seasons. From the preliminary survey, we found that 95.5% were still growing OFSP varieties they had received and only 4.5% had lost the variety due to drying up during the prolonged dry seasons.

Nutrition

The project employed a community-based nutrition education approach that focussed on giving nutrition messages and counselling. Nutrition trainings and information were delivered during community nutrition sessions or home-to-home visit by CHWs using CIP developed nutrition-sensitive counselling cards. These cards were based on key messages related to maternal, infant young child nutrition (MIYCN) translated in the local language Kinyarwanda. CHWs organise community session 1 day per week in which mothers and caregivers discuss nutrition topics and perform cooking demonstrations. Also, the project utilises any community gathering in the work area for the CHWs to give short nutrition messages to the general community. One opportunity that has been used well is the Community Work Day which takes place on the last Saturday of the month in Rwanda, followed by a community meeting.

For delivering nutrition counselling, CHWs visit homes and discuss with caregivers' various nutrition topics as organised in the training material. They listen and watch the caregivers perform their tasks and then give specialised counselling information. In the reporting period, 38,238 (27,711 female, 10,527 male) beneficiaries received nutrition messages through community sessions organised by CHWs (i.e. 72% females, 28% males). A total of 10,377 HH (5,362 females, 5,015 males) got nutrition counselling through home-to-home visits; gender disaggregated is 52% female-headed HH and 48% male-headed HH.

Value chains

OFSP roots sale, processing, and marketing. SUSTAIN–Rwanda continues to strengthen OFSP value chains by linking farmers with markets and supporting processors who want to invest in OFSP processing. Urwibutso Enterprises also continued to produce OFSP products. They sold big doughnuts with a sales value of $33,476; small doughnuts with the sales value of $142,989; boxed biscuits at $11,598; biscuit big sachets at $8,369; and small sachets at $3,291. The total value of sales by Urwibutso was $199,723. The cooperatives have sold processed products worth $14,271; the DVMs have sold vines worth $41,114. Individuals and cooperatives have sold roots that have been recorded with a value of $11,887. In addition, SUSTAIN has linked about 400 farmers to the value chain (70% female, 30% male), exceeding the project target of 300 smallholders. This is reflected in the volume and value of products on the market

Communication activities and events. In the reporting year, SUSTAIN–Rwanda has produced and distributed 58,863 cooking instructions flyers, leaflets, vines labels, and brochures. We have also produced several online magazines and project updates. Three TV episodes on agriculture and nutrition were produced and aired on TV as dedicated programmes. Three radio stories and eight success stories have been published in online newspapers, and 200 magazines have been printed and distributed to partners and stakeholders.

5.4.2 Key issues emerging

1. **Collaboration with government and local NGOs**. The continuation of engagement of both the central and local governments as well as local NGOs in Rwanda has started to pay off. Collaboration with central and local governments changed the government's view of the growing of sweetpotato in Rwanda. Before the programme, MoA did not support the growing of sweetpotato in low lands that were set aside for "high value crops". This limited the

commercialisation of sweetpotato seed systems. The government of Rwanda now recognises the role OFSP can play in HH food security and national nutrition goals. Together with evidence that sweetpotato is a climate-smart crop, this has contributed to increased policy support for sweetpotato in Rwanda. In January 2017, MoA contacted CIP–Rwanda for help in developing a country strategy to utilise OFSP as a quick way to assist HH that were affected by the 2016 prolonged drought. CIP–Rwanda brought together all NGOs and donors working on food security and drafted a strategy which was accepted, adopted, and implemented. This required the collaboration between CIP–Rwanda, as the coordinator of the OFSP seed system, NGOs who facilitated the delivery of OFSP to areas that were not being covered by CIP SUSTAIN, and U.S. Government's Feed the Future OFSP projects. The government also bought vines from the DVMs and distributed them, as MoA's emergency response, together with the Rwandan Army, as part of their annual Army month activities. SUSTAIN–Rwanda provided an important impetus for broad-based utilisation of OFSP as a food security and emergency response crop in Rwanda.

2. **Climate change**. Throughout 2016, Rwanda faced severe weather when the rainfall in the March–June season was less than the long-term average. Rainfall was unevenly distributed and ended earlier than expected. This led to a drought period with many crops failing. The second season usually runs from September to October; however, in 2016 the season rainfall onset delayed, starting in mid-November to mid-December. Moreover, rains were short, infrequent, and insufficient. However, these were compensated for by the rains that started on time from February to around March 2017. In the context of these changes in climate and unpredictability in weather patterns, sweetpotato, due to its reliable yields under unstable weather conditions, is increasingly becoming an important crop for HH food security, while crops such as maize prove to be less reliable for this purpose.

Interactions with DFID and other institutions

The interactions between the DFID–Rwanda and the CIP–Rwanda offices occur often and at different levels. Most interactions occur during national/government meetings where DFID's livelihood officer and other officials attend. In May 2017, CIP and a designated DFID staff visited some of the SUSTAIN field sites. The visit afforded the DFID representative an opportunity to observe different aspects of the implementation strategy: seed systems to roots production in the field, community nutrition activities being conducted with CHWs in a school setting, food processing activities with the cooperatives, and our commercial processing partner Urwibutso enterprises. A photo story report of this trip is available upon request.

5.4.3 New initiatives/collaborations

SUSTAIN activities have influenced nutrition implementation activities of several local and international NGOs working on nutrition-related issues. Most of these institutions have included OFSP as an entry point for their nutrition and food security intervention. Smallholder farmers are their primary beneficiaries. These institutions procure vines from SUSTAIN-established DVMs, leading to high returns for vine multiplication in Rwanda. This has catalysed the development of a commercial OFSP vines seed system there. In the current reporting period, DVMs sold vines worth $41,114. We expect that more development projects and the Government of Rwanda will continue demanding vines from the vine multipliers, thereby making the seed system more commercial and more HH growing OFSP on their farms. To ensure that the OFSP seed system runs efficiently, CIP–Rwanda intends to create a seed tracker that will assist in management of seed inspection and certification, demand, and supply. All seed actors will have access to the application to ease the pressure of ensuring that OFSP seed production is tracked well throughout the growing season.

5.5 BANGLADESH

Bangladesh has made major progress in reducing malnutrition over the past 20 years. However, under-nutrition rates are still among the highest globally: 43% of preschool-age children, more than 9.5m individuals, are stunted and 56% underweight. Bangladeshi children suffer also from high rates of vitamin A, iron (Fe), and zinc (Zn) deficiencies. Vitamin A deficiency (VAD) still affects around 20% of children under the age of 14. The most vulnerable rural populations do not have access to vitamin A supplementation programmes and commercially fortified cooking oil. Food-based approaches with biofortified OFSP as a key component offer a viable and highly effective complementary strategy to reduce VAD. Increasing vitamin A intake also strengthens immune system responses and makes young children less vulnerable to the terrible affliction of physical and developmental stunting.

SUSTAIN has been collaborating with Bangladesh Agricultural Research Institute (BARI) and BRAC since July 2015, in Faridpur, Gaibandha, Kurigram, Rangpur, and Satkhira districts (Fig. 11). Satkhira is in the south-western part of Bangladesh and is a saline-prone area. The other three districts are mainly north-eastern districts and are char (islands) areas of Bangladesh. As of April 2017, the programme had reached 14,788 (89% women) beneficiaries during the 2016–2017 season. It should be noted that, in Bangladesh, sweetpotato planting starts in November and harvesting ends by April.

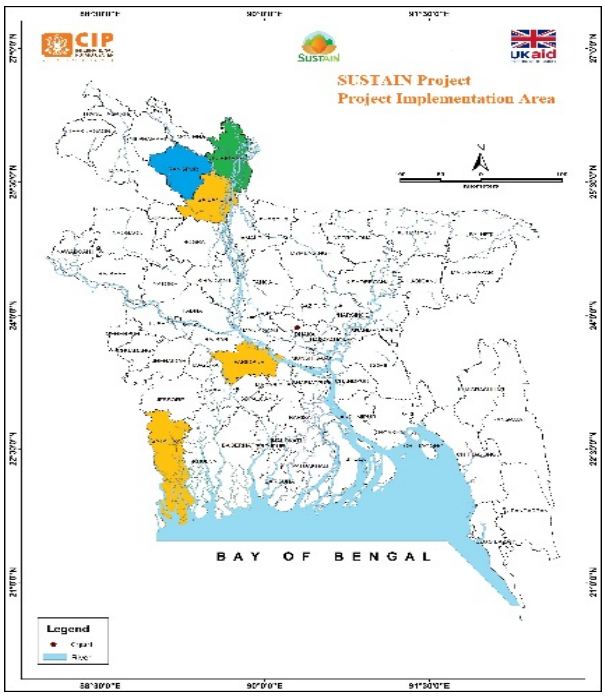


Figure 11. Map of Bangladesh with project implementation area.

5.5.1 Planting material

Ongoing research programme of sweetpotato. Three sweetpotato trials were set up in November 2016 at research stations of Tuber Crops Research Center; BARI; and farmers field in Bogra, Gaibandha, Gazipur, Jamalpur, and Satkhira districts. The objective was to find suitable short-duration varieties that are rich in beta-carotene and high dry matter, and suitable to grow in saline areas. In total, 30 OFSP clones were included in these trials. In March 2017, all 30 clones were harvested and evaluated. Sixteen total clones were selected for the upcoming trial period (2018) in the same districts.

OFSP vine multiplication and distribution. During the reporting period, the project continued to multiply OFSP vines using the existing DVMs. There were 203 (105 men, 98 women) DVMs who produced 2,903,750 vine cuttings. The produced vines were distributed to 3,500 root-producing farmers, 9,075 farmers under the community nutrition component, and parents of 1,940 students through awareness programmes on nutritional value of OFSP in schools. On average, every nursery owner sold 14,302 vine cuttings with an earning of BDT 7,151 ($88.70). Income earned from their multiplication business are reinvested in different income-generating activities (e.g. poultry rearing, tree plantation, paying off land mortgage for crop production, etc.). They also share their earnings with their husband to meet daily HH expense and expenses for child education and to pay medical bills.

SUSTAIN is targeting marginal and smallholder farmers, with at least 75% women prioritising HH having children under 5 years. The programme has now reached 14,788 beneficiaries, of which 89% are women farmers (Table 8).

Table 8. Farmer distribution based on activity in 2016-2017 reporting year

Districts	Men	Women	Total
OFSP nursery	98	105	203
OFSP root production	631	2,869	3,500
Community nutrition scholars (CNS)	0	75	75
Participants for nutrition education	0	9,000	9,000
Child-to-parent behaviour change through school children	957	1,053	2,010
Total	**1,686 (11.4%)**	**13,102 (88.6%)**	**14,788 (100%)**

Nutrition training and events

To increase nutrition awareness about healthy diets and increase consumption of nutritious foods, CIP has trained and graduated a cadre of 75 young women as CNS. After receiving the training, the CNS selected 9,000 women (i.e. each CNS selected 120 women from their respective communities). The CNS stepped down the training they had received to the selected women from February to April 2017. Topics covered by the CNS included (1) the importance of nutrition and balanced diet; (2) importance of OFSP; (3) micro-nutrients in food; (4) breast-feeding; (5) complementary food for children; and (6) safe motherhood, hygiene, and gender-sensitive food distribution. These topics are covered under the broad theme of MIYCN. Each CNS conducted 12 nutrition education sessions for six groups of 20 members each on a weekly basis through courtyard meetings.

In Bangladesh, because of cultural practices and social restriction, women do not often leave their homes. Most need permission from their husbands to go out, and CIP has been including husbands of the selected mothers in the first session. A gender sensitisation session is conducted with these men so that they can understand the importance of training and so allow mothers to participate in the training as well.

Value chains

OFSP root production. CIP–Bangladesh selected and trained farmers from four districts to produce OFSP roots. The project trained 3,500 (82% women) farmers on "improved production technology and management of OFSP"; all the farmers planted OFSP in November 2016 (Table 9).

Table 9. OFSP production and sales data for Bangladesh—2017

	Districts			
	Gaibandha	Satkhira	Kurigram	Rangpur
Total harvest (t)	533.32	145.18	369.54	89.96
Average yield (t/ha)	29.28	10.25	25.36	24.69
Average harvest per HH (t)	0.355	0.29	0.308	0.299
Total area under cultivation (ha)	18.2	14.2	14.6	3.6
Average area under cultivation (ha)	0.012	0.012	0.012	3
Percentage of harvest sold	40.7%	65.5%	41.2%	34.9%
No. of farmers	1,500	500	1,200	300

Marketing of OFSP. In 2016, the programme developed linkages with the districts and regional markets as well as negotiated the price of OFSP for the buyers of these markets. In 2017, SUSTAIN will adjust the marketing approach and have farmers manage root sales on their own, as market linkages have now been established.

Mobile Selling. SUSTAIN communicated with two traditional small sellers from Kurigram who are selling fruits using rickshaw vans. The objective of this initiative was to popularise and create awareness of OFSP among consumers of Kurigram District. Initially they collected 200 kg of OFSP from farmers at Taka 15/kg ($0.18), which is a good price at the farm gate. Following this, other small sellers through their own initiative have sold OFSP in the nearby villages.

OFSP supply chain developed with urban market. In 2015, the project signed a memorandum of understanding with Agora, a supermarket in Dhaka, for selling OFSP at their different outlets. This year the project staff and farmers' representative negotiated with Agora to sell a bulk quantity directly to the Dhaka market. Under this agreement the farmers have now sold 1.24 Mt OFSP to Agora in the reporting period.

Linkages with private sector for OFSP processing. SUSTAIN has entered an agreement with Alauddin Bread and Confectionary bakery in Rangpur and Bogra Hotel and Restaurant in Kurigram to use OFSP in their regular products. Six regular bakery products—bread, cake, toast biscuit, Nimok Pora (Nimki), and Chanachur—are being produced on test basis with several trials held in January 2017. The bakery reported it had received positive results for using OFSP as an ingredient to substitute for some percentage of wheat flour. The bakery plans to incorporate OFSP into its bakery line on a regular basis during seasons of root availability.

Field days. During harvesting period (Feb.–Mar. 2017), seven field days were organised by our partner organisation BRAC in four districts—Gaibandha (2), Kurigram (3), Rangpur (1), and Satkhira (1)—to create awareness of the importance of quality sweetpotato production at farm level for increasing yield and generating income. Altogether, 700 (180 men, 520 women) participants attended the field days to observe quality sweetpotato produced, quality of roots, yield per hectare, and estimated income from sweetpotato production, and to ensure continuation of the cultivation system through farmer-to-farmer knowledge sharing (Table 10). Participants (DAE, BARI, BRAC, Print Media, and farmers) expressed their views and shared knowledge on the importance of quality sweetpotato production at farm level.

Table 10. Field days per location, and participants by gender, during 2017

Location	No. of Field Days	Participants		
		Male	Female	Total
Gaibandha	2	19	181	200
Kurigram	3	97	203	300
Rangpur	1	14	86	100
Satkhira	1	50	50	100
Total	**7**	**180**	**520**	**700**

OFSP promotion at schools. To assess the acceptability of OFSP, and to understand preferences of taste, colour, and sweetness, the programme organised OFSP consumption promotion open days at different schools in four districts. A total of 1,940 parents (85 men, 1,855 women) participated in the open day from the selected six schools. A total of 4.26 Mt of OFSP was distributed to the students. An acceptability assessment was conducted among 350 students. The sample selection process was to pick 5 boys and 5 girls from each class randomly. The data are now being analysed, and results will be reported in the next quarter.

6. OPERATIONAL STUDIES

CIP understood, right from the start, that the implementation of the SUSTAIN programme was complex and that there were many implementation knowledge gaps that would need to be filled

through a series of systematic and well-designed operational research (OR)/studies. Thus, conducting OR to fill these knowledge gaps has been part of routine activities over the life of the project. Owing to the multi-country nature of the project, some of the gaps in knowledge were context specific and have been investigated at country level. Others were cross-cutting , and were filled through cross-cutting analyses or case studies. The various operational studies conducted as part of the learning on effective implementation of SUSTAIN are summarised below under the broad themes earlier proposed to DFID.

6.1 Assessing OFSP varietal performance among smallholders and developing cost-effective yield measurement approach

To understand how the OFSP varieties promoted by SUSTAIN are performing relative to local farmer varieties, CIP has conducted several crops cuts and surveys in Rwanda and Mozambique. The crops cuts were conducted in farmer plots and were managed by the farmers themselves. They therefore provide yields under farmer conditions. Moreover, the farmers selected were representative of the smallholder sweetpotato farmers. Both male and female farmers were selected to assess differences, if any, in the performance of varieties by gender. Preliminary analysis of the Rwanda data generated from these crops cuts demonstrate that the CIP-promoted high-quality varieties (shaded in Table 11) have higher yields under farmer conditions than the old farmer varieties. Further trials will be conducted to determine to what extent this difference is due to the genetic quality of new varieties or to the quality of the planting material available.

Table 11. Means for total sweetpotato yield of the demo plots in Rwanda, September 2016, survey (shaded rows represent CIP-related varieties)

Variety	Gicumbi	Kayonza	Muhanga	Ruhango	Rulindo	Rwamagana	Mean
Gihingumukungu	16.71	7.001	10.34	9.09	14.75	9.517	11.24
Kabode	18.69	8.273	14.69	9.27	18.87	15.323	14.19
Kakamega 7	16.46	7.558	7.65	10.82	12.18	5.207	9.98
Local variety	17.08	7.196	11.40	8.99	15.69	10.954	11.89
Terimbere	23.06	8.966	5.30	12.21	21.52	9.097	13.36
Vita	17.63	8.462	10.65	11.03	14.60	8.898	11.88
Grand mean	**18.27**	**7.91**	**10.01**	**10.24**	**16.27**	**9.83**	**12.09**

These results are consistent with the findings of the variety performance evaluation conducted in farmer fields under the Mother and Baby trials in Malawi that also demonstrated that the new CIP-introduced OFSP varieties outperformed local varieties, including the previously introduced OFSP variety 'Zondeni'.

Conducting crops cuts can be quite expensive. To reduce the cost, SUSTAIN in Rwanda and Mozambique adopted ODK tools and protocols developed by the CIP–SSA (sub-Saharan Africa) M&E team. The tools were piloted in Rwanda, refined (i.e. adapted to Rwanda sweetpotato-growing practices), and rolled out for crop cuts as well as in collecting other monitoring data. The refined and adapted tools were used by the SUSTAIN team in Mozambique during the reporting year, to assess the performance of the varieties the programme is promoting there. The use of these tools has notably reduced the cost of data collection and processing since data capture and entry are combined into one step.

6.2 Assess the effectiveness of planting material dissemination approaches used in SUSTAIN in terms of adoption, gender, and efficiency

Several research activities have been conducted under this OR theme. First, in all the SUSTAIN countries, the planning of planting material supplies and distributions is now facilitated through

ODK tools. For instance, ODK tools are used to register and monitor DVMs for availability and quality of planting materials to allow for harvest scheduling. The use of these tools has led to major cost-savings in the sourcing of planting materials. Of greater relevance to this theme, SUSTAIN has conducted OR studies in Kenya, Mozambique, Rwanda, and Malawi to determine the adoption of OFSP varieties. In Kenya, the study targeted HH reached through the coupons. In Mozambique, Malawi,[3] and Rwanda, however, the beneficiaries who participated in these studies were reached through a combination of coupons and mass dissemination events. In all the cases, the beneficiaries received both planting material and basic agronomic information. The major finding of these studies is that a significantly large proportion of beneficiaries of OFSP planting material dissemination was still growing the OFSP varieties they received at least 1 year later. In Mozambique, the retention rate was 83%, in Kenya it was 76%, and in Malawi it was 75%. Rwanda is still analysing the data collected as part of this OR theme. However, preliminary results show that 97% of the respondents are still growing OFSP 3 years into implementation.

The role of gender on the dissemination of OFSP planting material remains a major interest to SUSTAIN and CIP. Using the data collected in Kenya, SUSTAIN therefore examined labour use in the growing of OFSP varieties promoted and decision-making regarding the utilisation of the OFSP harvest, among other issues. Results have shown that more than 85% of labour used is from female HH members. In terms of utilisation, the Kenya results show that, in more than 88% of the cases, females were the ones who decided how the OFSP harvested was used. These results suggest that women still dominate the production and utilisation of OFSP and are likely to continue to drive the demand for the OFSP planting material.

SUSTAIN also analysed existing qualitative and quantitative data in Malawi and Tanzania to establish what are the gender roles and division for marketing. Results in Tanzania showed that on average volumes of fresh roots traded by male traders are higher than women's volumes. Second, the number of women trading reduced by 7% in the low season, which may be attributed to lower mobility compared with men as well as low capital base. Qualitative data in Malawi further illustrate that while both men and women derived some economic and social benefits from OFSP root and vine cultivation, women who belonged to HH where men were selected as the DVMs often mentioned that they did not benefit directly from the vines but from the roots. This was so because men controlled the income from the vines and left women to deal with the roots which fetched a lower market value. In Malawi and Tanzania, women mentioned lack of finance and business skills as a major obstacle to engaging in sweetpotato businesses.

6.3 Assess decision-making on OFSP adoption and nutrition behaviour change at HH level and relate these to SUSTAIN's agriculture-nutrition-marketing approaches

An important goal of the SUSTAIN programme is to achieve the incorporation of OFSP into diets of young children, especially those 6–23 months of age, as complementary food. The baseline study and interactions with mothers had revealed that most would not feed their children on sweetpotato or foods incorporating it. Under this theme, therefore, SUSTAIN conducted an OR study to assess the effect of psychosocial/behaviour factors on complementary feeding involving the use of right amount of OFSP to supply needed vitamin A fed in the right form at regular intervals. The study was conducted as a field experiment in western Kenya among mothers targeted by the project. It also examined the effect of behaviour change communication strategies employed by SUSTAIN on MIYCN. The findings reveal that nutrition messaging, nutrition counselling, mother-to-mother health talks, and cooking demonstrations implemented by

[3] The Malawi team combined mass dissemination and the Mother-and-Baby trial usually designed, implemented, and managed by CIP scientists. In Mozambique, on the other hand, the studies were conducted as annual mini-studies to track the adoption of OFSP varieties over time.

SUSTAIN and partners affect the use of MIYCN. In addition, social and behavioural factors (e.g. social environment, one's trust in ability to implement complementary feeding incorporating OFSP, fear of negative social evaluation, and advance planning) affect intent to practice MIYCN among mothers. The study also found a combination of behavioural factors that influence the adoption of exclusive breast-feeding by mothers.

In addition, analysis of the data from a gender formative study conducted in Tanzania revealed that nutrition information affects men's adoption of OFSP. Men who adopted OFSP did so because of the nutritional benefits they expected to get from OFSP. At the same time, however, the study found that nutrition information was given, in many cases, at ante- and post-natal health clinics, which men did not normally attend. It thus concluded that it is important that men and women get equal access to OFSP nutrition information. This can be achieved through targeting men with appropriate messages by use of community meetings, which men attend, and men's peer groups.

Further, SUSTAIN has used the data collected during a field experiment in western Kenya involving sweetpotato consumers to analyse the role that knowledge regarding biofortification of OFSP plays in the acceptance (adoption and consumption) OFSP among caregivers of children under 5 years. The analysis has revealed that knowledge of the positive attributes (nutrition and health benefits) of OFSP increases the acceptance OFSP, hence is likely to promote adoption. It also found that knowledge of negative attributes had the opposite effect, indicating that consumers (and farmers) who have been exposed to negative information about OFSP will need more nudging to adopt OFSP.

6.4 Analyse constraints to expansion of OFSP puree value chains considering supply management, demand trajectories, and smallholder participation

Several OR studies have been conducted under this theme to understand the constraints to the expansion of OFSP puree value chains. A team of CIP and partner scientists recently synthesised the constraints to sourcing of fresh roots, processing the roots into puree, and subsequent marketing to Tuskys into a paper that was recently published in a journal under the title "Lab to life: making storable orange-fleshed sweetpotato purée a commercial reality". The article highlights the challenges of matching fresh root supplies with demand, meeting quality standards, and lining up the puree production with Tusky's needs. Further, the SUSTAIN team in Kenya conducted an OR study that aimed at assessing the feasibility of root production in Kericho. Kericho is located between the current production location and Nairobi and has soils and climate that can support OFSP production. Diversifying OFSP fresh root production is seen as an important strategy for smoothing fresh root supplies to the processing factory thus allowing year-round production.

Puree production and utilisation occur at different locations separated by close to 500km distance. Thus, ensuring that puree can be stored for a period of time after its manufacture has been an important matter. Through FANEL, CIP scientists and students conducted a series of OR studies to assess (1) the efficacy of preservatives microbial growth and beta-carotene retention in OFSP puree; (2) food safety practices, microbial contamination, and training in OFSP puree processing; (3) the quality of OFSP bread and white bread; and (4) consumer knowledge and attitude towards OFSP bread. These studies were conducted in Western Kenya and have generated very valuable findings and lessons that have been used to further improve puree processing and to understand consumers' perception of the bread produced by Tuskys. One of the key findings and a lesson from the OR studies conducted by FANEL was that OFSP bread from puree produced from clean unpeeled roots was just as good and acceptable to consumers, yet more nutritious.

In Malawi, a market and situation analysis was completed as part of the plans to launch value-added OFSP-based products. The study used a SWOT analysis to map the strengths, weaknesses,

opportunities, and threats to OFSP value chain development in Malawi. It also analysed the macro-environment and the markets in which value-added OFSP products will be launched. The study, for instance, identified strengths that include (1) increasing local demand for OFSP; (2) consumers' increased interest in locally manufactured goods, particularly with a high content of locally produced products; (3) willingness by major national store chains to carry OFSP lines; (4) growing consumer interest for nutritious foods; and (5) the growth in middle-class populations. These factors are likely to drive demand and create a strong pull effect in the production and management of the OFSP value chain to deliver the attributes the consumers need. The study also highlights other key issues that need to be considered to promote a successful OFSP value chain in Malawi.

7. GENDER

7.1 ACCESS TO OFSP PLANTING MATERIAL BY SMALLHOLDER HH WITH CHILDREN <5

7.1.1 Involvement of women in vine multiplication

The project has made concerted efforts in Malawi, Rwanda, and Mozambique, where low participation of women had been recorded in the previous reporting period, to engage women as DVMs. Major obstacles cited are that women do not have access to land and water and other resources such as money to invest in order to multiply vines. Between 2014 and 2017, women vine multipliers in Rwanda increased from 21% to 54% of the total number of DVMs under the SUSTAIN project there. In Mozambique women participation as vine multipliers increased from 14% to 29%. This sustained increase in women's participation has been a result of several strategies, including efforts to register women as vine multipliers instead of their husbands, and also involving men and negotiating with them to allow their wives to participate as vine multipliers. Engaging with men has been important for Mozambique ,which has strong patriarchal structures. Often, women in Mozambique did not wish to register themselves as vine multipliers for fear of creating conflicts in their homes with men HH heads, making it harder to capture the real participation of women in vine multiplication. In Malawi, while the model of engaging with one major commercial vine multiplier did not create avenues for engaging women, the project has instead engaged with close to 300 women in Karonga and 50 women in Mzimba, training them on conserving their own planting material. This is regarded as key to sustaining access to vines since most women in Malawi may not be able to buy sweetpotato planting material without project support.

The current structure of the programme may impact women's ability to participate in vine multiplication as well as the investments in women DVMs through the increased ability of women to access training and other project resources. For example, in Bangladesh SUSTAIN has always targeted women vine multipliers. A total of 220 women-run multiplication nurseries were established for the 2015–2016 season in Gaibandha, Faridpur, and Satkhira districts to ensure supply of quality planting material to root producers through the SUSTAIN project. Additionally, Bangladesh and Kenya, both with high numbers of women DVMs, also had a high number of female facilitators who promoted women's participation in vine multiplication.

7.1.2 Distribution of benefits accruing from vine multiplication

Data have not yet been analysed for all cases on accrual of benefits by men and women from vine multiplication. Yet there is evidence that in some countries both men and women have benefitted. In Kenya for example, there has been a sustained effort to ensure that women participate in planting material multiplication and marketing. In 2016, 54% of the total amount of revenue generated by planting material multipliers linked to the project accrued to female entrepreneurs. In Bangladesh, where the project targeted women, on average every nursery owner sold 20,972 vines cuttings with earnings of BDT 10,454 (about $130). For the 2017 season, 203 new multiplication nurseries have been established and are expected to produce 3m vine cuttings for

distribution among 3,000 farmers. Anecdotal evidence from Rwanda illustrates that women vine multipliers have benefitted. For example, documented case studies show that women have used money accrued from selling vines and invested in assets such as irrigation equipment and water-harvesting technologies, as well as in housing and accommodation. These examples illustrate the opportunities in vine multiplication for improving women's lives and well-being.

However, in some countries there is also some ambivalence on women's role in DVM multiplication in improving their well-being and livelihoods. As noted before, women in Mozambique may be involved in vine multiplication and provide most of the required labour. But it is not always clear what benefits accrue to them in the process. This is mainly because of existing gender relations that regard men as the head of the HH and representative of family to outsiders; some women vine multipliers insist that their husbands are registered instead of themselves. This has implications for payments which are then paid to the men, who in some cases come with their wives to collect payment. Anecdotal evidence also shows that the money paid to women vine multipliers may lead to conflict within HH as there is a struggle over control of this resource. However, we have not yet been able to follow up with both men and women vine multipliers to understand how benefits are distributed within HH, and whether this leads to an improvement of HH livelihoods, including women and children.

7.1.3 Involvement of women in commercial marketing of roots and processed products

The importance of markets for both men and women root producers cannot be overemphasised. For example, evidence from Mozambique shows that both men and women farmers may drop out of sweetpotato production as well as vine multiplication when they do not have access to markets. With regards to involvement of both men and women in root markets, women have managed to dominate root marketing in all countries. For example, in Rwanda the Rulindo road-side market was developed because of collaboration between CIP/SUSTAIN and the district to provide a market for fresh roots for men and women producers (Fig. 12). From this perspective, fresh roots markets provide opportunities to benefit women since the common refrain against women participating in vine multiplication has been that they may not have access to land and irrigation. In addition, deliberate targeting to ensure that women are engaged in value-chain upgrading promote women's participation in roots markets where they can supply roots to the private sector. For example, in Kenya, a gender-responsive approach to value-chain upgrading has meant that slightly more than 50% of people supplying roots for puree processing to Organi Ltd are women. In Rwanda, more than 70% of farmers supplying fresh roots to Urwubutso Enterprises processor and two other processors linked to the project are women.

Figure 12. Rulindo road-side market in Rwanda.

7.2 ACCESS TO IMPROVED NUTRITIONAL KNOWLEDGE AND DIVERSIFIED USE OF OFSP BY BOTH FEMALE AND MALE CAREGIVERS

7.2.1 Promoting women and women as innovators and role models is important for nutrition messaging

In Bangladesh, CIP scaled out the CNS model that enables young women to acquire and share skills in nutrition, hygiene, and health counselling in support of achieving nutrition outcomes from OFSP introduction. The SUSTAIN project trained 159 young women from project communities as CNS during 2015–2016 who have provided training to more than 19,000 women and men in 2016. Training consists of 12-sessions modules, introduced to groups of 12 women at a time and covers topics such as malnutrition; homestead vegetable gardening; cooking practices; breast-feeding and children's food; personal hygiene; and women's health, including pregnancy and childbirth.

In both Rwanda and Kenya there has been a deliberate approach for institutional capacity building targeting both men and women health officers and nutritionists. In Kenya for example, 37 (23 females, 14 males) health care workers were trained. In Rwanda there are more male CHWs than women. However, the male CHWs were not willing to carry out cooking demonstrations because they regard them as a woman's domain; but they were more interested in traditional health work such as vaccination. However, through SUSTAIN's capacity building, the men CHWs are increasingly engaging in activities that they previously regarded as women's roles. Men are carrying out nutritional counselling and now also understand the value of including men in the process. In this respect, SUSTAIN has been able to shape and influence gender relations related to nutrition in the communities where we work in Rwanda.

7.2.2 Social and behaviour change communication to promote adoption of OFSP by men and women

Social and behaviour change communication (SBCC) can play a key role if it uses gender-responsive methodologies for supporting demand creation for new sweetpotato technologies such as planting material of new varieties. Qualitative studies in both Malawi and Tanzania showed that women more than men expressed willingness to purchase clean OFSP planting material. They mentioned mostly the training they had received on the health benefits of OFSP as a key reason why they were interested. This illustrates the effectiveness of a nutrition-focussed SBCC strategy—at least for female farmers—and raises the question whether this strategy could have similar outcomes amongst men.

Data from all SUSTAIN countries show very high participation of women in nutrition training and lower participation of men in the same. This is evident in the 2016/2017 percentages of women participating in nutrition training: Kenya (73%), Malawi (59%), Mozambique (82%), Rwanda (66%), and Bangladesh (100%). It has also been noted in this and other projects that it is difficult to involve men in nutrition training because they may not see any immediate financial benefits and regard nutrition as a woman's duty. This is problematic because research in Malawi and Tanzania has illustrated that men are key decision-makers about HH nutrition. For example, they may allocate land for crop cultivations, and decide how much to invest for the production for different crops.

To overcome this division between female and male spheres of extension messaging, the SUSTAIN project in Malawi is increasingly promoting the participation of men in nutrition education as well as nutrition counselling. In 2016, 2,670 men and 3,755 women participated in nutrition-related training activities. Likewise, in Bangladesh CIP has adopted approaches to strengthen capacities of both women and men in nutrition, hygiene, and child care to promote the safe and effective consumption of OFSP. For example, men as key HH decision-makers were specifically invited to attend the opening sessions that also included gender sensitisation, and explained the importance

of allowing women to attend all the 12 sessions. The effectiveness of the CNS model is currently under review, and can be compared to similar models used by other nutrition programmes in Bangladesh and to CIP's nutrition and SBCC models in Africa.

7.3 IMPROVEMENT OF M&E SYSTEMS TO COLLECT GENDER DATA AND TO ANALYSE THE DATA

In Rwanda, the M&E protocol was redesigned and aligned to the Feed the Future gender-mainstreamed M&E framework. The current monitoring, learning, and evaluation tools capture gender participation by collecting the following information:

- Sex of DVM captured in ODK and women registered as the owner of multiplication sites; they are the ones to receive direct payment from vine sales.
- The sex of person who picks/ directly receives vines to capture the participation of women and men during the training delivered during the day of vine distribution.
- Registering of beneficiaries (those who receive vines) with all identification of the members of HH; members under 5 are separated by gender.
- Sex of training participants.
- Seasonal monitoring survey tool has been designed to ensure we capture gender participation of the individuals growing OFSP.
- Yield estimation done through crop cuts which was done seasonally; collected information on the sex of plot manager.
- Collection of sex-disaggregated data on monthly vine and roots sales.

These data are still being analysed to draw issues which will help in designing gender-responsive programming.

8. NUTRITIONAL ANALYSES AND ACTIVITIES OF FANEL

FANEL was established with funding support from SUSTAIN and other CIP projects to support nutrition, food processing, post-harvest management, and breeding programme efforts. The laboratory is fully operational with state-of-the-art equipment such as high-performance liquid chromatography, ultra-performance liquid chromatography, gas chromatography–mass spectrometry, liquid chromatography–mass spectrometry, and atomic absorption spectrometry (AAS). This equipment supports work on vitamin, antioxidant, and food composition analysis using basic wet chemistry techniques. FANEL activities are housed in the Nutrition and Food Safety Platform in the Biosciences eastern and central Africa (BecA). The BecA–International Livestock Research Institute (BecA-ILRI) Hub is a shared agricultural research and biosciences platform located at and managed by ILRI in Nairobi, Kenya. The platform increases access to world-class laboratories for African and international scientists conducting research on African agricultural challenges. FANEL is now an integral part of this Hub and within CIP and the RTB CRP.

FANEL performs fat soluble vitamin analysis in biological matrices using protocols validated against the US Federal government NIST Micronutrients Measurement Quality Assurance Programme analysis. This analysis provides participants with measurement comparability assessment through use of inter-laboratory studies; standard reference materials; and control materials, methods development and validation, workshops, and tutorials. The laboratory also added capacity to analyse basic food composition such as proximate analysis to support work on food processing with OFSP using IUPAC-approved protocols. FANEL collaborates with premiere institutions such as the Natural Resources Institute at Greenwich University to develop and validate food analysis and food safety protocols, and with North Carolina State University and Tufts University in the United States.

FANEL implements a broad array of OFSP processing-related research activities and laboratory analysis. Table 12 provides a list of completed activities with the countries involved and the period during which they were implemented.

Table 12.Completed R&D activities by FANEL during reporting period

Title	Country	Period
Consumer knowledge and attitude towards orange flesh sweet potato (OFSP) bread in Kenya	Kenya	Aug.–Dec. 2016
Comparative study on texture profile analysis and volume properties of OFSP puree bread and standard white bread	Kenya	Aug.–Dec. 2016
Shelf-life of OFSP bread; interactions between water activity, moisture content and microbial activity	Kenya	Aug.–Dec. 2016
Effects of sodium benzoate, potassium sorbate and citric acid combinations on β-carotene retention in OFSP puree		Aug.–Dec. 2016
Food safety knowledge, attitude and practices of orange flesh sweetpotato (OFSP) puree handlers in Kenya	Kenya	Aug.–Dec. 2016
Microbial growth and the effects of preservatives in Orange Flesh Sweetpotato (OFSP) Puree: "A challenge study"	Kenya	
To develop formulations for shelf-stable OFSP puree bread and compared the bread volume and sensory attributes to standard white bread	Kenya, Malawi, Mozambique, Rwanda	Aug. 2016–Jan. 2017
OFSP Product Development in Mozambique	Mozambique	Nov. 2017

Below we summarise preliminary findings in draft format of the most recent activities. Most of this work was conducted by students working on their master's degree thesis projects with CIP.

8.1 FOOD ANALYSIS OF OFSP PRODUCTS

In SUSTAIN project OFSP has been transformed into a puree that is being used as a wheat flour substitute in bakery products. The OFSP puree bread value chain is working very well in Kenya, Mozambique, and Malawi. In FANEL we examined the nutritional and food composition analysis of OFSP puree bread (Table 13). The aim of the experiment was to determine the nutritional value of bread made with different levels of wheat flour substitution with OFSP puree, compared with standard white bread. These results show that there are marginal but significant differences between standard white bread from 100% wheat flour and OFSP puree bread made with 20%, 30%, 40%, and 50% wheat flour substitution. However, the biggest and most significant difference was the amount of β-carotene from OFSP puree in the bread compared with white bread. The more the OFSP puree, the greater the β-carotene and pro-vitamin A value of the bread. No β-carotene was detected in white bread because none of the white bread ingredients had pro-vitamin A carotenoids.

Table 13. Nutritional composition of OFSP breads with different proportions of OFSP puree

Sample	Moisture	Crude Ash	Crude Fat	Crude Protein
White bread	31.0 ± 0.3^{a}	1.3 ± 0.0^{a}	5.6 ± 0.1^{c}	10.7 ± 0.5^{b}
OFSP bread–30% puree	33.4 ± 0.5^{b}	2.5 ± 0.1^{b}	4.4 ± 0.1^{b}	9.2 ± 0.2^{a}
OFSP bread–40% puree	35.5 ± 0.1^{c}	3.0 ± 0.1^{c}	4.7 ± 0.3^{b}	9.5 ± 0.3^{a}
Treated OFSP bread, 30% puree fat free	33.8 ± 0.1^{b}	3.4 ± 0.1^{d}	2.4 ± 0.1^{a}	9.2 ± 0.1^{a}
Treated OFSP bread, 40% puree fat free	33.4 ± 1.5^{b}	$2.7\pm0.1b^{c}$	2.2 ± 0.0^{a}	9.6 ± 0.1^{a}

Values represent mean values and standard deviation. Values bearing different superscript letters are significantly different ($p<0.05$). Values are expressed on dry matter basis.

The analysis of sodium, which is found in many processed products, was not conducted in the time frame of this reporting cycle. An AAS is available for analysis.

Below we summarise the most important research outcomes to date.

Consumer knowledge and attitude towards OFSP bread in Kenya

Background: The addition of OFSP puree as an ingredient in baking bread is new in SSA. OFSP puree affects the nutrition, taste, colour, and texture of the bread. It is known that consumer knowledge about health benefits derived from specific functional ingredients is linked to their product acceptance. The purpose of this study was to profile OFSP puree bread consumers and to assess their knowledge, attitudes, practices, and acceptance of OFSP puree bread. *Methods*: 1,024 consumers were interviewed from selected retail stores in Nairobi, Kiambu, Kajiado, Kisumu, and Kaka-mega counties, Kenya. *Results*: The OFSP puree bread was purchased by consumers aged 30 years and older (80%), 58% were formally employed, and 60% were female. Consumers from Western and Nyanza regions of Kenya as expected were well informed about the OFSP fresh roots than the OFSP puree bread, compared with consumers from other regions. After purchase, most consumers (42%) store their bread on the shelf (in the open), 38% store in the refrigerator, and the rest store in cupboards. Consumers agreed that the OFSP puree bread could be a source of energy, vitamins (especially vitamin A), and minerals (94%). The acceptance ratings for OFSP bread ranged from 7.4 to 7.7 on a 9-score hedonic scale, therefore "liked moderately". *Conclusions*: Consumer and public awareness, knowledge, attitude, and socioeconomic factors such as gender, education, income, and ethnic background influence consumer practices and acceptance of OFSP puree bread and should be considered during product marketing.

Comparative study on texture profile analysis and volume properties of OFSP puree bread and standard white bread

Background: The quality of bread depends on a variety of factors, most importantly consumer after- purchase practices. To increase the acceptance of OFSP puree bread, it must not require special storage conditions. OFSP puree bread should match or exceed shelf-life of standard bread. The storage temperature is the most significant factor determining the storage quality of bread. Consumers have the option of storing bread at controlled temperatures such as refrigeration or at room temperatures. *Methods:* In this study, comparative evaluations on the physical properties of OFSP puree bread and white bread due to differences in storage temperatures of 4˚C, 20˚C, 25˚C, and 30˚C were investigated. Specific volume was obtained as volume to weight ratio (cm^3/g). The specific volume of white bread was found to be significantly ($p<0.05$) higher, ranging 4.4–4.6 cm^3/g than that of the OFSP puree bread, which ranged 3.7–4.0 cm^3/g. The texture of OFSP and white bread was analysed using Texture Profile Analysis. *Conclusions*: Refrigeration temperatures increased hardness ($p < 0.05$), crumb firmness, and chewiness, whereas increasing incubation time decreased ($p < 0.05$) crumb cohesiveness, chewiness, and resilience of both breads.

Shelf-life of OFSP bread; interactions between water activity, moisture content, and microbial activity

Background: The partial substitution of wheat flour with OFSP puree affects the bread properties such as taste, colour, flavour, nutritional content, and shelf-life. To increase the acceptance of OFSP puree bread, it must not require special storage conditions. OFSP puree bread should match or exceed shelf-life of standard bread. This study was conducted to evaluate the effect of storage temperature on the moisture content, water activity and total microbial and fungal count, colour and carotenoids, and consequently the shelf-life of OFSP puree bread. *Methods*: OFSP puree bread and standard white bread were made at Tuskys Bakery and observed for 7 days. These samples were stored at refrigeration temperatures of 4˚C, 20˚C, 25˚C, and 30˚C. *Results*: The moisture content and water activity of both loaves of bread decreased with increase in storage temperature

and time. Greater losses in moisture content and water activity were exhibited in bread stored at refrigeration temperatures, which resulted in fast staling. Refrigeration temperatures preserved both the OFSP and white bread—hence no microbial growth—whereas further increase in temperature led to fast spoilage of the bread, especially the white bread. Thermal degradation resulted in decreased carotenoid levels of the bread. The β-carotene levels of OFSP puree bread initially ranged on average at 0.053 mg/100g fresh weight. These decreased significantly by 50% to 0.026 mg/100g with increase in storage temperature and storage duration. No β-carotene was detected in white bread. The colour of the crumb and crust significantly (p<0.05) decreased after storage at the different temperatures. *Conclusions*: Storage of OFSP puree bread increases its shelf-life and nutritional content.

Effects of sodium benzoate, potassium sorbate, and citric acid combinations on β-carotene retention in OFSP puree

Background: OFSP puree increases the nutritional value of bread. In SSA, a shelf-storable OFSP puree will ensure continuous supply to bakeries at lower cost than under cold storage. Information on β-carotene retention during processing of OFSP roots into puree and the storage at ambient conditions is important in defining the importance of vitamin A consumption of OFSP puree-formulated products. This study was carried out to determine the effects of sodium benzoate, potassium sorbate, and citric acid on β-carotene retention in OFSP puree during storage. *Methods*: OFSP puree was prepared, treated with preservative combinations, and kept at room (16°–25°C) and refrigeration (4°C) temperatures for 12 weeks, with baseline and biweekly β-carotene analysis. The treatments were (1) control (non-supplemented puree); (2) 0.05% potassium sorbate plus 0.05% sodium benzoate plus 1% citric acid; (3) 0.1% potassium sorbate plus 0.1% sodium benzoate plus 1% citric acid; (4) 0.2% potassium sorbate plus 0.2% sodium benzoate plus 1% citric acid; and (5) 1% citric acid. *Results*: β-carotene content decreased significantly (p<0.05) with storage period at both conditions. The average OFSP puree β-carotene retention under refrigeration temperature was 70% compared with 60% at room temperature over the 12-week period. Citric acid alone seems to have a protective effect on β-carotene. *Conclusion*: Even after 12 weeks of storage at ambient temperature, OFSP puree still contains significant amount of β-carotene to affect human health.

Food safety knowledge, attitude, and practices of OFSP puree handlers in Kenya

Background: Lack of food safety knowledge and inappropriate food-handling practices by food handlers are leading causes of food-borne diseases in developing countries. Food handlers play an important role in ensuring food safety along the food chain. This study was aimed at assessing the level of food safety knowledge, attitude, and hygiene practices (KAP) among OFSP puree handlers in Kenya. *Methods*: A cross-sectional study was conducted among 35 OFSP puree handlers. Respondents were chosen by exhaustive sampling, and a self-administered structured questionnaire was used to assess their level of KAP. *Results*: Food handlers in this study had low level of knowledge about food contamination, food-borne illnesses, cleaning, and sanitation. Percentage mean scores were 64.3 ± 33.4, 75.7 ± 16.9, and 62.5 ± 13.9 respectively. Food-safety training had a significant positive impact on food-safety KAP and overall KAP (p=0.020, 0.050, 0.006, and 0.001 respectively). A moderate positive correlation existed between knowledge and practices (r=0.358, p=0.035) and attitude and practices (r=0.42, p=0.013). *Conclusion*: Food handlers had unsatisfactory level of knowledge and practices but demonstrated a positive attitude towards food safety. Frequent food-safety training is needed to improve their knowledge and hygiene

Microbial growth and the effects of preservatives in OFSP puree—A challenge study

Background: OFSP puree is a convenient form which can be used in formulation of many products. The major bottleneck in expanding the use of the puree is the limitation posed by its high perishability. *Methods*: A study was carried out to determine the anti-microbial effect of sodium benzoate, potassium sorbate, and citric acid on the growth of *Staphylococcus aureus* and

Escherichia coli in OFSP puree. The puree was stored at room temperature and refrigeration (4°C). The microbiology of the puree was evaluated during storage for 12 weeks. Inoculation of puree with *E. coli* and *S. aureus* at 109 CFU/ml resulted in less than 1-log increase after 12 weeks' storage of non-supplemented puree at room temperature and a 3-log decrease in puree at refrigeration temperature. *Results*: Significant reduction of counts was observed for the supplemented puree with preservatives and citric acid both at room and refrigeration temperatures ($p<0.05$). There was total inhibition of total viable counts and yeast and moulds during the storage period of the puree both at room and refrigeration temperatures except for acidified puree at room temperature. A more significant reduction of the counts was observed in refrigerated puree compared with that at room temperature ($p<0.05$). *Conclusions*: The preservatives at the concentration used in puree are adequate to stave off pathogenic microorganisms and ensure extensive use of puree.

To develop formulations for shelf-stable OFSP puree bread and compare the bread volume and sensory attributes with those of standard white bread

Background: The feasibility and viability of using OFSP puree as a wheat flour substitute (20–50%) have been demonstrated in bakeries in Kenya, Malawi, Rwanda, and Mozambique. The major bottleneck to expanding use of puree is the inconvenience of having to prepare and store it. Currently, processors store and utilise the roots for puree as needed, or prepare the puree and freeze it for future use. Therefore, it is important to develop a shelf-stable OFSP puree to reduce the cost associated with the cold chain and ensure year-round supply of OFSP puree to bakeries in SSA. Trials in Kenya showed that OFSP puree treated with 1% citric acid, 0.2–0.5% potassium sorbate, and 0.2–0.5% sodium benzoate, together with vacuum packing, can extend the shelf-life of OFSP puree by 3–6 months under ambient conditions. However, the preservative potassium sorbate affects yeast during dough development, hence dough proofing time and bread volume. This study was carried to determine the effect of baking powder, proofing time, yeast amount, and OFSP puree proportion in the dough on the bread volume. In this study 6-month-old OFSP puree was treated with 0.5% sodium benzoate, 0.5% potassium sorbate, and 1% citric acid. *Conclusions*: Shelf-stable OFSP puree produces a good volume bread almost similar to standard white bread by adjusting the yeast from 1% to 1.5–2% and including baking powder in the formulation at 1%.

Proximate analysis of OFSP puree bread

The nutritional composition of bread made with wheat flour substitution with OFSP puree was unknown. This information is important for consumer education and for promotion of OFSP puree bread in SSA. Samples of commercially produced white, brown, and OFSP puree bread were obtained from our partner Tuskys supermarkets bakeries in Nairobi and brought to FANEL for biochemical analysis. The samples are being analysed for moisture, protein, dietary fibre, lipid and ash, and available carbohydrate (Table 14). Other important physiochemical characteristics such as colour, bread volume, and texture will also be analysed.

Table 14. Proximate composition* in white bread, OFSP puree, and OFSP breads

Sample	Moisture	Crude Fat	Crude Protein	Crude Fibre	Crude Ash	Carbohydrate
White bread (0% puree)	28.6±0.9a	5.4±0.0b	10.6±0.0c	2.0±0.0a	2.3±0.0a	79.7±1.2a
OFSP puree	67.5±0.4e	0.6±0.1a	5.2±0.0a	5.0±0.2b	4.3±0.1e	84.9±1.2b
OFSP bread (20% puree)	29.1±0.5ab	5.0±0.0b	9.5±0.2b	1.8±0.0a	2.4±0.0a	81.3±0.8a
OFSP bread (30% puree)	30.8±0.7bc	5.1±0.1b	10.0±0.2bc	1.8±0.1a	2.5±0.0a	80.6±1.1a
OFSP bread (40% puree)	31.9±0.5cd	5.4±0.3b	10.4±0.2c	1.7±0.1a	2.8±0.2b	79.6±1.1a
OFSP bread (50% puree)	32.7±0.8d	5.5±0.2b	10.4±0.5c	1.8±0.2a	3.2±0.1c	79.1±1.8a

*In g/100g on a dry weight basis.

There were no significant differences in the fat content of the OFSP puree breads and standard white bread because the amount of fat used in the recipes was the same. The values for crude fat were all within internationally published values for white bread (USDA Nutrient database). *Conclusions:* Shelf-stable OFSP puree produces a good volume bread, almost like standard white bread, by adjusting the yeast from 1% to 1.5–2% and including baking powder in the formulation at 1% (Fig. 13).

Figure 13. Product development of 6-month-old preservative-treated OFSP puree to match the volume of standard white bread at ILRI Petma Kitchen.

8.2 CURRENT STAFFING AT FANEL

Tawanda Muzhingi, MS, PhD, (regional food scientist) is the laboratory director and Mr Daniel Mbogo MSc, MS (research associate) is the laboratory manager. Mr Derick Malavi, BSc, is a research assistant); Ms Elisabeth Wafula, MSc, is a temporary research assistant; and Mr Martin Monari is a temporary baker and laboratory assistant. Robert Ackatia-Armah, M.Phil. PhD, is a regional nutritionist. Administratively, FANEL is supported by Ms Tassy Karioki (programme assistant), Ms Christine Bukania (knowledge management specialist), and Ms Vivian Akotas (regional communication specialist).

8.3 FANEL BUSINESS PLAN DEVELOPMENT

FANEL is now an essential component of CIP and RTB nutrition and value addition projects and food safety systems. The laboratory supports breeders, project managers, private sector partners, and community OFSP/RTB producers in self-assessment and provides technical assistance. The quality of this service is clearly dependent on scientific know-how and equipment, but its continuity is also strongly dependent on maintaining financial health and regular investment. It is therefore essential for FANEL to build a business plan. The first steps taken this year were securing approval from programme leaders and executive leaders at CIP to develop the business plan. Now FANEL is in direct contact with CIP–HQ to develop templates for the business plan.

Below is a list of analysis performed in FANEL to date: FA
Pro-vitamin A carotenoids determination in OFSP fresh roots from CIP and NARS partners breeding programmes in SSA:

- Pro-vitamin A carotenoids determination in OFSP puree include the shelf-storable OFSP puree trials (OFSP puree is used as wheat flour substitute for bakery applications in SSA)
- Pro-vitamin A carotenoid determination in OFSP processed products (OFSP puree bread, OFSP flour bread, OFSP juice, OFSP cookies/biscuits, and OFSP fufu)
- Pro-vitamin A carotenoid determination of biofortified cassava and cooked cassava products (HarvestPlus)
- Pro-vitamin A carotenoid determination of biofortified orange maize and cooked maize products (HarvestPlus)
- Vitamin C determination in OFSP fresh roots and OFSP processed products

- Anthocyanin and total phenolic compounds analysis in OFSP fresh roots and OFSP juices
- Food safety analysis (environmental sampling) of OFSP puree processing factory
- Moisture content determination of OFSP fresh roots and processed products
- Water activity determination of OFSP shelf-storable puree and shelf-life studies processed products
- pH determination of OFSP shelf-storable puree and OFSP juices for food safety and shelf-life
- Colour determination of OFSP fresh roots, shelf-storable puree, and OFSP puree products
- Sensory analysis and consumer acceptance of OFSP fresh roots and products
- Food safety analysis (food microbial analysis) of shelf-storable OFSP puree, OFSP bread, and OFSP juice
- Food safety evaluation of OFSP puree processing plant environmental sampling.

Research protocols for additional food composition analysis

- Determination of crude protein by Kjeldahl method
- Determination of total fat by acid by hydrolysis method
- Determination of total dietary fibre by enzymatic gravimetric method
- Determination of ash by gravimetric method
- Determination of minerals by AAS.

8.4 FANEL CAPACITY BUILDING

FANEL hosted eight graduate students working on OFSP and other RTB crops. Five master students in the Food Safety and Quality Management at University of Nairobi (Cecilia Wanjuu, Joyce Musyoka, and Derick Malavi) worked on various OFSP-related projects in FANEL. Cecilia's thesis was entitled "The quality of OFSP puree bread and consumer profiling in Kenya", and she conducted studies on OFSP consumer profiling, OFSP bread shelf-life, and OFSP puree bread physiochemical properties. Joyce's thesis was entitled "The efficacy of chemical preservatives on the microbial growth and beta-carotene retention on OFSP puree", and its objective included a food-safety challenge study on shelf-stable OFSP puree and determining the effects of chemical preservative on beta-carotene retention in OFSP puree over time at ambient conditions. Derick Malavi's thesis focussed on the food safety and good manufacturing practices at the local OFSP puree-processing factory in Western Kenya. Mr Joshua Ombaka worked on "Consumer acceptance and sensory evaluation of OFSP puree breads made with fresh puree and made with 3-6-month-old shelf-stable OFSP puree". Ms Mercy Chepkoech, from the nutrition department, is working on a thesis entitled "Current practices on OFSP utilisation and infant nutrition among rural households in Homa Bay county". FANEL is also hosting a Malawian PhD candidate, Sarah Chilungo, from North Carolina State University's Department of Food Science, Nutrition and Bioprocessing. She is working on determining the bioaccessibility of beta-carotene from OFSP fresh roots and OFSP-processed products. BecA also assigned FANEL two PhD candidates working on nutrition and food composition analysis. Ghebreslassie, Biniam Mesfin from Eriteria, PhD candidate at Jomo Kenyatta Univesity of Agriculture and Technology, is working on "Characterization of Potato (*Solanum tuberosum L.*) Cultivars Grown in Eritrea Using Morphological, Molecular and Nutritional Descriptors". The second BecA student is Mr Maurice Mogga, a rice breeder from South Sudan and PhD candidate at Makerere University. He is working on "Determination of rice chemical, nutritional and anti-nutritional changes during storage". In 2017 FANEL will be hosting a regional workshop "OFSP Food Processing and Food Safety" with Natural Resources Institute and BecA to enhance the quality of OFSP products in SSA. Therefore, FANEL has rapidly positioned itself as a leading hub for state-of-the-art for plant nutritional research and training of advanced human talent, not only from Kenya but also from other African countries.

9. EXTERNAL EVALUATION

The external evaluation of the SUSTAIN programme is being implement by MSU under the leadership of Dr Mywish Maredia, professor of economics. The evaluation falls into two broad components, one using qualitative and one using quantitative methodologies. This section provides an update on the evaluation and revised work plan for its completion, taking into account adjustments to the budget.

9.1 QUALITATIVE CASE STUDY EVALUATION OF SUSTAIN–MALAWI AND SUSTAIN–KENYA

The qualitative evaluation is guided by four evaluation questions (EQs):

1. What are the *strategies* used to reach scale?
2. How are they being implemented? Are they working?
3. What are the *adaptations* made to our practice and *what are we learning* as we progress?
4. What does each of the cases tell us about *strategies to scale up*?

The qualitative evaluation comprises two separate case studies conducted in Kenya and Malawi. Each case is structured to accommodate design features that are unique to each country's implementation plan, while still addressing a common set of EQs regarding the process of scaling up. Thus far, the cases have been conducted separately. However, the final step will be to integrate the findings across the cases to assess what has been learned about the process of scaling up the dissemination of a biofortified crop. The approach is wholly qualitative and has been flexible to accommodate the dynamism that is inherent in each country's implementation plan. A qualitative approach allows us to attend to the contextual factors in each country; it is appropriate since the programmes are complex and not fully described on paper. The two case studies have relied upon a small, interdisciplinary team that has expertise in a number of disciplines that are pertinent to this interdisciplinary project. The team includes researchers who share a common understanding of how to collect and analyse qualitative data. It includes both students and consultants; however, all data collection and analysis occur under the direction of Kimberly Chung. There are no contractors who worked independently of the team.

Activities in 2016 focused on data collection that cover EQs 1–3. The approach is rooted methodologically in ethnography. As such, the primary modes of data collection include in-depth interviews with partners and CIP staff members; participant observation of OFSP dissemination, planting, harvesting, and educational activities; brief interviews with farmers; and document review.

Malawi case study

Partnerships are an essential part of SUSTAIN–Malawi's work. As such, the Malawi case study is structured around understanding SUSTAIN's experience with various partners. In late 2015, six "partner cases" were chosen purposively to represent different kinds of partnering experiences that we hypothesised might be important to success with scaling up.

Several criteria were used. First, we chose partner organisations that we thought would be likely to stay at least 2 years in the SUSTAIN partnership. Since this could not be known at the time of sampling, the final sample is likely to include a mix of organisations with varying tenure with the project. In the end, we chose partnerships that showed diversity across three different factors: (1) programming sector of the partner programme; (2) funding relationship between SUSTAIN and partners; and (3) scale of partnership effort (small, medium, or large number of Mother-and-Baby plots in rainy season 2016).

For each partner three different kinds of data were collected each year. These data comprised direct observation of how the project is implemented in the field, in-depth qualitative interviews

with partners who were intimately involved in the implementation of SUSTAIN activities, and brief interviews with project beneficiaries to corroborate implementation details.

The data collection activities were designed to learn more about project implementation (EQ2) as well as perceptions of how the project was working (EQ3). We also explored the partners' experience with the SUSTAIN M&E tools (EQ4). The general topic of learning (EQ4), however, was deferred to 2017. Taken together, the various data collection activities were meant to provide multiple perspectives on the intervention as well as to develop our own understanding of the work through participant observation of dissemination, planting, and harvesting activities.

In-depth interviews were held with staff at different levels for each partner; one interview is done per partner at the leadership level. This was usually the main contact person at the partner organisation, often the person who negotiated the partnership with CIP. We also interviewed partner field staff, including front-line staff who are responsible for implementing the actual programme in the field. Typically, these staff were interviewed when we visited the project to observe a field event.

Direct observation. We observed at least one SUSTAIN event for each partner per year, usually a planting or harvest event during the rainy or dambo season. Some partners made their activities schedules readily accessible to us; hence we were able to choose multiple events to attend and in general were able to collect more observation data from their work. For most partners we have multiple observations from 2016. Other partners were less forthcoming about their schedules, and for these we did our best to observe at least one event per year. In such cases we were not given many choices of events. We hope to gain more from these organisations in 2017.

Brief survey. We also conducted brief surveys with short, open-ended questions with a limited number of beneficiaries identified on partner distribution forms for the 2016 rainy distribution. The purpose of this survey was to corroborate information shared by partners about implementation procedures. Two different types of farmers were interviewed: (1) lead farmers (n=2 per partner; each in a different location), and (2) beneficiary farmers (n=6 per partner; 3 in each location).

Data processing. All notes have been expanded, and recorded interviews have been transcribed verbatim. A significant amount of time was also spent cleaning the data. We had some quality issues with the transcription done in Africa and had to bring the data back to MSU to re-process. This has delayed our process somewhat, but the data for Malawi are now complete and cleaned.

Analysis. We have coded and analysed the data at various levels by partner. To do this, the interview transcripts were read by the principal investigator (Chung) and co-investigator (Vardhan) and, where necessary, were checked for clarification against the original audio and field notes. The transcripts were reviewed and analysed through thematic coding, with an eye for extracting key themes and concepts. Summary statements were made for piece of data by code and then compiled at the level for each partner into conceptually clustered displays. These displays form the basis of the written analysis.

Kenya case study

The Kenya case study comprises two distinct parts, one focussed on the health centre model that uses a coupon scheme to link access to OFSP planting material with nutrition education at rural health centres. The second part is a smaller effort on the agricultural extension model that provides agricultural training and facilitates planting material distribution through demonstration plots and field days.

Health centre model

Study design. The health centre model is organised around four case studies. For this research, community units (or CUs) serve as the unit of analysis for the case studies. There are 33 CUs in the health model intervention; we endeavoured to choose 4 as cases that could be followed during 2016 and 2017.

In August 2016, we consulted with CIP and the NGO partner PATH and in a week of preliminary field work we developed a new structure for the case study. In this design we contrasted four cases based on two sets of criteria linked to the presence of the previous USAID-funded Aphia Plus health sector intervention and the extent to which the SUSTAIN team has introduced new tools and methodologies during the implementation: (1) non-Aphia Plus/Aphia Plus and (2) adapted protocols versus follows expected protocol.

Data collection. The data collection activities were designed to learn more about project implementation (EQ2) as well as perceptions of how the project was working (EQ3). We also explored the partners' experience with the SUSTAIN M&E tools (EQ4).

For each CU five kinds of data were collected each year: (1) in-depth qualitative interviews with CU staff, including community health education workers, facility in charge, and assigned coupon writers if applicable. In cases where community health education workers were re-assigned mid-project, we endeavoured to interview all who were involved. (2) in-depth interviews with DVMs; (3) brief interviews with project beneficiaries to corroborate information on implementation; (4) observation of coupon-writing and vine distribution at each CU; and (5) observation of feedback meetings. Because the personnel involved in SUSTAIN differs across CUs, the number of interviews and observations in each location were not always uniform by CU. Overall, 83 pieces of data were collected in 2016 for the health centre model study.

Agricultural Extension Model

Study design. The agricultural extension model study was conducted in two distinct phases. Phase 1 was conducted in January–February 2016, and included interviews with the project partners in the six geographic areas where the model was implemented. Three beneficiary farmers in each area and CIP staff were also interviewed. The purpose of these interviews was to understand project implementation, expectations about the project, motivations for participating, and the various roles of the different actors.

Phase 2 was conducted in August–September 2016, and included follow-up interviews with project partners and CIP staff. The two phases bookend very different periods for the agricultural extension model. Phase 1 documents a period of relative optimism during the project. Phase 2 documents perspectives after the terms have changed significantly and there is significant adjustment to the project. Overall, 43 pieces of data were collected in 2016 for this study.

Kenya case study progress

In 2016, the MSU team spent 131 person days in Kenya collecting data. Of these, senior researchers with PhDs spent 34 days in the field. The remaining time was were conducted by an MSU MS student (63 days) and a bilingual MS student who is a Kenyan national (34 days). Senior staff will continue to lead the data collection in Kenya in 2017.

Data processing and analysis. The bulk of the data was collected between August and December 2016. As a result, data entry and processing only started in the autumn. With respect to transcription and translation, we encountered serious quality issues with the transcription process in Kenya and had to re-contract the work in Michigan in December. The Kenya data are still in

progress but will be complete soon; about 15% of the data remains to be corrected still. Once these are done we will begin to analyse these data and write the report.

Analysis. Once the data are complete, we expect to use the same process as with the Malawi data— in short, coding of the data, extraction, and analysis using conceptually clustered displays.

Qualitative work plan for 2017–2018

The qualitative team has adjusted its work plan to budget revisions. We are now focussed on the Kenya case study and any information that will lead to more generalizable findings on the process of scaling up. Proposed activities include:

- Concentrate remaining data collection on Kenya case study, focussing on interviews of partners on remaining nutrition education activities and, where possible, observe activities. Our travel and data collection budget is severely constrained, hence this effort will be very focussed and must be limited. Owing to the upcoming national elections we believe that May is the best season as it is after the primary election and before the August general election. It is also the agricultural period during/after the upcoming distribution.
- We will conduct learning and reflection sessions with SUSTAIN–Kenya towards the end of calendar 2017, to engage in a process of reflection and an integration of knowledge across the MSU and SUSTAIN teams. Again, because budgets are constrained this will involve only the core SUSTAIN team and Chung from MSU. We will work with SUSTAIN–Kenya to schedule this visit/work at a mutually agreed time and, if possible, to overlap with the annual meetings.
- The team plans to discontinue field data collection in Malawi and will summarise results from remaining data. The preliminary report submitted March 5th analysed the majority of the data; but more analyses can be done and incorporated into a final report. If possible we will conduct skype interviews with project leaders—depending on the budget. We are still unsure of the nature of activities in both Kenya and Malawi; hence we will need to determine if there is time to do this. This activity will take lower priority to the Kenya case study.
- We will write up all data collected before August 2017 in an annual report due January 12, 2018.
- We will submit two final case reports, one on each country, due June 30, 2018. These will be cumulative, including data analysis from previous annual reports.

9.2 Quantitative Evaluation of SUSTAIN project—RCT in Rwanda

Quantitative evaluation study in Rwanda uses an RCT field experiment to test the effectiveness of different combinations of the integrated agriculture–nutrition–market approach of promoting the adoption and consumption of OFSP at scale. The research design consists of randomly assigning project villages to one of the following six treatment arms: (1) base model: all the components of the integrated agriculture–nutrition–marketing approach; (2) base model less nutrition counselling; (3) base model less marketing; (4) base model less nutrition counselling and marketing; (5) base model but only one season; and (6) base model with the second time vine distribution at a higher price.

These treatment arms are designed to include or exclude project components and sub-components that substantially differ in projected cost and benefits. Given the resource constraints, the goal of the project is to maximise the number of beneficiaries (direct + indirect) per unit of cost. The benefits of the project are measured on two dimensions : (1) the total number of beneficiaries reached/impacted (i.e. the *extensity dimension*); and (2) the average effect per beneficiary as measured by the adoption and consumption of OFSP by children, women, and men 3 years after the project intervention (i.e. the *intensity and sustainability dimension*).

Progress to date

Towards the quantitative evaluation, a baseline survey was conducted in 2014–2015 to collect detailed data at the HH, farm, and individual level from more than 2,400 HH across 252 villages that are selected for the RCT. A report summarising the results of this baseline survey was submitted to CIP in December 2015. Since the submission of this report, the following activities have been completed or are in progress as of the end of 2016:

1. **Data documentation**. Organisation and documentation of hundreds of do files and data files created for baseline report analysis were major activities undertaken with the help of the graduate research assistants in early 2016. The goal of this exercise is to make sure data files are properly coded and documented for future public release of the data (as required by the funding agency), as well as to ensure its readiness for use in the impact evaluation once the endline data are collected.
2. **Data analysis.** Beyond the descriptive analysis reported in the2015 baseline report, the research team continued to explore the dataset by doing some pairwise correlations between key consumption, nutrition, and well-being indicators. The main objective of these analyses is to see if and how the data conform to expectations, and whether they can be used to test some interesting hypothesis on the relationships between food consumption, dietary diversity, and nutritional outcomes. Some emerging (and not surprising) results from these descriptive analyses and correlation regressions include:
    - The wealth index and various measures of dietary diversity are all significantly positively correlated with a woman's body mass index.
    - Spending more hours per week collecting firewood or drinking water is significantly negatively correlated with a woman's body mass index.
    - Spending more hours per week on personal care, TV, radio, reading, social and religious activities, and hobbies is significantly positively correlated with a woman's body mass index.
    - Number of days of consumption of vitamin A-rich foods is significantly negatively correlated with young children being underweight or wasted.
    - Children's dietary diversity is positively correlated with a child having a vaccination card, HH dietary diversity, total HH expenditures, and wealth index.
    - Children's dietary diversity is negatively correlated with number of children 6–15 years old in the HH, and a child being born in the dry months (June–August).
    - The magnitudes of many of these correlations are small, but their directions are what we would expect to see.
    - Being born in a dry month is also associated with a lower height-for-age Z-score. We are in the process of acquiring detailed rainfall data for Rwanda to further pursue this relationship between the month when a child is born and nutritional outcomes. These results can potentially be linked with the agricultural production cycles, and to draw implications for sweetpotato production season and availability for consumption.
    - M. Maredia participated in the annual project planning meeting in Maputo in April, and presented the main findings of the baseline survey results, and a progress report on the qualitative evaluation.

Work plan for 2017–2018

- The team plans to continue some of the descriptive analysis based on the baseline data, and develop a manuscript for publication.
- Design the questionnaire for the endline survey to collect census data, community-level data, and HH-level data.

- Identify a survey firm to help implement the endline survey. The plan is to implement the survey using CAPI method. The same HH included in the baseline survey will be re-visited to collect the data.
- To assess the spread of the adoption and consumption of OFSP more broadly within a community, we plan to conduct a village-level census using a 2-page instrument.
- Depending on resource availability and interest from CIP, conduct experiments in selected villages to elicit consumer preference and willingness to pay for OFSP compared with traditional types.
- The HH survey and village-level census survey will be conducted around the same time as the baseline survey (Dec.–Mar.) to make the data comparable across the two surveys.
- Prior to the start of the survey, the team will need to get approvals from three different authorities within the Government of Rwanda to conduct the planned evaluation research. These includes getting the visa approval from the National Institute of Statistics of Rwanda, getting approval from the Ministry of Education to conduct research in Rwanda, and from the Rwanda National Ethics Committee.
- Systematically collect data on project implementation costs and capturing experience / assessments from implementing partners through structured instruments and semi-structured interviews.
- Analyse the data, develop the evaluation report, and present the results.
- Develop manuscripts targeting peer-reviewed international journals based on the results of the quantitative evaluation.

Deliverables

In view of the budget revisions and the need to align the time frame of the endline survey with the months when the baseline data were collected, the revised schedule of deliverables for the remainder of the grant period is as follows:

# (as in the contract)	Description of Deliverables	Due Date
6	Annual report for 2017 that will include the write up of all the qualitative evaluation data collected before August 2017	Jan. 12, 2018
7	Quantitative endline survey initiated in Rwanda	Dec. 31, 2017
8	Report from endline survey	June 30, 2018
9	Manuscripts for at least two articles for publication in peer-reviewed journals drafted; and final case reports for Kenya and Malawi submitted	June 30, 2018

ANNEX 1. EVIDENCE OF IMPROVED VALUE FOR MONEY OVER THE REPORTING PERIOD

SUSTAIN continues to place importance on delivering value for money (VfM). Table A1 summarises progress made over the reporting period across the four dimensions of VfM.

Table A1. Summary of improved VfM

DFID's 4Es	Top VfM indicators and examples of good practices
Economy = minimising input costs	**Introduce cost-saving measures** • Improved partnership models for cost-sharing, co-location, and synchronising of activities result in reduced input costs. This has resulted in savings of approximately 50% of costs for disseminating OFSP planting material and farmer training in Malawi and, to a lesser extent, in other countries. Where NGO- and government-led programmes have taken on dissemination and training activities at their own costs, SUSTAIN was thus able to increase its reach by more than 210,000 beneficiary HH in 2016–2017 outside its area of direct operations. Savings made through these partnerships were invested in OR and could compensate for some of the exchange-rate losses during this period. • Use of ODK for surveys and M&E data collection reduces the cost of data collection, entry, and cleaning and reduces errors compared with time-consuming paper surveys. • Cost-sharing of operations with related projects. In Kenya, Malawi, Mozambique, and Rwanda, costs of running offices and field operations have significantly reduced through cost-sharing. **Use best practices in procurement** • Competitive tender and transparent procurement rules (e.g. 3 independent quotations required on purchase) to choose the strongest and most relevant proposals in the acquisition of services and purchase of supplies and equipment. • Purchasing OFSP planting material from suppliers who have undergone training and MoA certification to ensure product quality (Malawi). • Collaboration with other CGIAR centers to jointly procure some services at more competitive prices (Rwanda). **Establish financial oversight structures and mechanisms** • Providing financial training on budgeting and financial reporting to implementing partners.
Efficiency = maximising research outputs in relationship to budget inputs	**Develop project management strategies for better delivery** • Use of standardised M&E framework and tools supports adaptive management and more effective delivery. **Increase quality and quantity of research output** • Contracting MSU as an international leading research partner • Have developed and are implementing an OR plan for the programme • Publication of research in peer-reviewed journals • Regional training of CIP/partner staff on key topics in nutrition and agriculture and on proposal and manuscript writing to build future capacity.
Effectiveness = translating research outputs into real-life development impact	**Demonstrate ability to attract additional funding** • Several new projects funded in programme countries, leveraging on SUSTAIN results and capacities for a cumulative total of more than US$25m to date (over 140% of programme value) • SUSTAIN contributed lessons and insights to the development of the proposal for the CGIAR RTB Phase 2, in particular for Flagship Projects 2 (varieties and seed systems), 4 (nutritious foods and value addition), and 5 (improving livelihoods at scale). **Promote research uptake** • The programme has actively communicated research findings and promoted technologies and methodologies through scientific and policy-related fora and media. This has included national and sub-national agriculture and nutrition policy platforms in Bangladesh, Kenya, Malawi, and Rwanda; regional dialogue through the Alliance for a Green Revolution in Africa; and global-level symposia in the context of the 2016 World Food Prize recently awarded to CIP–OFSP scientists. • SUSTAIN's support to OFSP processing has stimulated significant private sector investments in

DFID's 4Es	Top VfM indicators and examples of good practices
	puree production and utilisation in Kenya, Malawi, and, to a lesser extent, in Mozambique and Rwanda.
	Promote involvement of Southern researchers • Through SUSTAIN, CIP has recruited 8 Southern researchers. • The programme has involved and trained more than 20 researchers from NARS. • The programme has contributed to building research capacity of university students in all programme countries. **Consider social inclusion** • Drawing conclusions from M&E data and operational studies that indicated constraints to women's participation and benefits, the programme adjusted its approach to improve the inclusion of women as planting-material multipliers. Additional studies are underway that analyse the intra-HH flow of benefits as well as potential new constraints to gender equity arising from institutional changes such as certification and standard setting for OFSP planting material. • SUSTAIN has strengthened the capabilities of local NGOs in technical, administrative, and financial management aspects. This is expected to improve the participation of rural stakeholders in the agricultural development process.

ANNEX 2. PEER-REVIEWED PUBLICATIONS IN 2016

Table A2 provides an overview of CIP's peer-reviewed publications in 2016.

Table A2. CIP peer-reviewed publications in 2016

Year	ISI Thomson Journal Articles	Other Journal Articles	Open Access Journal Articles	Book Chapters	Books, Monographs	Conference Abstracts
2011	51	16	27	29	19	12
2012	36	21	20	30	5	35
2013	46	21	30	28	4	67
2014	49	40	47	10	25	65
2015	51	30	32	33	6	22
2016	**40**	**12**	**31**	**9**	**15**	**6**

ANNEX 3. RISK MANAGEMENT PLAN

1. Context risk

Adverse weather conditions, in particular drought, have continued to affect OFSP production in Malawi, Mozambique, and to some extent in Rwanda, resulting in lower than expected yields in 2016. The project adjusted its plan for multiplication of planting material by increasing support to multipliers with access to irrigated land and sourcing planting material from these suppliers. As a result, distribution of planting material and implementation of demonstrations, variety evaluation, and farmer training proceeded as scheduled and project targets for the season were met.

The security in Bangladesh and Mozambique continued to be a concern in places, and CIP has adjusted its field sites and operations to focus on areas of relative security. With these adjustments, project implementation has gone ahead according to schedule. CIP continues to monitor the security situation in consultation with government and international organisations operating in these countries.

2. Delivery risk

CIP has further refined its delivery methods on the basis of observations from OR and regular M&E data. As a result, HH targets under Outputs 1–3 are being achieved more efficiently and are indeed about to be exceeded. This is also freeing up more time and resources for further analysis and learning from the past 3 years of implementation, contributing to Output 4. The external impact evaluation has adopted an accelerated schedule to be able to contribute to this learning and help identify effective and efficient delivery options before the end of this project phase.

Progress with the development of commercial partnerships has picked up in all four countries, though clearly is strongest in Kenya. We expect that all four countries will meet the project target of putting at least one commercial product on the market. However, the sales levels and numbers of farmers selling into these commercial market chains will be uneven.

3. Safeguarding risk

CIP's monitoring of progress against all key indicators is disaggregated by gender. The programme is following CGIAR gender guidelines in the design and implementation of interventions and the design and use of M&E tools and processes. CIP is addressing the risk of excluding women by specifically targeting women as OFSP multipliers and ensuing that financial transactions are made to the person who is actually managing the multiplication site. As a result, the percentage of planting material sold by women has increased to at least 30%.

4. Operational risk

CIP is implementing the programme through well-established country offices in each country, backstopped by operational teams in regional offices in Nairobi with oversight from CIP–HQ. The programme is managed within DFID by an SRO supported by a deputy programme manager.

5. Fiduciary risk

CIP has demonstrated the capacity to implement and manage the financing of the programme, and has a strong track record in the management and delivery of research programmes. Owing to exchange rate losses between GBP and USD incurred in 2015–2017, the available project budget in USD has been reduced by approximately $1.1m compared with the original budget. CIP has had to reduce project activities as a result.

6. Reputational risk

CIP continues to manage the SUSTAIN programme effectively. The programme is aware of potential risks to HH nutrition from promoting sale of OFSP roots in the initial stages of establishing OFSP in local farming systems, and from promoting the consumption of some

processed OFSP-based food products. SUSTAIN addresses these risks by carefully selecting HH and communities for marketing interventions where surplus production has been established and by focussing its support on the production and marketing of healthier alternatives to existing processed products. CIP is monitoring the outcomes from root sales on HH incomes and diets.

Summary

Table A3 summarises potential risks and mitigation strategies. The table indicates that the SUSTAIN team is aware of several potential risks and has developed mitigation strategies for each.

Table A3. Summary of perceived risks and their respective mitigation strategies

Risk Category	Risk Contents	Mitigation
Context	Drought and other environmental risks to OFSP production (all countries)	• Focus on establishing reliable sources of planting materials • Farmer training in conservation of planting material on-farm
	Security concerns (Mozambique, Bangladesh)	• Adjusted locations for field activities • Continued monitoring
Delivery	Complexity of a project that combines research with development	• Fine-tuned delivery methods for efficiency • Increased emphasis on analysis, evaluation, and learning
	Private sector interest is slow to pick up	• Focus on fewer partnerships and products • Synergies with related programmes
Safeguarding	Exclusion of vulnerable groups (e.g. women from OFSP multiplication)	• Prioritizing selection of women as multipliers • Project operations (such as vouchers and payments) prioritise women
Operational	Managing a multi-country intervention area	• Management support through local CIP offices • Careful selection of local partners
Fiduciary	Exchange rate losses	• Adjustment of work plans to focus on essentials
Reputational	Promotion of unhealthy foods by commercial partners	• Focus on healthier alternatives to existing processed foods • Consumer education campaigns to promote healthier diets

ANNEX 4. SUSTAIN GLOBAL COMMUNICATIONS

During the reporting period, the programme continued its communications activities to increase global visibility of programme achievements and contribute to research and development debates of issues related to agriculture and nutrition. The following is a selection of programme communication materials produced and disseminated in 2016/17.

Presentation of research findings and process lessons in international conferences, including:

- International Root and Tuber Crops Congress (January 2016)
- Global Conference on Agricultural Research for Development (April 2016)
- Experimental Biology (April 2016)
- LCIRAH (June 2016)
- International Agricultural Economists (July 2016)
- Micronutrient Forum (October 2016)
- African Potato Association conference (October 2016): https://cipotato.org/event/apa-10th-triennial-conference-2016/ (All SUSTAIN Country programme managers and regional staff)
- 7th Africa Agriculture Science Week and FARA General Assembly Meeting (June 2016)
- 7th Annual Sweetpotato for Profit and Health Initiative Technical Meeting (October 2016)
- International Symposium on Sustainable Food Systems for Healthy Diets and Improved Nutrition (FAO–Nov. 2016)
- Marketing, Processing and Utilisation Community of Practice, March 1–3, 2017, Kisumu
- 13th International Symposium for the International Society for Tropical Root Crops-Africa Branch Dar Es Salaam, Tanzania (5–8 March) https://cipotato.org/press-room/blog/accelerating-africas-economic-growth-root-tuber-crops/
- Global Landscapes Forum, November 16–2016 meeting: Making the connections in the landscape: Harnessing the power of sweetpotato for vulnerable populations https://cipotato.org/press-room/blog/making-connections-landscape-harnessing-power-sweetpotato-vulnerable-populations/ and http://www.landscapes.org/making-connections-landscape-harnessing-power-sweetpotato-vulnerable-populations/
- Press release: "Climate Resilience through Sweetpotato (CReSP): Harnessing the power of sweetpotato to improve nutrition and livelihoods in the face of climate change" http://www.landscapes.org/glf-marrakesh/pressroom/climate-resilience-sweetpotato-cresp-harnessing-power-sweetpotato-improve-nutrition-livelihoods-face-climate-change/

Dissemination of lessons and insights through technical briefs, discussion forums, knowledge portals, and other social media:

- In 2016, communications coverage of the SUSTAIN programme continued to highlight the achievements using different communication channels and in collaboration with our partners.
- Social media coverage was particularly high. CIP focussed its efforts on twitter (@Cipotato) and Facebook and also on the Sweetpotato Knowledge Portal http://www.sweetpotatoknowledge.org/.
- A selection of research updates, articles, blogs, photo stories, and discussions/chat rooms were hosted through these links tagging relevant partners. The existing database capturing high-quality and engaging images of CIP and Sweetpotato in sub Saharan Africa and OFSP at work in Bangladesh continues to grow, with more than 15,000 images available for download and use in advocacy- and communication-related activities.

ANNEX 5. PROGRAMME ASSET REGISTER

Table A5. CIP's asset register of the SUSTAIN programme

TYPE	PREFIX	DESCRIPTION	TOTAL COST GBP	AQUISITION DATE	BRAND	MODEL	SERIAL NUMBER	LOCATION
Fixed assets	VEH	Automobile	6,913.49	16-May-14	Toyota	Land Cruiser	HZJ76R-RKMRS-20	Malawi
Fixed assets	VEH	Automobile	6,913.49	16-May-14	Toyota	Land Cruiser	HZJ76R-RKMRS-20	Malawi
Fixed assets	VEH	Automobile	6,913.48	16-May-14	Toyota	Land Cruiser	HZJ76R-RKMRS-20	Malawi
Fixed assets	VEH	Automobile	6,913.48	16-May-14	Toyota	Land Cruiser	HZJ76R-RKMRS-20	Malawi
Fixed assets	VEH	Automobile	5,285.00	16-May-14	Toyota	Hilux Double	KUN25R-PRMDHN-M6	Malawi
Fixed assets	VEH	Automobile	5,285.00	16-May-14	Toyota	Hilux Double	KUN25R-PRMDHN-M6	Malawi
Fixed assets	VEH	Automobile	5,284.99	16-May-14	Toyota	Hilux Double	KUN25R-PRMDHN-M6	Malawi
Fixed assets	VEH	Automobile	5,284.99	16-May-14	Toyota	Hilux Double	KUN25R-PRMDHN-M6	Malawi
Controllable	HWD	Tablet	2,095.87	29-Jul-15	PREMIUM	Clear screen projector	-	Malawi
Fixed assets	VEH	Automobile	35443.03797		Vehicle (Pick-up) (IT209RD)	Pick up	ITFR22G306030096	Rwanda
Fixed assets	VEH	Automobile	29123.48608		Vehicle (Land Cruiser) (IT502RE)	SUV	JTEEB71J407024014	Rwanda
Fixed assets	VEH	Automobile	22350.86203		Vehicle (Pick-up) (IT503RE)	Pick-up	AHTFR22GGX0685449	Rwanda
Fixed assets	VEH	Automobile	24,910.14	15-Feb-14	Toyota Hilux	4x4 Double Cabin Pick-Up	KUN25R-PRMDHN	Kenya
Fixed assets	VEH	Automobile	24,910.14	15-Feb-14	Toyota Hilux	4x4 Double Cabin Pick-Up	KUN25R-PRMDHN	Kenya
Fixed assets	REQ	Puree-filling hydraulic machine for use in Kisumu	4,636.49	31-Aug-15	-	-	-	Kenya
Controllable	HWD	Laptop	2,122.77	25-Jun-15	LENOVO	-	-	Kenya
Controllable	REQ	Hose	1,490.00	29-Oct-15	-	-	-	Kenya
Controllable	OTHER EQ	Pumps	1,490.00	29-Oct-15	-	-	-	Kenya
Controllable	HWD	Laptop and docking station	939.49	20-Jul-16	HP	ELITEBOOK 820	TPX40EA / 5CG6203VQ8 & 5CG6203VSS	Kenya
Controllable	HWD	Laptop and	939.49	20-Jul-16	HP	ELITEBOOK 820	TPX40EA / 5CG6203VQ8	Kenya

TYPE	PREFIX	DESCRIPTION	TOTAL COST GBP	AQUISITION DATE	BRAND	MODEL	SERIAL NUMBER	LOCATION
		docking station					& 5CG6203VSS	
Controllable	HWD	Tablet	637.77	17-Feb-15	SAMSUNG	NOTE 4	-	Kenya
Controllable	HWD	Notebook	618.57	30-Sep-15	HP	PROBOOK 430 G2	-	Kenya
Fixed assets	REQ	Research equipment	38.069,97	30-Sep-15	-	-	-	Mozambique
Controllable	HWD	Laptop	1.184,80	21-Jul-14	HP	-	-	Mozambique
Controllable	HWD	Laptop	1.184,80	21-Jul-14	HP	-HP probook	2CE4220JQS	Mozambique
Controllable	HWD	Laptop	786,62	21-Jul-14	HP	INTEL 450	2CE4111TC3	Mozambique
Controllable	HWD	Laptop	786,62	21-Jul-14	HP	INTEL 450	2CE4111T6R	Mozambique
Toyota	VEH	Automobile	$46.945,21	14.11.2014	Land Cruiser	Kenya-Offie	JHZ-0761646	Mozambique
Toyota	VEH	Automobile	$29.348,35	14.11.2014	Hilux	Kenya-Offie	2KD-A380967	Mozambique
Fixed assets	VEH	Automobile	32,499.29	28-Feb-15	Toyota	1VD-0243372	JTMJV03J-X04137997	Uganda
Controllable	OTHER EQ	Office generator	3,795.48	1-Dec-13	-	-	-	Uganda
Controllable	OEQ	Telephone system	764.31	17-Feb-14	Panasonic	KX-TA616 PBX	-	Uganda
Controllable	OTHER EQ	Air conditioner	680.04	10-Feb-14	-	-	-	Uganda
Controllable	OEQ	Cell phone	588.42	24-Feb-14	Blackberry	-	3.5401E+14	Uganda

ANNEX 6. SUSTAIN DELIVERY PARTNERS

Sub-recipients	Effective Date of Agreement	Budget (US$)	Modif.1	Modif.2
Agência de Desenvolvimiento Económico de Manica	August 1, 2014–June 30, 2015	81,800	$89,080	$208,980 Aug. 2014–July 2016
BARI	November 1, 2015–June 30, 2016	11,000	$22,154 Oct. 2015–June 2017	
BRAC	September 1, 2015–June 30, 2016	179,843	$338,942 Sept. 2015–June 2017	
Concern Worldwide (CONCERN)	October 1, 2014–September 30, 2015	46,771.12	$46,771.12 Oct. 2014–Dec. 2015	$82,064 Oct. 2014–Dec. 2016
Feed the Children	October 1, 2015–September 30, 2016	50,000.00	Revise the budget	$50,000.00 Oct. 2015–Dec. 2016
IMBARAGA Farmers' Organisation	July 1, 2014–June 30, 2015	48,348	$132,837 July 2014–June 2016	$192,837 July 2014–June 2017
Michigan State University	May 1, 2014–June 30, 2018	370,000	$570,000 Jan.–Dec. 2015	$800,539 Jan.–Dec. 2016
PATH	January 1, 2014–December 31, 2015	100,000	$120,000 Jan.–Dec. 2015	
PROSHIKA Manabik Unnayan Kendra	August 1, 2015–June 30, 2016	75,580		
Rwanda Agriculture Board	July 1, 2014–June 30, 2015	37,920	$76,893 July 2014–June 2016	$104,891 July 2014–June 2017
Union of Agricultural cooperatives of Marracuene	January 1, 2016–June 30, 2016	20,000	Jan.–July 2016	$38,542 June–Aug. 2016
Young Women's Christian Association of Rwanda	July 1, 2014–June 30, 2015	80,000	$200,523 July 2014–June 2016	$300,523 July 2014–June 2017
Zizile	January 15, 2016–April 30, 2016	5,000	Jan. 15/July 30, 2016	

The International Potato Center (known by its Spanish acronym CIP) is a research-for-development organization with a focus on potato, sweetpotato, and Andean roots and tubers. CIP is dedicated to delivering sustainable science-based solutions to the pressing world issues of hunger, poverty, gender equity, climate change, and the preservation of our Earth's fragile biodiversity and natural resources.
www.cipotato.org

CIP is a member of CGIAR.

CGIAR is a global research partnership for a food-secure future. Its science is carried out by 15 research centers in close collaboration with hundreds of partners across the globe.

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