The Power of Fruits and Vegetables to Improve Nutrition in Tanzania

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Executive Summary

Malnutrition has the potential to bankrupt countries and prevent children from reaching their full potential. Poor diets cost the global economy an estimated $5.5 trillion yearly.\(^1\)\(^2\) Stunting linked to malnutrition leads to decreased human capital, while healthcare expenses associated with noncommunicable diseases (NCDs) related to overweight and obesity—like type 2 diabetes—soar. Fruits and vegetables, unlike other food groups, provide beneficial outcomes across all forms of malnutrition. Yet, despite their nutritional power, the current global consumption of fruits and vegetables is far below the minimum requirement of five portions per day.\(^3\)

Fruits and vegetables are packed with vitamins and minerals necessary for optimal health, especially during growth periods like the first 1,000 days of life from conception to age two and adolescence. Inadequate fruit and vegetable intake led to an estimated 3.9 million deaths globally in 2017, due in part to the role of diet in infectious diseases like HIV/AIDS and NCDs like cardiovascular disease.\(^4\) Poor diets caused 11 million global deaths in 2017: the third leading cause of these poor diets was low intake of fruits, and the fifth leading cause was low intake of vegetables.\(^5\)

This report focuses on the United Republic of Tanzania, which has announced bold goals to combat malnutrition. Stunting, or low height for age, occurs in 32 percent of Tanzanian children under age five; about 30 percent of Tanzanian women of reproductive age are anemic and 32 percent are overweight or obese.\(^6\) Tanzania set nutrition targets to tackle the triple burden of malnutrition—undernutrition, overweight or obesity, and micronutrient deficiency—and is striving to reduce stunting to 28 percent by 2021 and 15 percent by 2025.\(^7\)\(^8\)

Given Tanzania’s booming youth population, improved nutrition is crucial to Tanzania’s future prosperity. Forty-five percent of the population is younger than 14, and that number is forecast to rise.\(^9\) Half of the world’s population growth projected for 2050 will occur in only nine countries, and Tanzania is one of them.\(^10\) The negative impacts of poor nutrition, specifically stunting, on brain development in early life greatly diminishes a country’s human capital. As little as a 1 percent loss in adult height from childhood stunting is associated with a 1.4 percent loss in national economic productivity.\(^11\)

Because of malnutrition’s impact on livelihoods and economies, the government of Tanzania has been strongly committed to ending malnutrition for nearly 10 years. In 2011, Tanzania was one of the first countries to join the Scaling Up Nutrition (SUN) Movement and developed its National Nutrition Strategy and the Tanzania Agriculture and Food Security Investment Plan. In 2016, the country continued its momentum by recognizing the need for a multisectoral approach across the government in its National Multisectoral Nutrition Action Plan. For 2015 and 2016, the government’s overall nutrition expenditure for the mainland was about $375 million.\(^12\) The United States supports Tanzania’s political will to end malnutrition: Tanzania was one of the U.S. government Feed the Future Initiative’s initial target countries and is currently an aligned country.

**RESEARCH QUESTIONS**

1. What are the barriers of fruit and vegetable consumption at the individual and household level?

2. What are the current strategies to increase fruit and vegetable intake that are funded by the United States, an additional foreign aid donor, and a local organization?

3. What kinds of multisectoral approaches and public–private engagements are necessary to increase fruit and vegetable consumption?
tered by the U.S. Agency for International Development Tanzania (USAID/Tanzania): Mboga na Matunda and Lishe Endelevu. To more holistically understand foreign donors’ approaches to address malnutrition in Tanzania, the research also assessed Vegetables for All, a public–private partnership co-funded by several partners, including the Netherlands Ministry of Foreign Affairs. A local Tanzanian nonprofit, the LisheYangu Initiative, founded and facilitated by the small-medium enterprise ONA Enterprise Ltd. provided the context for a grassroots approach.

Research indicated the major barrier to individual and household consumption of fruits and vegetables was lack of knowledge, including a basic misunderstanding of nutritional needs versus hunger, generational misinformation on cooking vegetables too long to cleanse them of pesticides, and taboos concerning the effects of certain vegetables on male reproductive health. The research also uncovered how four distinct projects at the nexus of food security, nutrition, and agriculture are incorporating fruits and vegetables into the seed-to-plate value chain. The projects shared similar objectives—to increase small-holder farmer livelihoods and resilience, educate local communities and increase access to and diversity of fruits and vegetables, and create sustainable nutrition-forward behaviors among community members—but differed in their multisectoral approaches, multi-stakeholder engagements, target populations, funding models and budgets, and focus regions.

The following recommendations are intended for U.S. foreign policy and other donors to boost fruit and vegetable consumption in four ways: create demand, broaden implementation, scale up an integrated multisectoral approach, and accelerate public–private engagement.

1. **CREATING CONSUMER DEMAND**

Although this research focused on the barriers to fruit and vegetable consumption at the individual and household level, the real challenge is creating sustainable consumer demand. About half the food in African rural areas is purchased rather than produced at home and the rural–urban food supply chain grew 800 percent in the past 25 years. Even with efforts to enhance knowledge about the health benefits of fruits and vegetables, dietary choice is a complex, multifaceted decision where knowledge may not be sufficient to increase consumption. Growing consumer demand is necessary not only to increase consumption of fruits and vegetables, but all nutrient-dense food.

Food preferences are as much about taste as about income, geography, knowledge, behavior, culture, gender, and other determinants. As high-income countries have shown, the desirability and convenience of food are crucial demand variables within a broader food system. The blanket concept that guided international development and nutrition research for decades—that lifting people out of poverty will lead to better diets and health—no longer applies. Sectors like agriculture, health, education, marketing, and finance all have roles in creating demand for fruits and vegetables. Policy and funding approaches require a new lens that goes far beyond educational efforts and raising incomes: they must make a major shift to rethink how the quality rather than quantity of food affects health and how to develop and sustain the demand for healthy food.

2. **BROADENING IMPLEMENTATION**

**Focus on Taste Preferences During the First 1,000 Days**

The flavors of food consumed during the first 1,000 days of life can be transmitted to the womb and baby through amniotic fluid and human breastmilk. In fact, eating fruits and vegetables during pregnancy and breastfeeding may lead to better acceptance of those tastes when the baby is introduced to food, whereas babies who are not breastfed become conditioned to the flavor of formula. Educating adolescent girls and pregnant women about how their diet may shape their future children’s taste preferences may persuade them to consume additional fruits and vegetables during pregnancy and breastfeeding. Increased consumption during this period could contribute to higher taste preferences for fruits and vegetables in their children, a benefit that can last a lifetime.

**Extend the Focus on Men as Nutrition Beneficiaries**

Field research repeatedly showed that men play a substantial role in household food consumption and decisionmaking. Additional efforts should be made to increase male participation in nutrition education. Including men does not imply lowering project efforts to
empower women but rather acknowledges the influence of gender on household nutrition. Women are significant actors in reducing malnutrition because of the long-term effect their nutritional status—prior to and during pregnancy and breastfeeding—has on their children. While men typically control food purchasing, women are responsible for the health of the household. Projects that support women empowerment should continue and be scaled up. At the same time, gender-sensitive components of the projects should include men because they can be essential allies in building gender equality.

**Incorporate Water, Sanitation, and Hygiene (WASH)**
Over the past four years, use of soap and handwashing has declined in Tanzania. Approximately 70 percent of Tanzanian households have soap, but only 2.7 percent of households reported having used soap in handwashing at least twice during the past 24 hours.17 Only one project, Lishe Endelevu, included WASH as a project priority.

**Integrate Overweight and Obesity Awareness**
Education about preventing overweight, obesity, and NCDs was minimal in the projects. Tanzania has a growing overweight and obesity rate and the Tanzania National Multisectoral Nutrition Action Plan has three NCD or overweight and obesity impact targets, which offers an additional opportunity for foreign donors to support the Tanzanian government.

**Increase Mass Communication Methods**
Vegetables for All was the only project that included a large-scale communication campaign through its radio messaging. The project also used WhatsApp for group messaging and Facebook for communication to project participants. Social media offers an opportunity to extend project reach beyond trainings and provide enduring nutrition education.

### 3. SCALING UP AN INTEGRATED MULTISECTORAL APPROACH

Tanzania’s National Multisectoral Nutrition Action Plan offers an opportunity for foreign aid donors to work with the Tanzanian government to build local capacity across its ministries. The field team learned that local communities listen to Tanzania’s political and religious leaders and their recommendations carry weight. The current political resolve is ripe for donors to gain Tanzanian commitments and support.

An integrated multisectoral approach is no easy task within large governmental bureaucracies. To fully understand the gaps and opportunities, a large-scale evaluation of USAID/Tanzania is needed and should be conducted by a third-party evaluator with no previous affiliation with USAID to avoid vested interests. To gain new perspectives, USAID and the evaluator should co-create the scope of the evaluation. Systemic changes are required, and only after an in-depth analysis of the system is completed can Tanzania and the United States develop an effective, efficient, and feasible pathway to truly reach the potential of Tanzania’s multisectoral plan and USAID integration efforts.

### 4. ACCELERATING PUBLIC–PRIVATE ENGAGEMENT

The predominant private-sector businesses engaged in two foreign aid donor projects were seed companies. Seed companies are a natural fit for public–private engagement because they have an imbedded interest in expanding the fruit and vegetable market in Tanzania. Rijk Zwaan, a Dutch seed company, was a common partner that provides seeds, technical assistance, or funding and management support and was one of several donors co-funding Vegetables for All through a matching mechanism. Except for in-kind seed distribution that benefits Rijk Zwaan, USAID does not co-fund any aspects of the projects.

A leading challenge of public–private engagement is the balance of power in decision making. To avoid complications with donors, public–private partnerships should collectively design project goals, identify and prepare for potential risks of the partnerships, and formally agree on responsibilities and roles. Success depends on how well the partnership applies the expertise of each partner, establishes the parity of the financial contributions, and ultimately governs and operationalizes the partnership.

The public–private engagements in Vegetables for All and Mboga na Matunda could provide the evidence base to further pursue and broaden partnerships with the private sector. In business engagement, the projects were limited to seed companies and financial lending
institutions; they did not use small- and medium-sized enterprises, which may be valuable resources. To improve public–private engagements and expand the limited evidence base, case studies and evaluations of the partnerships, conducted by external organizations, are needed to understand what works and what does not work in partnerships to provide necessary guidance. Future research should investigate the feasibility for the U.S. government to co-fund projects in a mechanism like the Dutch government.
INTRODUCTION
Fruits and vegetables are critical components of sustainable and healthy diets globally and have recently gained attention as a smallholder farmer income resource in low- and lower-middle-income countries.

Except in East Asia, current consumption of fruits and vegetables does not meet the World Health Organization (WHO) recommendations of at least five portions daily.18,19 Fruits and vegetables provide many of the micronutrients necessary throughout the lifecycle, like vitamin A, iron, zinc, and folate, especially during times of growth like the first 1,000 days of life from conception to age two and adolescence. In fact, fruits and vegetables are among the few food groups with beneficial outcomes across all three forms of malnutrition: undernutrition, overweight or obesity, and micronutrient deficiency (i.e., hidden hunger).

Despite growing awareness of the positive role fruits and vegetables play in diets, consumption remains low globally. Tanzania is undergoing a food system change in retail and processing, especially in urban areas.20 Fruits and vegetables are less affordable in urban areas and Tanzanian urban dwellers consume more meals and snacks outside the home, favoring convenient foods such as rice, bread, and other cereal products.21,22 However, low consumption of fruits and vegetables is not limited to urban areas. In southeastern Tanzania, 82 percent of people did not meet the recommended daily fruit and vegetable intake. The same study found that only 15.5 percent consumed fruits daily and 44.2 percent consumed vegetables daily.23

The low intake of fruits and vegetables contributes to the global burden of disease. An estimated 3.9 million deaths globally were attributed to inadequate fruit and vegetable intake in 2017, partly because of the role diet plays in infectious diseases like HIV/AIDS and malaria as well as NCDs such as cardiovascular disease, cancer, and type 2 diabetes.24 Poor diets were responsible for 11 million global deaths in 2017: the third leading cause of these poor diets was low intake of fruits, and the fifth leading cause was low intake of vegetables.25 The Food and Agriculture Organization of the United Nations declared 2021 as the International Year of Fruits and Vegetables, highlighting the global drive to increase fruit and vegetable intake.

In low- and lower-middle-income countries, fruits and vegetables present an opportunity to diversify diets and improve nutrition, provide labor opportunities, ignite entrepreneurship, and generate income for smallholder farmers.26 Yet today’s complex food system poses challenges from plant breeding to consumption, with unique difficulties for fruits and vegetables. Fruit and vegetable production suffers high postharvest losses that range from 30 to 50 percent, which may be caused by a combination of inadequate cooling, physical damage, and insufficient drying and dry storage.27,28 Many smallholder farmers and local retailers lack electricity and access to cool storage; many also lack access to quality seeds, microfinancing technical assistance and lending, and education about the safe use of fertilizers and pesticides.

Because of postharvest loss, fruit and vegetables cultivation is historically a risky investment for financial lenders. The effects of climate change—such as droughts, floods, and rising temperatures—amplify the
uncertainty of investments in local production. Unexpected weather events and disasters can interrupt or halt the ability to make loan payments. Because of the many farming and production challenges, between 0.8 and 1.9 billion people living in sub-Saharan Africa may lack fruit and vegetable availability to meet daily WHO recommendations by 2050.29

**Research Questions and Objectives**

The research questions that guide this report are rooted in the outcomes of a 2017 workshop at the University of California, Davis.30 The workshop white paper identified a research gap in factors driving consumer demand, which contributed to the first research question below on barriers to fruit and vegetable consumption.31 Research question two about current strategies to increase fruit and vegetable intake arose from the need to identify current projects in Tanzania. Plans and progress toward USAID implementing global nutrition activities across sectors, along with the role of public–private engagement in nutrition, was the basis for research question three. Tanzania was chosen because of its commitment to nutrition over the past 10 years, current triple burden of malnutrition across the country, and large investments from the U.S. government through Feed the Future.32

1. What are the barriers of fruit and vegetable consumption at the individual and household level?

2. What are the current strategies to increase fruit and vegetable intake that are funded by the United States, an additional foreign aid donor, and a local organization?

3. What kinds of multisectoral approaches and public–private engagements are necessary to increase fruit and vegetable consumption?

In responding to these questions, this report:

- describes the important role fruits and vegetables play in optimal nutrition;
- summarizes the Tanzanian government’s commitment to decrease malnutrition;
- highlights four projects being funded in Tanzania by the U.S. government, the Dutch government in partnership with the private sector, and a local foundation;
- illustrates the barriers to fruit and vegetable consumption at the individual and household levels;
- explores the potential for multisectoral approaches and public–private engagement to increase fruit and vegetable production and consumption; and
- presents recommendations, targeting U.S. policymakers and implementors.

**The Implementing Players: Foreign Donors and Local Initiative**

Identifying foreign aid donor projects that do not solely focus on agriculture was challenging, in part because many in international development continue to view poor nutrition as a matter of food quantity rather than food quality or behavior. Nutrition is inherently multidisciplinary and intersects agriculture, humanitarian aid, global health, biology, the environment, education, social and behavioral science, and economics. The range of disciplines involved makes multisectoral approaches crucial for greater impact.

Because of the multitude of factors that may affect nutritional status, nutrition is divided into two types of interventions: nutrition-specific and nutrition-sensitive. Nutrition-specific interventions target immediate causes of malnutrition, such as iron supplementation for pregnant women. Nutrition-sensitive interventions target the underlying causes of malnutrition, such as increasing access to healthy foods by providing microfinancing to smallholder fruit and vegetable farmers. However, in nutrition-sensitive interventions, nutrition is often not the driver of the interventions. Increasing consumption of fruits and vegetables is a nutrition-sensitive approach because some of the barriers to consumption involve behavior, access, and affordability. The projects included in this research use nutrition-sensitive approaches.

The CSIS Global Food Security Project’s research has historically focused on U.S. government Feed the Future projects. In this work, the scope expanded to in-
include two other projects: Vegetables for All, which is co-funded by the Netherlands and the private sector and is specifically dedicated to improving nutrition through vegetables; and the LisheYangu Initiative, a local nonprofit identified for its emphasis on nutrition education in primary and secondary schools through its LisheClubs. These projects allow a comparison of Feed the Future projects with a project funded by a foreign aid country donor and a grassroots initiative. Detailed project backgrounds and the research methodology are in Chapter 2.

THE UNITED STATES VIA USAID
The United States is the second leading foreign aid donor for nutrition, following the United Kingdom. In 2010, the U.S. government launched Feed the Future in response to the food price spikes approximately two years before. At the 2009 G8 Summit in L’Aquila, then-president Barack Obama announced the U.S. investment of $3.5 billion over three years to address global food security. Led by USAID, Feed the Future supports country-owned strategies to improve food security and is a whole-of-government approach that engages 11 U.S. agencies. The U.S. government
disseminates nutrition-specific funding primarily through USAID’s Bureau for Global Health. Nutrition-sensitive funding comes from an array of U.S. government funding streams to support sectors that affect malnutrition, as noted in the 2017 USAID nutrition disbursement table.

Because of the multisectoral and multidisciplinary nature of nutrition, USAID is prioritizing nutrition throughout the agency during its current transformation. The Bureau for Food Security will transition to the new Bureau for Resilience and Food Security; a new Nutrition Leadership Council will oversee and coordinate nutrition activities across USAID and mandate budgetary recommendations, technical leadership and external engagement, technical policy guidance, and program oversight. The secretariat for the council will be a new Center for Nutrition within the Bureau for Resilience and Food Security, which will work closely with the Bureau for Global Health and Office of Food for Peace. The new organizational structure will support USAID’s Multi-Sectoral Nutrition Strategy 2014–2025 and the Strategy’s Monitoring and Learning Plan. The U.S. government identified gaps in communication and collaboration across the eight agencies and departments that engage in or implement global nutrition activities and therefore developed the U.S. Government Global Nutrition Coordination Plan, which identified collaboration areas: food fortification, nutrition information systems, food safety, the first 1,000 days, nutrition-related NCDs, infectious diseases and nutrition, global food security strategy, and implementation science. Tanzania was one of the 11 assessment countries evaluated in the USAID Multi-Sectoral Nutrition Strategy Periodic Assessment, 2018.

Tanzania was one of the original 19 Feed the Future target countries and dropped to an aligned country status in 2018, joining 34 other countries. In USAID global health funding for nutrition, Tanzania is the sixth highest funded country, with $31.4 million in investments from 2014 to 2017. This report researched two U.S. Feed the Future projects: Mboga na Matunda and Lishe Endelevu. Mboga na Matunda is a large $20.2 million contract but only 7 percent—a mere $1.41 million—is used for nutrition activities. The entire $20 million budget for the Lishe Endelevu cooperative agreement is dedicated to nutrition, funded by USAID’s global health programs nutrition-specific subaccount. Both projects are administered through USAID/Tanzania’s Economic Growth Office, which currently manages four other projects that include nutrition: Agricultural Sector Policy and Institutional Reform Strengthening Nutrition, Feed the Future Tanzania NAFAKA II, CGIAR-Africa Research in Sustainable Intensification for the Next Generation (Africa RISING), and Alliance for Inclusive and Nutritious Food Processing.

USAID publicly reports nutrition output data, aggregated across projects in Tanzania, on the USAID Dollars to Results website. USAID tracked nine indicators in Tanzania from 2014 to 2018 and has made efforts to expand and increase the consistency of this data. This data, however, provides only the reach of USAID projects, not the effectiveness of interventions.
The Dutch government emphasizes the “Dutch Diamond” approach to sustainable development, which stresses the importance of multi-stakeholder initiatives that incorporate the strengths of government, knowledge institutions, civil society organizations (i.e., non-governmental organizations [NGOs]), and business. For example, the Amsterdam Initiative Against Malnutrition (AIM) and its project Vegetables for All, which was part of the CSIS field research, uses this approach in its work to develop systemic change and address obstacles to market entry for nutritious products.

AIM was conceived in 2009 through a meeting that included stakeholders such as the Dutch Ministry of Foreign Affairs, DSM, Unilever, the Global Alliance for Improved Nutrition (GAIN), Wageningen University and Research, Rabobank, and Rijk Zwaan. Organizational leaders brainstormed and collaboratively developed an initiative to focus on malnutrition for base of the pyramid consumers in Kenya, Ethiopia, Tanzania, Bangladesh, and South Africa. The founding partners of AIM included the Ministry of Foreign Affairs Development Cooperation, GAIN, Wageningen University and Research, AkzoNobel, DSM, ICCO, and Unilever. AIM developed an innovative yet complex funding and partnership model that provided financial support through a matching mechanism between the Dutch Ministry of Foreign Affairs and the private sector. An array of partners also provided in-kind contributions. Through this funding model, the Netherlands Enterprise Agency awarded a Facility for Sustainable Entrepreneurship and Food Security grant to AIM from 2014–2019 for $11.8 million, and the private sector contributed $12 million. GAIN leads AIM and its 30 partners, which initially consisted of seven projects and one support umbrella. Currently, two of the initial seven projects are active and scheduled to close in December 2019, including Vegetables for All.

Local Tanzania Grassroots Initiative

Based in Morogoro, Tanzania, ONA is a small-medium enterprise that started in 2015. After the birth of her daughter, owner Mboka Mwanitu founded the business as a social enterprise to provide nutritious and convenient food for first-time mothers like herself. ONA organizes, supplies, and delivers seasonal fruit and vegetable baskets. Mwanitu started ONA with five client families comprised of her friends and family. Within six months, demand grew to more than 40 families. However, many

### USAID Nutrition Outputs in Tanzania

<table>
<thead>
<tr>
<th>Indicator</th>
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<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
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<tr>
<td>Children &lt;5 received vitamin A supplements</td>
<td>812,202</td>
<td>1,059,087</td>
<td>1,276,244</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Children &lt;5 reached by nutrition programs</td>
<td>-</td>
<td>938,117</td>
<td>1,127,284</td>
<td>1,502,779</td>
<td>-</td>
</tr>
<tr>
<td>Children &lt;5 reached by nutrition-specific interventions</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1,350,888</td>
</tr>
<tr>
<td>Children &lt;2 reached with community-level nutrition interventions</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>579,643</td>
<td>400,000</td>
</tr>
<tr>
<td>Individuals received nutrition-related professional training</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>612</td>
<td>288</td>
</tr>
<tr>
<td>National multisectoral nutrition plans or policies in place that includes responding to emergency nutrition needs</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>People trained in child health and nutrition</td>
<td>14,145</td>
<td>22,540</td>
<td>13,881</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pregnant women reached by nutrition-specific interventions</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>310,229</td>
<td>310,986</td>
</tr>
</tbody>
</table>

Source: USAID Dollars to Results
of the fruits and vegetables in the baskets were unfamiliar and the mothers did not know how to prepare and cook them. This gap in knowledge inspired Mwanitu to create the LisheYangu Initiative, a nonprofit dedicated to improving nutrition in Morogoro. The field team visited a primary school LisheClub, where the LisheYangu Initiative has a school-based project focused on nutrition education and gardening.

**Tanzania’s Political Will to Improve Nutrition**

Because of malnutrition’s impact on livelihoods and economies, the government of Tanzania has demonstrated a strong commitment to end malnutrition for nearly 10 years. In fact, Tanzania ranks 9th out of 45 countries on the Hunger and Nutrition Commitment Index, a ranking of countries with high burdens of hunger and undernutrition on 22 indicators that reflect a government’s commitment to hunger and nutrition. Tanzania was one of the initial countries to join the SUN Movement in 2011 and has a current progress score of 67 percent. The SUN progress score evaluates a country’s advancement in four areas: bringing people together, coherent policy and legal framework, aligning program around a common results framework, and financial tracking and resource mobilization. Honorable Mizengo Pinda, former prime minister of Tanzania, remarked in a 2011 high-level meeting on nutrition in Dar es Salaam: "Let me reiterate that the government will work day and night with all partners involved to attain the noble objectives and goals and triumph in the SUN."

The same year, the national dedication to combat malnutrition began with the publication of the Tanzania Agriculture and Food Security Investment Plan and the National Nutrition Strategy, which embarked on a multisectoral approach with a nutrition point of contact within each ministry. Also in 2011, the government of Tanzania formed a high level steering committee on nutrition, chaired by the permanent secretary in the prime minister’s office with membership from permanent secretaries of many nutrition-sensitive ministries, development partners, NGOs, and private sector representatives. In 2016, the country published its National Multisectoral Nutrition Action Plan, steered by the Office of the Prime Minister through a committee chaired by the director of government business coordination, who is also the SUN focal point. The Tanzania Food and Nutrition Centre coordinates and implements relevant activities. The main goal of National Multisectoral Nutrition Action Plan is to decentralize nutrition implementation and resources to be more effective and efficient across the sectors that affect malnutrition.

In 2015 and 2016, overall government expenditure for Tanzania’s mainland for nutrition was approximately $375 million, or 3.8 percent of total government expenditure (0.9 percent of gross domestic product). In 2017, the national nutrition budget increased by an additional $6 million to broaden support to maternal, infant and young child, and adolescent nutrition. The government of Tanzania formed a High Level Steering Committee on Nutrition in 2011. The committee is chaired by the permanent secretary in the prime minister’s office with membership from permanent secretaries of many nutrition-sensitive ministries, development partners, NGOs, and private sector representatives.

According to the USAID Multi-Sectoral Nutrition Strategy First Periodic Assessment 2018, the government of Tanzania does integrate nutrition in planning cycles through annual budgeting guidelines. The government also now holds annual planning sessions with councils before budgets are allocated. The fiscal year 2016/17 budget met only 19 percent of the planned financial targets to address malnutrition. To better use financial resources, the Tanzanian government incorporated specific nutrition objectives into a redesigned planning and reporting tool. The Tanzanian vice president also signed a compact with regional commissioners to increase the appropriate use of malnutrition funding.

Decreasing malnutrition in Tanzania is tangible because of the country’s political will and the support of foreign donors like the United States and the Netherlands. By increasing the consumption of fruits and vegetables, nutrition will improve as well as the livelihoods of the smallholder farmers who grow them. Projects similar to those highlighted in this report are the first step in prioritizing the role of fruits and vegetables in diets.
CHAPTER 1

THE CURRENT STATE OF MALNUTRITION IN TANZANIA
Optimal nutrition is a critical element in a country’s health, prosperity, and security.

Malnutrition affects every stage of the lifecycle. Adolescent girls, pregnant women, and children in the first 1,000 days of life are the most vulnerable: malnutrition may leave them with lasting or irreversible effects. Twenty percent of growth restriction occurs in the womb. Stunting (low height for age) and wasting (low weight for height) are indicators that describe undernutrition in children younger than five. While global statistics for stunting have decreased since 2000 from 32.5 percent to 21.9 percent, wasting has remained stagnant at approximately 7 percent.

Global undernourishment across ages has increased since 2015, with current estimates at 821.6 million (10.8 percent). Even while undernourishment increased, overweight and obesity are now the primary risk factors of NCDs globally—higher than unsafe sex and alcohol, drug, and tobacco use combined. These global statistics reflect the current state of malnutrition in Tanzania.

Malnutrition in Tanzania

Tanzania, on the eastern coast of Africa and spanning roughly 365,000 square miles, is nationally food self-sufficient. Yet food insecurity exists at the regional, district, and household levels because of rain-fed agriculture and lack of modern farming. More than half of Tanzanians work in agriculture (66 percent) and the youth population is booming, with 45 percent of the population younger than 14. This high youth population—commonly referred to in Africa as the “youth bulge”—stems from country’s success in lowering infant mortality along with sustained high fertility. Half of the world’s population growth projected for 2050 will occur in only nine countries, Tanzania being one of them. This increase in the youth population will place a heavy burden on education, housing, and healthcare services. Tanzania must invest in human capital to support an educated and skilled workforce. The negative impacts of poor nutrition, specifically stunting, on brain development during the first 1,000 days greatly diminishes a country’s human capital. As little as a 1 percent loss in adult height from childhood stunting is associated with a 1.4 percent loss in national economic productivity.

Although Tanzania’s national stunting rates have fallen, malnutrition continues to plague the country. Recent data showed stunting decreased by more than 10 percent since 2005, wasting has experienced no change, and underweight has decreased by 2 percent.
Tanzania experiences the triple burden of malnutrition throughout the country: undernutrition, overweight or obesity, and micronutrient deficiency. Anemia in Tanzania is high and not well understood. Anemia in women was higher than 40 percent, according to almost 10 years of data until 2018; however, the 2018 anemia rates of 28.8 percent among women aged 15 to 49 showed a 16 percent decrease from 2015–16 data collected by the Tanzania Demographic Health Survey. The 2020 Tanzania Demographic Health Survey will use more advanced biomarkers to accurately capture the scale of the micronutrient deficiency.

Some regions that experience higher stunting rates receive little to no nutrition intervention support because of poor infrastructure and lack of roads, according to fieldwork interviews. Tanzania’s southern and northwestern borders have the highest stunting rates. A 2018 mapping of nutrition donor coverage reported the Katavi, Rukwa, and Tanga regions had zero district-level projects and approximately one-third of mainland districts had zero project coverage. The Lishe Endelevu project began implementation in Rukwa after the donor mapping was published. These regions also have high rates of anemia and overweight or obesity in non-pregnant women of reproductive age. Close to 44 percent of the children in Katavi, in western Tanzania, are stunted, while almost a third of women are anemic, and a quarter are overweight or obese. Despite these high malnutrition statistics, this region has no donor activity.

Tanzania had approximately 320,000 refugees and asylum seekers fleeing political instability and violence in Burundi and the Democratic Republic of the Congo as of April 2019. The Katavi region has no current nutrition activities but, along with Kigoma and Tabora regions, contains nearly 87 percent of refugees and asylum seeker camps. The lack of nutrition interventions causes local disputes, because ignored community members witness refugees receiving food aid, according to one interviewee. USAID’s Office of Food for Peace contributed $20 million in 2019 to Tanzania for “locally and regionally sourced in-kind food rations, U.S.-grown in-kind food aid, and cash transfers for food.” The areas where Food for Peace provides food aid and the areas that Feed the Future projects target do not overlap.

Of the total 32 projects included in the nutrition stakeholder mapping, only four projects targeted adolescents, while 21 focused on pregnant and lactating women and 19 on children under five. No data is available for projects focused on diet-related NCDs and only five projects concentrated on multisectoral nutrition governance. This gap in coverage for adolescents, diet-related NCDs, and multisectoral governance does not reflect the nutrition priority areas that scientific literature supports. Pregnant and lactating mothers and children under five will—and should—continue to be beneficiaries, but current coverage needs to expand to include additional topics and populations that warrant attention.

Adolescents are a vital population because the rapid growth that occurs during this age requires optimal nutrition. By the time an adolescent girl becomes pregnant, nutrition interventions that only target pregnant women may be too late for impact. Diet-related diseases also call for attention because of the rising overweight and obesity rates in Tanzania, with projections of type 2 diabetes to double from 2011 to 2030. Although a relatively new priority for both the U.S. and Tanzania governments, multisectoral governance is an implementation aspect that should be integrated in every project.

**Perceptions of Fruits and Vegetables**

Tanzanian perceptions of fruits and vegetables are based on limited knowledge. This is a critical gap in the scientific literature. Understanding the drivers of consumer demand is essential to creating sustainable dietary behavior. Research in other African countries showed that dietary taboos are generational during pregnancy and that socioeconomic demographics play a role. A study in Nigeria found that pregnant woman believed eating okra would cause the baby to drool more and that pregnant women were more likely to adhere to food taboos if they were adolescents, had a low body mass index, did not have formal education, and had low income. Traditional (i.e., indigenous) African vegetables, such as amaranth and Ethiopian mustard, are more affordable options for the most impoverished, depending on location. Despite the high nutritional quality of many traditional African vegetables, consumption was low because...
TRIPLE BURDEN OF MALNUTRITION IN TANZANIA AND PROJECT COVERAGE

This map shows the co-occurrence of three major outcomes of malnutrition—being overweight or obese, stunting, and anemia—as experienced by key populations in Tanzania. The key population for stunting, or below average height for age, is children under 5. Women of reproductive age (15 to 49 years) is the key population for anemia and overweight or obese. The district-level value (DLV) shows how many nutrition interventions in each region for mainland Tanzania out of 32 projects in 2017.
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they were perceived as being “poor people’s” plants. They were also perceived as being “poor people’s” plants.64 Efforts to increase the market share of traditional African vegetables have included education and outreach to facilitate demand. As the demand for traditional African vegetables increased, the price also rose, thus making these vegetables more attractive commercial crops for farmers.65 Smallholder farmers now not only find traditional African vegetables attractive because of the minimal capital requirement and the resilience of the plants to adapt regionally, but also because of their viability in the market with a growing consumer base.

A Push Towards Diverse and Sustainable Diets

Consumption of a diverse diet supports nutrient adequacy. The dietary diversity of households in Tanzania is low because of the high consumption of carbohydrates like cereal.66 In rural households, starchy staples may comprise up to 70 percent of household diets.67 Women and children have less access to foods like animal-source proteins, with 46 percent of women and 26 percent of children achieving minimum dietary diversity.68 Only 22 percent of Tanzanian adolescents consumed five or more servings of fruits and vegetables.69 An opportunity for Tanzanians to diversify their diets is through increased intake of fruits and vegetables, which contain many of the micronutrients needed during pregnancy and early childhood development, such as vitamin A and iron.

Global diets gained attention in 2019 with thought leaders, such as the EAT-Lancet Commission on Food, Planet, Health and the Intergovernmental Panel on Climate Change, promoting the role of sustainable nutrition to lower greenhouse gas emissions to impede climate change. Diets may lower greenhouse gas emissions by reducing the consumption of animal-source proteins like red meat. A growing body of literature in sustainable nutrition support diets that produce lower greenhouse gas emissions are indeed healthier. Diets low in animal-source protein tend to reduce consumption of red and processed meats, salt, fats, and increase fiber consumption, leading to possible lower rates of coronary stroke, heart disease, and stomach, lung, and breast cancer.70 Healthy plant-based diets also are associated with lower rates of type 2 diabetes.71

Diets rich in animal-source protein are important in low-income countries—especially during the first 1,000 days and throughout childhood.72 However, this attention on sustainable diets could synergize with raising awareness of the nutritional quality of fruits and vegetables, not only in high-income countries but globally.

Although stunting in children younger than five and anemia in women of reproductive age have decreased, overweight and obesity continue to rise in Tanzania. In rural areas that lack infrastructure, few nutrition interventions exist creating a clash of circumstances among local community members and refugees and asylum seekers from neighboring countries experiencing conflict and violence. Because of recent attention and research on the value of plant-based diets on the health of people and the planet, this new emphasis on sustainable nutrition provides an opportunity for fruits and vegetables to be emphasized in policy.
CHAPTER 2

RESEARCH METHODOLOGY AND BACKGROUND OF FIELD PROJECTS
The research methodologies consisted of a literature review, field observations, in-depth interviews, focus groups, and community beneficiary interviews.

A modified snowball sample\(^7\) contributed to 65 interviews and four focus groups, representing a total of 21 organizations (Appendix A). Interviews employed a semi-structured 28-item question guide, which was adapted continuously. Implementing partners provided access to interviewees and local community project beneficiaries in each field location, who were identified for willingness to respond. Within groups of five or more community project beneficiaries, one to two individuals provided answers on behalf of the group. The field team met with approximately 90 beneficiaries.

The field team consisted of a CSIS Global Food Security Project research fellow and the program coordinator and research assistant. In addition, an external dedicated native Swahili translator provided field assistance and a local photographer documented the projects. For two weeks in August 2019, the field team visited Dar es Salaam, Morogoro, Zanzibar, and Arusha. These locations were strategically identified for interviewee access and project implementation locations in diverse regions of Tanzania. The field visits encompassed stakeholder and project-related organization offices, smallholder farms, project farm demonstration plots, a health clinic, primary schools, cooking demonstrations, a local market, and community project beneficiary homes (Appendix B).

The field team experienced multiple research limitations, including gaps in the organizational sample due to lack of response to interview requests, inability to visit every location of project implementation, and language barriers. The greatest data collection limitation was the lack of access to project beneficiaries without the implementation partners’ facilitation of field visits. The community beneficiary responses to questions may have been influenced by social desirability bias (i.e., answering questions to be viewed favorably by others) because of the physical presence of the implementation partner. The field team attempted to overcome this bias by separating and conducting multiple interviews simultaneously. Another major limitation was cultural: most Tanzanians do not share information unless directly asked. For example, the team discovered vegetable taboos by chance, late in the field research.

**Background of Field Research Projects**

The field research focused on three government foreign aid projects and one local initiative. Supported by funding as part of the U.S. government’s Feed the Future Initiative, USAID/Tanzania administers Mboga na Matunda and Lishe Endelevu. The Dutch Ministry of Foreign Affairs co-funds Vegetables for All along with multiple in-kind and financial donors such as Rabobank Foundation and Rijk Zwaan. ONA facilitates the LisheYangu Initiative with in-kind and financial support from community members and volunteers, the Ministry of Foreign Affairs of Denmark with the Danida Fellowship Centre, ASAS Dairy Farm Ltd., and technical assistance provided by GAIN.
These four projects provide examples of how a variety of donors and implementing partners are incorporating fruits and vegetables into nutrition and food security efforts. The projects share similar objectives—to increase smallholder farmer livelihoods and resilience, educate local communities and increase access to and diversity of fruits and vegetables, and create sustainable nutrition-forward behaviors among community members—but differ in multisectoral approaches, multi-stakeholder engagements, target populations, funding models and budgets, and focus regions. Each project has multiple partners across stakeholders and uses a multisectoral approach. The United States is the second largest donor of global nutrition development assistance and the Netherlands ranks sixth.74

**U.S. GOVERNMENT FEED THE FUTURE PROJECTS:**
**MBOGA NA MATUNDA AND LISHE ENDELEVU**

Led by USAID, Feed the Future is a whole-of-government approach. For its 35 aligned countries, budgets are more vulnerable and less reporting is required than for the 12 target countries, according to one interviewee, but the distinction from target to aligned does not change how the office or projects operate. USAID global health nutrition-specific subaccount funding for Tanzania, which is administered via the USAID/Tanzania Economic Growth Office, hovered at approximately $8 million annually from 2014 to 2018 but was reduced to $6 million in 2019.75 The Lishe Endelevu project is solely funded by the USAID global health nutrition-specific subaccount.

**Mboga na Matunda**

This four-year, $20.2 million Feed the Future project focuses on improving nutrition by making fruits and vegetables more attractive and accessible to smallholder farmers by scaling up improved technology and practices and building capacity through market system models. Using a market systems approach, the project intends to deliver optimal agricultural practices, basic technologies, and nutrition education to 50,000 project beneficiaries.

Mboga na Matunda provides multisectoral technical assistance and inputs—and facilitates farming clusters, centers of excellence, and cooking demonstrations—for local smallholder farmers and community members through demonstration plots, as well as for the Tanzania Ministry of Agriculture and its government extension officers. Most of the Feed the Future funding is allocated to smallholder farming elements, while only 7 percent of the budget funds nutrition-sensitive activities. Training of trainers provides technical assistance for government extension officers to build local capacity to ensure sustainable outcomes after U.S. foreign aid ends. The project uses multiple platforms to disseminate knowledge, including government extension officer and Mboga na Matunda staff field visits, training of trainer boot camps, farmer exchange visits, village nutrition seminars, agribusiness training, introductions to local financial lending institutions, cooking demonstrations, and behavior change social marketing (e.g., verbal communication, leaflets, and booths at events).

Mboga na Matunda uses a stepwise approach to provide technical assistance to smallholder farmers through organized cluster demonstration plots. Clusters cost-share one time with Mboga na Matunda, with the choice of three packages: beginner, intermediate, and full. After the initial cost-share package, the Tanzania Ministry of Agriculture and Mboga na Matunda provide technical support only and the cluster is financially responsible for the plot. The end goal is for the cluster to graduate and use what they learned to develop their own plot and harvest individually. Mboga na Matunda and the Ministry of Agriculture continue to provide support through graduation.

In Zanzibar, Mboga na Matunda is operationally similar but focuses more on microfinancing education. Every demonstration plot has three beds for nutrient-dense crops to be sold commercially. Before joining in the Mboga na Matunda project, farmers must follow generally accepted accounting principles. The project trains cluster farmers in record keeping, marketing, and agribusiness engagement. Participating in an Mboga na Matunda cluster increases a farmer’s likelihood of receiving a loan from a financial institution and lowers the risks of vegetable farming perceived by microfinancing lenders.

**Lishe Endelevu**

This four-year, $20 million Feed the Future project focuses on intensifying and integrating nutrition interventions for women, children, and adolescents. Lishe Endelevu is a continuation of a seven-year (2011–

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CHAPTER 2 | RESEARCH METHODOLOGY AND BACKGROUND OF FIELD PROJECTS
2018) Feed the Future program called Mwanzo Bora Nutrition Program.

The project uses a three-pronged approach to develop local knowledge, coordinate among sectors, and change behavior to drive women’s empowerment. The six major components of the project include monitoring, evaluation, and learning; WASH; livelihood; social behavior change; nutrition; and finance and grants. Increasing the consumption of fruits and vegetables is only one component of the project that falls into the greater framework to improve nutrition.

The overarching goal of Lishe Endelevu is to reduce stunting in children under age five. Additional goals include increasing the proportion of women of reproductive age consuming a diet with a minimum acceptable diversity of foods and increasing the proportion of children ages six to 23 months receiving a diet with a minimum acceptable frequency of feeding and diversity of foods. The project accomplishes these goals by training of trainers of community health workers, reproductive health and maternal treatment mentors (with a target of 60 in fiscal year 2019), and nutrition-focused government extension officers who represent both the district health and agriculture departments (with a target of 85 in fiscal year 2019). The district health department extension officers work with mothers while the agriculture department works with smallholder farmers.

Although the project receives funding solely through the USAID global health nutrition-specific subaccount, the project implements nutrition-sensitive activities, including agricultural education through farm demonstration plots. Some training overlap exists among extension officers working with Mboga na Matunda and Lishe Endelevu in areas where both are located. The four core target beneficiaries are community health workers, local mothers, smallholder farmers, and extension officers at the local government authority level. This project focuses not only on fruit and vegetable crops but also on livestock among the nine councils and 106 villages targeted in the Morogoro region. To date, the project has trained 216 community health workers (two from each village within Morogoro’s nine councils), including 27 community health workers trained specifically on social behavior change strategies and platforms to promote optimal nutrition.

Lishe Endelevu began in October 2018, when the national stunting level was 32 percent. By supporting Tanzania’s National Multisectoral Nutrition Action Plan, the Save the Children Morogoro staff are confident that Tanzania will reach its goal to reduce stunting to 28 percent by 2021 and to 15 percent by 2025. Lishe Endelevu uses a multisectoral approach across USAID and the Tanzanian government. The project plans to work closely with the Ministry of Health; the Ministry of Community Development, Gender, Elderly and Children; the Ministry of Agriculture; the President’s Office for Regional Administration and Local Government; and the Tanzania Food and Nutrition Centre to increase synergies and avoid duplication.

**Vegetables for All**

Under the Netherlands’ 2009 AIM, Vegetables for All uses a multisectoral and multi-stakeholder approach through a financial and in-kind matching funding mechanism. This six-year project, with a budget of $3.4 million, is much smaller than the Feed the Future projects. Vegetables for All has four overarching goals: to increase the availability of vegetables, produce a strong and sustainable vegetable supply chain, improve access to vegetables for bottom of the pyramid consumers, and increase consumption of vegetables by bottom of the pyramid consumers. To accomplish these goals, Vegetables for All is divided into seven result areas, each with different lead and implementing partners. Vegetables for All is led by the seed company Rijk Zwaan and GAIN and is implemented in the northeast dry corridor of Tanzania. The four regions of the project do not overlap with the USAID projects and have very different fruit and vegetable production conditions. The CSIS field research focused on the vegetable consumption behavior change focus area.

GAIN, Wageningen Centre for Development Innovation, and Tanzania Horticulture Association (TAHA) implemented the result area on vegetable consumption that included a radio messaging campaign, training of trainer activities, community cooking demonstrations, and school nutrition and garden clubs. TAHA issued a call for proposals and selected 11 local NGOs to receive small grants to implement school clubs and cooking demonstrations. The field team vis-
ited one of these NGOs, the Women on Health and Economic Empowerment Arusha (WOHEEA).

TAHA uses one lead trainer who developed training manuals and conducted training for government extension officers and the 11 NGOs on cooking and preparation, nutrition of specific crops, and safe storage. Under other result areas, Vegetables for All provided additional training on agricultural practices, business plan development, and cash management. Trainings encompassed classroom and practical aspects along with group presentations and discussions. After TAHA trained WOHEEA, local NGOs then trained approximately 1,900 students in primary schools and 44 of their teachers. Currently, 53 school clubs are active.

Local Grassroots Organization: LisheYangu Initiative

Much smaller than the multimillion-dollar foreign aid projects, the LisheYangu Initiative hopes to fundraise a budget of $25,000 to execute two years of activities. This local organization was founded by ONA, a woman-owned small-medium enterprise in Morogoro, Tanzania that organizes, supplies, and delivers seasonal fruit and vegetable baskets that are produced in Morogoro and distributed in the city of Dar es Salaam.

The LisheYangu Initiative supports LisheClubs in six schools across the Morogoro region. The clubs manage nutritional education in the schools, including fruit and vegetable preparation, the role of necessary nutrients for health, and school gardening. Schools benefit from the LisheClubs because the school gardens provide food for lunches and children with special needs. Unique among the researched projects, the LisheClubs depend on volunteers. A total of 30 volunteers assist clubs and six nutrition students or recent graduates from the neighboring Sokoine University of Agriculture serve as teachers for the clubs.
CHAPTER 3
THE CHANGEMAKERS
One theme quickly emerged during the fieldwork: each site visited had a local changemaker, someone who influences their community for the greater good.
While the projects designated and supported some of these individuals to fill this role, others became changemakers from the knowledge they gained by participating in the projects. Education empowered them. These changemakers were diverse in every aspect: their only similarity was their initiative to educate their families and community members about the importance of nutrition and the role of fruits and vegetables to grow incomes and improve health. Their stories are shared throughout this chapter.
With the soaring youth population in Tanzania, encouraging young people to pursue employment in farming is invaluable. Young people can be leaders in improving farming methods and prioritizing nutrient-dense fruit and vegetable cultivation. They also play a critical role in ending malnutrition. At the Misongeni Cluster in Morogoro, all the cluster members (except the chairperson) were younger than 31 at the time of the field visit, with many in their early twenties. When asked how Mboga na Matunda has altered their lives, members said that the project created employment opportunities and engaged youth. With new employment opportunities, members are now able to purchase different foods and their diets have changed because of the vegetable varieties available. These young farmers feel empowered and consider themselves conduits of change for their community, families, and friends. Their duty, they feel, is to share the knowledge they have gained to influence other young people to improve what they grow and consume.
As Edward Dodo, a local nutritionist, lectured to the class, the beneficiaries were captivated by his charismatic presence and smile. The only male nutrition officer who teaches nutrition classes at the Sabasaba Health Center in Morogoro, he is committed to improving children’s health and educating women about how alcohol use inhibits nutrient absorption. His interest in nutrition began when he learned about the importance of optimal nutrition during pregnancy and the first 1,000 days of life. He believes the biggest challenge facing malnutrition in Morogoro is lack of knowledge. Many women do not know the best cooking methods to preserve nutrients in food, and the local community does not consume raw vegetables because of fear of pesticides. Men are important too, he added. He teaches men about the significance of nutrition for the entire family and provides counseling to them outside the clinic; he wants to speak to both the male and female members of the household simultaneously. By visiting homes, Edward broadens the reach of nutrition education beyond the women who typically attend the clinic classes.
CHAPTER 1 | MALNUTRITION IN TANZANIA
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Nadhifa Ally is a young mother and entrepreneur. As a mother of two (ages eight and four) and with one on the way, she started to attend the Sabasaba Health Center nutrition class when she was three months pregnant with her third child. To expand her family income, she became a *mama mboga*, or a woman who sell fruits and vegetables and other goods. Her career began unsuccessfully when she borrowed TZS 2,000 (2,000 Tanzanian shillings, equivalent to $0.87) from a friend, and because she was uneducated about the food costs, her target customer segment, and lack of cool storage, all the vegetables she bought rotted before she was able to sell them. Nadhifa looked to other *mama mbogas* for guidance and tried again with $2.18 borrowed from a friend to purchase vegetables to sell. On her first day she had a return on investment of 100 percent. She sells daily from 7 a.m. to noon, passing through commonly traveled routes, selling to the same households, and identifying new customers by way of alternative travel routes. Without a refrigerator, she learned to put leftover vegetables in cool water and remove them after five to six hours to preserve them for sale the following day. The capital necessary to start her business was equivalent to the cost of two mangos in Dar es Salaam. Unique among her fellow nutrition classmates, Nadhifa has a husband who accompanies her to the clinic when possible. Her husband supports her in her business and as the decisionmaker for the health of the household. Through the cooking demonstrations, she has learned to cook vegetables for half the time she normally did, which preserves more nutrients.
Each month, Meena Underson attends the Sabasaba Health Center nutrition class with her nine-month-old child. She makes time for the class and cooking demonstrations despite being occupied by a young child and being a secondary school teacher of linguistics. When she and her husband were both unemployed, they could not afford fruits and vegetables. But after she became a teacher and her husband a driver, their increased income allowed them to diversify their diets. The cooking demonstrations taught her that cooking time can play a role in retaining or leaching nutrients. When she cooks, she uses a mixture of vegetables for different nutrients. She and her husband share the household cooking responsibilities and she visits a small market daily and the bigger local market weekly. She wants to keep her fruits and vegetables fresh and worries about pesticides. Her favorite fruits and vegetables include banana, pineapple, orange, Chinese cabbage, and amaranth.
The students listened intensely to the volunteers teaching the LisheClub and exhibited enthusiasm and pride, jumping in excitement when the school garden was mentioned. The volunteers consisted of two students and two recent graduates of Sokoine University for Agriculture. Maternus Adriano (sitting) is the project coordinator for ONA and LisheYangu and he works closely with school leadership and volunteers. The volunteers want to focus on the first 1,000 days of life, pregnant and lactating women, and children younger than 12 as focus areas in their careers; one volunteer wants to be a dietitian. They enjoy educating children about the importance of nutrition and the opportunity to apply what they learned through their studies. They understand the importance of influencing the next generation of Tanzanians to improve health through nutrition. Unlike other projects visited in the field, the LisheYangu Initiative is the only project that uses university volunteers. Because of Tanzania’s youth population growth, the health infrastructure in Tanzania must grow to meet the demand of this future population. The students and recent graduates will play a principal role in treating nutrition-related NCDs like cardiovascular disease and type 2 diabetes.
At 12 years old, Kelvin Rajabu is making nutrition profitable for his family. He started and manages his home garden all on his own, using seeds and his new nutrition literacy learned at school. He built a stone bed and retrieves water morning and night from a well down the street. The garden contains the fruits and vegetables Kelvin finds most tasty, such as spinach, banana, and passion fruit. He knows that spinach has vitamin A, which is good for his eyes. His mother, Lita, is proud and learns from him. She is a single mother of three and appreciates Kelvin’s help with cooking and tending the garden. Before the kitchen garden, their meals were mostly dried fish without vegetables; now every meal has vegetables. Lita values the garden because the vegetables have decreased household costs. When Kelvin is not gardening at home, he practices math and draws.
As a young chairperson of the Tushikamane Zanzibar Cluster, Bakari Haji Ally owns the cluster’s land. What he grows and how he grows have changed because of his participation in Mboga na Matunda. Bakari now uses drip irrigation, raised beds, and new seed varieties. The seed company Rijk Zwaan provided starter seeds to Bakari to build the local market demand in Zanzibar with new varieties. The tourist demand for nutritious crops influences him to primarily grow okra. Okra is a popular vegetable in Tanzania but not in Zanzibar or among Tanzanian men because of taboos related to sexual and reproductive health. When asked if he likes okra, Bakari replied with a huge grin. He loves okra for the taste—and the profits. The partnerships between Mboga na Matunda and seed companies amplify the project’s reach and resources. The profits Bakari earns through the Hotel Crop Initiative are enough to convince him to continue farming fruits and vegetables.
A major farming challenge at the Mlali demonstration plot is droughts and access to water via drip irrigation. By his own admission, Khalifa Said lacked farming technical and production skills before the Mboga na Matunda project. For his one-acre tomato farm—which he chose because tomatoes are a cost-effective crop—he invested TZS 2 million ($870) in capital with the hopes of an TZS 8 million ($3,481) profit, despite harvesting during a low-price season. After a TZS 1 million ($435) investment in his agridealer village store, his capital grew to TZS 14 million ($6,092) in one year. The success of the business allowed him to send his oldest child to a university and expand his sales territory. His shop now exports seeds and other agricultural inputs to areas outside of Morogoro such as Dodoma and Iringa. The local community admires Khalifa, because he shares his knowledge among his community and educates other farmers.
After retiring from a safety company, Reginald Hugo became a farmer. At first, he only grew tomatoes and cabbage, but he recently expanded his farm to include Chinese cabbage, kale, and cucumber. He cooks and teaches other community men that taboos about vegetables (like Chinese cabbage and male sexual reproduction) are misinformed. The men in his village are more likely to listen to his advice because he is a village leader. Reginald is changing gender dynamics by cooking, which is viewed as a woman’s role. As a farmer who understands the fear of pesticides among his neighbors, he tries to use non-chemical pesticides on his crops and waits two weeks after application before selling his vegetables at the market.
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FROM THE GROUND:
PERCEPTIONS, STRATEGIES, AND BARRIERS IN INCREASING FRUIT AND VEGETABLE CONSUMPTION
The greatest barrier to increasing fruit and vegetable consumption, in an overwhelming consensus among interviewees, was the lack of knowledge about nutrition in general and fruits and vegetables in particular.

Tanzanians sometimes conflate optimal nutrition with physically feeling full. One stakeholder said that rural Tanzanians see nutrition as having a full belly versus an empty belly, not as a long-term health effect. Another stakeholder mentioned that animal-source protein is viewed as prestigious and vegetables are used for animal feed.

Lack of knowledge underlies other barriers that stem from generational norms and misinformation. Most dietary behavior is generational in Tanzania—women learn from their family and community elders what to eat and how to cook. As culinary skill is passed down through the women of the household, their preferences, habits, and misconceptions about how to best prepare foods also are transmitted from one generation to the next. However, generational norms are changing because of urban migration. Tanzanians are moving away from childhood villages to cities and encountering more diverse foods.

Taboos are another barrier. The field team came across this major finding by chance in Arusha, the last region visited. Men do not eat Chinese cabbage and okra because they believe these vegetables will affect their reproductive health and make them impotent. Bitter eggplant is believed to make women angry. Vegetables for All training and TAHA’s cooking demonstrations that target men discuss these taboos, but they are deep-rooted and will take a long time to correct through education.

An additional barrier is the overwhelming fear of pesticides. Because of this fear, Tanzanians do not eat raw vegetables and prefer vegetables from kitchen or school gardens rather than the market. Some of this fear is generational. One community beneficiary noted that a family 30 years ago may have experienced an illness after consuming vegetables from a market, and from that day, the family members avoid vegetables from the market. This fear also is warranted because smallholder farmers may not know how to use pesticides or herbicides correctly. In addition, counterfeit pesticides are available, so local farmers may not know what chemicals they are using. This fear also supports generational cooking trends. Women will boil vegetables for much longer than necessary to “clean” the vegetables of pesticide residue, completely unaware they are stripping the nutrients in the process.

In the research literature, a common barrier is the cost of fruits and vegetables. As an energy source, fruits and vegetables are more expensive per calorie than grains and starchy staples. From a satiety perspective, fruits and vegetables may not keep an individual full compared to high-protein sources or fats. However, fruits and vegetables are less costly than animal-source protein. The field research learned that cost is not necessarily a barrier to consumption for Tanzanians in the regions visited. The affordability of fruits and vegetables depends on and is specific to the region, season, and crop. For the extremely poor, however, price is an affordability challenge at any cost, regardless of food group.
Learning from the Field

From quality seeds to partnering with the private sector, the field projects give a sampling of the possible interventions that ultimately may influence diets. Whether these interventions increase fruit and vegetable consumption cannot be determined without a thorough dietary assessment of project participants.

STARTING WITH QUALITY SEEDS

The use of quality seeds is imperative for farming nutritious fruits and vegetables. Mobilizing and ensuring quality seeds through plant breeding is a goal of the World Vegetable Center (WorldVeg), which has five global centers, three of them in Africa. WorldVeg focuses on seed breeding, the vegetable value chain, healthy diets, and impact assessments. The field team visited the Eastern and Southern Africa office, home to the largest seed gene bank in Africa, with 2,700 varieties of which 75 percent are traditional African vegetables. WorldVeg is a partner in both Mboga na Matunda and the Vegetables for All projects.

USAID partners with WorldVeg in developing and distributing seed kits, which provide seed access to three main populations: home gardens for income and nutrition purposes, school children, and disaster relief programs and refugee camps. Unique to Feed the Future, the seed kits have been distributed for more than five years. Each kit provides five to seven seed samples, enough for a garden for a four-member household, and information on how to grow seeds and the nutritional content of crops. Kits contain seeds for traditional African vegetables like African nightshade and eggplant, amaranth, and Ethiopian mustard.

The new seed varieties WorldVeg breeds are important to local farmers. In Tanzania, WorldVeg has bred 18 new...
varieties since 1997. The economic gains from breeding investments in Tanzania until 2014 were $255 million for tomatoes and $5 million for African eggplant.80 Seed breeding is a nutrition-sensitive approach that affects the availability, access, and use of crops, which influences the underlying causes of malnutrition.

BUILDING HEALTH AND NUTRITION LITERACY

Each project’s core goal is to build local capacity through top-down and bottom-up approaches targeted toward government extension officers, local NGOs, health clinics, and primary and secondary school teachers and students. Tanzania’s extension system is the backbone of smallholder farmer education. The projects provide agricultural training in farming nutrient-dense crops, financial planning, and health training in nutrition, fruit and vegetable preparation and cooking, and home and school garden startup and management.

On the Farm

Through the Mboga na Matunda Government Extension Officer Initiative to increase beneficiary reach and sustainability through systems change, government extension officers provide technical assistance for farmers to grow seedlings and prepare quarter-acre demonstration plots, with 10 pilots in Morogoro and 10 in Zanzibar. The goal is to have 60 extension officers, with each one helping 10 demonstration plots and each plot with 10 farmers in the cluster. The extension officers provide technical assistance with Mboga na Matunda’s intermediate package only; they are expected to visit the demonstration plots weekly and during emergencies.

The extension officers provide guidance on the steps in planting to local smallholder farmers. For example, the tomato seedlings pictured will need to grow for 21 days before they can be planted. While the seedlings grow, the farmer must prepare the demonstration...
plot soil with irrigation. Once the tomatoes are planted, the plants require 75 days to be harvested. The extension officers teach the farmers that companion planting, where multiple crops are grown together, can mitigate pests at a low cost. Planting corn around the tomato plants mitigates pests and thus reduces pesticide use. The biggest challenge for the farmer interviewed was not knowing what season to sell the tomatoes for maximum profit: although learning new agricultural techniques is difficult, a more significant challenge is understanding how to best apply that knowledge for commercial success.

Extension is the pathway for agricultural research to reach those who need this education most: smallholder farmers. Extension provides local farmers the knowledge and technology to improve their practices based on current evidence. The agricultural extension system in Tanzania is changing, with an additional focus on food and nutrition security, poverty reduction, and new partners such as NGOs and the private sector. All three foreign aid projects used extension to build local capacity and sustainability of efforts.

**In Health Clinics**
Lishe Endelevu trains government extension officers in both farming and health. The health extension officers focus on women and infant education, while the agriculture extension officers target farmers. The project also trains community health workers and volunteers. While in Morogoro, the field team visited a nutrition class at the Sabasaba Health Center. Among the 40 attendees, 25 were breastfeeding mothers and 15 were pregnant.

Facilitated by one female and the only male nutrition officer, the nutrition class used a participatory model to engage beneficiaries through verbal quizzes, repetition of key nutrition facts, and a picture book as a visual teaching aid. Class attendees were asked to list the vegetables they consume daily, name the nutrients (e.g., carbohydrates,
protein, and fats) needed by the body, and explain the importance of consuming nutritious food. Some women were shy and reserved, while others answered and asked questions. Clinic staff developed a slogan to serve as a reminder: "Eating healthy results in delivering and raising a healthy child."

Many of the clinicians commented that because women consume caffeine and alcohol during their pregnancies, their nutritional status suffers. Some class participants also mentioned that men may cause some of the nutrition deficiencies within a household, but the burden and responsibility is placed on women. The class facilitators stressed the importance of men attending the training, because they do not always listen to their wives. No men attended the observed nutrition class, and male engagement in nutrition education activities was low throughout the field visits.

The classes provide health and nutrition literacy to local community members. They learn how specific nutrients and food affect their bodies during different stages in life. However, the beneficiaries only consisted of pregnant or lactating women, perhaps because this is the population who regularly visits the clinic. Although the first 1,000 days of life is a crucial timeframe in optimal nutrition and early childhood development, the nutrition classes should increase the participation of adolescent girls and men.

In Schools
The field team visited two primary schools with nutrition and garden clubs. Vegetables for All Engosengiu school was in Arusha and LisheYangu Initiative Bungo school was in Morogoro. Both schools targeted children ages 10 to 14. As one local NGO representative commented, targeting grades five through seven has the most impact to influence behavior.

With Vegetables for All, TAHA trains government extension officers and 11 local NGOs. The local NGOs then train teachers at the 53 schools. The school nutrition club model flourished in reach, totaling about 28,000 beneficiaries through the children sharing their new knowledge at home. The model was simple. Local project NGOs provided seeds to teachers to distribute. The students manage the garden and bring water from home for irrigation. The students then sell vegetables to teachers and the money earned goes back to support the school garden. Students become ambassadors and teach family and community members about nutrition and start kitchen gardens at home. Students then manage their home gardens and sell the vegetables the family does not consume to neighbors or wholesalers. The profits earned are used to buy schoolbooks or shoes. The students have become young entrepreneurs and found a way to make nutrition profitable.

The LisheYangu Initiative is much smaller in scale and is administered mostly through volunteers. The field team observed a LisheClub of 29 students. Bungo primary school has a total of 200 LisheClub members: 127 girls and 73 boys. The teachers attributed the lower participation among boys to the assumption that girls are supposed to cook. The Sokoine University for Agriculture nutrition volunteers lead 40-minute LisheClub sessions every Monday and Tuesday. The 10-year-old girl pictured presented to the class on how to prepare amaranth.
The school garden at Bungo faces significant challenges because of water shortages and nightly theft of vegetables. Morogoro experiences droughts and floods; because of the lack of irrigation, club members access water 200 meters away from the school. When the garden is active, vegetables grown include amaranth, okra, sweet potato leaves, cabbage, and tomatoes. Quarterly, the school provides cooking demonstrations for the club members.

School gardens are a common nutrition intervention throughout the world both in low- and high-income countries. Because of the target population, hands-on approach, and community engagement, gardens at school are an attractive intervention. As a multisectoral method that crosses agriculture, education, health, and nutrition, the assumption is children would change their behavior and increase their knowledge. However, the evidence is mixed. Research indicated that school gardens do increase knowledge but have no effect on fruit and vegetable consumption behavior in low-income countries.\textsuperscript{83, 84} These projects were unique in pairing preparation and cooking education with nutrition and health literacy and garden management. These primary school nutrition clubs and gardens are a bottom-up approach that extends impact beyond the classroom walls. The clubs provide education on general life skills because of the tasks involved with garden management. As witnessed in Vegetables for All, the students are becoming entrepreneurs by taking what was learned at school and creating small businesses at home. The students are also local changemakers because of the knowledge they share at home and throughout their communities. They influence their mothers about how to properly prepare fruits and vegetables and the role of nutrients in health.

**RAISING SMALLHOLDER FARMER INCOMES**

All three foreign aid donor projects used a market-based approach to increase smallholder farmer incomes. Much of the training revolves around developing business plans and building relationships with microfinancing lenders. Obtaining loans for fruit and vegetable farming is challeng-
ing, as the field team heard repeatedly; however, after participating in an educational program, the farmers are perceived as less of a risk for loans.

Although raising smallholder farmer incomes is necessary to increase the availability and affordability of nutrient-dense fruits and vegetables, higher incomes do not necessarily mean better diets. When project beneficiaries were asked what kind of gift they would prefer, the response was Coca-Cola. A sugar-sweetened beverage was clearly not part of a typical daily diet; but this could be a function of cost and access, not health awareness. In Arusha, the cost of one Coca-Cola is comparable to one papaya. In other words, if Coca-Cola becomes more affordable and attainable in rural Tanzania, would soda be consumed more regularly?

The field team learned that health and nutrition literacy additionally needs overweight and obesity prevention education to increase consumption of fruits and vegetables. Pairing fruit and vegetable education with information on the possible effects of unhealthy food characteristics such as added sugar, sodium, and saturated fats would be valuable, because stunting may be associated with overweight and obesity later in life. Tanzania also saw a 96 percent increase in sugar-sweetened beverage consumption from 1990 to 2010. While urbanization is a driver of overweight and obesity, recent research found that body-mass index is rising at the same or higher rate in rural low- and middle-income countries compared to cities, except among women in sub-Saharan Africa. In Tanzania, overweight and obesity in nonpregnant women from ages 15 to 49 has almost tripled to a staggering 31.7 percent.

**COOKING TO PRESERVE NUTRIENTS**

An excited group of women clustered around a trainer; in center of the crowded semi-circle, a large pan was heating with sunflower oil. During a Mboga na Matunda cooking class at the Tushikamane Cluster in Chaani Zanzibar, the enthusiasm was palpable. The women participants watched the cooking demonstration trainer intensely; some took photos and videos of the instruction using their cell phones. First shaved carrots went into the pot, followed by sweet peppers and onions. The trainer included tomatoes because they are a staple. In Zanzibar, okra consumption is low compared to mainland Tanzania, so the recipe integrated okra with more familiar vegetables. While cooking, the trainer explained, “vitamins and minerals prevent disease and help eyes, bones, and muscles. A balanced diet needs starches, vegetables, fruits, oil, protein. Starch is needed for energy . . . protein for body . . . vitamins from vegetables.”
Women crowd around the cooking demonstration in Zanzibar.
The beneficiaries asked questions and received answers. As the vegetables cooked, the trainer emphasized that vegetables needed only five to seven minutes in the pot. After the pot is removed from the heat, the vegetables must stop cooking to retain their nutrients, so the pot should be covered with paper instead of a lid, keeping the vegetables warm but preventing further cooking. About 120 people attended; 70 percent were female. During the demonstration, men stood on the sidelines while women and children watched. After preparation, everyone lined up and washed their hands before the food buffet.

At the cooking demonstration, women commented on the difficulty of learning new knowledge from their husbands. Those with husbands participating in Mboga na Matunda said their husbands do not share what they have learned at home. The women are left to manage their own kitchen gardens without guidance from husbands who are participating in a cluster demonstration plot. Cooking and household health are viewed as a female role, but the Muslim women at this cooking demonstration do not go to the market and ultimately have no control over what is purchased. They ask their husbands to buy fruits and vegetables used in the demonstrations, but the husband will buy “what he wants.” Some of the vegetables used in the demonstration were not readily available in Zanzibar, like carrots, women commented. Carrots are exported from Dar es Salaam to Stone Town, Zanzibar, and often do not travel past the main tourist area. One beneficiary replied that in the event her husband does not like a recipe, she will prepare the nutritious recipe for herself and her children but prepare something else for her husband.

A similar buzz could be felt in Arusha during a Vegetables for All cooking demonstration. About 30 beneficiaries acquired new cooking techniques: they learned to decrease cooking time, cut vegetables larger, and add salt later in the cooking process to maintain nutrients. During the demonstration, they prepared kale, spinach, carrots, onions, tomatoes, and green sweet peppers that were later served with beans and rice. The six men at this location actively participated in the meal preparation.

**COMMUNICATING THROUGH RADIO MESSAGES**

Vegetables for All is the only project that included a mass communication method to disseminate education messages. From January to July 2019, more than 100 behavior change messages aired across six radio stations in the four target regions. Vegetables for All focuses on bot-
tom of the pyramid populations across age segments and gender. When the project began, the implementing team quickly realized that they needed to develop new messages that were more appropriate for the target population. Most existing messages focused on nutrition for pregnant and lactating women as well as young children. The project lacked messages about nutrition for general health or targeting men, adolescents, or school aged children and had to create them. During the cooking demonstration the field team visited, the radio messages were played. Messages were categorized into the themes of general nutrition, preparation, quantity and frequency, drying and processing, and safety.

**PARTNERING WITH DIVERSE STAKEHOLDERS**

Nutrition does not work in isolation and is part of a complex food system where the private sector is a critical contributor. Thus, a multitude of diverse partners—including businesses—is necessary to build local capacity and ultimately influence dietary behaviors. Each of the four projects included a variety of partnerships among the government, the private sector, research institutions, and NGOs. Across the three foreign aid projects, the main private and public engagement was with seed companies, financial institutions, and NGOs, but with little private-sector engagement outside of seed companies and financial institutions. Vegetables for All is the only project with a financial matching mechanism for non-government donors.

The Mboga na Matunda project has several centers of excellence that provide additional training and educational resources to community members. The seed companies Rijk Zwaan and Syngenta manage the centers of excellence in Zanzibar and Morogoro, which the field team visited. Mboga na Matunda covers all costs related to the Rijk Zwaan center of excellence in Morogoro, a demonstration plot that trains 60 farmers every month whom Mboga na Matunda invites. The demonstration plot was a strategic area for the annual August 8 Nane Nane Day, which hosts 10,000 farmers as part of the government public holiday recognizing the contribution of farmers to the Tanzanian economy.

The Hotel Crop Initiative in Zanzibar started when Mboga na Matunda staff and farmers noted a trend in higher commercial demand for nutrient-dense crops because of tourist demand. The major challenge to filling this demand is the lack of financial assistance. Mboga na Matunda introduces clusters to local hotels to sell passion fruit, papaya, and butternut squash. In Zanzibar, unlike Morogoro, Mboga na Matunda receives in-kind input and services from the partnering seed companies: Rijk Zwaan provides in-kind sample seeds for at least one acre to introduce new varieties to build the local market demand. Through Mboga na Matunda and Rijk Zwaan seed distribution engagement, demand for seeds increased for African eggplant, cucumber, tomato, cantaloupe, and yellow and red peppers. This public–private engagement between Mboga na Matunda benefits both parties. Rijk Zwaan is documenting its seed varieties adaptability to local environments in Zanzibar, and farmers can grow nutrient-dense fruits and vegetables for home consumption and business.
WorldVeg partners with the private sector through its Africa Vegetable Breeding Consortium, which gives participating private-sector companies and other members discussion platforms to evaluate breeding approaches and share data. Members pay tuition on a sliding scale to be part of the consortium and receive early access to seed breeding lines. When asked if partnerships are difficult, a long silence filled the room, followed by a smirk from the interviewee. The lack of transparency is a challenge in working with seed companies, for example, when seed companies cross seed varieties to create hybrids but do not disclose the original breeding. “The relationships with seed companies has taken a long time,” and interviewee commented.

In Tanzania, the government certification process of new seeds takes three years. Of the seeds sold by companies in Tanzania, 85 percent come from WorldVeg source varieties. The WorldVeg seed gene bank is guided by demand, although WorldVeg does try to convince the private sector to prioritize nutritious seed varieties. Seeds require resilience, nutrition, resistance, and—an important role for new seed varieties—adaptability to climate change. “The greatest challenge in climate change is droughts and flooding, but for nutrition it is behavior change,” said an interviewee, succinctly summing up key challenges in the seed-to-plate value chain.
CHAPTER 5

MOVING FORWARD: RECOMMENDATIONS FOR U.S. FOREIGN POLICY AND IMPLEMENTATION
To increase fruit and vegetable intake, the four projects employed a variety of methods: their multidisciplinary nature illustrates the need for a systems approach to make fruits and vegetables more popular in diets.

Starting with quality seeds, the projects emphasized how better farming and cooking techniques can impact health. Education encompassed financial, health, and nutrition literacy. Although these projects are making strides, gaps exist in their design. Recommendations fall into four categories: demand creation, implementation, multisectoral approaches, and public–private engagement.

Creating Consumer Demand

Although this research focused on the barriers to fruit and vegetable consumption by individuals and households, the real challenge is creating sustainable consumer demand. Even with efforts to enhance knowledge of the health benefits of fruits and vegetables and the importance of nutrition, dietary choice is a complex, multifaceted decision where knowledge may not be sufficient to increase consumption. Growing consumer demand is a necessity not only for fruits and vegetables, but for all nutrient-dense food.

Food preferences are as much about taste as about income, geography, knowledge, culture, gender, and other factors. As high-income countries—and the Tanzanian village women who requested Coca-Cola—have demonstrated, the desirability, price, and convenience of food are imperative demand variables. Processed foods high in sugar, salt, and saturated fats are no longer restricted to high-incomes or urban geographies. About half the food in African rural areas is purchased rather than produced at home and the rural–urban food supply chain grew 800 percent in the past 25 years. Although urbanization helps drive overweight and obesity, recent research found that body-mass index is rising at the same or higher rate in rural low- and middle-income countries compared to cities, except among women in sub-Saharan Africa.

To fully understand what drives consumer demand, researchers and implementors must better assess dietary intake in specific locations. Current dietary assessment research tools are not only flawed but also limited to consumption. Dietary assessment does not try to deconstruct food choice. Food design and sensory preferences are important determinants of dietary choice. Although taste influences eating behavior significantly, so does texture, odor, and how food is consumed. For example, soups can reduce hunger and increase the sensation of fullness compared to solid foods. Project design should consider food design and sensory variables. Would cooking demonstrations of vegetable soup preparation increase consumption and demand of certain vegetables? Questions like these are worth exploring.

The key to increasing fruit and vegetable demand is to make them more convenient (e.g. less perishable and time consuming to prepare) and attractive from a sensory perspective, while maintaining or lowering costs. This is the first step to influencing sustainable and positive dietary behavior. The blanket concept that guided international development and nutrition research for decades—that lifting people out of poverty will lead to bet-
ter diets and health—no longer applies. Sectors like agriculture, health, education, marketing, and finance and their stakeholders have a role in creating demand for fruits and vegetables. Policy and funding approaches require a new lens that goes far beyond educational efforts and raising incomes: they must make a major shift to rethink how the quality rather than quantity of food affects health and how to develop and sustain the demand for healthy food.

**Broadening Implementation**

**FOCUS ON TASTE PREFERENCES DURING THE FIRST 1,000 DAYS**

Many of the projects focused on the first 1,000 days of a child’s life, the most critical time in brain development and the period when taste preferences can be most influenced. Children naturally want foods that are sweet and salty because they signal calories and minerals and reject bitter tastes because they signal poison. Children’s acceptance of vegetables is low because of taste, but one way to positively sway a child’s taste is through the maternal diet.

The flavors of food consumed during the first 1,000 days can be transmitted to the womb and baby through amniotic fluid and human breastmilk. In fact, eating fruits and vegetables during pregnancy and breastfeeding may lead to better acceptance of those tastes when the baby is introduced to complementary feeding. Babies who are not breastfed do not have this option because they have become accustomed to the flavor of formula.

The projects are tackling basic health and nutrition literacy and teaching the concept of taste preferences is challenging. Educating adolescent girls and pregnant women on how their food choices may shape the health and taste preferences of their future children may persuade them to consume more fruits and vegetables during pregnancy and breastfeeding. Increased consumption during this period could contribute to increased taste preferences for the flavors of fruits and vegetables in their children, a benefit that can last a lifetime. Integrating this message in education and communication campaigns would be simple. Projects must consider early life taste preference development because of the role taste plays in generating consumer demand.

**EXTEND FOCUS ON MEN AS NUTRITION BENEFICIARIES**

Nutrition is everyone’s responsibility. A repeated theme during the field research was that men play a substantial role in household food consumption and decision-making. Only in the schools did health and nutrition literacy blend with farming and cooking across genders. Although the projects’ nutrition-related education (i.e., cooking demonstrations and health clinic nutrition classes) is open to both women and men, the beneficiaries are mostly women. Additional efforts should be made to increase male participation across projects. Most global nutrition education occurs in health centers and focuses on women and mothers with children younger than five. To be effective, projects should deliver nutrition education in environments that are friendly to a wide variety of community members. A way to persuade men to attend nutrition classes is to provide incentives that are specific to the geography and population. Another option is to integrate nutrition education in male-dominated forums.

Female heads of household are more likely to have a kitchen garden, and when women are the decision-makers for food preparation and cooking, greater amounts of vegetables in meals are likely. Men also can contribute to improved household food and nutrition security by limiting their food consumption away from home, especially during food shortages, and using savings to purchase nutrient-dense food for the family.

Including men does not imply lowering project efforts to empower women but rather acknowledges the influence of gender on household nutrition. Women are significant actors in reducing malnutrition because of the long-term effect their nutritional status—prior and during pregnancy—has on their children. While men typically control food purchasing, women are responsible for the health of the household. Projects that support women empowerment should continue and be scaled up; simultaneously, gender-sensitive project components should include men as essential allies in building gender equality.
INTEGRATE WASH IN NUTRITION EDUCATION

WASH affects a child’s nutritional status in three ways: by helping prevent diarrheal diseases, intestinal parasite infections, and environmental enteropathy (i.e., a chronic disease of the small intestine). Among infectious diseases, diarrheal diseases contribute most to malnutrition because they decrease nutrient absorption, reduce food consumption, and increase the breakdown of nutrient reserves. Proven interventions in WASH related to fruit and vegetable consumption are handwashing with soap and the safe handling of food, preparation, and storage. Behavior change adherence is a challenge with soap and handwashing because in rural areas of Tanzania access to water on the premises is rare.

Approximately 70 percent of Tanzanian households have soap, but only 2.7 percent of households reported having used soap in handwashing at least twice during the past 24 hours. The Tanzania National Nutrition Survey 2018 reported that household soap decreased 21 percent and having used soap in handwashing at least twice during the past 24 hours dropped 9 percent compared to 2014. Lishe Endelevu was the only project that included WASH as a project priority. Handwashing was prevalent during the fieldwork cooking demonstrations because handwashing before a meal is a cultural norm in Tanzania; however, given the 2018 WASH statistics, projects should consider ways to integrate WASH.

INTEGRATE OVERWEIGHT AND OBESITY AWARENESS

Tanzania has overlapping forms of malnutrition with growing overweight and obesity: many of the regions with the highest stunting rates also have high overweight and obesity rates in women. Overweight, obesity, and NCD prevention education was minimal in the projects visited. The Tanzania National Multisectoral Nutrition Action Plan has three NCD, overweight, and obesity impact targets to maintain current levels, but not to reduce them. This is an opportunity to expand impact, to support the Tanzanian government, and to integrate overweight and obesity in health and nutrition literacy.

Because of its looming “youth bulge” and expanding population, Tanzania needs to go beyond simply maintaining overweight and obesity rates. The growing population of youth—and of those aged 60 and over—already strain the healthcare infrastructure. NCDs chronically decrease productivity because of absenteeism, early retirement from disability, and the mounting healthcare expenses of potentially life-long treatments; these all exacerbate costs. Nutrition-related NCDs that accompany the rising overweight and obesity rates will further stress the Tanzanian economy. Coupled with the financial effects of undernutrition outcomes such as stunting, malnutrition has the potential to bankrupt the country, creating political instability.

Projects can incorporate education about preventing overweight, obesity, and NCDs into the education that they are already disseminating. Informational booths at local markets and village events offer other opportunities. In the increasing number of supermarkets, Tanzania could implement education similar to the United States where nutritionists offer assistance to shoppers.

INCREASE MASS COMMUNICATION METHODS

Social media can provide an opportunity to extend the reach of the projects outside of trainings and build enduring capacity. Social media is low-cost and intensifies and reinforces in-person learning. Vegetables for All was the only project that included a large-scale communication campaign through its radio messaging. The project also used WhatsApp group messaging and Facebook for communication to project participants.

The field team observed multiple women filming and taking photos of the cooking demonstrations at Mboga na Matunda. Through social media platforms such as Facebook and Instagram, projects could reinforce messaging among current and new beneficiaries. Beneficiaries also could be changemakers by sharing their photos and videos of trainings on social media.

Social media has the potential to be an important resource in reaching adolescents. Although social media use is still low at 8.2 percent (4.9 million people) in Tanzania compared to high-income countries, 75 percent of users are age 18 to 34. Because 45 percent of Tanzanians are younger than 14, the under-34 population will continue to rise quickly. Internet use is higher among Tanzanians, reaching 38 percent (23 million). Projects could develop channels on YouTube with cooking or farming demonstration videos as an alternative method...
for instruction. YouTube was the second highest visited site, with close to nine minutes being spent on the website daily, and Facebook was the fifth visited site.106

Mobile health (mHealth), or the use of mobile phones or other wireless technology in health services, has the potential to effectively reach a wide audience in Tanzania, where 72 percent of Tanzanians have a mobile subscription and the most used social messenger is WhatsApp.107 Recent research found that 70 percent of mHealth interventions across 15 studies in 13 developing countries effectively improved diet quality.108

Scaling Up an Integrated Multisectoral Approach

Tanzania’s National Multisectoral Nutrition Action Plan offers an opportunity for foreign aid donors to work with the Tanzanian government to build local capacity across government ministries. The field team learned that local communities listen to Tanzania’s political and religious leaders and their recommendations carry weight. The current political resolve is ripe for donors to receive commitments and support.

Internally, each project incorporated multisectoral approaches across microfinancing, agriculture, nutrition, education, and health. But projects such as Mboga na Matunda and Lishe Endelevu, which are both in the Morogoro and Iringa regions, could strengthen their integration with each other. Tanzania has four platforms to help coordinate multisectoral approaches, including the USAID/Tanzania Multisectoral Nutrition Working Group, which meets quarterly. Although these government platforms help motivate and integrate disparate projects, progress is slow. All levels of project management must engage and commit to an integrated multisectoral approach for nutrition interventions to be most effective. Concurrently, donors, project implementors, and Tanzanian government representatives should communicate and meet regularly to keep abreast of potential collaboration and integration. Country leadership combined with leadership from the district and village levels is mandatory for success.

An integrated multisectoral approach is not an easy undertaking within large governmental bureaucracies. To fully understand the gaps and opportunities, a large-scale evaluation within USAID and the country mission is needed and should be conducted by a third-party evaluator with no previous affiliation with USAID to avoid vested interests. To gain new perspectives on areas of investigation, USAID and the evaluator should co-create the scope of the evaluation. Systemic changes are required and only after an in-depth analysis of the system is completed can Tanzania and the United States develop an effective, efficient, and feasible pathway to truly reach the potential of Tanzania’s multisectoral plan.

Accelerating Public–Private Engagement

In an era of fiscal responsibility and demand for innovation, global nutrition warrants increased public–private engagement in foreign aid projects. The Netherlands has a history of prioritizing public–private engagements through its Dutch Diamond model, while USAID is increasing this emphasis in its 2018 Private-Sector Engagement Policy.

The predominant private-sector businesses engaged in the two foreign aid donor projects were seed companies. Rijk Zwaan, a Dutch seed company, was a common partner that provided seeds, technical assistance, or funding and management support and was one of several donors co-funding Vegetables for All through a matching mechanism. Except for in-kind seed distribution that benefits Rijk Zwaan, USAID does not co-fund any aspects of the projects.

Seed companies are a natural fit for public–private engagement because they have an embedded interest in expanding the fruit and vegetable market in Tanzania. However, the private sector is hesitant to collaborate with governments because of the potential to over-complicate and delay project implementation. Public–private engagement is an opportunity to expand and align resources and draw on the innovation the private sector offers, but each partner needs a specific role to avoid duplication.
Projects that engage multiple partners—whether private or public—need a management plan that allows for course corrections. When the funding mechanism is established, flexibility in project management and implementation would allow for corrections and adaptive management. Public–private projects evolve and change, and field implementors must systematically modify plans using the evidence learned from the field. Alterations to the project warrant discussions with donors. To support adaptive management, project leads must conduct systematic reviews and have in place contingency mechanisms if plans change unexpectedly or are delayed. Donors and partners should involve local implementors in developing project plans from the beginning, because realities on the ground may differ.

A leading challenge of public–private engagement is the balance of power in decisionmaking. To avoid complications with donors, public–private partnerships should collectively design project goals, identify and prepare for potential risks of the partnerships, and formally agree on responsibilities and roles. Partnership success depends on how well the partnership applies the expertise of each partner, establishes the parity of the financial contributions, and ultimately governs and operationalizes the partnership. Constant communication across donors and within projects from the top and from the bottom is necessary.

The public–private engagements in Vegetables for All and Mboga na Matunda could provide the evidence base to further pursue and broaden partnerships with the private sector. In business engagement, projects were limited to seed companies and financial lending institutions in business engagement; they did not use small and medium-sized enterprises, which may be valuable resources. To improve public–private engagements and expand the limited evidence base, external organizations should conduct much-needed case studies and evaluations of the partnerships to understand what works and what does not work in partnerships and provide necessary guidance. Future research should investigate the feasibility for the U.S. government to co-fund projects in a mechanism like the Dutch government.
Appendix A

ORGANIZATIONS REPRESENTED IN RESEARCH
(IN ALPHABETICAL ORDER)

- Africa RISING East and Southern Africa Project
- Agri Thamani Foundation
- Bioversity International
- Fintrac
- Global Alliance for Improved Nutrition (GAIN)
- Michigan State University
- ONA Enterprise Ltd.
- Rijk Zwaan
- Save the Children
- Scaling Up Nutrition (SUN) Business Network
- Sokoine University of Agriculture
- Southern Agricultural Growth Corridor of Tanzania (SAGCOT)
- Syngenta
- Tanzania Horticultural Association
- Tanzania Ministry of Agriculture
- University of California, Davis
- U.S. Agency for International Development (USAID), Bureau for Food Security
- USAID Tanzania Mission, Economic Growth Office
- Wageningen Centre for Development Innovation
- Women’s on Health and Economic Empowerment Arusha (WOHEEA)
- World Vegetable Center

Appendix B

PROJECT BENEFICIARIES VISITED

Mboga na Matunda, Morogoro
- Misongeni Cluster
- Rijk Zwaan Center of Excellence
- Kingorwila Cluster
- Mlali Cluster
- Syngenta Center of Excellence

Mboga na Matunda, Zanzibar
- Kumekucha Cluster
- Sisi Kwa Sisi Cluster
- Rijk Zwaan Center of Excellence
- Tujikomboe Cluster
- Tushikamane Cluster and cooking demonstration

Lishe Endelevu, Morogoro
- Sabasaba Health Center
- Beneficiaries home cooking demonstration
- Local market

Lishe Yangu Initiative LisheClub, Morogoro
- Bungo primary school

Vegetables for All, Arusha
- Engosengiu primary school
- Student and mother home visit
- Cooking demonstration
About the Author

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Prior to joining CSIS, Dr. Beaudreault was the director of nutrition and health at the World Food Center at the University of California, Davis. In addition, she was associate director at The Sackler Institute for Nutrition Science, a program at the New York Academy of Sciences; managed the Ohio State University Extension Agricultural Safety and Health Program; and worked in various capacities in government consulting, research, health communication, and program management. She has organized more than 25 international scientific symposiums and workshops and has published in peer-reviewed journals such as Advances in Nutrition, Annals of the New York Academy of Sciences, and the Journal of Agricultural Safety and Health. She holds a BS in journalism from the E. W. Scripps School of Journalism at Ohio University, and an MS in agricultural communication, a PhD in agricultural education and extension, and a graduate certificate in survey research from The Ohio State University.
Endnotes


4. Ibid.


13. The seed-to-plate value chain is defined as the elements needed for fruit and vegetable supply, including but not limited to production, processing, distribution, and marketing.


19. WHO, “Increasing Fruit and Vegetable Consumption.”

20. Claire Ijumba et al., “Stages of Transformation in Food Processing and Marketing: Results of an Initial


24. WHO, “Increasing Fruit and Vegetable Consumption.”


49. Undernourishment is measured by moderate or severe food insecurity based on the Food Insecurity Experience Scale.


75. USAID Tanzania, personal communication, August 2019.


78. The United Republic of Tanzania, The Tanzania Development Visions 2025.


87. NCD Risk Factor Collaboration, “Rising Rural Body-Mass Index is the Main Driver of the Global Obesity
89. Tschirley, Goeb, Snyder, ““Fresh Produce and the Diet Transformation in Africa: Challenges to Ensuring a Safe and Fresh Supply to Growing Urban Populations.”
91. NCD Risk Factor Collaboration, “Rising Rural Body-Mass Index is the Main Driver of the Global Obesity Epidemic in Adults.”
95. Complementary feeding is when breast milk is no longer enough to meet the nutritional requirements of babies, and other foods and liquids are needed to accompany breast milk.
96. Mennella, “Ontogeny of Taste Preferences.”
101. Ibid.
106. Ibid.
107. Ibid.