

Integrating health and agriculture to maximize the nutritional impact of orange-fleshed sweetpotato: Results from the Mama SASHA project endline survey in Western Kenya

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Results from the Mama SASHA endline survey indicate good uptake and utilization of OFSP among project participants. Diet diversity and food security improved significantly.

Notes: HKI score is a binomial variable, which is calculated by adding up the number of days the child or caregiver consumed different vitamin A rich foods over a 7 day period. The sample is considered to be vitamin A deficient if the mean frequency of total consumption of animal and plant sources of vitamin A is 6 days per week or less.

Nutrition Knowledge Score is a summative variable. The score is based on nutrition knowledge and knowledge about vitamin A. A higher score implies more suitable answers.

Health and Childcare Knowledge Score is a summative variable combining 13 measures of knowledge about health seeking behaviors and childcare. A higher score means more suitable answers.

OFSP Knowledge Score is a summative variable created by the combination of measures on the caregiver's agricultural practices and knowledge of OFSP. Higher scores imply more suitable answers.

Caregiver dietary diversity index was obtained by summing up the consumption of 10 food groups over a 24 hour period. Each food group was quoted as 0 if not consumed or 1 if consumed.

The food groups included: 1) starchy staples, 2) dark green leafy vegetables, 3) vitamin A rich fruits and vegetables, 4) fruits and vegetables, 5) organ meat, 6) meat and fish, 7) Eggs, 8) legumes, nuts and seeds, 9) milk and milk products, 10) oils and fats. The median value was used to categorize households into two equal groups of dietary diversity: high and low. The food groups used for the tabulation of the reference **child's dietary diversity index include:** 1) grains, roots and tubers, 2) legumes and nuts, 3) dairy products 4) flesh foods (meat, fish, poultry and liver/organ meats), 5) eggs, 6) vitamin-A rich fruits and vegetables, and 7) fruits and vegetables. Each food group was quoted as 0 if not consumed during the past 24 h and 1 if consumed. The dietary diversity index was obtained by summing up the quotes for the 7 food groups. The possible range of the dietary diversity index was from 0 to 7. The cut-off of at least 3 food groups consumed out of 7 was used to define minimum dietary diversity based on the median value.

Household food security was assessed using the FANTA Household Food Insecurity Assessment Scale that has been previously validated in a similar context (Coates et al., 2007).

Table 3. Anthropometry measures among children under five years of age

Variable	Overall	Control	Intervention	Participation Level, Intervention Areas		
	Mean	Areas	Areas	None	Partial	Full
Prevalence of stunting	0.25 (0.009)	0.27 (0.013)	0.23 (0.012)	0.23 (0.018)	0.25 (0.022)	0.19 (0.026)
			<i>0.013</i>	<i>0.044</i>	<i>0.434</i>	<i>0.008</i>
Number of observations	2265	1106	1159	534	388	237
Prevalence of undernutrition	0.10 (0.006)	0.11 (0.010)	0.09 (0.008)	0.10 (0.013)	0.07 (0.013)	0.08 (0.017)
			<i>0.042</i>	<i>0.578</i>	<i>0.021</i>	<i>0.093</i>
Number of observations	2242	1096	1146	525	386	235
Prevalence of wasting	0.02 (0.003)	0.02 (0.005)	0.03 (0.005)	0.03 (0.008)	0.03 (0.009)	0.00 (0.004)
			<i>0.916</i>	<i>0.490</i>	<i>0.498</i>	<i>0.049</i>
Number of observations	2245	1098	1147	525	387	235

Note: Standard errors in parentheses are clustered at the sublocality level; p values are in italics, comparing each participation group with the control group

What's next?

The longitudinal cohort study (following the same women over time) complements the cross-sectional household surveys in intervention and control communities. The endline cross-sectional data will also be compared to the baseline cross-sectional data that were collected in the same season of the year to evaluate final impact. Together, the cross-sectional household surveys and the nested cohort study provide a robust measure of impact of the intervention by 2015. Economic costs and health benefits from the endline survey will be used to re-estimate the cost-effectiveness of the intervention.



Fig. 3 Data on endline questionnaires were entered the same day as collected (credit J. Low)



Fig. 2 Vouchers received at ante-natal care clinic to be redeemed for vines (credit C. Loechl)



Fig 1. The whole family benefits from healthy orange-fleshed sweetpotato (credit R. Odengo)

What is the problem?

Vitamin A deficiency (VAD) contributes to significant rates of blindness, disease, and premature death in Sub-Saharan Africa (SSA). Young children and pregnant or lactating women are particularly at risk of VAD. Orange-fleshed sweetpotato (OFSP) is an important source of energy and beta-carotene, which is converted into Vitamin A in the body. One medium-size sweetpotato provides enough to meet the recommended daily allowance of vitamin A for children and non-lactating women. Evaluations of food-based approaches promoting increased OFSP production and consumption have shown significant positive impacts on Vitamin A intake and status.

Pregnancy should be a particularly opportune time to reach women with nutritional and health interventions that can lower their risk of VAD, mitigate negative environmental and

socio-economic factors, and enhance the survival and growth of their infants.

This five year project (2010-2014) sought to explicitly integrate agriculture and nutrition interventions into antenatal health care services to maximize the potential benefits of OFSP on the health status of mothers and children less than 2 years of age. It is the first time such an intervention was tested at the community-level in SSA – and the first one of its kind to focus explicitly on pregnant women.

What did we want to achieve?

The aim of this project was to provide solid evidence for the effectiveness of this innovative approach to integrate OFSP promotion and production with public health care services. The expected impacts include significant increases in both the consumption of Vitamin A-rich foods and use of antenatal care services.

Where were we working?

The project was implemented in selected health facilities across Busia and Bungoma districts of Western Province, Kenya. In these areas, sweetpotato is important for food security. But the majority of sweetpotato varieties are either white or yellow-fleshed, containing little beta-carotene. The challenge was to introduce the beta-carotene-rich OFSP varieties and promote their production, uptake, and consumption alongside overall improvement in child and household dietary practices.

How did we make it happen?

The project was implemented within the existing USAID/Kenya AIDS, Population and Health Integrated Assistance Program (APHIA Plus). That program worked directly with communities and public health facilities throughout Western Province to strengthen a wide range of health services.



Partners

- The International Potato Center (CIP), leading from a field office based in Bungoma
- PATH, an international non-profit organization focused on health
- Kenyan Agricultural Research Institute (KARI)
- Local government stakeholders, especially the Ministries of Health and Agriculture
- Community Research in Environment and Development Initiatives (CREADIS)
- Appropriate Rural Development Agriculture Programme (ARDAP)
- With scientific inputs from the University of Toronto, Emory University and the University of Washington

The Mama SASHA intervention used community health workers to encourage pregnant women to seek early and recommended ante- and postnatal care services. They also established and ran community-level pregnant women's clubs, with monthly dialogue sessions focused on nutrition and health topics. During each antenatal care visit, nurses provided improved nutrition counseling along with vouchers, which women used to obtain OFSP vines to plant. The vine cuttings were obtained from trained secondary vine multipliers, located near the health clinics.

To evaluate the program's impact, an equal number of intervention and control sites were randomly selected from among eight community health facilities. The four intervention sites received the full range of nutrition, outreach, and health services described above, along with the vouchers. The four control group facilities offered the standard APHIA Plus training and sensitization on Infant and Young Child Nutrition services, but without the pregnant women's groups, vouchers, or support for the production of OFSP.

Full implementation of the program began in April 2011 and ended in December 2013.

❖ What did the project achieve?

After implementing a 10-month pilot program, where 823 women received vouchers – 75% of whom redeemed them for planting material, we conducted operational research to refine the implementation design. The finalized design of the Mama SASHA project was implemented between April 2011 and August 2013. By September 2013, over 5,900 pregnant or lactating women had received 7,159 pairs of vouchers, far exceeding the project's stated goal of reaching 900 women. Out of this, 4,464 pairs of vouchers (63%) were redeemed for vines. Community health workers (CHWs) established 215 pregnant women clubs made up of 2,764 members. CHWs working with agricultural extension held several field days to demonstrate the production and consumption properties of OFSP to the wider community.

❖ What did we learn?

The Mama SASHA evaluation strategy was designed to apply rigorous qualitative and quantitative methods to assess effectiveness, acceptability, feasibility and affordability. Operational research conducted in 2012 found high acceptance among health workers, agricultural extension officers, community and pregnant women of linking OFSP to ANC services. Community Health Workers (CHWs) emerged as a critical link for reaching pregnant women and connecting them to antenatal health care

services and their community vine multipliers who provided OFSP planting material. Success brought increased workload to health care and agricultural professionals and community health workers, but it also provided enhanced training, more effective nutrition messaging, tangible recommendations to improve diet quality, higher job satisfaction and overall improved motivation upon seeing the positive benefits for pregnant women and ultimately, their babies.

A cross-sectional endline survey targeting 2,398 mother-child (under 2 years of age) pairs and 207 pregnant women in intervention and control communities was conducted from November to May 2014. Results from the endline survey demonstrate that the project was effective in increasing the production and consumption of OFSP, improving health and nutrition knowledge increasing the consumption of other nutrient rich foods and improving antenatal and postnatal health care service utilization. Table 1 and 2 provide comparisons of key indicators between the intervention and control, but also look at changes in key outcomes between intervention households who participated in all aspects of the project (full participants, those who participated in some aspects (partial participants) and households who did not participate at all.

Collectively, the project actions resulted in the full participants have significantly lower prevalence of stunting (19%) and wasting (0%) than control children (27% and 2%, respectively) at endline (Table 3).

Highlights:

- Mama SASHA significantly increased total acreage and output of sweetpotato production through adoption of OFSP among partial and full participants.
- The proportion of caregivers and children consuming OFSP at least once a week was 62% among full participants compared to the control (5%) and those consuming OFSP three times per week was 30% compared to 2% in the control ($p < 0.000$)
- Mama SASHA nutrition education messages and pregnant mother's clubs improved female caregivers' knowledge about nutrition, vitamin A, health seeking behavior, and child care practices.
- Mama SASHA significantly improved caregiver and children's dietary diversity and increased their consumption of vitamin A rich foods.
- Women who fully participated in the Mama SASHA project had significantly higher number of antenatal care visits (4.6) compared to the control (4.2); non-participants in the intervention area had significantly fewer ANC visits (3.9).
- OFSP Mama SASHA significantly improved breastfeeding practices among women who fully participated in the project.

Table 1. OFSP production (2013/2014) and the proportion of children eating any sweetpotato and OFSP in the past 7 days.

Variable	Overall	Control	Intervention	Participation Level, Intervention Areas		
	Mean	Areas	Areas	None	Partial	Full
Total OFSP (kgs) per household	663 (164)	220 (131)	1085 (294)	441 (117)	859 (172)	2912 (1385)
			<i>0.008</i>	<i>0.282</i>	<i>0.009</i>	<i>0.000</i>
OFSP production (kg) per capita	176 (41)	44 (20)	302 (77)	95 (24)	281 (74)	804 (352)
			<i>0.002</i>	<i>0.131</i>	<i>0.000</i>	<i>0.000</i>
Proportion consuming any type of sweetpotato at least once a week	0.63 (0.010)	0.54 (0.015)	0.71 (0.013)	0.64 (0.021)	0.75 (0.022)	0.82 (0.025)
			<i>0.000</i>	<i>0.000</i>	<i>0.000</i>	<i>0.000</i>
Proportion consuming OFSP at least once a week	0.19 (0.008)	0.05 (0.006)	0.33 (0.014)	0.17 (0.016)	0.37 (0.025)	0.62 (0.032)
			<i>0.000</i>	<i>0.000</i>	<i>0.000</i>	<i>0.000</i>
Proportion consuming OFSP at least 3 times per week	0.08 (0.006)	0.02 (0.004)	0.14 (0.010)	0.06 (0.010)	0.15 (0.018)	0.30 (0.030)
			<i>0.000</i>	<i>0.000</i>	<i>0.000</i>	<i>0.000</i>
Number of observations	2271	1108	1163	536	390	237

Note: Standard errors in parentheses are clustered at the sublocality level; *p* values in italics compare each participation group with the control group

Table 2. Mean knowledge scores for the principal female caregiver, HKI frequency of vitamin A index intake, dietary diversity score and household food insecurity score

Variable	Overall	Control	Intervention	Participation Level, Intervention Areas		
	Mean	Areas	Areas	None	Partial	Full
Nutrition knowledge score	4.8 (0.057)	4.4 (0.077)	5.1 (0.083)	4.5 (0.112)	5.1 (0.132)	6.5 (0.202)
			<i>0.000</i>	<i>0.770</i>	<i>0.000</i>	<i>0.000</i>
Vitamin A knowledge score	3.1 (0.037)	2.8 (0.051)	3.4 (0.052)	3.0 (0.074)	3.3 (0.086)	4.4 (0.110)
			<i>0.000</i>	<i>0.004</i>	<i>0.000</i>	<i>0.000</i>
Knowledge about health service seeking score	5.9 (0.034)	5.8 (0.047)	6.0 (0.050)	5.6 (0.076)	6.1 (0.075)	6.6 (0.110)
			<i>0.002</i>	<i>0.082</i>	<i>0.001</i>	<i>0.000</i>
Knowledge about child care score	9.3 (0.053)	9.2 (0.075)	9.4 (0.075)	8.8 (0.110)	9.6 (0.125)	10.5 (0.148)
			<i>0.021</i>	<i>0.007</i>	<i>0.007</i>	<i>0.000</i>
OFSP knowledge score	3.6 (0.040)	3.1 (0.054)	4.1 (0.054)	3.5 (0.081)	4.3 (0.088)	4.9 (0.102)
			<i>0.000</i>	<i>0.000</i>	<i>0.000</i>	<i>0.000</i>
Attitude score on child caregiving and feeding OFSP	5.7 (0.124)	5.4 (0.176)	6.1 (0.174)	5.1 (0.245)	6.0 (0.300)	8.3 (0.382)
			<i>0.005</i>	<i>0.449</i>	<i>0.082</i>	<i>0.000</i>
Caregiver HKI Index vitamin A food consumption frequency	6.24 (0.088)	6.09 (0.118)	6.38 (0.129)	6.05 (0.183)	6.02 (0.192)	7.73 (0.351)
			<i>0.097</i>	<i>0.849</i>	<i>0.748</i>	<i>0.000</i>
Index child HKI Index vitamin A food consumption frequency	5.29 (0.090)	5.04 (0.119)	5.53 (0.133)	5.15 (0.181)	5.20 (0.200)	6.93 (0.376)
			<i>0.007</i>	<i>0.628</i>	<i>0.503</i>	<i>0.000</i>
Caregiver diet diversity score (maximum possible:12)	4.54 (0.028)	4.37 (0.039)	4.71 (0.040)	4.51 (0.055)	4.59 (0.068)	5.35 (0.090)
			<i>0.000</i>	<i>0.029</i>	<i>0.004</i>	<i>0.000</i>
Index child diet diversity score (maximum possible:12)	3.37 (0.029)	3.19 (0.041)	3.55 (0.040)	3.35 (0.057)	3.52 (0.067)	4.05 (0.097)
			<i>0.000</i>	<i>0.018</i>	<i>0.000</i>	<i>0.000</i>
Household Food Insecurity Score (Maximum 80) (higher more food insecure)	12.27 (0.220)	12.62 (0.313)	11.94 (0.308)	12.48 (0.443)	12.11 (0.542)	10.44 (0.695)
			<i>0.121</i>	<i>0.792</i>	<i>0.410</i>	<i>0.004</i>
Number of observations	2271	1108	1163	536	390	237

Note: Standard errors in parentheses are clustered at the sublocality level; *p* values are in italics, comparing each participation group with the control group