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Changing Perception through a Participatory Approach by Involving Adolescent School Children in Evaluating Smart Food Dishes in School Feeding Programs – Real-Time Experience from Central and Northern Tanzania

Christine Wangari[a], Catherine Mwema [a], Moses Siambi[a], Said Silim[b], Rose Ubwe[c], Kathleen Malesi[d], Seetha Anitha [b], and Joanna Kane-Potaka[b]

[a]Eastern and Southern Africa Research Program, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Nairobi, Kenya; [b]Smart Food Initiative, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Hyderabad, India; [c]Technology Transfer and Partnerships, Tanzania Agricultural Research Institute (TARI) Selian Centre, Arusha, Tanzania; [d]Hospitality Management, Moi University, Eldoret, Kenya

ABSTRACT

The study aimed to test the prospects for, and acceptance of, pigeonpea and finger millet-based dishes in a school feeding program for 2822 adolescents' in Central Tanzania. The focus was on incorporating nutritious and resilient crops like finger millet and pigeonpea through a participatory approach involving series of theoretical and practical training sessions, for the period of 6 months on the nutritional quality and sensory characteristics of these two unexplored foods in Tanzania. Sharing knowledge on the nutritional value of these crops and involving students in the acceptance study changed their negative perception of finger millet and pigeonpea by 79.5% and 70.3%, respectively. Fifteen months after the study period, schools were still continued feeding the dishes and more than 95% of the students wanted to eat the finger millet and pigeonpea dishes at school. Around 84.2% of the students wanted to include pigeonpea 2–7 times a week and 79.6% of the students wanted to include finger millet on all 7 days in school meal. The study proved that it is possible to change food perceptions and bring about behavior change by sharing knowledge on their benefits and by engaging the consumers through a participatory and culturally appropriate approach.

KEYWORDS

Perception; pigeonpea; finger millet; acceptance; Smart Food

Introduction

Pigeonpea is the third largest food legume grown in Tanzania in terms of production, after beans and groundnut (Milne, Ganga Rao, and Orr 2015). Tanzania's annual production of pigeonpea is approximately 200,000 million tonnes, most of which is exported to India as whole grain.

CONTACT Seetha Anitha s.anitha@cgiar.org Smart Food Initiative, International Crops Research Institute for the Semi-Arid Tropics, Hyderabad, India

Supplemental data for this article can be accessed publisher's website.

Among African countries, Tanzania is the primary exporter of pigeonpea to India (Ahlawat, Sharma, and Singh 2016), which receives 20.68% of its pigeonpea from Tanzania (Ahlawat, Sharma, and Singh 2016). However, in 2017 the export market collapsed in Tanzania. Despite of the critical need for protein in the diets of rural and urban Tanzanians, whose diet is currently dominated by maize and cassava, only 35% of the pigeonpea is consumed domestically (Simtowe, Asfaw, and Abat 2016).

In developing countries where animal-source food is not often affordable by the poor, legumes can play a major role as a promising source of protein (Mfikwa and Kilima 2014; Saxena, Kumar, and Sultana 2010). Tanzania's vast production is aimed at export markets with no big domestic market since people traditionally eat beans rather than pigeonpea as their main legume in the diet (Rogath 2015). Some of the major reasons for this are the lack of pigeonpea processing facilities for local markets, which lead to export most of the pigeonpea produced as whole without value addition. Moreover, paucity of knowledge on how to cook pigeonpea, and many myths surrounding the crop further reduced its consumption. Low consumption is also attributed to the close nexus between producers and export markets (Lo Monaco 2003).

On the other hand, finger millet is produced traditionally in Eastern and Southern African countries. In Tanzania, it is either sold as whole grain, or with increasing urbanization, processed into flour and packed as either a 100% flour or a 20% blend (Schipmann-Schwarze et al. 2015). Finger millet consumption stands at 67% compared to 100% for maize and 88% for wheat. Finger millet is a dryland cereal which is grown mainly for income generation. With increasing awareness of its nutrition, and with growing health consciousness among people, its consumption has seen a rise, especially in urban Tanzania (Schipmann-Schwarze et al. 2015). On average and regardless of variety, finger millet is rich in calcium, containing three times that in milk; it also contains iron, zinc, and high level of essential amino acid, methionine (Longvah et al. 2017; Shobana et al. 2013). Given that legumes are typically very low in methionine, the combination of legumes like pigeonpea with finger millet, makes a complete good quality and highly digestible plant protein (Anitha, Govindaraj, and Kane-Potaka 2019).

In view of the protein requirements within the country and the unstable export market, it is very important to find a sustainable way to promote the use of pigeonpea locally. The calcium, iron, and zinc requirements and the need to complement pigeonpea with methionine content to make a complete amino acid profile (Anitha, Govindaraj, and Kane-Potaka 2019) make it imperative to promote finger millet, of which consumption is currently inadequate. Moreover, millets, sorghum, and legumes are viewed by the Smart Foods initiative as being "good for you" (highly nutritious and healthy), "good for the planet" (environmentally sustainable) and "good for the farmer" (-resilient and climate smart) (www.smartfood.org). Therefore, the current study aimed to

(i) understand the current nutrition gap and adolescent school students' knowledge, attitude and perception (KAP) of pigeonpea and finger millet; (ii) introduce pigeonpea and finger millet dishes through a participatory approach so as to impart knowledge on their nutritional values and suitability as any other traditional food they regularly consume; (iii) test the acceptability of pigeonpea and finger millet dishes among adolescent school students' and other stakeholders who are part of the system, and who otherwise regularly consume maize and bean; and (iv) estimate the nutritional levels of the new menu items compared to the previous menu and to analyze its economic benefits when included these foods in the school menu.

Methods

Study design

The study design adopted is given in Figure 1. It included randomly recruiting schools that are located in the pigeonpea and finger millet producing area followed by a series of assessments such as institutional dietary assessment, baseline assessment to understand the knowledge, attitude, and perception (KAP) toward pigeonpea and finger millet and focus group discussions. For introducing pigeonpea and finger millet dishes sensitization sessions for students, cooking sessions with chef's and, sensory evaluations for all were conducted to understand their acceptance. Fifteen months later, without any further intervention, a detailed survey with 681 (26%) students, 18 teachers, and chefs in four schools (Dareda, Babati day, Bukulu, and Amani Abeid) were undertaken to understand the preferences and constraints in feeding pigeonpea and finger millet.

Institutional dietary assessment

Four residential schools were selected in Kondoa district, Dodoma region, and Babati district, Manyara region of Tanzania, where significant quantities of pigeonpea are produced. The schools follow a seven-day cyclical meal pattern with a fixed menu. The per capita consumption in the schools was documented based on the schools' data on raw food utilization per day.

Knowledge, attitude, and perception survey

A baseline survey was conducted to understand the students' and other related stakeholders' (including chefs, teachers, and parents) knowledge, attitude, and perception (KAP) of pigeonpea and finger millet. Structured questionnaire and Focus Group Discussions (FGDs) were used to evaluate the KAP. The detailed assessment was undertaken 15 months after the end of

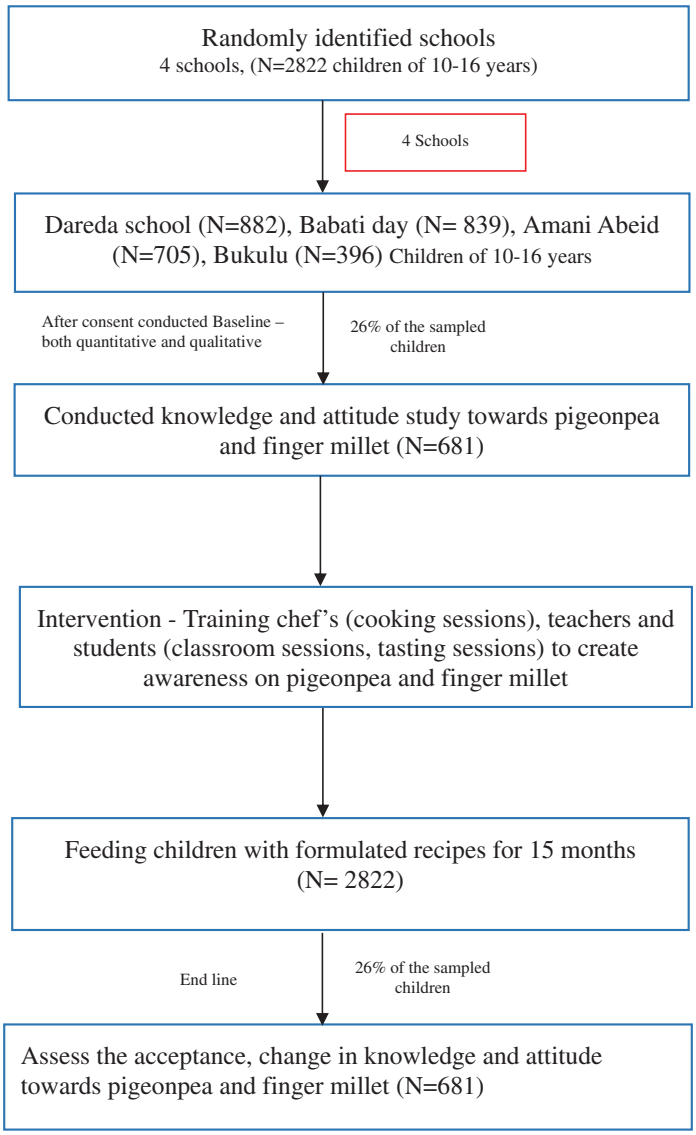

Figure 1. Flow diagram for the study design.

the initiative and therefore captured the sustainability of the initiative and longer term acceptance of the foods with no inputs, encouragement or assistance involved. Written consent was obtained from all the participants.

Focus group discussions

Focus Group Discussions were conducted separately with randomly selected school students (both female and male), and key informants' interviews were conducted with teachers and chefs to understand their KAP toward pigeonpea and finger millet before and after they were included in the school meal

program. The discussions started with general food consumption behavior and then focused on two of the target crops – pigeonpea and finger millet. The guided questions in the FGDs aimed to gather insights on normal consumption behavior and their knowledge of and attitude toward these two crops. Two focus group sessions were conducted in each school, with 7 to 10 students in each session. A total of 60 students participated in the FGDs. These sessions were conducted until the saturation of discussions/questions. A facilitator guided the group through the discussions and the note taker transcribed the notes without participating in the interaction. A technician was responsible for recording the FGDs and the recordings were then used to create a transcript of the event. Some of the probing questions asked during the FGDs included: (i) What do you know about pigeonpea and finger millet? (ii) What do you think about the image these crops have among other foods? (iii) Have you ever eaten products made from these crops? and (iv) If not, what was the specific reason? Once pigeonpea and finger millets were introduced in the school meal program, another round of FDGs was conducted to gauge (i) if there had been any difference in their knowledge and perception following the training and tasting; and (ii) did they now want to continue eating these dishes in the school meal program?

Sensitization on two Smart Food crops

Two thousand eight hundred and twenty-two students from four schools and 48 stakeholders including teachers, parents, and chefs participated in the sensitization program that was conducted over five phases to create awareness on the health and nutritional benefits of pigeonpea and finger millet. Step 1 was a theoretical session where pigeonpea and finger millet were introduced and their nutritional values were described. Millets and pigeonpea were branded as "Smart Foods" which helped in communicating the message of their value and creating a buzz around the food. In the second step, dishes made of the two crops were prepared and practical training was given on their preparation, with alterations being made based on the feedback from students and stakeholders, especially chefs. The training was mainly aimed at chefs. However, other stakeholders and students also observed the preparation and participated in this process. Step 3 was the tasting and evaluation of these dishes by teachers and chefs. This stage was more interactive to get feedback from local chefs and teachers and ensured that the dishes were prepared in a more culturally appropriate manner, and the preparation methods were then finalized. The fourth stage involved students, parents, and other stakeholders for tasting dishes. In the fifth stage, the students evaluated the dishes for their palatability and acceptance.

Recipe formulation

Prior to formulating the pigeonpea and finger millet recipes, FGDs were held with chefs to understand the different cooking methods customarily used for maize and beans, and the possibility of adopting these for finger millet and pigeonpea formulations. Cooking them in a similar way would show that these recipes are not something new but comparable to those in their own cooking culture. To complement the previous dishes (Table 1) including maize porridge, *ugali* (maize meal) with bean and *makande* (maize and bean stew) the new improved recipes were formulated to have crop and nutritional diversity. These dishes included finger millet porridge, *makande* (maize and pigeonpea stew), and *ugali* (maize meal) with pigeonpea as a complementing dish (Table 2).

Table 1. Previous regular seven-day cyclic school menu served at school.

Day	Breakfast (Average serving size in g/student/meal ±SD)	Lunch, Average serving size in g/student/meal ±SD	Dinner, Average serving size in g/student/meal ±SD
1	Maize porridge (400 ± 100)	Maize meal (*Ugali*), 350 ± 100, Bean as side dish, 200 ± 50	Maize meal (*Ugali*), 350 ± 100, Bean as side dish, 200 ± 50
2	Maize porridge (400 ± 100)	Maize meal (*Ugali*), 350 ± 100, Bean as side dish, 200 ± 50	Rice 350 ± 100, Bean as side dish 200 ± 50
3	Maize porridge (400 ± 100)	Maize cooked together with bean (*Makande*), 400 ± 100	Maize meal (*Ugali*), 350 ± 100, Bean as side dish, 200 ± 50
4	Maize porridge (400 ± 100)	Maize meal (*Ugali*), 350 ± 100, Bean as side dish, 200 ± 50	Rice 350 ± 100, Bean as side dish 200 ± 50
5	Maize porridge (400 ± 100)	Maize cooked together with bean (*Makande*), 400 ± 100	Maize meal (*Ugali*) 350 ± 100, Bean as side dish 200 ± 50
6	Maize porridge (400 ± 100)	Maize meal (*Ugali*), 350 ± 100, Bean as side dish, 200 ± 50	Maize meal (*Ugali*) 350 ± 100, Bean as side dish 200 ± 50
7	Maize porridge (400 ± 100)	Maize meal (*Ugali*) 350 ± 100, Bean as side dish, 200 ± 50	Rice 350 ± 100, Bean as side dish 200 ± 50

Table 2. Improved school menu with higher diversity and nutrition.

Day	Breakfast (Average serving size in g/student/meal ±SD)	Lunch, Average serving size in g/student/meal ±SD	Dinner, Average serving size in g/student/meal ±SD
1	Finger millet porridge (400 ± 100)	Maize meal (*Ugali*), 350 ± 100, pigeonpea as side dish, 200 ± 50	Maize cooked together with pigeonpea (*Makande*), 400 ± 100
2	Finger millet porridge (400 ± 100)	Maize meal (*Ugali*), 350 ± 100, pigeonpea as side dish, 200 ± 50	Rice 350 ± 100, bean as side dish 200 ± 50
3	Finger millet porridge (400 ± 100)	Maize cooked together with pigeonpea (*Makande*), 400 ± 100	Maize meal (*Ugali*), 350 ± 100, Bean as side dish, 200 ± 50
4	Finger millet porridge (400 ± 100)	Maize meal (*Ugali*), 350 ± 100, bean as side dish, 200 ± 50	Rice 350 ± 100, pigeonpea as side dish 200 ± 50
5	Finger millet porridge (400 ± 100)	Maize cooked together with pigeonpea (*Makande*), 400 ± 100	Maize meal (*Ugali*) 350 ± 100, Bean as side dish 200 ± 50
6	Finger millet porridge (400 ± 100)	Maize meal (*Ugali*), 350 ± 100, pigeonpea as side dish, 200 ± 50	Maize cooked together with pigeonpea (*Makande*), 400 ± 100
7	Finger millet porridge (400 ± 100)	Maize meal (*Ugali*) 350 ± 100, pigeonpea as side dish, 200 ± 50	Rice 350 ± 100, Bean as side dish 200 ± 50

Table 3. Estimated average per capita intake of major nutrients in the regular menu compared to improved menu.

Nutrients	Amount of nutrient from previous menu, Average (SD)	Amount of nutrient from current menu, Average (SD)
Energy (Kcal)	899.0 (154.0)	1580.0 (134.0)
Protein (g)	28.9 (5.0)	48.6 (9.0)
Fat (g)	12.2 (3.0)	22.2 (3.0)
Iron (mg)	9.1 (1.7)	18.9 (2.3)
Calcium (mg)	101.7 (30)	572.7 (140.0)
Zinc (mg)	5.4 (1.3)	12.1 (3.7)

Sensory testing

During the cooking exercise, the recipes were assessed for their taste, palatability, and acceptance among children and all other stakeholders, so that alterations could be made in their cooking to be in tune with the recipes in their culinary culture. Sensory evaluations were conducted in all the four schools by randomly selecting 681 (26%) students who agreed to participate. In each school, both girls and boys as well as two teachers, particularly the head teacher and the teacher in charge of student meals, school chefs and parent representatives from each school also participated in the sensory evaluation. The five-point hedonic scale with relevant emoji pictures was used to capture the degree of like or dislike toward pigeonpea and finger millet based meals. In addition, semi-structured questionnaires were used to: (i) assess current perceptions of the recipes developed in terms of taste and palatability; (ii) determine which recipes they would prefer to have included in their school meal plans; and (iii) determine the frequency with which they would prefer to have the new recipes served in their meal plan.

Determination of nutrient value

The baseline nutrient value of the recipes that were already part of the school meal program was determined using the Tanzania food composition table (Lukmajni et al. 2008). The average nutrient consumption per day per child during the baseline was calculated and the nutrition gap was assessed using the dietary assessment data collected from the institutional dietary assessment (Table 3). The newly formulated Smart Food recipes' nutrient value was also calculated using the Tanzania food composition table (Table 3).

Results

As every school participating in this study was residential, students ate all their meals at school. The schools provide three main meals a day, which include breakfast, lunch, and dinner along with morning and afternoon snacks and black tea. The usual menu included *ugali* (maize meal) with

beans, *makande* (beans cooked with maize) and rice with beans provided in the afternoon and for dinner in a seven-day cycle. Maize porridge was served at breakfast and as of mid-morning snack. Though the students eat three main meals a day, the calorie intake, especially of protein and major micronutrients like iron and calcium, was found to be low. The Smart Food products developed (Table 2) and the nutrient value of their formulations show that they meet almost 40–100% of all the major nutrients based on the Recommended nutrient intakes (RNI) established by WHO for adolescents in developing countries (FAO/WHO 2004; FAO/WHO/UNU 2004, 2007) (Table 3). Specifically, the high calcium content of the improved menu is coming from finger millet, high protein content is from the amount of pigeonpea used and iron content comes from both finger millet and bean.

Focus Group Discussions revealed that the initial perception of the school students and other stakeholders about pigeonpea and finger millet were influenced by myths. Before training, most of the students had eaten pigeonpea when it is still raw and fresh (not dried, i.e., as a vegetable). The majority of the students thought matured pigeonpea (dried, i.e., a legume) had a bad odor, was not palatable and might not be tasty. One of the major constraints in eating pigeonpea and finger millet is the method of cooking, as quoted by students, "If it is cooked tasty like the one provided at school we would love to eat it every day." Moreover, students liked the recipes of pigeonpea and finger millet meal at school and mentioned that, "The pigeonpea meal prepared at school was tastier than the one I tasted at home," and "I passed the recipe to cook pigeonpea to my mother." For stakeholders, the major constraints in providing pigeonpea and finger millet-based meals were the associated cost of finger millet, policies that support maize and bean only, and limited knowledge on cooking methods (Table 4). After training on various dishes, chefs realized cooking pigeonpea is not difficult and they even felt it saves fuel and time compared to some types of beans which take a long time to cook. Teachers mentioned that "students liked *makande* (maize and pigeonpea stew) and if they don't see pigeonpea in it they are upset."

The original negative perceptions on pigeonpea and finger millet eventually underwent a positive change among almost 70.3% (Table 5) of the students following the branding of them as "Smart Foods," education and tasting of the recipes and information inputs about the nutrition and other values of these Smart Food crops. Albeit not shown in the table, the data on sensory acceptance showed that the pigeonpea-based meal had high acceptance with the score of 4.2 ± 0.9 (1 being highly disliked and 5 being highly liked) among 681 students who participated. Similarly, finger millet porridge had high acceptance scores of 4.4 ± 0.9 among the 681 students who participated. Fifteen months past the intervention, the students not only

Table 4. Students and other stakeholders' knowledge and attitude toward pigeonpea and finger millet-based meals.

Statements/questions asked	Example students' answers	Example teachers' and chefs' answers
What do you know about pigeonpea and finger millet?	"My mother told finger millet doesn't taste good" "I heard people saying finger millet is only for poor" "We never cooked finger millet at our home" "I know finger millet is for weaning children but mothers don't buy it in our village due to high price" "At my home finger millet is cooked with milk" "We never cooked finger millet at our home" "At our home pigeonpea is cooked when it is green together with pounded cassava leaves" "At our home, we prefer to eat green pigeonpea"	
What are the constraints in consumption of pigeonpea and/finger millet?	"If it is prepared with good taste we are ready to eat" "It is not provided for us regularly at school" "It causes flatulence problem" "At home none of the family member know to cook it tasty"	"School feeding committee don't have policy to feed pigeonpea" "Cost of the finger millet is high and is not affordable" "Know only few recipes which makes the meal boring"
What did you learn about pigeonpea and finger millet based meals?	"If is cooked properly with onion and spices it is tasty" "These are highly nutritious foods which help in growth" "Finger millet is high in calcium which is good for bone health" "We need to eat a variety of foods so that we get more nutrients"	"Pigeonpea takes less time to cook and it becomes soft and palatable"
How much do you like pigeonpea and finger millet?	"If I don't see pigeonpea in *makande*, I am upset" "Finger millet porridge is tastier that maize porridge" "I like to eat them everyday"	"Pigeonpea is simple to cook and tastier especially in *makande*" "When I didn't add pigeonpea in *makande* children were asking me why"

liked the Smart Food products but were also keen on continuing the new recipes in their school meal programs.

The final survey conducted 15 months after the completion of project and training sessions revealed 84.2% of the students wanted to have pigeonpea meal in their school meal program 2–7 times per week (Table 6) of the week.

Table 5. The baseline and post-intervention end-line responses of the students and stakeholders (teachers, parents, and chefs) on their perception and acceptance of finger millet porridge.

	Student Responses N = 681		Stakeholder Responses N = 18	
Questions asked	Yes	No	Yes	No
Baseline				
Had you ever tasted pigeonpea?	651 (95.5)	30 (4.4)	18 (100)	-
Had you eaten pigeonpea frequently? (more than 3 times a week)	-	651 (95.5)	-	18 (100)
Had you ever tasted finger millet?	659 (96.7)	22 (3.2)	18 (100)	
Had you eaten finger millet frequently? (more than 3 times a week)	-	659 (96.7)	-	18 (100)
Did you have negative perceptions on pigeonpea?	310 (45.5)	371 (54.5)	18 (100)	-
Did you have negative perceptions on finger millet before training	254 (37.3)	427 (62.7)	18 (100)	-
Post intervention End-line				
Have you changed negative perceptions on pigeonpea after training?	218 (70.3)	92 (29.7)	18 (100)	-
Have you changed negative perceptions on finger millet after training?	202 (79.5)	52 (20.5)	18 (100)	-

Numbers in parentheses are percentage.

Table 6. Students' preference on the number of days they wanted to have pigeonpea and finger millet-based food as part of the school meal (Surveyed about 15 months after the intervention stopped).

	Children responded (N = 681)				
Preference	Once a week	Twice a week	3 to 6 times a week	Everyday	Don't like to eat
Pigeonpea meal	77 (11.3)	334 (49.0)	118 (17.3)	122 (17.9)	30 (4.4)
Finger millet meal	18 (2.6)	53 (7.8)	59 (8.7)	542 (79.6)	9 (1.3)

Numbers in parentheses are percentage.

Table 7. Cost reduction (in Tanzanian Shillings) by substituting one meal of beans with pigeonpea.

School Name	Number of students	Cost of maize with bean food/student/meal	Cost of maize with pigeonpea food/student/meal	Percentage cost reduction
Dareda	882	537.5	425.0	21
Babati day	839	247.0	196.7	20
Amani Abeid	705	597.0	459.5	23
Bukulu	396	200.0	150.0	25

On the other hand, 79.6% of the students wanted finger millet porridge every day.

Study also estimated an average cost reduction of 22.2% when a pigeonpea-based meal was used to complement bean-based meal in the four schools, with the cost reduction varying from 20.0% to 25% (Table 7).

Discussion

In Tanzania, the school feeding program was initiated in 1956. Half-day meals were given more emphasis at that time (Haile 2019). School feeding programs aim to improve both attendance at school and the health of children, alleviate short time hunger, and thus improve their focus on studies, and in the long run improve household food security (WFP 2004).

The regular meals provided at the four schools as part of the feeding program were maize meal and beans. Thirty-two to 51% of calories come from maize in Tanzania, either as a thick or thin porridge, lacking in protein and micronutrients. Adolescent children need more protein and micronutrients (especially iron and calcium) as they are at a critical growth stage. The current-improved menu items are highly nutritious and as shown in Table 3 they provide more nutrients than the previous menu hence addition of pigeonpea and finger millet dishes in school menu complemented the previous menu.

The baseline survey on knowledge and perception revealed two major constraints with regard to consumption of pigeonpea and finger millet, which includes a negative perception of these crops and scant knowledge of cooking methods at the household level as these crops were rarely cooked in most of these students' homes. The training on nutritional value together with the dishes made with pigeonpea and finger millet created an opportunity for the students to taste them and appreciate the palatability, flavor, and odor of the Smart Food recipes.

Complementing bean and maize by incorporating pigeonpea and finger millet not only infused crop diversity in the school feeding program but also improves the nutritional content of the meal. Moreover, replacing beans with pigeonpea can save schools 40% in food costs at prevailing prices (Mhando 2018). The current study also shows that schools were continuing to feed pigeonpea at least two times a week to 7 times a week to complement bean for two reasons which includes cost reduction in using pigeonpea and students liked it very much in some specific dishes like *makande* (maize and pigeonpea stew) which was traditionally prepared with bean. This difference in cost estimated for all four schools is due to the variation in pigeonpea cost in different villages. It was noted that the schools could not continue finger millet on the menu as it was expensive. This is largely due to the low availability; hence, bulk supplies were difficult to access for the schools, as this was not a major production area for finger millet. This highlights the need to drive both demand and supply in unison. It is estimated that school feeding with pigeonpea and finger millet can create the potential market demand of 700 metric tonnes of pigeonpea per week and 140 metric tonnes of millet per week in Tanzania which brings

income to farmers in addition to nutritional benefit to the student community.

The present study identified one limitation, the students were not monitored for their anthropometry growth status or micronutrients status before and after the inclusion of pigeonpea and finger millet dishes which could have given further evidence on the growth impact by improved nutritional content of the food.

Conclusion

The Smart Food formulations were not only found to be tasty but were also well accepted among the school students. More importantly, they are markedly more nutritious compared to maize meal. The intervention provided the students an opportunity to realize that perceptions and reality are not always the same. The current study proved that perceptions can change when sufficient knowledge is imparted and cultural sensitivities are kept in mind while adapting cooking methods. The supporting Smart Food branding is expected to have contributed to the success of the communications. The success of the recipes was greatly influenced by the involvement of stakeholders who tailored them to the regional food culture. It is recommended that this model be scaled nationally so that locally available nutritious foods are consumed to improve the nutrition security of the country while providing more stable income for pigeonpea and finger millet farmers. Quick and major impacts can be achieved through its implementation in institutions use like schools, hospitals, prisons, and military canteens. A similar approach needs to be taken with regard to tasty and culturally sensitive recipes created by local chefs, complemented with edutainment branded programs to build awareness and a positive modern image for new foods. Supporting entrepreneurs in developing products made from these Smart Foods will further build market awareness and enhance their domestic consumption. This study serves as a model to popularize these Smart Foods in countries where similar nutritional situations, dietary patterns, and underutilization of these potential crops exist, in order to improve dietary diversity and nutritional status and create local market opportunities for these crops.

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ORCID

Catherine Mwema http://orcid.org/0000-0001-8015-5747
Seetha Anitha http://orcid.org/0000-0001-7393-5489

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