frontiers in Sustainable Food Systems

ORIGINAL RESEARCH
published: 26 February 2021
doi: 10.3389/fsufs.2021.621608

Policies, Multi-Stakeholder Approaches and Home-Grown School Feeding Programs for Improving Quality, Equity and Sustainability of School Meals in Northern Tanzania

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Specialty section:
This article was submitted to Social Movements, Institutions and Governance, a section of the journal Frontiers in Sustainable Food Systems

Received: 26 October 2020
Accepted: 01 February 2021
Published: 26 February 2021

Citation:
Roothaert R, Mpogole H, Hunter D, Ochieng J and Kejo D (2021) Policies, Multi-Stakeholder Approaches and Home-Grown School Feeding Programs for Improving Quality, Equity and Sustainability of School Meals in Northern Tanzania. Front. Sustain. Food Syst. 5:621608. doi: 10.3389/fsufs.2021.621608

Malnutrition among children of school-going age is a challenge of serious concern in developing countries especially Sub-Saharan Africa. Many programs focus on mothers and under-5-year-old children, leaving the school going age unattended. It has been shown that school meals can reduce school absenteeism, improve concentration in class and reduce early dropouts. In Tanzania, successful home-grown school feeding programs are localized in few areas but have not been scaled-out. The objective of this study was to analyze the policy and organizational environment which enables or promotes home-grown school feeding approaches. The study consisted of a systematic review, key informant interviews and focus group discussions in Arumeru and Babati Districts, Tanzania. In total, 21 key informant interviews with 27 participants and 27 focus group discussions with 217 participants were conducted. The results show that Tanzania lacks a clear policy on school feeding; there are no guidelines for school meal quality, participation in school feeding programs is not mandatory, leading to many students being left out and going hungry. Students in private schools tend to be better off than those in public schools in terms of provision and quality of school meals. We recommend that policies and practices are developed based on positive experiences of home-grown school feeding programs implemented in Tanzania by the World Food Programme and Project Concern International and emphasize that these policies need to be developed in a multi-sectoral manner. A conceptual framework for improving home-grown school feeding in public schools in Tanzania highlights four critical components: leadership and public awareness; operational modalities; contributions from parents; and meal diversity and nutrition. The home-grown school feeding model provides mechanisms to improve diversity of meals and their nutritional value, increase participation of communities and inclusion of students. Parents will still be responsible for the largest part of food supplies,

but the model also requires participation of multiple stakeholders, and provision of natural resources such as land and water by the local government for production of nutritious food for young students. Minimum levels of social protection are recommended to ensure that no student is denied school meals.

Keywords: supply chains, food system, behavior, vegetables and fruits, dietary diversity, farm to school

INTRODUCTION

Despite the progress made towards ending hunger and malnutrition, more than 820 million people are still undernourished globally (FAO et al., 2019). School-age children are often left out as many nutrition interventions focus on combating malnutrition during the first 1,000 days of a child's life starting from conception. The World Food Programme (WFP) estimated that there at least 66 million primary school-age children who attend classes across the developing world who are hungry, with 23 million in Africa alone (WFP, 2015). Furthermore, studies on the nutritional status among school children revealed high levels of malnutrition and micronutrient deficiencies in primary schools in 76 countries (Best et al., 2010) and underweight in secondary schools in India and Nigeria (Banerjee et al., 2011; Omobuwa et al., 2014).

Malnutrition in children is associated with a broad range of adverse functional and developmental consequences, including delayed motor development and impaired cognitive function if it occurs during the formative years resulting in low school enrolment rates, higher school absenteeism, and poor performance among school-going children (Bundy et al., 2009). If allowed to continue, malnutrition will seriously undermine the achievement of several United Nations' Sustainable Development Goals related to ending poverty, ending hunger and achieving food security, ensuring healthy lives at all ages, and achieving inclusive and equitable quality education.

Despite nutrition enhancing efforts to date, malnutrition continues to be a major issue of concern in Tanzania. The country has one of the highest malnutrition burdens in East and Southern Africa, threatening not only individual lives but the next generation's economic advancement in lost educational achievement, lost income, and lost opportunities. About one-third of the population is malnourished, while under-weight and wasting among children is high (CIAT and WorldBank, 2017; Teblick et al., 2017). An estimated 450,000 children in Tanzania are acutely undernourished or wasted, with over 100,000 suffering from the most severe form of acute undernutrition (IARAN, 2017). Several studies conducted in Tanzania (Kinabo et al., 2016; Ochieng et al., 2017; Kejo et al., 2018) have primarily focused on children (0–59 months) and women of reproductive age. While this age group is presumed to be the most susceptible to under-nutrition, the lack of data on older children (primary school age) can mask the rate and importance of malnutrition in the group. Undernutrition levels for children are dropping though, from 50% stunting in 1991–1992 to 34% stunting in 2015–16 to 31.8 in 2018 (MoHCDGEC et al., 2016, 2018).

School feeding programs have increasingly gained recognition in developing countries due to their triple role, acting as a productive safety net to improve nutrition for children in the short-term, increasing enrollment and attendance rates, and supporting livelihoods for farmers who supply produce to schools (NE, 2018; PCD, 2020). Today, an estimated 368 million children worldwide are fed daily at school through school feeding programs (WFP, 2013). The Tanzanian government has been concerned about the health and nutritional status of primary school children, realizing that there is a relationship between nutritional status and school attendance (Sanya, 2015). High absenteeism, lack of concentration in class and early dropouts are the results of short-term hunger among the school going children. About 50–70% of the students go to school without breakfast and they do not get any meal during school hours. Hunger can have serious consequences in the long run, such as stunting, diminished cognitive abilities, reduced school performance, increased morbidity, and mortality rates. All these effects can adversely affect productivity, income, and national development.

In Tanzania, school feeding programs have mainly been led by WFP with minimum involvement of the government through the Ministry of Education and Vocational Training (Sanya, 2015). In most cases school feeding programs have targeted areas with high poverty and school drop-out rates, poor primary school performance, and high levels of malnutrition. WFP started implementing school feeding programs in three regions in Tanzania in the year 2000: Dodoma, Arusha, and Singida. In 210 schools, 72,120 day scholars were given porridge in the morning break and lunch in the afternoon (URT, 2013). Oganga (2013) reports that by 2013 school feeding programs extended to Shinyanga, and Singida Regions, covering a total of 1,166 schools in 15 districts with a total of 601,572 students. In 2003, the New Partnership for Africa's Development (NEPAD), launched home-grown school feeding (HGSF) in Tanzania supported by WFP and other international organizations (WFP, 2017). HGSF programs have been described as cost-effective school feeding programs using food that is locally grown by smallholder farmers, creating triple win action improving diets, enhancing school attendance, and improving farmer livelihoods (DevelopmentInitiatives, 2017). In some schools, parents contribute foodstuffs from their farms to the school to feed their children directly. In other cases, parents contribute money to enable the schools to purchase foods from the local markets. Some trade-offs defined by Bundy et al. (2009) of HGSF indicate that it requires community involvement, which is less required with alternative feeding programs such as snacks, high energy biscuits or take-home rations. FAO and WFP (2018) mention that the major risks associated with HGSF are assessing and managing food safety and quality, while also mentioning

challenges related to ensuring constant supply. Some private schools provide a midday meal throughout the school year at a relatively low cost, with similar objectives as the school feeding program (Musamali et al., 2007).

Similar to HGSF programs is the Farm-to-school (F2S) approach which is often used in developed country contexts. F2S is defined as an approach that connects schools and local farms with the objectives of serving locally produced healthy foods in schools, improving student nutrition, providing health and nutrition education opportunities and at the same time supporting farmers (FIC, 2018; Christensen et al., 2019). Local food procurement, nutrition education, and school garden development are some of the basic elements that characterize F2S networks (FIC, 2018). While school feeding was pioneered by Brazil in 1953, the application of a new law in 2009 made it mandatory for 30% of federal budgets for school feeding to be used to purchase from local family farmers. This in turn inspired Brazil to develop the Purchase from Africans for Africa (PAA) pilot program to promote food security and economic inclusion in rural areas (Beltrame et al., 2016). The F2S movement has grown rapidly over the past two decades (Chabite et al., 2018; FIC, 2018). In Africa, this concept has been adapted into the HGSF program, which combines the objectives of a traditional school feeding program (e.g., educational, nutritional, or social safety nets outcomes) with the additional goals of homegrown aspects (smallholder farmers' access to a stable market). HGSF was piloted by WFP in collaboration with the Government of Tanzania and other partners including Plan Concern International (PCI) between 2011 and 2016 (WFP, 2016).

The overall aim of this study was to review the enabling environment for home-grown school feeding programs in northern Tanzania, and to identify ways of scaling out feasible programs that will benefit more students and farming communities. Specific objectives were to:

- Assess the current policy environment, other influencing factors and capacity to plan and deliver nutritious school meals for school-aged children.
- Carry out a comprehensive analysis of the institutional settings in the different locations, current public procurement mechanisms and costing frameworks at school level.
- Review existing programs in Tanzania in which school feeding is linked to food supply chains in the community; find opportunities to intervene where more food diversity from farmers could be introduced; assess the suitability of a HGSF program in Tanzania with a workable food procurement approach that can be scaled out.

METHODS

Literature Review

A literature review was conducted to review the policy frameworks regarding school feeding programs in Tanzania, to understand the institutional settings in selected locations in northern Tanzania, current livelihood and food security contexts, nutritional aspects, public procurement mechanisms, and costing frameworks capturing fixed and recurrent costs incurred at school level. The screening process was based on the preferred reporting items for systematic reviews and meta-analyses (PRISMA) (Moher et al., 2009). The materials included in the review were mainly searched electronically with the Google internet based search engine using keywords such as home-grown school feeding programs; school meals; public or institutional food procurement; value chain; gender; nutrition; biodiversity; food for education; food procurement; Tanzania; and developing countries. Published and gray literature, relevant reports, national databases, policy documents, and strategies were reviewed.

Informal Interviews

Information gaps were filled using focus group discussions (FGDs) and key informant interviews (KII). FGDs and KIIs were also used to explore household food security gaps and opportunities for school meals to introduce traditional local foods. The participants in the study comprised of community leaders (elders, representatives of farmer associations, policy makers in government or NGOs, market- and value chain actors) and schools (students, headmasters, procurement officers, caterers) and representatives of parent-teacher associations and school boards and committees.

KIIs were used to gather information from the representatives of the government departments and NGOs, the head teachers, representatives of farmer groups and extension officers. Questionnaires were used to obtain in-depth information on the existing policy framework for school feeding programs and market opportunities for establishing farm-to-school networks. The interviews were conducted at district level with the government officials and at school or village level for school and community representatives. A few interviews were conducted with purposively selected relevant partners. Plan Concern International (PCI) was selected because of its experience in school feeding and the earlier mentioned piloted HGSF programs in Tanzania. The Tanzania Food and Nutrition Center (TFNC) was selected because of its national mandate to provide guidelines, education and community awareness on food and nutrition. In total, 21 KIIs with 27 participants (15 men and 12 women) were conducted.

A focus group discussion guide was prepared to direct the discussion with each group consisting of 6–12 participants. FGDs were conducted at school with teachers, parents and student representatives separately. Only schools that provided meals at schools were included in the study. To cover the entire spectrum of schools, interviews were carried out in: primary public and private schools, secondary public and private schools as well as schools with special needs. In each of these categories, one school was randomly selected to be included in the study in each district. A total of 10 schools were included in the study and a total of 27 FGDs with 217 participants (104 male and 113 female) were conducted.

Study Sites

The study was conducted in Arumeru and Babati Districts. In Arumeru District, the study focused in Meru District Council (Meru DC) while in Babati District the study covered both Babati Town Council (Babati TC) and Babati District Council (Babati DC). Both districts, located in Northern Zone of Tanzania, which are rich in biological diversity, have agro-ecological zones and sufficient rain suitable for growing a diverse range of crops. In both areas, agriculture is the largest source of employment and income with most farmers practicing subsistence agriculture on a mixed crop-livestock production system. The locations of the study areas are indicated in the map of **Figure 1**.

Data Analysis

Audio recordings of the interviews were made using digital recorders to complement the notes taken during the interviews and discussions. The recordings were transcribed following the Gisted transcription approach (Paulus et al., 2013) prior to analysis. The transcripts were anonymous. Gray literature as well as other collected qualitative data were analyzed by using direct content analysis (Hsieh and Shannon, 2005).

Ethical Considerations

This study was approved by World Vegetable Center's (WorldVeg) Institutional Bio-safety and Research Ethics Committee (IBREC) on 2 November 2018. Permission to conduct the study was obtained from Local Government Authorities (LGAs). A written informed consent was obtained from the KIIs and FGDs participants. Enumerators explained the purpose of the research and confidentiality issues to the respondents. Participants signed a consent form prior to the interviews or discussions.

Study Limitations and Risks

No interviews with the national government officials were conducted due to issues of accessibility. However, attempts were made to obtain similar information through desk review of gray literature as well as KIIs interviews with partners who have worked with the government in school feeding programs.

RESULTS

Policy Environment

The persistent prevalence of malnutrition did not feature high in the Tanzania Development Vision 2025, which was developed in the nineties. There have been inadequate institutional arrangements in place at national and local authority levels for nutrition (SavetheChildren, 2012) but Tanzania has benefited from bilateral development programs in recent years, funded by USAID, EC, and other donors, aiming to tackle malnutrition. The low prioritization of nutrition has for a long time been evident by the shortage of district and regional coordinators for nutrition in many areas, the poor coverage of many key nutrition services and the slow progress in reducing school child malnutrition, such as promotion of school feeding programs and good nutrition in schools (URT, 2013). In Tanzania, many policies were formulated during the 1990s and only two policies were formulated earlier than 1990, i.e., the National Agricultural Policy and National Science and Technology Policy. In 2000, some of the policies were reviewed and others are currently being reviewed. Policy review in the country takes a long time and some have been under review for more than 5 years, including the Food and Nutrition Policy (SavetheChildren, 2012).

In this study, different policy and strategic documents related to food and nutrition were reviewed in order to understand the plan, strategies, and implementation of school meals programs; an overview of policies that are related to nutritional issues is presented in **Table 1**. The documents discuss general nutritional issues and strategize how to combat malnutrition focusing on children under 5 years, women and adolescents. It becomes clear that most reviewed policy documents have incorporated nutritional issues but not necessarily related to school meals programs; it is only from 2010 that school feeding starts to be mentioned in five different policy documents. When school meals are mentioned, it is mostly in the context of primary schools. Some policy documents that mentioned school meal programs include: National Multisectoral Nutrition Action Plan (NMNAP); Education and Training Policy; National Strategy for Growth and Poverty Reduction (MKUKUTA II); Tanzania National Nutrition Strategy; and Education Circular No. 3 of 2016. Although the issue of school meals has been mentioned, it has received very little support.

The review also revealed that there are limited statements on inter-sectoral collaboration during planning and implementation of policies. This may lead to one sector not knowing what other sectors are planning to implement; overlap of activities with suboptimal allocation of resources; while leaving other activities unattended such as school meal programs. An exception is the National Multisectoral Nutrition Action Plan (URT, 2016) which has placed strong emphasis on improving nutrition of children, adolescents, women, and men in Tanzania, using an approach involving many stakeholders within and outside the government.

Characterization of School Meal Programs in Meru and Babati Districts

Almost all schools in Arumeru and Babati Districts had some form of school feeding program. In Arumeru District, 152 out of 162 public primary school had some form of feeding program. At the time of visit (2–3 weeks after school opened from long year-end holidays), some schools were still mobilizing contributions from parents. At the time of visit, 52 out of 143 schools in Babati District were operating some form of school feeding, while the rest of the schools were still struggling to mobilize contributions from parents. The school feeding program varied from one school to another depending on whether they were public or private, and whether they were primary or secondary schools. With a few exceptions of donor support, public schools did not have established kitchens. Some of them used temporary wooden structures roofed with iron sheets. Private schools had well-established kitchens. The feeding program for public schools was coordinated and operated by parents through their own established committees. Members of school food committees were nominated in a parents' meeting.

FIGURE 1 | Map of Tanzania with administrative boundaries indicating the study areas in red circles. Source: OPNO (2020).

The roles and responsibilities of the school food committee included: raising contributions from parents either in monetary terms or in kind; procuring food in case parents contributed in monetary terms; storing the collected or purchased food; hiring cooks; supervising the preparations and distributions of food; issuing meal coupons to students whose parents have contributed; liaison with heads of school (HoS) and the Local Government Authority (LGA) about the school feeding program.

TABLE 1 | Policy content covered in relation to nutrition and school meals.

Policy document and year of publication	Aspects related to nutrition	Aspects related to school meals
Food and Nutrition Policy for Tanzania, Published in July 1992	Malnutrition; food security; diseases; nutrition education; care; child nutrition; maternal nutrition; school children nutrition	None
Child Development Policy, Published in October 1996	Nutrition knowledge; awareness; education (recognizes nutrition to be an important factor for child growth and survival)	None
National Science and Technology Policy for Tanzania, Published in April 1996	Achievement of food self-sufficiency; security; improvement of methods of preparing, drying, preserving and handling food to ensure nutritive values, palatability, and reduction post-harvest losses	None
Community Development Policy, Published in June 1996	Nutrition knowledge, awareness, education (recognizes nutrition to be one of the indicators that can be used to show the levels of development and welfare in communities)	None
Women and Gender Development Policy, Published in 2000	Nutrition knowledge; awareness; education (recognizes good care to be necessary for nutrition well-being of women and children)	None
National Population Policy, Published in 2006	Infant mortality as they relate to better health care; food security; water and sanitation; food and nutrition education; controlling micronutrient deficiencies; cultural barriers related to nutrition	None
National Youth Development Policy, Published in December 2007	Nutrition knowledge; awareness; education (recognizes good nutrition to be among the necessary rights for the youth)	None
National Strategy for Growth and Poverty Reduction (MKUKUTA II), Published in July 2010	Malnutrition; food insecurity; diseases; nutrition knowledge, awareness and education; high dependency ratio; child growth and development; maternal nutrition	School meals programs: implement school feeding programs at all levels in public schools with community involvement
Tanzania National Nutrition Strategy, Published in 2011	Dietary improvement in schools, hospitals, orphanage, prisons, and other institutions	Requires that public and private schools should provide meals with appropriate dietary content
National Agricultural Policy, Published in October 2013	Production of nutrient dense crops; disease burden to households that hampers food and livelihood insecurity; enhancement of food security through production of sufficient quantity and quality foods; monitoring trends of food security	None
Sera ya Elimu (Education and Training Policy), Published in 2014	Education on environment and public health (diseases, malnutrition)	Mentions that the government will ensure that basic services including nutritious foods are available in schools and colleges
Tanzania Food and Nutrition Center-Strategic Plan, Published in October 2014	Malnutrition; food security; diseases; nutrition education; care; child nutrition; maternal nutrition; school children nutrition; nutrition information system; nutrition knowledge, awareness, education (recognizes nutrition to be an important factor for child growth and survival)	None
National Multisectoral Nutrition Action Plan (NMNAP) July 2016–June 2021, Published in October 2016	Maternal, Infant, Young Child and Adolescent Nutrition (MIYCAN); promote optimal intake of essential micronutrient; Integrated Management of Acute Malnutrition (IMAM); prevention and management of Diet Related Non-Communicable Diseases (DRNCDs); promote multisectoral nutrition sensitive interventions; strengthen multisectoral nutrition governance; establish a multisectoral nutrition information system	Mentions school feeding and school gardens in primary and secondary schools without further details
Education Circular No. 3 of 2016 (Waraka wa elimu namba 3 wa mwaka 2016 kuhusu utekelezaji wa elimu msingi bila Malipo)	None	Specifies that parents and teachers together should design and implement their own school feeding programs.
National Health Policy, Published in 2007. The National Health Policy of 2017 (6th Draft)	Malnutrition; diseases; care of children and the sick; maternal nutrition; child growth and development; food quality and safety at all stages; environmental health and sanitation; water quality and safety	None

Updated from SavetheChildren (2012).

Some school food committees operated bank accounts for the funds raised for the school feeding program. Out of six visited public schools, only two school food committees had opened and operated bank accounts. For the majority of school food committees, the raised funds were physically kept by a designated committee member appointed by parents. This did raise issues of trust, leading to some parents being reluctant to contribute, worrying about safety of funds among other reasons. In private schools, the school feeding program was mainly operated by directors or owners of schools rather than school management or other committees. In these schools, the school feeding program was mandatory. The majority of such schools issued school fees as a package without necessarily providing a break down for the cost of food. It was clear that at private schools, parents were more

concerned with the academic performance of students than the meals they took at school, as they assumed that the school meal program was adequate. General differences observed between public and private school feeding programs are summarized in **Table 2**.

In general, the school feeding program was regarded as highly important by teachers, students, and parents. Although many parents in public schools were reluctant to contribute, they still wanted their children to eat at school. Teachers, parents, and students mentioned various important reasons why they valued feeding programs in public schools:

- Distance—some students come from far away, walking up to 7 km to school. It is difficult for these students to go home for lunch and come back again for the afternoon sessions. Other students become hungry because of walking long distances to school.
- When students eat at school it is easier to adhere to the school timetable than when students go home for lunch. Some would return to school late after lunch or not come back until the next day. Those going home for lunch may not find anything to eat as parents may not be home yet.
- To reduce the burden to students of preparing food on their own in the afternoon when their parents are still working in farms or in their businesses.
- Increasing attendance—students who are not guaranteed food at home come to school to eat. Many students live with poor grandparents who cannot afford food even for themselves. In some schools it was estimated that up to 50% of students lived with grandparents.
- Increase academic performance—students who have eaten have higher levels of concentration. Without lunch, afternoon classes are not attentive.
- Many students are adolescents who need to eat frequently and cannot stay the whole day without eating.

Generally, the importance of school feeding programs cannot be overemphasized. Teachers considered school feeding as a basic human right considering that when students do not eat their mental cognition process slows down.

Contributions and Food Purchases for School Feeding Programs

Most schools made *ad hoc* food purchases from local markets. With the exception of one private school, there were no contractual arrangements with traders or farmers. **Table 3** presents the procurement modalities of the school feeding programs for different schools visited in this study. School feeding programs in public day schools is governed by parents through their own established food committees. Teachers were not directly involved in the school feeding program for many reasons including the lack of trust from parents. Teachers illustrated this lack of trust by quoting parents: "you are a teacher and your job is to teach; why do you bother about contributions for meals?" Parents feared that teachers would gain financially or in kind from the school feeding program. Teachers, on the other hand, mentioned that they should not be involved in school feeding programs as stated by the government. There were challenges after the introduction of free basic education system as contribution of food for school feeding was not mandatory. As a result, school food committees and HoS had to spend a lot of time and energy raising awareness and mobilizing parents to contribute for school meals.

At public day schools, teachers were involved in sensitization and awareness raising of the school feeding program, as well as sourcing wood and water for cooking, maintaining the kitchen and storage facilities. They also helped preparing lists of students whose parents had contributed or paid for food. In some schools, teachers and student leaders helped the school food committee with the daily food issues such as rationing, preparing, and serving food to students. However, in other schools, teachers were completely withdrawn or excluded from participation.

In terms of contributions to the school feeding program, there were two main approaches; (1) contribution in kind plus some cash for hiring cooks and purchase of cooking oil, salt, sugar, and other supplies; and (2) contribution in monetary terms only. In all private schools (primary and secondary), contributions were in monetary terms only as part of a mandatory fee, but parents were not aware how much exactly was allocated for food. In the majority of public day schools, in kind contributions plus some cash was practiced, while in a few schools contributions were made in monetary terms.

There was no standard for the amount of food required for each student. As a result, the contributions in kind or in monetary terms varied greatly among schools. As seen in **Table 3**, in-kind contributions in public schools varied from 20 kg of maize, 5 kg of beans plus TZS 6,000 (USD 2.61) per year to 40 kg of maize, 20 kg of beans plus TZS 30,000 (USD 13.04) per year. Contributions in monetary terms at public schools ranged from TZS 36,400 (USD 15.83) to TZS 100,000 (USD 43.48) per year. Converting these to total monetary value using average wholesale prices of USD 0.20 per kg of maize and USD 0.70 per kg of beans (FEWSNET, 2018), contributions ranged from USD 10.10 to USD 35 per student. This variability raises the issue of how much food is required per student per year.

Schools sourced food in various ways. Private schools sourced food directly from farmers, especially during harvest season when prices were relatively low. For instance, three of the private schools visited in January 2019 had a stock of food that was acquired in July 2018. Also, some private schools had relatively large plots and contracted farmers or hired causal laborers to produce food. One school produced maize, beans, vegetables, banana, and cattle for beef and had its own milling plant. In case of deficit the school purchased food from nearby farmers. Public day schools, on the other hand, could not take advantage of food price fluctuations and bulking during the harvest season because of irregular monetary contributions. Even when they were able to purchase or collect food in bulk, they lacked storage facilities.

Access to School Meals

For public day schools, not all students benefited from the school feeding program. With the exception of a few schools, eligibility for the school feeding program was based on contributions. For public schools with boarding facilities, the food cost for the

TABLE 2 | Public versus private school feeding programs.

	Public schools	Private schools
1.	Operated by school food committees formed by parents.	Operated by the director who often is the owner of the school.
2.	Limited involvement of teachers.	High involvement of Head of School and teachers.
3.	Food is procured by the school food committee.	Food is procured by the school director.
4.	Contribution is non-mandatory. Parents decide whether or not to contribute or whether or not to have a school feeding program.	Contribution is mandatory. Parents pay as part of school fees.
5.	Parents contribute food either in kind or in monetary terms or both.	Parents contribute in monetary terms.
6.	Not all students eat at school. Eligibility is based on contribution.	All students eat at school.

boarding students was included in the government budget but the food cost for the day students wasn't. Students whose parents had paid for the school feeding program were given meal coupons. Most students who didn't contribute to the school feeding program had poor parents or were raised by poor grandparents. It was mentioned during the FGDs though that students whose parents were unable to contribute were the ones who needed it most as they were not assured of any meals at home. Students who were part of the school feeding program felt sad for their friends who were excluded. It was hard for them to eat in front of friends who were hungry, and sometimes they shared their food. During the school interviews, researchers saw some students lying lethargically in the grass while others were eating.

Surprisingly, not all parents who had not paid were unable to pay. Students who participated in FGDs estimated that about a half of parents whom they knew had not paid were actually able to do so. It could be that they were not paying because they expected that food would also be provided for free after the introduction of the free basic education system. Also, it was learnt that parents were more willing to contribute food in monetary terms for students enrolled in secondary school than those in primary school. For primary schools, parents seemed to prefer to contribute food in-kind rather than in monetary terms. The willingness to pay for meals in secondary schools originated from being used to pay for secondary school fees and meals before the introduction of the free school system. Value of contributions for school meals in the two secondary public schools ranged from USD 35.04 to USD 43.48 and in the two primary schools from USD 10.11 to USD 18.61, including in kind contributions. All students with special needs in the special education schools had access to meals.

Quality of School Meals in Tanzania

Ochola and Masibo (2014) point out that school-age children in developing countries are mainly consuming plant-based diets which are predominantly derived from cereals, roots and tubers, and limited animal source foods and that this dietary pattern is especially common in rural communities. Cereal meals are the most important sources of energy while dairy products are missing from the diet. They mention that in Zambia school meals are mainly stiff cereal porridge and beans, while green vegetables were rarely consumed. In some schools, pupils produce vegetables for their lunches from school gardens, but a challenge is the integration of class activities and school gardening programs.

Information on the composition of school meals in Tanzania is very scarce. Very few studies have been conducted to assess the type and quality of meals provided in schools (Muhimbula and Zacharia, 2010). Oganga (2013) carried out one of the few studies and found that the meals provided to pupils in Chamwino District of Dodoma Region did not meet their nutrient requirements (**Table 4**). The results show that the meals provided in the beneficiary schools are not adequate to meet the pupils' daily nutrient requirements. Main foods provided were stiff maize porridge (*ugali*) and pigeon pea as energy and protein sources, respectively. Besides, Sanya (2015) concludes that the quality of food provided to pupils in Tanzania is low. Her study of the impact of school feeding on student attendance in schools in Kiteto District Tanzania show that 97% of the pupils were not satisfied with the food which they ate every day. The food provided, however, was common for all schools. *Kande* (mix of maize and beans), *ugali* and beans were consumed during lunch time. The main cause of this poor quality of food was poor parents' contribution and lack of government support of the implementation of this program. Only 40% of the parents were able to contribute maize and beans for their children at schools and the others weren't due to poverty.

School Gardens and Other Agricultural Activities at the Schools

Most schools in Arumeru District had vegetable gardens. Details about their school gardens, types of meals provided, types of food served, rations, availability of vegetables and fruits, and considerations for nutritious foods are shown in **Table 5**. However, during the time of this study, most school gardens were not yet operational after the long end of year holidays. In one case, a well-functioning garden was too small to feed all students. This school also kept poultry and a fish pond as a separate business rather than for food for students. It was reported that students in this school once suffered from scurvy due to shortage of vitamin C which prompted the establishment of a vegetable garden. In Babati District, only one school had a vegetable garden, produced maize, beans, and bananas and kept cattle for beef. The school was self-sufficient regarding the vegetables and food crops for the school meals.

Nutritional Aspects of School Meals in the Study Area

The type and frequency of meals varied among schools. Some non-boarding schools provided two meals (porridge during the morning break time and a meal in the afternoon) while others provided just one meal in the afternoon. If breakfast was provided, it was during the morning break and consisted of maize porridge. In boarding schools, three or four meals per day were

TABLE 3 | Procurement modalities of food for school feeding programs.

School	Nature of school	Overseer of school feeding program	Procurement of food	Financing	Nature of contributions	Source of food	Eligibility for school meals	Proportion of students taking school meals	Distribution of food to students
Meru District Council									
School 1	Public primary school	School food committee of parents	School food committee of parents	Contributions from parents	In-kind (maize 32 kg, beans 8 kg) plus TZS 15,200/year	Direct contributions from parents	Students whose parents contributed	All (301) students irrespective of contributions	Non-selective
School 2	Private primary school	Director (owner of school)	Director (owner of school)	Parents pay as part of school fees	Monetary contributions, TZS 160,000/year	Purchased from market	Students whose parents paid for food	92% of 221 students whose parents have paid	Selective based on payment
School 3	Public secondary school	School food committee of parents	School food committee of parents	Contributions from parents	Monetary contributions, TZS 100,000/year	Purchased from farmers and market	Students whose parents paid for food	About 40% of 511 students	Selective through the use of coupons
School 4	Private primary and secondary	Director (owner of school)	Director (owner of school)	Parents pay as part of school fees	Fees 1,500,000–1,850,000 for hostel and 900,000 for day students	Purchased from farmers and market	Students whose parents have paid school fees	All students were allowed to eat irrespective of fees payment	Non-selective
School 5	Public special education primary school	• Head teacher for special education students • School food committee for regular students	• Head teacher for students with special needs • School food committee for regular students	• Government for students with special needs • Contribution from parents for regular students	• Capitation grant for students with special needs • Monetary contributions, TZS 36,400/year for regular students	• Public tenders for special education program • Purchased from farmers or market for regular students	• Students with special needs eat at school • For regular students it is based on contribution from parents	• All students with special needs eat at school • For regular students only about 25% were eating at school in 2018. Mobilization was ongoing for 2019	Selective for regular students through the use of coupons
Babati District (Babati DC and Babati TC)									
School 6	Private primary school	Director (owner of school)	Director (owner of school)	Parents pay as part of school fees	Fees TZS 550,000 for class IV and VII, 350,000 for pre-school and 450,000 for other students	Purchased directly from farmers and market	All students. School feeding program is mandatory	All students eat at school	Non-selective
School 7	Public primary school	School food committee of parents	School food committee of parents	Contributions from parents	In-kind (maize 20 kg, beans 5 kg) plus TZS 6,000/year	Direct contributions from parents	• Students whose parents contributed • Vulnerable students (e.g., orphans)	All (427) students eat at school. However, 25% of students have not contributed for food	• Non-selective • Food committee is considering to use coupons
School 8	Private Catholic boarding secondary school	School management and school food committee of teachers	School management	Parents pay as part of school fees	Fees TZS 1,600,000 per students per year	Produces own food (maize, beans, vegs, banana, cattle). Additional purchases from farmers	All students; school feeding program is mandatory	All students eat at school	Non-selective
School 9	Public secondary school	School food committee of parents	School food committee of parents	Contributions from parents	In-kind (maize 40 kg, beans 20 kg) plus TZS 30,000/year/child	Direct contributions from parents	Students whose parents contributed	About 50% of 460 students	Selective through the use of coupons
School 10	Public special education primary school	• Head teacher for special education students • School food committee for regular students	• Head teacher for students with special needs • School food committee for regular students	• Government for students with special needs • Contribution from parents for regular students	• Capitation grant for students with special needs • In-kind for regular students (40 kg of maize, 10 kg of beans per year) plus TZS 4,000 per month	• Public tenders for special education program • Direct contributions for regular students	• Students with special needs eat at school • For regular students it is based on contribution from parents	• All students with special needs eat at school • For regular students only about 12% of 797 had contributed	Selective for regular students through the use of coupons

TABLE 4 | Daily food ration per pupil in school feeding programs in Chamwino District.

Commodity	Ration (g)	Energy (Kcal)	Protein (g)	Fat (g)
Cereals	120	420	12	5.5
Pulses	30	101	6.6	0.5
Vegetable oil	5	45	–	5
Corn Soy Blend (CSB)	40	152	7.2	2.4
Total	**195**	**718**	**25.8**	**13.7**
Min. Recommended Value		**2,100**	**45.6**	**50**
% supplied by ration		**34.2%**	**56.6%**	**27.3%**

Oganga (2013).

provided and the nature of the food differed among schools. One private school provided tea with bread during the morning break. For lunch and supper, the typical meals were *ugali* with beans or *kande*. A few schools provided rice and beef occasionally. A few day schools provided *kande* only throughout the year (**Table 5**).

Vegetables and fruits were hardly served in schools. In most schools, the meals were far from balanced. For public schools, it was reported that the amount of contributions from parents determined the type of meals students took at school. However, vegetables were sometimes also left out because of cultural reasons when eating vegetables was not common especially among children and among men. Sometimes vegetables were offered but students left the vegetables on their plate without eating them, because they were not used to eating them or didn't know the benefit. The few schools that served vegetables mixed them with beans to stimulate consumption of vegetables.

Generally, nutritional aspects were not taken into account in the school feeding programs. What mattered mostly to parents was there being any type of food for students to eat. Parents mentioned that even at home they were eating similar meals and they themselves had grown up in similar situations, thus there was nothing to worry about. Even more so, parents stated that when they ate vegetables it wasn't for nutritional reasons but out of poverty, saying that if there were options, they would not eat vegetables. **Figure 2** presents some illustrative quotes about these type of parent perceptions. Some parents forbid their children to take vegetables at school out of fear of agro-chemicals in the food. They complained that safety of vegetables was not guaranteed and urged the government to regulate application of chemicals on vegetables. There was some skepticism on quality and safety of food for the school feeding programs. For example, in one public secondary school the food committee changed from accepting contributions in-kind to cash because of quality concerns.

Private schools had more consideration for nutrition and diversity than public schools. For instance, one private boarding secondary school had a privately operated canteen in which students ate at their own cost. Although some students had to trick their parents to get additional money to spend at the canteen, other parents voluntarily provided allowances for their children to eat at the canteen. The school controlled the range and prices of food in the canteen. As a result, there was more diversity albeit not very different from other school meals. Parents supported the presence of this private canteen in the school and it was noted that these parents were relatively well-off.

Parents and farmers had limited knowledge about nutritious foods. Although nutritious foods were available in their localities they were not adequately included in meals. In Meru DC, for example, some parents were involved in selling vegetables at market places, but all vegetables were sold leaving only beans at home. Vegetables were more for commercial purpose than for home consumption. The FGDs with teachers indicated the need to emphasize nutritional education to influence their culture so that when students grow up, they will have improved eating habits.

Challenges Analyzed Through a New Conceptual Framework

There are a number of factors that seem to influence the capacity to plan and deliver nutritious meals to students. Bundy et al. (2009) present these factors in many different conceptual frameworks, related to multisectoral interaction, food systems, school meal quality, or community feedback systems. They also use an analytical model consisting of policy, institutional framework, funding, program design, and community aspects, to analyze examples of school feeding programs in different countries. This model has formed the basis of a more recently developed SABER-SF framework, which is a rubrics analytical and assessment framework for school feeding programs at national level (WB et al., 2016). We are presenting a different conceptual framework in **Figure 3**, based on a decentralized system that is heavily dependent on community involvement, yet harboring similar factors. The challenges in **Figure 3** can be grouped into four categories: coordination; operational modalities; contributions from parents; and type of foods, dietary diversity and nutrition.

Coordination Related Challenges

The education circular No. 3 (JMT, 2016) mentions that parents need to work with the school management to put in place procedures to provide meals to the students, to be endorsed by the Council Director. No further details are provided, and all activities related to school feeding programs for public schools have been left to the respective school food committees. Parents lacked wider understanding on school feeding which made them reluctant to contribute. There was no involvement of LGA officials in providing clarity on what constituted the free education system. In rare situations, when LGA officials participated in raising awareness to mobilize contributions for school feeding, other key stakeholders were not involved, such as Community Development Officers (CDOs). The involvement of CDOs is important in many ways. They are familiar with participatory community planning processes that ensure ownership of projects by the local communities. Secondly, the department of community development is linked to Tanzania Social Action Fund (TASAF) that supports poor households

TABLE 5 | Type of meals and dietary diversity in school feeding programs.

School	Type of school	School or farm garden	Type of meals	Type of foods	Ration served	Time of meals	Vegetables served	Fruits served	Consideration for nutritious food in meals
Meru District Council									
School 1	Public primary school	Had a school vegetable garden in 2018	• Porridge for early years • Lunch for other students	• Maize porridge • *Ugali* with beans • *Kande* (maize boiled with beans)	No standard unit established	• 10 a.m. for early years • 12 noon lunch	Not served. Waiting to revive the garden	No fruits served	No considerations for nutrition. What matters is that the students get something
School 2	Private primary school	No vegetable garden	• Porridge • Lunch	• Maize porridge • *Ugali* with vegetables • Rice with beans • Cooked banana with beans or beef	No standard unit established	• 10 a.m. for porridge • 12.20 p.m. for lunch	Vegetables (kale and amaranth) are served more often than beans	No fruits served	Dietary diversity and nutrition are considered. However, fruits are not served
School 3	Public secondary school	Has vegetable garden operated by students	• Porridge for hostel students • Lunch • Supper for hostel	• Maize porridge • *Ugali* with beans • Rice with beans • *Kande*	No standard unit established	• 6.30 a.m. for porridge • 1 p.m. for lunch • 7.00 p.m. supper	Vegetables are served in almost all meals	No fruits served	To some extent. Mostly based on availability of vegetables in the school garden
School 4	Private primary and secondary	Operates a vegetable garden. Has large plot of land that can be used for food production	• Porridge (early breakfast for hostel) • Tea with bread • Lunch • Supper for hostel	• Maize porridge • Tea with bread • *Ugali* with beans or meat • Rice with beans or meat • *Kande*	• 1 kg rice for 5 students • 1 kg maize flour for 4 students	• 6.00 a.m. porridge • 10.40 a.m. tea break • 1.10 p.m. lunch • 7.10 p.m. supper	Vegetables served occasionally. Priority is given to students with special diet needs	Fruits are rarely served	To some extent. Vegetables are served based on availability from school garden. Students had not taken vegetables for the past 3 weeks
School 5	Public special education primary school	Has a garden although it was not operational at time of survey	• Four meals a day for (boarding) students with special needs • Lunch for regular students	*Kande* every day for regular students	No standard unit established	12.20 p.m. for lunch (*kande*) for regular students	Not served for regular students	Not served for regular students	Not at all for regular students. It is *kande* every day.
Babati District (Babati DC and Babati TC)									
School 6	Private primary school	No vegetable garden	• Porridge • Lunch	• Maize porridge • *Ugali* with beans • *Kande*	• 55 kg rice for 300 students • 13 kg beans for 300 students	• 9.30 a.m. porridge for pre-school • 10 a.m. porridge for students • 12.30 p.m. lunch	No vegetables served	No fruits served	Not much considerations for nutrition or diversity of food
School 7	Public primary school	No vegetable garden	• Lunch only	• No timetable for meals but often *kande*	No standard unit established	• 12.30 p.m. lunch	No vegetables served	No fruits served	Not considered at all. Yet meals are better than their home meals
School 8	Private Catholic boarding secondary school	Owns a school vegetable garden operated by causal laborers	• Porridge for breakfast • Lunch • Supper	• Maize porridge • *Ugali* with beans • Rice with beans • *Kande* • Meat once a month	N/A	• 10 a.m. porridge for breakfast • 1 p.m. for lunch • 7.00 p.m. supper	Served two to three times a week	Bananas from school farm	To some extent. The school has a private operated canteen to enhance nutrition and diversity which students use at own expense

(Continued)

TABLE 5 | Continued

School	Type of school	School or farm garden	Type of meals	Type of foods	Ration served	Time of meals	Vegetables served	Fruits served	Consideration for nutritious food in meals
School 9	Public secondary school	No vegetable garden but has large plot of land. Water is the main challenge for a vegetable garden	• Porridge in the morning • Lunch • Supper for a few hostel students (40 girls)	• Maize porridge • *Ugali* with beans • *Kande*	No standard unit established	• 10 a.m. porridge for breakfast • 1 p.m. for lunch • 7.00 p.m. supper	Not served at all	No fruits served	No considerations for nutrition. What matters is that the students get something
School 10	Public special education primary school	No vegetable garden due to shortage of water	• Lunch for regular students • Students with special needs have own arrangements similar to Patandi	*Kande* every day for regular students	1 kg of maize for 6 students	12.20 p.m. for lunch (*kande*) for regular students	Not served for regular students	Not served for regular students	Not at all for regular students. It is *kande* every day.

with small grants and income generating activities. Thirdly, the department of community development coordinates and provides interest free group loans which could be used by parents to contribute to the school feeding program and meet other basic household requirements.

Challenges Related to Operational Modalities

The limited coordination further affects how the school feeding program is implemented at school level. At operational level a number of challenges were identified including limited cooperation between parents and teachers, limited use of bank account by the school food committees, committee members spending most of their time at school at the expense of their own economic activities, and challenges related to infrastructure such as limited storage facilities, kitchen, water, and energy or fuel for cooking. Moreover, the effectiveness and efficiency of school food committees are questionable in many respects:

- They have no mandate to enforce parents to contribute for the school feeding program, while some parents think that contributing for the school feeding program is optional.
- Instead of operating bank accounts, the funds were physically stored by a trusted member of the school food committee. Some examples of funds embezzlement were mentioned, not surprisingly leading to distrust of parents toward school food committees.
- For efficient functioning, at least one member of the school food committee has to be always present to collect contributions and supervise the storage, rationing, preparation, and provision of food to students. However, it was reported that food committee members do not show up to school regularly, and when they do, they don't come on time. Cooks explained that in the past when the program was coordinated by teachers, things used to run smoothly and all students were eating at school. Pointing to the inefficiencies of school food committees, cooks said:

"... Sometimes the storekeeper (a member of the school food committee) closes the store earlier than normal and does not collect contributions from parents until the following day. So, parents have to go back home carrying with them the in-kind contribution they brought to school. Sometimes they are disappointed and often they don't come back the following day..."

"... The school food committee gives out a small ration and asks cooks to add more water to beans or kande so that all students who have contributed get something to eat..."

Reliable sources of water for cooking, food stores, and a suitable kitchen are often missing. Students often have no dining hall and sometimes eat while seated on the grass or under trees, raising concerns about hygienic conditions. A few schools had received support to establish rain water harvesting systems, water storage tanks, and modern kitchens. Some of the cited supporters in both districts included Save the Rain, the Rotary Club of Arusha, and World Vision International.

Poor Contributions From Parents

The challenges in operational modalities of school feeding programs negatively affects willingness of parents to contribute.

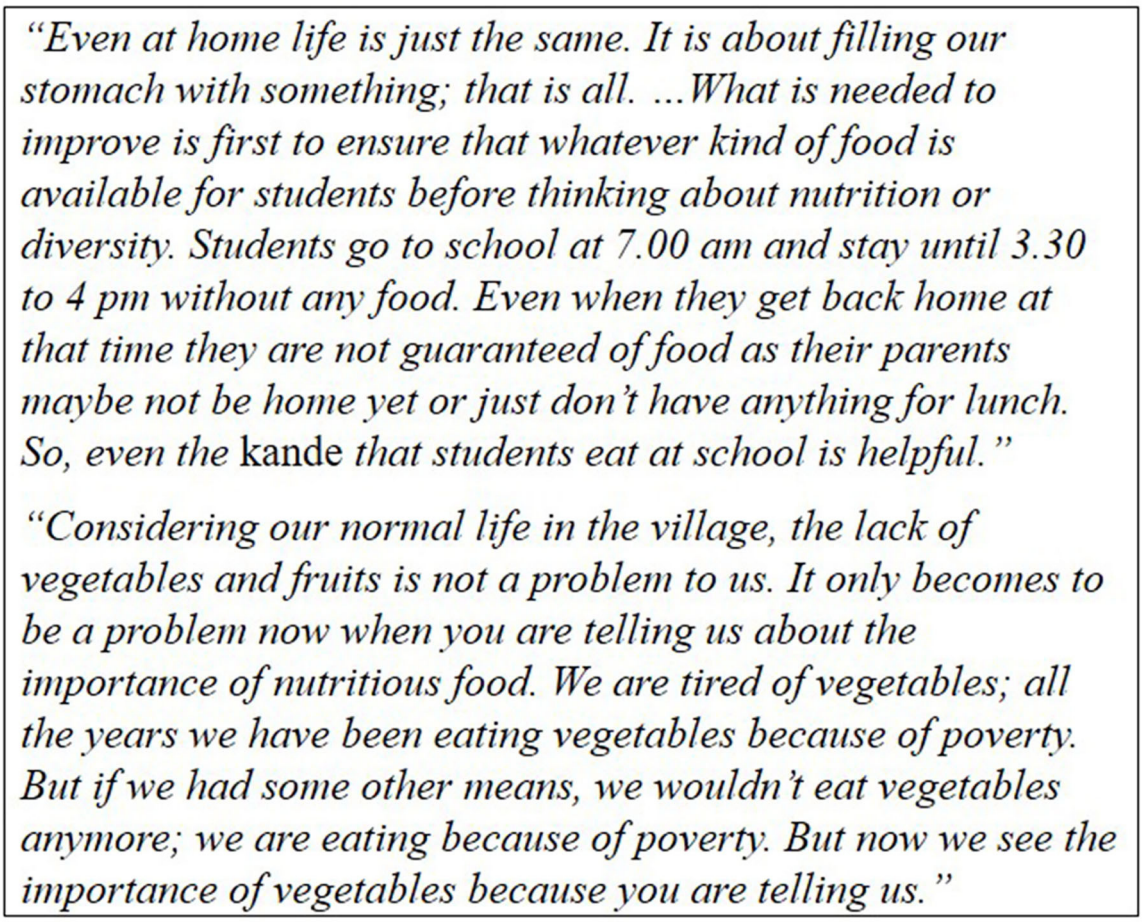

FIGURE 2 | Perceptions of parents toward vegetables in meals.

The variations in contributions among similar schools also reduce trust. Although students in secondary schools are bigger and eat more than students in primary schools, this cannot not fully justify the large range in the total value of monetary and in-kind contributions in public schools from USD 10 to USD 44 per student; it raises the question why variations are so high for the same type of school in the same locality. Limited understanding of the free basic education system is another challenge. Parents perceived that the free education system included free school meals.

Poverty of parents and grandparents coupled with limited understanding of free basic education was cited as one of the major challenges in raising contributions for the school feeding program. The FGDs with student representatives showed that some students were occasionally visiting neighbors to get something for supper. Related to inability of parents to contribute to the school feeding program is the number of children enrolled in school per household, particularly in polygamist communities such as the Maasai. Some families had up to seven children enrolled in school, in primary or secondary school or both, making the total amount of required contributions too high.

Challenges Related to Access, Dietary Diversity and Nutrition of Meals

Lack of parent contributions affected the number of meals served, portion sizes, diversity, and nutritive value of meals. Meal portions were too small to satisfy those students who were lucky to benefit, and the number of meals were not enough to provide all students. In many cases, but especially in public primary and secondary schools, students were not satisfied with the amount, nor the type of food served. Eligibility for the school feeding program was based on contributions from parents. This resulted in discrimination and stigmatization of the students whose parents were either unable or unwilling to contribute. While many schools used coupons to classify eligible students, a few schools allowed all students to take school meals irrespective of contributions to avoid stigmatization. Nonetheless, allowing all students to take school meals irrespective of contributions demotivated other parents to contribute in the future, threatening the sustainability of the very program.

The incorporation of vegetables in school meals was rare for various reasons: first, because of poor contributions from

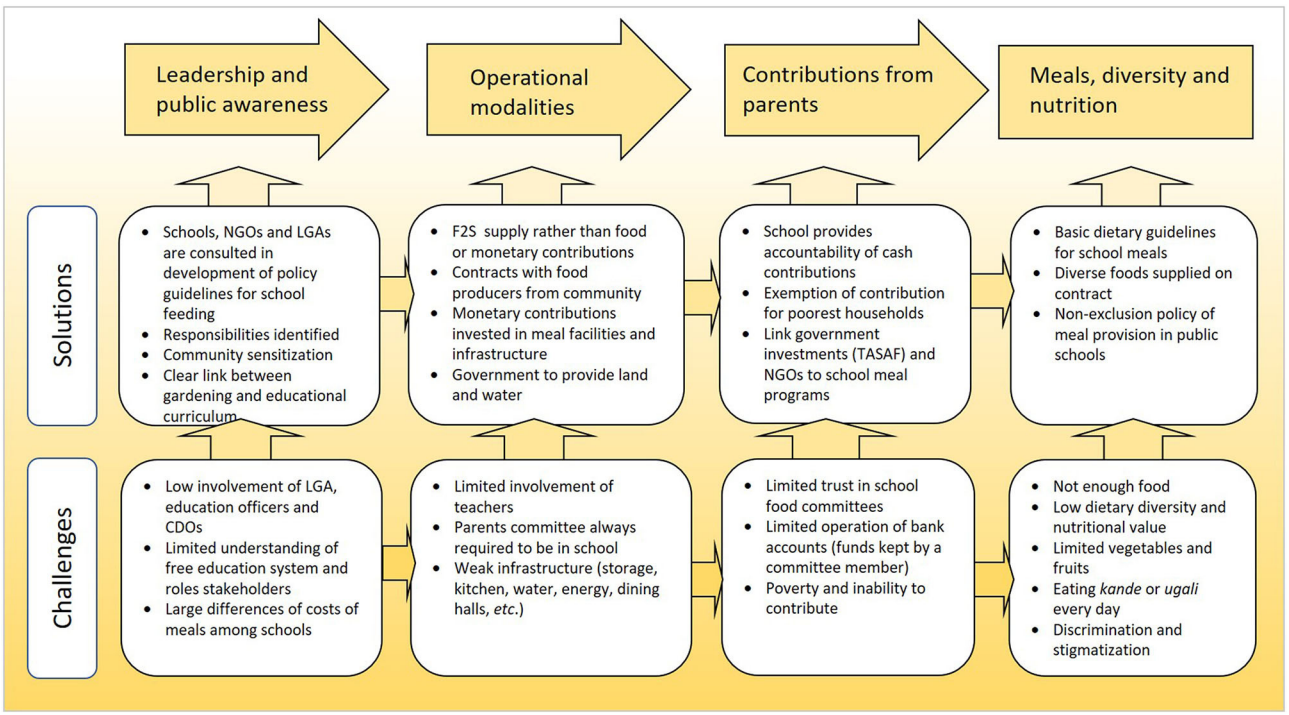

FIGURE 3 | Conceptual framework for planning and delivering nutritious meals in schools.

parents; second, because of absence or limited space for vegetable gardens; third, because school committees had limited funds to hire cooks and purchase kitchen utensils; fourth, due to lack of parents' awareness on importance of vegetables; fifth, because of traditional practices whereby parents associated the eating vegetables with poverty; and, sixth, because of the earlier mentioned health and safety concerns of vegetables. Fruits were mostly absent from school meals due to lack of funds and lack of awareness about their importance. With exception of a few private schools, nutritional value of meals was not taken into account in the school feeding program. School food committees had to serve whatever was available rather than what would be considered a nutritious meal.

Experiences From HGSF Projects in Tanzania

HGSF was piloted by WFP in collaboration with the Government of Tanzania and other partners including PCI. Between 2011 and 2016, WFP piloted HGSF programs in Mara and Singida Regions to link local production supplies with food requirements of the local schools (WFP, 2016). The transitioning of WFP from the traditional school meal programs to HGSF was part of the sustainability plan to ensure that local communities could continue supply food to schools beyond the project lifetime. Through the HGSF program, local government and schools received cash from WFP to purchase and distribute locally grown food to schools in Ikungi District in Singida Region and Bunda District in Mara Region. Over 28,000 students from 40 primary schools received a mid-day meal (WFP, 2016). The program procured maize and beans locally whereby school meals were complemented with key essential package interventions, such as nutrition- and health education, and water and sanitation. The program included provisions of imported fortified vegetable oil (with vitamins A and D) because the oil produced and processed locally did not meet WFP's and the government's standards. The ration per person per day was of 120 g of maize, 30 g of beans and 5 g of oil. The program was managed by school food committees in each school. The committees oversaw commodity management; food preparation and distribution as well as recruiting and paying the cooks.

KIIs with PCI showed that after successfully piloting HGSF under WFP in Bunda, PCI started a similar program in Musoma District. PCI, with funds from USDA, mobilized local communities to supply nutritious foods to primary schools. At the time of writing, PCI supplied food 2 days a week while the community supplied foods for 3 days a week. The intention was that the local community would become fully responsible for supplying nutritious foods to the schools. PCI mobilized local communities surrounding a particular school in the form of farmer groups to supply nutritious foods for school meals. The groups then entered into agreement with the schools, either through sales or donations. For example, a school would provide a plot for a farmer group to cultivate and produce foods such as passion fruits, banana, and sweet potatoes. After harvest, harvested products were shared between the group and the school. PCI also promoted school gardens which were managed

by students and other staff. Despite many positive outcomes, PCI listed a couple of challenges while implementing this approach:

- Mobilizing farmers and parents to organize themselves into working groups at the initial stages of the project, as parents took time to fully understand the initiative.
- Availability of land for the groups.
- When production increases and becomes a commercial engagement in near future, farmers might not supply to school anymore because of lower prices and untimely payments.

According to Watson et al. (2012), another possible challenge is the amount of time involved in the HGSF program by everyone at the expense of time spent on academic activities. This might result in Districts and schools withdrawing from HGSF programs. This argument is consistent with findings from the FGDs with teachers, who mentioned that parents were more concerned with academic performance of students than school meals. Thus, there is a need to strike a balance between academic and nutritious objectives in any school feeding program.

SUGGESTED IMPROVEMENTS FOR SCHOOL FEEDING PROGRAMS IN PUBLIC SCHOOLS

The study has revealed that there are challenges in the school feeding programs in the study area, but discussions with KII and FGDs also revealed many suggestions to tackle them. Solutions have been summarized in the conceptual framework of **Figure 3**.

Policy Implications

Clear guidelines for school feeding programs in public schools are missing. Although some policy documents have mentioned school meal programs, there are no specific strategies of ensuring that nutritious foods are provided in schools. No implementation plan or strategy for school meals was found in the reviewed documents. Only education circular No. 3 of 2016 indicated the responsibility of parents in the implementation of school feeding programs. Tanzania has prepared a multi-sectoral approach regarding nutrition in 2016, building on the existing linkages in the overall and sectoral development policies and strategies of a country. TFNC has a mandate to coordinate all food and nutrition issues including linkages with other sectors. The multi-sectoral approach is a great first step, but it needs to be followed up with an approach to improve the quality of school feeding programs. Such a policy document needs to maintain the multi-sectoral nature, and cover all four stages in the conceptual framework: leadership and public awareness; operational modalities; contributions from parents; meal diversity and nutrition. It was also learned during the study that the Ministry of Education, Science and Technology (MoEST) was collaborating with PCI through their HGSF program in Musoma to develop a national guideline for school feeding.

No school feeding program reaches its objectives if the most vulnerable students are excluded from benefiting, as it leads to stigmatization, hunger, sickness and poor school performance. This paper recommends mainstreaming a HGSF system in those parts of the country where it is possible to grow a diversity of crops, such as the various highland areas, the western part, and the coastal area. HGSF provides more opportunities for poor farming households to contribute, while at the same time it offers opportunities to improve diversity and quality of school meals. Despite these increased opportunities to participate, however, there might still be households that cannot afford to contribute part of their farm produce as they have no other sources to feed themselves. Building on good examples from the field, we recommend that guidelines at national level and bye-laws at local government level are formulated to incorporate social protection which enables all students, rich or poor, to benefit from school meals.

Home Grown School Feeding

Although school representatives, teachers, farmers, and parents who participated in this study did not know the concept of HGSF, some schools have been indirectly practicing it, particularly private schools. Private schools sourced foods directly from farmers especially during harvest seasons to take advantage of lowest prices. One private school in Babati District had entered into an agreement with farmers to produce food in the school farms and supply the food to the same school at market prices. This enabled the school to control food safety, which was a serious concern of parents.

Based on the findings of this study and the experience from PCI-HGSF program in Musoma, it is expected that HGSF can be further scaled out in Tanzania. In the HGSF program in Musoma, smallholder farmers, majority being women, have been mobilized to form producer groups, which have entered into contractual arrangements to supply nutritious food to public primary schools. Farmers and parents in Meru and Babati have expressed their eagerness to supply nutritious food to schools and generate income. If this is implemented, it can also address the issue of food safety, because some external suppliers bring food of poor quality knowing that nobody checks its quality. This was one of the reasons why some schools did not accept contributions in-kind. This can be avoided by contracting farmers whose kids are in school. When farmers are aware that the food, they produce will be eaten by their own children in the school they are unlikely to apply unnecessary agrochemicals or poor quality water. And according to Galluzzi et al. (2010), there are additional benefits: the closer the producer is to the consumer the more sustainable is the food system as it increases trust, reduces transport costs and removes other market barriers such as involvement of middlemen in the value chain. Several authors (Morgan and Sonnino, 2008; Gelli et al., 2016; UNSCN, 2017) also mention that school procurement and meals, if linked to local producers, can have a range of positive outcomes, such as: improved nutrition, engendered economic development by promoting small and medium enterprises; greater crop diversity in supply chains, diversification of agricultural landscapes, and resilience and adaptation to climate change. However, these effects are heterogeneous and context-specific and require a deeper and more rigorous analysis of the agro-ecological conditions and

market linkage settings. HGSF could be improved to incorporate nutritious traditional vegetables which would enhance quality of school meals as well as crop diversity on-farm. In Tanzania there is a wealth of diversity of traditional vegetables to tap into that have much higher nutrient contents than global vegetables (Roothaert et al., 2020).

Influencing Knowledge, Attitudes, and Practices Toward Healthy Eating

Influencing consumer behavior toward healthy eating is a complex challenge that many nutrition initiatives all over the world have been dealing with. Consumers choose what to eat based on knowledge, preferences, and affordability of the food that is available. Preferences in turn are influenced by cultural norms and practices. In many ways, the quality of meals that students consume is subject to similar influences. It becomes even more complex as knowledge about what constitutes a healthy school meal needs to be improved at various levels for it to have an effect on quality of school meals: parents, heads of schools, CDOs, cooks, teachers, and students. Similarly, healthy food preferences can be cultivated, but are more effective when children are influenced at a young age, and when eating habits of others in the community conform the desired consumption pattern. Knowledge and attitudes of students toward healthy eating can be influenced in a positive way as research in Nepal has shown (Schreinemachers et al., 2017). Nutrition, health, and food production needs to be embedded in the school curricula. In school, pupils can learn how to choose a healthy diet through the meals and snacks provided at school and can develop a range of consumer-based skills including food growing, handling, preparation, and cooking. Learning about vegetable production in school gardens and the nutritional value of crops in the garden will help reinforce nutritional knowledge and attitudes, as has been illustrated by many examples in the book of Hunter et al. (2020). But it will be equally important to educate all other adult stakeholders in the school feeding program. A pilot HGSF program in Nepal therefore included a nutritional literacy component for students and training of cooks (Shrestha et al., 2020).

Fortunately, our policy analysis shows that nutrition in general is incorporated in many policy documents in Tanzania, which creates a positive environment for non-governmental and public initiatives to increase nutritional awareness among the general public. Schools should not only be recipients of these initiatives, but they also have a role to influence the community that they serve on stressing the importance of healthy diets. A school garden is a core element of F2S programs as it provides education activities related to agriculture, food, health, and nutrition (Christensen et al., 2019). According to McGovern-Dole (2015), apart from supplying vegetables to schools, school gardens are regarded as an educational tool for students as well as surrounding communities. Through this study we found that PCI established demonstrations garden in schools for students and parents to learn. Public schools in Tanzania are often constrained with access to land and water for school gardens and local governments can play an important role in providing these fundamental resources.

Stakeholder Engagement

For HGSF to be successful there is a need to get a buy-in from the government at regional and district levels. The examples of HGSF in Bunda and Musoma Districts show that involvement of the Regional Administration and LGAs has been critical for the support HGSF. One of the main challenges faced by PCI in their initial stages was mobilizing and engaging local communities. Education on importance of school feeding, availability of nutritious foods, awareness raising on the concept of HGSF, and roles and responsibilities of parents and farmers turned out to be crucial. Most parents and farmers have had past experience with other projects, both positive and negative. A new concept such as an HGSF program therefore needs some explanation. The importance of engagement and empowerment became clear in one FGD where parents mentioned the case of Eluway primary school in Babati that was constructed by parents without external funds, saying: "… this school was constructed by our own efforts. The idea of HGSF will help to bring us together even more. … we need to understand how it works and what our roles will be." Although in the past, WFP was a major initiator and promotor of school feeding programs in Tanzania, in order to mainstream the program across as many public schools as possible, it requires a multi-stakeholder effort and commitment.

Improving the Quality of Meals

There is only very limited information available on the type and quality of meals provided to school children in Tanzania, which limits the assessment of the adequacy of the food provided to the children. The little information that is available from a few areas in the country shows that meals are not adequate in terms of providing macro- and micronutrients. These observations stress the need to improve the monitoring of school meal programs, and the need to improve quality of diets. The school diets are limited in diversity and meal patterns are inappropriate, consequently interfering with the spreading of nutrient intake over the day. Tanzania does not have a set of food based dietary guidelines for its citizens yet as being recommended by WHO and FAO (1996), although the TFNC has developed National Guidelines for Nutrition Care and Support of People with HIV. Similar guidelines are urgently needed for school meal programs.

Many parts of Tanzania, such as the highland areas, coastal area and western part of the country have suitable climates and soils to promote cultivation of a diverse pattern of crops as well as rearing livestock. Some of the sampled schools in this study are outside those high potential areas, but are still within diverse agricultural systems. In the biggest part of Tanzania, school feeding programs can tap into these diverse agricultural systems and communities. HGSF programs in such contexts have the advantage over the current in-kind and monetary contribution systems, in the sense that contractual arrangements can be made between farmers and schools to provide diverse, healthy, and safe foods for school meals. HGSF therefor can improve quality of

school meals in Tanzania while at the same time improving the livelihoods of farmers.

Limitations of the HGSF Model for Tanzania

There are also exceptions for which recommendations of this study will not apply. First, in rainfed farming systems in arid and semi-arid areas, cultivation of vegetables will be constrained without irrigation water, limiting the diversity of crops to be supplied from the community to schools, and therefore quality of meals of HGSF. Monetary contributions might be inevitable to supplement starchy staple crops with nutritious foods. Second, communities in urban areas are likely to be employed in other sectors than agriculture, hence HGSF is not very feasible. Third, community ownership of a feeding program for private schools is likely to be limited as directors or owners directly select farmer supply chains. Students in private school are fortunate though as they tend to come from wealthier families and school meals are of higher quality than in public schools.

CONCLUSION

Although the reviewed policies, strategies, guidelines, and circulars included nutrition aspects, only a few mentioned school feeding programs, and none provided strategies on how to source food, whether school feeding program is mandatory, how to deal with parents who cannot and don't want to contribute to the program, or whether it is the school's plight to provide school meals to students whose parents haven't contributed. The result is a mismatch of expectations from parents and schools, with students from poor families often taking the brunt and forfeiting meals. Parents coordinate the programs, but due to the absence of clear accounting mechanisms it is hard to prevent mismanagement and distrust. Policies also remain silent on rations, quality standards and costs of meals leading to poor quality of diets and sometimes too small portions. We identified two entities who are working on guidelines for school feeding programs in Tanzania, MoEST and PCI. The authors recommend policies for school feeding are developed in a multi-sectoral manner, in the same way the TFNC coordinated the National Multisectoral Nutrition Action Plan which aims to improve nutrition for the vulnerable people in the whole nation. Policies need to cover all four critical stages for successful school feeding: leadership and public awareness; operational modalities; contributions from parents; meal diversity and nutrition. Political will must not stop at policy level but encompass implementation and allocation of resources. If the recommended policies and guidelines are implemented, parents will still be responsible for the largest part of food supplies. Local governments must complement these efforts by providing resources to public schools such as land and water, and enforce minimum levels of social protection, so that students from the poorest families are no longer discriminated and excluded from school meals. Planning and implementation of HGSF requires a multi-stakeholder approach involving parents, farmers, schools, students, and local government. The proposed model is particularly recommended for public schools, as private schools tend to successfully operate independent commercial food supply chains. Limitations for HGSF are water- or land constrained ecosystems and urban areas, where home grown food production is difficult to realize.

DATA AVAILABILITY STATEMENT

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found at: HARVEST; doi: 10.22001/wvc.73744.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the World Vegetable Center's (WorldVeg) Institutional Bio-safety and Research Ethics Committee (IBREC) on 2 November 2018. The participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

RR, DH, and JO were involved in the design of the study. JO coordinated data collection. HM conducted the systematic literature review and participatory research processes. HM and RR analyzed the data, interpreted the results, and wrote the first report. RR turned the report into a paper. All authors read, edited, re-edited, and approved the final manuscript.

FUNDING

The funding for this research was provided by the Australian Centre for International Agricultural Research through the project Analysing Schools as Platforms to Improve Diets Livelihoods and the Environment in four countries in East Africa project number GP/2018/101 and long-term strategic donors to the World Vegetable Center: Republic of China (Taiwan), UK aid from the UK government, United States Agency for International Development (USAID), Australian Centre for International Agricultural Research (ACIAR), Germany, Thailand, Philippines, Korea, and Japan. The additional support of the CGIAR Research Programme on Agriculture for Nutrition and Health (A4NH) is acknowledged.

ACKNOWLEDGMENTS

We acknowledge with gratitude the District Officers of Arumeru and Babati, village health workers and hospital staffs. Special thanks goes to community elders, representatives of farmer associations, staff of PCI, students, headmasters, and representatives of parent-teacher associations and committees who voluntarily participated in this study. We appreciate the inputs of Pepijn Schreinemachers when reviewing the final draft of the paper.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.