

Smart Food in Tanzania

Pilot study to make healthier and cost-effective school meals



Smart Food brief 3

Good for you - the planet - the farmer®

The study

The Smart Food project in Tanzania was designed to test the potential market for pigeonpea and millet. These crops come under the definition of Smart Food as they are good for you, the planet and the farmer. The project selected **four residential schools with a total target of 2,822 high school students** to implement a nutrition education training and diversify the school meals composition to include pigeonpea and finger millet recipes (partially substituting beans with pigeonpea, and maize ugali porridge with finger millet porridge). Outcomes were measured for economic, social and nutrition impact. Fifteen months after the study period, 681 students (26%) were surveyed about their perceptions and preferences for the food choices.

Study Results

- **80%** and **70%** of the students changed their negative perception of finger millet and pigeonpea respectively.
- **>95%** of the students wanted to eat the finger millet and pigeonpea dishes at school.
- **84%** of the students wanted to include pigeonpea 2-7 times a week and **80%** of the students wanted to include finger millet on all 7 days in school meal.
- Substituting one meal of beans with locally available pigeonpea (half the price of beans) = **significant savings of 19,800 - 99,388 Tsh (US\$ 8.5 - 42) per meal** (depending on number of students in the school and the volume of beans they consumed prior to intervention).
- New pigeonpea and finger millet meals had significantly higher nutritional levels
 1. Almost double the energy, protein and fat
 2. Five times more calcium
 3. Double the amount of iron and Zinc
 4. 1.8 times more magnesium
- **Potential new market of upto 700 metric tonnes** of pigeonpea per week = **\$ 300,000** & **140 metric tonnes** of sorghum/millet per week = **\$ 200,000**.



Study undertaken by:



The United Republic of Tanzania
PRIME MINISTERS OFFICE
MINISTRY OF HEALTH AND SOCIAL WELFARE
MINISTRY OF EDUCATION AND VOCATIONAL TRAINING

With appreciation, support from:



IFAD
INTERNATIONAL FUND FOR AGRICULTURAL DEVELOPMENT
In collaboration with
Somni project

Current situation and challenges:

- Despite progress in improving nutrition, protein malnutrition and nutritional anaemia remains very high in Tanzania
- Tanzania is one of the largest producers of pigeonpea (multipurpose drought tolerant, protein rich legume which also enriches soil fertility due to nitrogen fixing capacity)
- Pigeonpea is not only a vital source of income for smallholder farmers, but a potential source of protein for families and source of fodder for livestock
- Tanzania's annual production of pigeonpea is approximately 200,000 metric tonnes, 80% of which used to be exported to India as whole grain. This reliance on export exposes farmers to high risk, as seen with the restrictions on pigeonpea imports by India since 2017, leaving farmers with excess stock and low domestic demand to buy the produce
- Pigeonpea consumption is low despite the need for protein to be included in diets of rural and urban poor, which is dominated by maize and cassava
- Low production and consumption of nutritious and climate resilient cereals like sorghum and calcium rich finger millet
- Maize is the most produced food crop. In the arid regions more suited to growing sorghum and millet, maize fails 3 out of 5 years.

Tanzania is one of the largest producers of protein-rich pigeonpea. Yet, consumption is low despite the need for protein to be included in diets of the poor.

Project design and implementation

Consultation and key partners included: The Prime Minister's office, Ministry of Education, Ministry of Health, Tanzania Agricultural Research Institute (TARI) - Selian, Export Trading Group (ETG - Farmers Foundation working with farmers to build their capacities to produce more and profitably) and Agricultural Markets Development Trust (AMDT - A trust working to develop agricultural value chains to improve livelihoods of farming communities).



3 main questions were tested:

- Did the students accept the changes in school meals?
- Did the Smart Food meals make economic sense?
- Did the changed recipes improve the nutritional value of the school meals?

District level nutrition officers from the Ministry of Health and chefs trained school cooks on recipes with sorghum, millet and pigeonpea. Recipes included finger millet porridge, pigeonpea with groundnut and with coconut milk.

Students were educated on nutrition values of foods and importance of diversity.



- School Locations: 2 in Babati and 2 in Kondoa district. Sites were selected due to existing projects to support farmers growing legumes and sorghum/millet
- Student population: 2822 high school students in total
- Baseline: Project analysed existing diets, perceptions and food budgets
- Previous school meal: Pure maize meal porridge, maize ugali with boiled beans, rice with boiled beans, fruit/vegetable twice a week
- New school meals: finger millet porridge (usually for breakfast), Maize cooked together with pigeonpea (Makande), maize meal with pigeonpea stew, rice with pigeonpea stew
- Baseline Perceptions: Pigeonpea is bitter, smells bad, not good for mental health etc.

Recipes used in the study

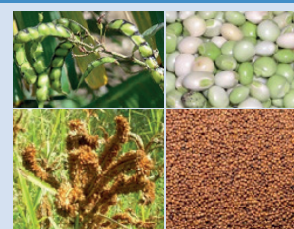
Day	Breakfast – Average serving size in g/student/meal ± SD	Lunch – Average serving size in g/student/meal ± SD	Dinner – Average serving size in g/student/meal ± SD
1	Maize porridge (400 ± 100)	Maize meal (<i>Ugali</i>) 350 ± 100, Bean as side dish 200 ± 50	Maize meal (<i>Ugali</i>), 350 ± 100, Bean as side dish, 200 ± 50
2	Maize porridge (400 ± 100)	Maize meal (<i>Ugali</i>) 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 (<i>Makande</i>) 400 ± 100	Maize meal (<i>Ugali</i>) 350 ± 100, Bean as side dish 200 ± 50
4	Maize porridge (400 ± 100)	Maize meal (<i>Ugali</i>) 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 (<i>Makande</i>) 400 ± 100	Maize meal (<i>Ugali</i>) 350 ± 100, Bean as side dish 200 ± 50
6	Maize porridge (400 ± 100)	Maize meal (<i>Ugali</i>) 350 ± 100, Bean as side dish 200 ± 50	Maize meal (<i>Ugali</i>) 350 ± 100, Bean as side dish 200 ± 50
7	Maize porridge (400 ± 100)	Maize meal (<i>Ugali</i>) 350 ± 100, Bean as side dish 200 ± 50	Rice 350 ± 100, Bean as side dish 200 ± 50

School meals were changed: Pigeonpea was offered 2 times a week and finger millet 2 - 7 times a week



School meals were previously reliant on maize and beans purchased from outside local area as the region is too arid to grow these crops

Pigeonpea is grown by local farmers usually for export. India's restrictions on pigeonpea imports had left farmers with surplus harvests, which was now bought by the schools. Calcium-rich finger millet is also grown in the region.



Economic impact of changing school meals to include locally available pigeonpea

	Cost reduction for the school
School A	99388 Tsh (US\$ 43)
School B	41700 Tsh (US\$ 18)
School C	97200 Tsh (US\$ 42)
School D	19800 Tsh (US\$ 8.5)

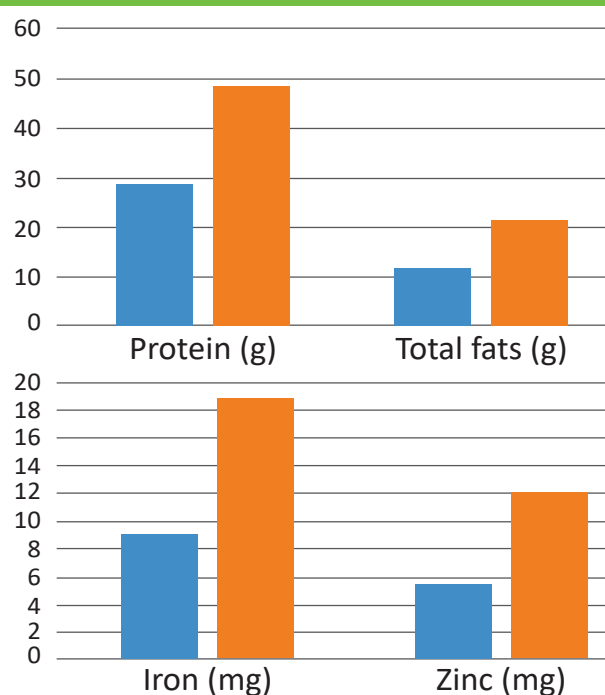
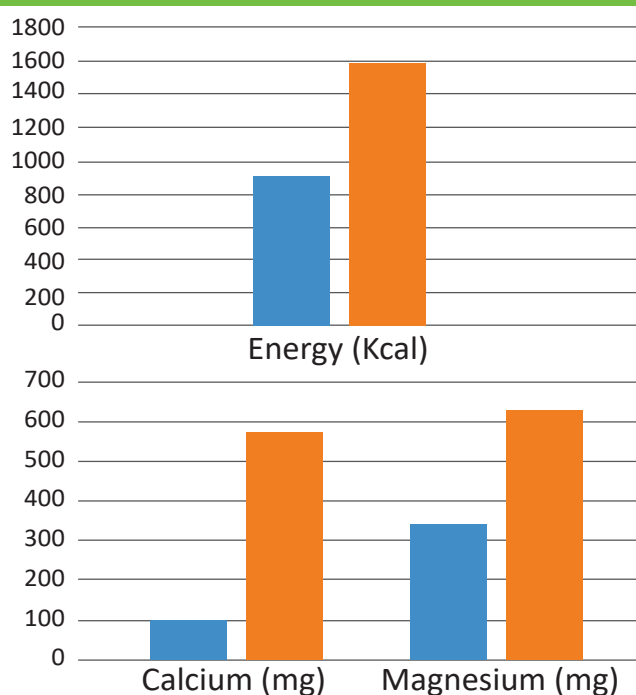


Savings per meal means more budget for extra fruit/vegetable to further improve nutrition

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)

Nutrient Value of previous menu (average) Vs new menu (average)



■ Previous menu (average) ■ New menu (average)

Nutrition comparison of previous and revised school meals

As the schools are residential, children eat breakfast, lunch and dinner there. The previous menu included ugali (maize meal) with beans, Makande (beans with maize) and rice with beans. This study used finger millet, pigeonpea, vegetables, peanut butter and maize to formulate recipes. Students' average nutrient intake was compared before and during the study intervention and summarized in the table below.

The Tanzania food composition table (Lukmajni et al., 2008) was used to calculate the nutrient value of recipes consumed before and during intervention. Each food item consumed by the students was calculated from dietary assessment which gave an average nutrient consumption per day for each child.

Though the students ate three main meals per day before the intervention, the calorie intake, and intake of protein and major micronutrients, especially iron and calcium, was low during baseline as shown in table below. These students were adolescents who especially need more nutrients as they are in a critical growth period when nutrients, in particular, micronutrients (iron and calcium), along with protein and calories, are essential.

Challenges faced during implementation:

- Access to fresh pigeonpea – parents prefer the fresh green pigeonpea which cooks quicker and tasted better in their view
- Increased demand for pigeonpea = increase in prices which then affect the school budget
- Insect damage in stored pigeonpea
- Cost and availability of crushed groundnuts which students like in the recipe
- Cost of finger millet
- Changing mindsets on school meals (this was addressed through nutrition awareness training).

How to address some of the challenges:

- Get improved pigeonpea varieties for school meals supply
- Increase training on recipes and sensitize other schools
- Farmers use safe storage methods to prevent insect damage like triple layer bags.



What needs to be done next?

- The project outcomes support a call to scale this out to other schools & institutions
- Train further schools to adapt nutritious recipes for their student populations
- Train and support schools to enable crop access and safe storage
- Reinforce this study with a detailed clinical trial on the nutritional benefits of the different meal combinations.

The published study:

Wangari C, Mawia C, Siambi M, Silim S, Ubwe R, Malesi K, Anitha S and Kane-Potaka J. 2020, **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.** *Ecology of food and nutrition*. <https://www.tandfonline.com/doi/full/10.1080/03670244.2020.1745788>

Citation: ICRISAT, 2019, Smart Food in Tanzania: Pilot study to make healthier and cost-effective school meals, Smart Food brief 3, Hyderabad, India. 4 pp.

Writers: Alina Paul; **Design:** Vengala Reddy Ch; **Editing:** Smitha Sitaraman

Photos: Salim Shabani, Real To Reel Film Production, Dar Es Salaam, Tanzania.

Photos edited: Srujan Punna, ICRISAT

Email: SmartFood@cgiar.org

Executive Council:

