Constructing a Nutritionally Balanced Food Basket for Zanzibar a Case Study

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Research Objective

This research builds on previous work in which the author used household survey data to construct a set of *representative* food baskets for different geographical regions of Tanzania (Cochrane and D'Souza 2015). By calculating the monthly cost of the food baskets and comparing that cost to per capita income, the author derived a measure of *access* (ability to purchase) to food. The new research takes that work one step further to address the *utilization* pillar (individual's ability to process nutrients and energy from food). The representative food baskets are based on actual consumption; they do not provide a nutritionally balanced diet; nearly all are deficient in a number of essential nutrients. The objective of the current research is to construct a set of "healthy food baskets" that meet key nutritional requirements while deviating minimally from traditional diets.

The results presented here focus on the island of Zanzibar—a semi-autonomous region of Tanzania. The Zanzibar diet relies primarily in rice as a source of calories. The representative basket provides adequate protein, thanks to the high share of fish. But it is inadequate in a number of vitamins and minerals. The charts and tables that follow present some preliminary adjustments that can be made in the food basket to provide a more nutritionally balanced diet.

Background: Building a Representative Food Basket for Zanzibar

The representative food basket was calculated using data from the 2010/11 Household Budget Survey (HBS) conducted by the Zanzibar Office of the Chief Government Statistician (OCGS) to obtain consumption patterns—specifically, calorie shares of typically consumed foods—for Zanzibar households. The calorie shares were used to construct a monthly food basket that achieves per capita daily intake of 2150 calories. The monthly food basket consists of a set of foods that are typically consumed by households in the zone and make up 90 percent of total calories consumed by the average household.

Using time series price data from OCGS it is possible to calculate the monthly cost of the food basket. The ratio of the monthly per capita food basket cost and monthly per capita income provides a practical measure of food access. Any decline in the cost of food and/or increase in

income are expected to improve the food security of a household. Monitoring food costs relative to consumer purchasing power can provide timely feedback on the effectiveness of food security policies and the investment required to address problems of food security.

On average rice provides 28 percent of daily calorie intake (fig. 1). Other important sources of calories are coconut, cassava and wheat. The major source of animal protein is fish.

Figure 1: Rice is the dominant source of daily calorie consumption

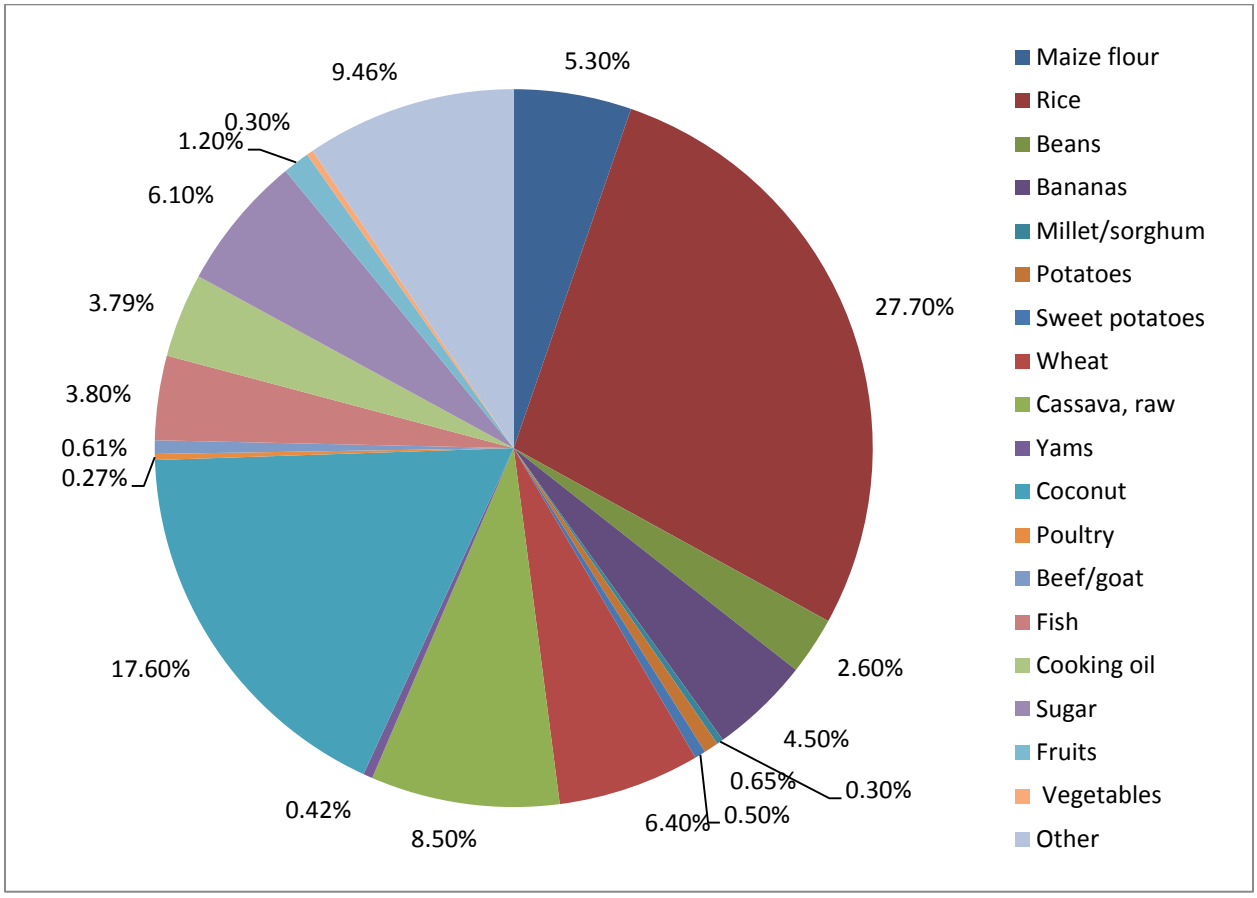


Table 1 shows the calculations of the components of the food basket in kilograms.

Table 1: Zanzibar Food Basket: Rice is the Dominant Source of Calories

Food Group	Calorie shares	Calories per kg	Calories (2150/day)	kg/day	kg/month
Maize flour	0.053	3,680	114	0.031	0.93
Rice	0.277	3,640	596	0.164	4.91
Beans	0.026	3,330	56	0.017	0.50
Bananas	0.045	1,350	97	0.072	2.15
Millet/sorghum	0.003	3,450	6	0.002	0.06
Potatoes	0.007	790	14	0.018	0.53
Sweet potatoes	0.005	1,050	11	0.010	0.31
Wheat	0.064	2,740	138	0.050	1.51
Cassava, raw	0.085	1,490	183	0.123	3.68
Yams	0.004	5,670	9	0.002	0.05
Coconut	0.176	3,760	378	0.101	3.02
Poultry	0.003	1,390	6	0.004	0.13
Beef/goat	0.006	1,550	13	0.008	0.25
Fish	0.038	820	82	0.100	2.99
Cooking oil	0.038	8,840	81	0.009	0.28
Sugar	0.061	4,000	131	0.033	0.98
Fruits	0.012	850	26	0.030	0.91
Vegetables	0.003	88	6	0.073	2.20
Other	0.095				

Source: USDA Economic Research Service using data from OCGS

..But These Representative Food Baskets Are Deficient In Key Nutrients

The representative food baskets reflect the typical diets of each region. But further analysis, using data from the Tanzanian Food Composition Tables, shows that they are seriously deficient in a number of key nutrients. The tables provide quantities of 49 macro- and micro-nutrients per 100 grams for a wide range of foods, including cereals, pulses, roots and tubers, vegetables, fruits, dairy products and miscellaneous other foods. We multiplied the daily quantities of each food in the food basket by the nutrient content of the food and summed up the values to derive an estimate of daily consumption of each nutrient. Comparing those estimates with average minimum daily requirements for adult men and women shows the following deficiencies.

Results for Zanzibar are shown in tables 2 and 3.

Table 2: Representative food basket provides inadequate amounts of most vitamins…

Nutrient	Protein	Fat	Vitamin A	Vitamin E	Thiamine	Riboflavin	Niacin	Folic acid	Vitamin B12
Unit	grams	grams	mcg	mg	Mg	mg	mg	Mcg	mg
Obtained from food basket	67.91	110.98	248.14	4.70	0.95	0.69	12.02	285.97	0.11
Requirements									
Men	39-46		900	15	1.2	1.3	16	400	2.4
Women	41		700	15	1.1	1.1	14	400	2.4

Source: USDA Economic Research Service using data from OCGS and the Tanzanian Food Composition Tables

Table 3: …as well as many minerals

Nutrient	Calcium	Phosphorous	Magnesium	Potassium	Sodium	Iron
Unit	mg	mg	mg	mg	mg	mg
Zanzibar	87.69	648.57	261.84	2031.81	101.04	8.06
Requirements						
Men	1000	700	410	4700	1500	8
Women	1000	700	315	4700	1500	18

Source: USDA Economic Research Service using data from OCGS and the Tanzanian Food Composition Tables

Among the important conclusions:

- The representative basket is adequate in protein, thanks to the high share of fish.
- The basket is seriously deficient in vitamins A, E, and B12, riboflavin, folic acid, calcium, magnesium, and potassium.
- The basket comes close to meeting requirements for other vitamins and minerals.

Towards a Healthier Food Basket in Zanzibar

In consultation with experts from the Zanzibar Ministry of Agriculture adjustments were made to the representative basket in a way that came closer to meeting daily requirements for key vitamins and minerals and did not raise the cost of the basket. The result came much closer to providing a balanced diet.

Table 4: Adjustments to the Food Basket

Added foods to the basket	Changes in calorie shares
Milk, omitted from the representative basket due to its low calorie share.	Raised shares of leafy green vegetables, using cassava leaves instead of spinach or other

	greens. Cassava leaves are more widely available and cheaper.
Eggs	Replaced white sweet potatoes with orange sweet potatoes and raised the share.
Separation of vegetables into two groups: leafy greens and tomatoes. These contain significant amounts of key vitamins and minerals, while differing in their nutrient content.	Reduction of the share of fish: while fish is an important source of protein, vitamin C, folic acid, calcium, and other minerals, it is very expensive and is not affordable in sufficient quantities for the lower income quintiles.
Separation of fruit into ripe bananas, mangos and papaya, and other fruit. These three groups differ in their nutrient content.	Raised the share of beans to provide a lower cost source of protein and other nutrients provided by fish in the representative basket
	Raised the share of fruit and selected papayas rather than mangos, since mangos are rather expensive
	Reduced the shares of wheat and sugar
	Raised the share of milk

The new basket provides adequate amounts of most vitamins, which the exceptions of vitamins E and B12, but it still falls short of requirements for calcium and other minerals. It proved particularly challenging to identify a readily available source of calcium.

Table 4: The healthier basket meets requirements for most vitamins…

Nutrient	Protein	Vitamin A	Vitamin E	Thiamine	Ribo-flavin	Niacin	Folic acid	Vitamin B12
Unit	grams	mcg	mg	mg	mg	mg	mcg	mcg
New basket	92.92	899.22	7.52	1.10	1.43	10.99	459.05	1.61
Requirements								
Men	39-46	900	15	1.2	1.3	16	400	2.4
Women	41	700	15	1.1	1.1	14	400	2.4

Source: USDA Economic Research Service using data from OCGS and the Tanzanian Food Composition Tables

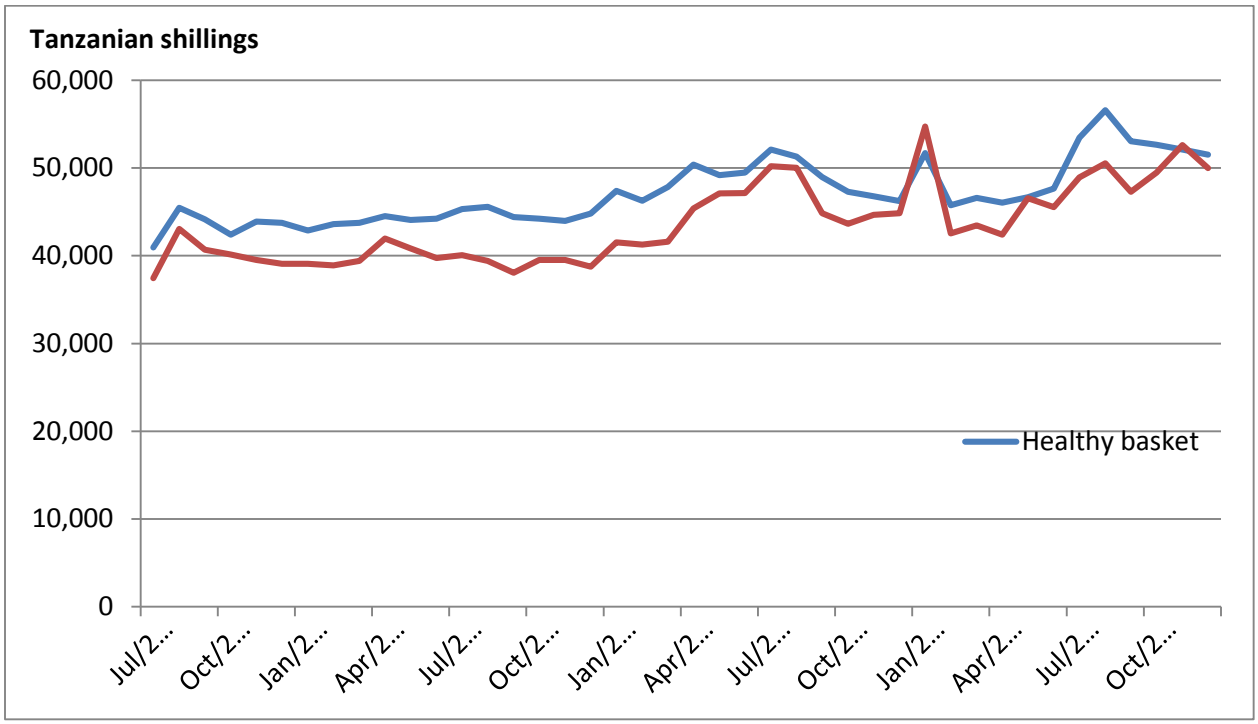
Table 5: …but still falls short on calcium and other minerals

Nutrient	Calcium	Phosphorous	Magnesium	Potassium	Sodium	Iron
Unit	mg	mg	mg	mg	mg	mg
New basket	466.94	957.59	318.47	2906.12	288.40	9.30
Requirements						
Men	1000	700	410	4700	1500	8
Women	1000	700	315	4700	1500	18

Source: USDA Economic Research Service using data from OCGS and the Tanzanian Food Composition Tables.

The new, healthier basket is somewhat higher cost than the representative basket, as can be seen in figure 1. The reason is the increase in the share of fruit, which is relatively expensive on Zanzibar markets.

Figure 2: Monthly cost of healthier basket is roughly the same as the representative basket



Source: USDA Economic Research Service using data from OCGS.

Policy Implications

Access remains a problem, particularly for the bottom income quintile. To measure access, the food basket cost was divided by average per capita GDP (the closest available proxy for household income) for each income quintile. For the bottom quintile, the cost of the representative food basket exceeds 80 percent of average income. The second quintile is also vulnerable to food insecurity, since the food basket cost is 60 percent of average per capita GDP. Since the healthy food basket is somewhat more expensive than the representative, access becomes a more serious problem.

Inefficient marketing system. In the representative basket, fish is the main source of protein. But fish is very expensive and has the largest cost share in the food basket. Experts at the Zanzibar Ministry of Agriculture estimate that post-harvest losses for sigh are as high as 40 percent. More efficient handling and marketing could lower the cost of fish for households. A number of deficiencies were also noted in the marketing of milk, fruits, and vegetables.

Need for nutritional education. Leafy green vegetables are widely grown in Zanzibar, but they are not consumed by households—examples are cassava and pumpkin leaves. Some nutrition projects are aimed at educating households on the importance of vegetables to a healthy diet, but they are only reaching a small portion of the population. Additionally, the Zanzibar food basket would benefit from some substitution away from rice, but nutrition experts there believe that that rice consumption is such a strong cultural tradition that it would be difficult to persuade households to consume less of it.

Fortification of foods may be necessary. It proved particularly difficult to identify sources of calcium, and fortification may be the only way to provide adequate amounts of calcium.

Selected References

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