Fill the Nutrient Gap

Nutrition situation analysis framework and decision tool

Findings for IANDA / Cost of the Diet in Ghana

WFP, 2017

The analysis conducted in this document was possible thanks to data collected for/by the IANDA project in collaboration with the Ghana Ministry of Food and Agriculture (MoFA), and funding to WFP from BMZ.

The FNG team was able to re-analyse the CotD in Ghana with an extended list of food and new prices that reflect the current market prices in the Northern and Brong Afaho regions in Ghana. In addition, new locally produced fortified products, which were designed for Ghanaian market, were also added to the list of foods. Results from this analysis are a follow up to the FNG analysis conducted in 2015/2016 in Ghana and are summarised in this document.

Executive Summary

Thanks to the data collected by the Ghana Ministry of Food and Agriculture (MoFA) in collaboration with IANDA, the impact of the food list on the estimated cost of a nutritious diet has been highlighted. Expanding the food list from 38 to 56 commodities, especially by adding more vegetables, fruits and legumes (out of 18 added foods, 6 are vegetables, 4 are fruits and legumes/seeds, 5 are fish and meat and 3 others), decreased the cost of the nutritious diet (SNUT) by 30%. This supports the decision of having a minimum list of close to 60 foods from diverse food groups for conducting Cost of the Diet analyses as one of the Fill the Nutrient Gap standards.

Also, the relatively high cost of a nutritious diet for adolescent girls and women, especially while pregnant or lactating, was highlighted. During pregnancy and lactation, some of the nutrient requirements are higher, which results in higher costs. For the child (6-23 months) provision of locally produced Kidifeed (voucher) and SQ-LNS (Grownut) (voucher) were the most effective in reducing the cost of a nutritious diet, respectively by an average of 84% and 60% in both regions, indicating that they are very good sources of essential nutrients. For the adolescent girl, the fresh food voucher for eggs and green leafy vegetables was the most cost-effective (average of 30% cost reduction in both regions), which is explained by their relatively high content of calcium, iron and B12, which are limiting nutrients. For PLW, SC interventions (SC, SC+ and SC with fortified oil) were the most cost-effective and even more so when SC was modelled by adding it to a daily diet that included one serving of staple food, rather than two. On average, provision of SuperCereal for free (using a voucher) reduced the cost of a nutritious diet for PLW by 50% in both regions.

For the Obaasima products, the analysis found them to be less cost-effective to meet nutrient requirements compared to other options, which is due to the fact that their content of specific nutrients, including panthotenic acid, iron and vitamin B12, was lower than that of the other fortified options included in the model. Among the three products, the Lola Milk Biscuit performed better, indicating that it was a more cost-effective source of essential nutrients. Besides nutrient content and cost, acceptability and actual amount consumed by the intended targeted group are also important determinants of whether a specific food will be able to make a good contribution to improving nutrient intake. Consumption of Obaasima products is likely to make a meaningful contribution to meeting nutrient intake requirements even when it has a lower content of certain micronutrients than other foods that consumers may or may not prefer over those products. Nevertheless, it would be good to consider increasing the content of the specific micronutrients for which content is relatively low.

Overall, the previous CotD analyses and those shared in this report have shown that the costs of a nutritious diet are relatively high, compared to a diet that only meets energy needs, and that a substantial proportion of the population cannot afford these costs (about one third in the previous analysis, ranging from 12% to 78% across regions). Any strategy or intervention that increases the availability and lowers the costs of nutritious foods (i.e. those that have a high content of essential nutrients relative to energy content), whether from natural foods or processed fortified foods, and whether by making them available for free, at subsidized price or regular price, and/or increases income can improve affordability and hence likelihood of increased consumption of nutrient-rich foods and hence better meeting nutrient requirements among different target groups.

The examples analysed in this report compare the extent to which different foods and distribution modalities reduce the cost of a nutritious diet for specific target group and can be used to select (combinations of) approaches and distribution channels for improving nutrition among specific groups or the population in general. Apart from selecting cost-effective options for improving nutrient intake, the acceptability and demand for the different foods by the target population should also be ensured.

Introduction

A Cost of the Diet (CotD) analysis was conducted in 2015/2016 in Ghana, using data collected in October 2015, by the "Fill the Nutrient Gap" (FNG) team from WFP. The results showed that, based on the data available from the Ghana Ministry of Food and Agriculture (MoFA) at the time, it was not possible to meet nutrient requirements for any of the SNUT[1] diets in four of the nine regions analyzed (Upper West, Upper East, Brong Afaho and Eastern). This is partly due to the short list of foods that prices were available for for those areas. For the other five areas, where prices were available for 36 foods, nutrient requirements could be met and a minimum cost of the SNUT (staple-adjusted nutritious) diet for a modeled household was calculated.

As a component of their research, the "Indicators of Affordability of Nutritious Diets in Africa" (IANDA) Project collaborated with the Ghana Ministry of Food and Agriculture (MoFA) to collect market prices of foods available in the Brong Afaho & Northern regions of Ghana. MoFA collected the data with their regular enumerators and methodologies, except that the food list was expanded to include a greater diversity of commonly-consumed, nutrient-dense foods such as green leafy vegetables. The new set of data includes a broader list of food commodities: 58 different food items compared to 36 used previously, and their current market prices. As part of a collaboration, the IANDA team was able to share the food price data collected in those two regions between November 2016 and January 2017 with the FNG team. In the future, data on the expanded food list will be publicly available for other regions as well, as MoFA is currently in the process of updating the food list nationwide.

The FNG team used this new set of data in order to analyze the Cost of the Diet (CotD) for the Household. To measure the impact of different prices and of a broader list of food commodities, the analysis was done in 3 parts. First, for the Northern region, the old list of food was updated only with the new prices, to see the impact that current prices had on the cost a nutritious diet for the household compared to the previous prices. Second, the broader list of foods with their recent prices was used to calculate the CotD for the Household (HH) for both regions. Results from the previous analysis "the SNUT- original food list (Oct 2015)", the analysis using only new prices "SNUT- original food list (Nov 2016-Jan 2017)", and the one using the broader list of foods "SNUT-IANDA expanded food list (Nov 2016-Jan 2017)" are summarized in the first part of this document. Thirdly, modelling of different food based interventions, including specific locally produced fortified products, was conducted using different distribution modalities (voucher vs market based) for both regions. Results for the latter analysis are presented in the second part of this document.

[1] Stapled adjusted Nutritious diet

Results of the CotD analysis

Comparison of the CotD in Northern and Brong Afaho regions, using the expanded IANDA-MoFA data

Details of the cost to meet the staple adjusted nutritious diet (SNUT) for each individual within the selected households are shown in Figure 1. This cost was calculated using the extended food list (58 commodities) with market prices collected between November 2016 and January 2017. The daily cost is 9.16GHC for a 5 person HH in the Northern region, and 8.82GHC for a 4 person HH in the Brong Afaho (BA) region.

In the Northern region, the most expensive diets are the ones for the PLW and for the adolescent girl, representing approximately 65% of the household's cost in the Northern region. In the BA region, the cost of the PLW is equal to almost 50% of the entire cost of the diet for the household (in the BA region, an adolescent girl was not included in the model). These charts highlight the difficulty for the PLW and adolescent girl to meet their nutrient requirements compared to other members in the HH.

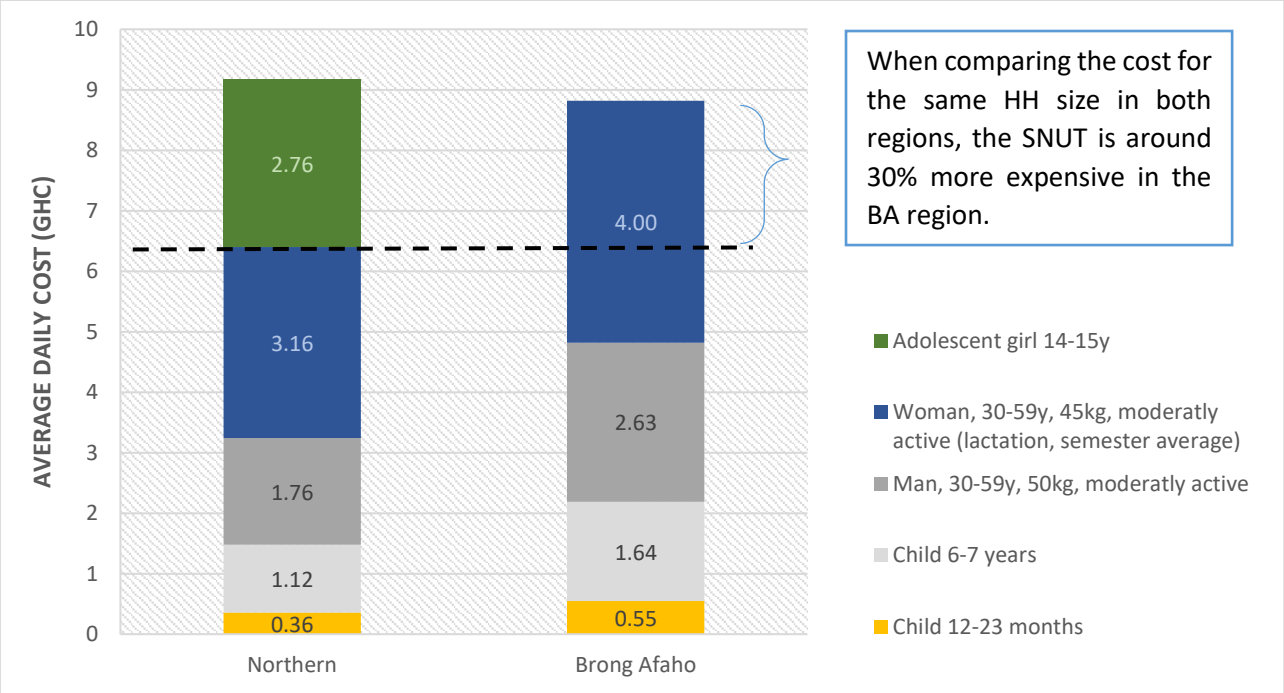


***FIGURE 1:* Comparison of the cost of the SNUT diet for a household in the Northern and Brong Afaho regions in Ghana**

Comparison of the results of the original short vs the expanded food list, for Northern region

The expanded food list contains twice the number of vegetables compared to the previous one. Vegetables are usually a cheaper source of different essential micronutrients (vitamin A, B-vitamins, folic acid, etc.), so including more of these foods in the list of foods from which the tool can select the most nutritious, lowest cost foods, is likely to result in a reduction of the cost of the diet of the household. Figure 2 shows the results of the analyses of Cost of the Diet for the HH in the Northern region. The first column uses the original price list and data collected in Oct 2015. In the second column, the cost has been calculated by updating prices without adding any new foods. This was done to be able to check whether the cost reduction observed with the IANDA-MoFA expanded food list compared to the original CotD analysis was caused by the larger number of foods now available and/or by a difference of prices. For the third column, the cost has been calculated with the expanded food list. The impact of this new food list is much more significant than the one with new prices. Note that the previous prices were collected a year before at the beginning of the same season, in October 2015.

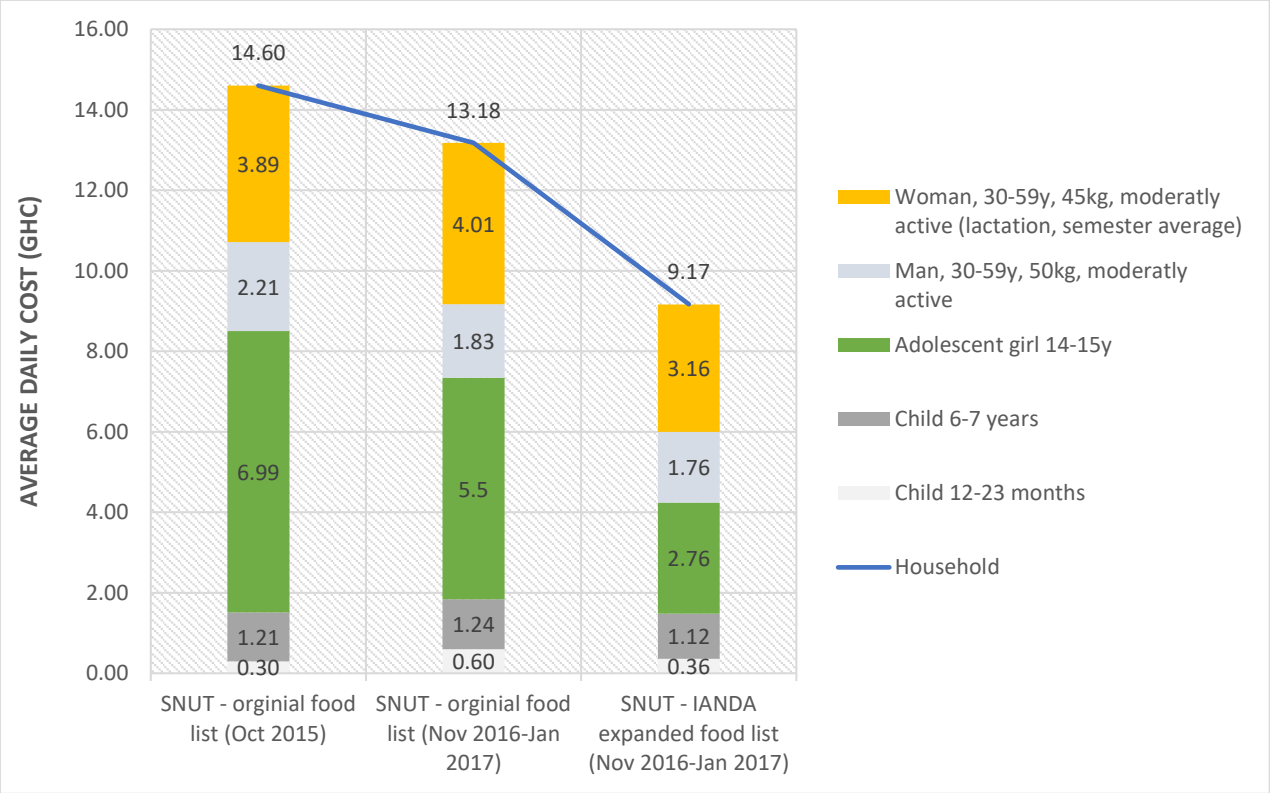


***FIGURE 2:** Comparison of Cost of the SNUT diet for Household (5P) using new prices and expanded food list in the Northern Province of Ghana*

Figures 3 & 4 shows the daily quantity of foods within food groups included in the SNUT for the HH. When the software tool models diets that most affordably meet nutrient needs, the main differences in the Northern region between the previous analysis and the current one are:

- The amount of legumes selected by the software has doubled
- The amount of vegetables selected by the software has increased 7 times
- The amount of fish and eggs selected by the software has decreased respectively by 6.3 and 2 times

The software is choosing vegetables (mostly green leafy) and legumes as source of several micronutrients, which in the previous diet calculated was mainly contributed by fish and eggs. Vegetables are much cheaper than fish or eggs, which can explain why the cost of the SNUT for the HH decreased by 30% when the food list was expanded. The original MoFA list of foods contains only 4 vegetables: Eggplant, Okra, Onion and Plantain. These commodities are not a great source of several micronutrients such as vitamin A & C, folic acid or calcium. The expanded MoFA food list, facilitated by IANDA, contains 10 vegetables, including water spinach, jute & amaranth leaves, which are good sources of the micronutrients listed above. For example, in the Northern region the model output includes a daily portion of 1064g of amaranth leaves (edible quantity) for the five HH members (e.g. approx. 200 g/cap/d), which provides 23% protein, 88.3% vitamin A, 222.7% vitamin C, 70% vitamin B2, 15% niacin, 36.5% vitamin B6, 50.9% folic acid, and 91% calcium that is required for the entire HH (at a 1.92 GHC cost).

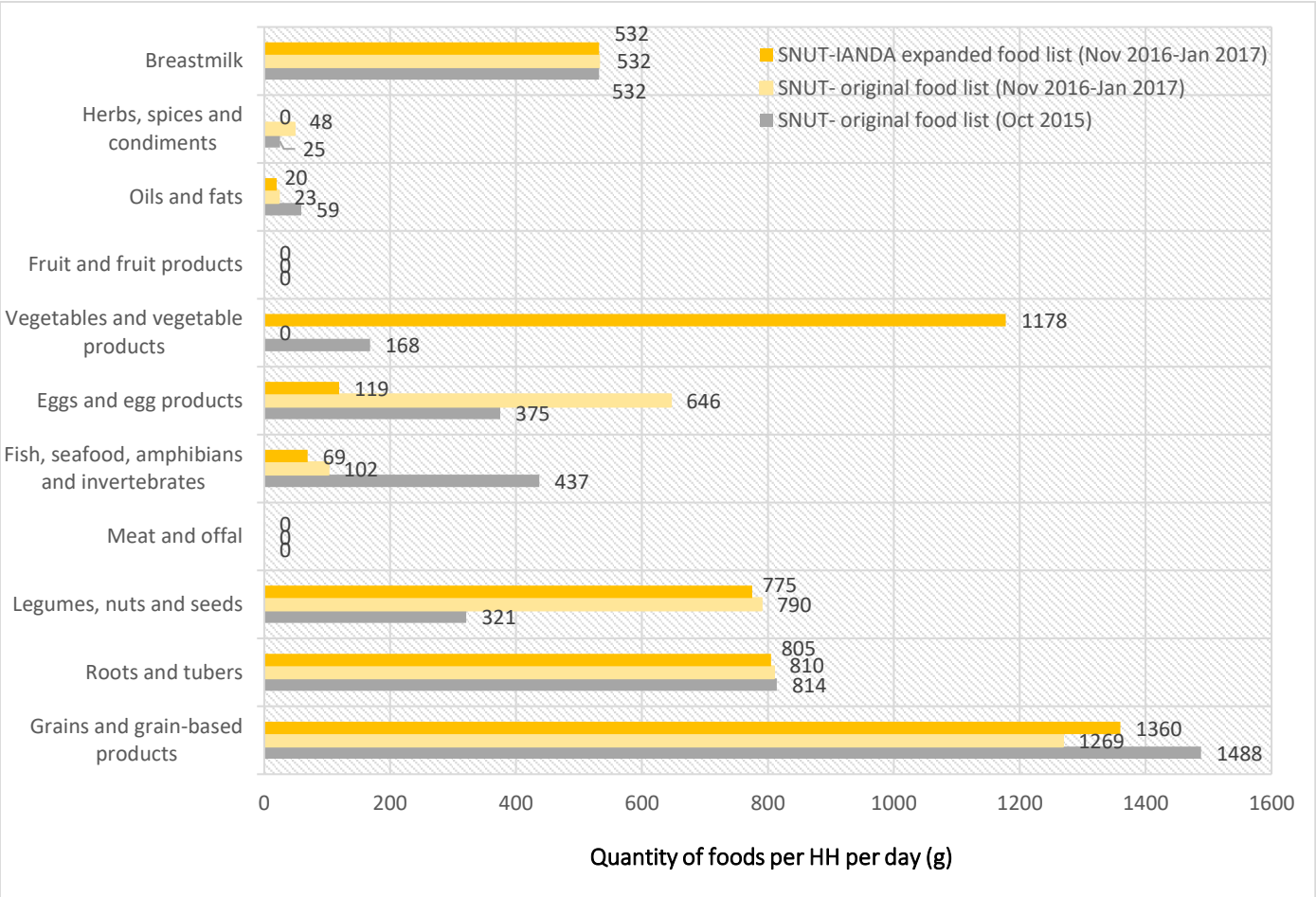


FIGURE 3: ***Quantity of foods per HH per day (g) in the different SNUT diets in the Northern region, Ghana***

Note: The software was not able to calculate a SNUT in the previous analysis made by the FNG team for the Brong Afaho region. All subsequent analyses for this region are for the extended list of foods.

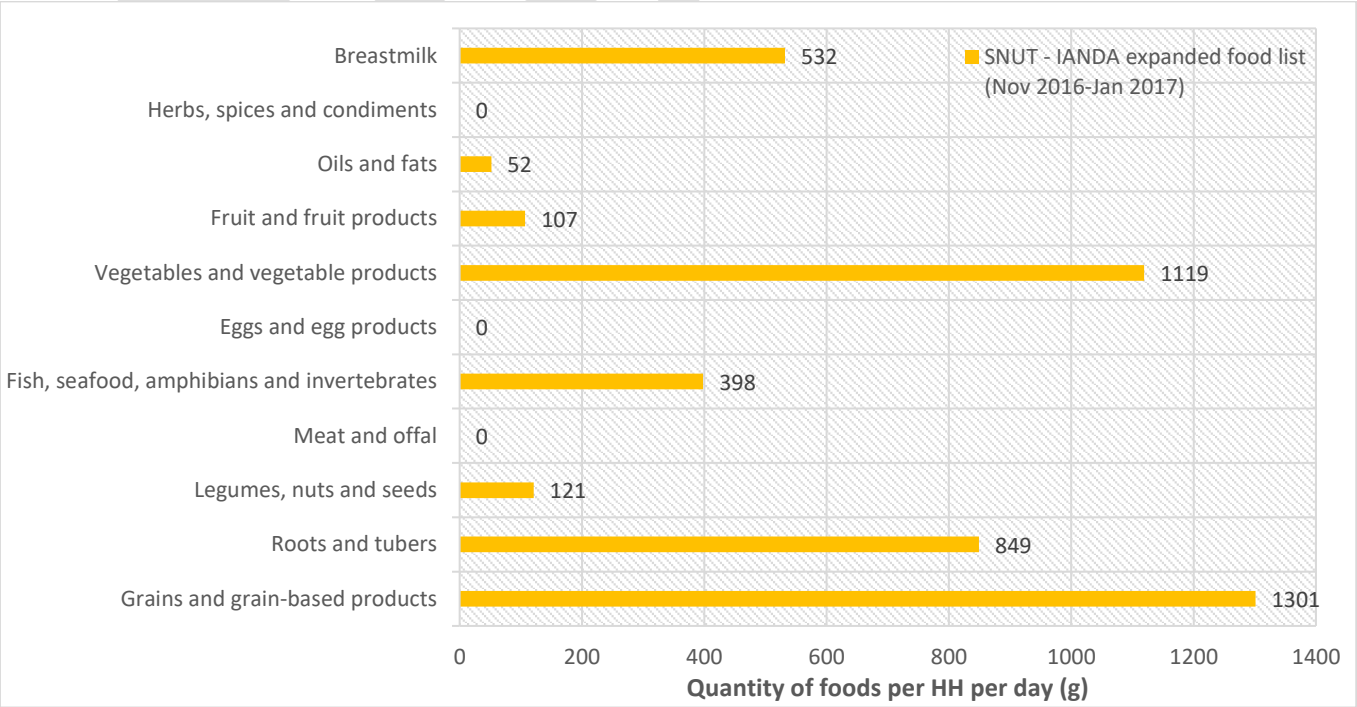


FIGURE 4: ***Quantity of foods per HH per day (g) in the SNUT diet in the Brong Afaho region, Ghana***

Modelling Plan

A number of suggested interventions were modelled to reduce the Cost of the Diet, in order to improve nutrient access for key target groups, such as through introducing fortified foods. For this purpose, the new food price data was complemented by data on fortified special foods. The selection of these foods was based on a recent WFP market assessment and report from the Country Office on the GIZ ANF4W project (Affordable Nutritious Foods for Women). The ANF4W project worked with Ghanaian small and medium enterprises (SMEs) to develop three locally produced products fortified with 18 vitamins and minerals, targeting PLW food habits and nutrient needs. ANF4W also developed a nutritional quality seal, the "Obaasima" seal, in collaboration with Ghanaian public and private sector stakeholders, to label the three products.[2]

With these fortified foods, the effects of different possible intervention types and transfer modalities were modelled, including vouchers (no cost to consumers) and subsidised prices (50% of the market price). The interventions that were modelled for the two regions were based on stakeholder inputs. In both regions, new Obaasima products along with Super Cereal (SC)[3] and orange flesh sweet potato[4] (OFSP) were included in the model for lactating women. Options for targeting young children might include vouchers for a fortified blended food like Maisoy Forte, KidiFeed, SC+, SC+ (CHAI), or CereSoya, a fortified complement to add to porridge, i.e. Koko Plus, or a small quantity lipid-based nutrient supplement (LNS-SQ), i.e. Grownut[5] or iLiNS formulation. For a comparison of the nutrient content of these products, see tables 12.1 and 12.2 in Annex. Voucher/market interventions were also modelled for potential specific intervention for adolescent girls in both regions.

[2] Obaasima products: TomVita (a fortified instant whole grain porridge), Lola Milk biscuit (a fortified cookie/biscuit), and Samba Shito (fortified hot pepper condiment sauce).

[3] Maizsoya is the Super Cereal (SC) that is modelled in the analysis, nutritional information is available in annex. It's currently produced in Ghana and being provided for PLW in certain parts of the country.

[4] OFSP is actively promoted in Ghana for PLW at ANC.

[5] Grownut is currently being produced by Project Peanut Butter for in-country distribution.

Target Group	Child 12-23 months							Lactating woman							Adolescent girl			
Modality	Voucher/market prices							Voucher/market prices							Voucher/market prices			
Intervention	SC+	SQ-LNS (groundnut) & (iLiNS)	Maisoy-Forte	Koko Plus	Cere-soya	Kidi-Feed	SC	Fruit and fish	Fruit and egg	SC and fortified oil	Obaasima products	SC +	SC	OFSP	Fruit and egg	Obaasima products	SC	OFSP
Brong Ahafo	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Northern	x	x	x	x	x	x	x			x	x	x	x	x	x	x	x	x
Portion size (g)	62	20	62	15	62	80	62	86g of palm fruit and 72g of herring fish	86g of palm fruit and 115g of eggs	150g SC and 28g of fortified oil	TomVita 100g, Lola Milk biscuit 40g, Samba Shito 15g	150	150	230	92g of palm fruit and 122g of eggs	TomVita 100g, Lola Milk biscuit 40g, Samba Shito 15g	150	245

TABLE 1: ***Modelling Plan***

General methodology

- When modelling the voucher modality, the specific products were provided at one portion per day at no cost to the consumer.
- When modelling at market price, the specific products are included in the food list among all the other food commodities, and the software will include the product in the diet if it is a cheaper source of nutrients than the other foods available.
- When modelling products at subsidised price (half of the market price), the same methodology is followed.
- The maximum intake has been set to one portion a day. The portion size depends on the product, see table 1 above.
- When different modelling was conducted, the specific method used will be described along with the result.

TomVita, Lola Milk biscuit & Samba Shito are the new locally produced fortified products for women that are called Obaasima products, which were designed especially for the Ghanaian market. They were modelled together and separately to measure the impact on the cost. When modelling all together, they were referred to as “Obaasima products”. For all 3 modalities of interventions (voucher, market prices, subsidised prices), the tool was able to include each of these 3 products or a combination of them or none of them into the diet. For example, when modelling the voucher, the tool was able to include a free daily portion of all of these 3 products into the diet, any combination of them, or none of them at all. In

this way, the most optimal combination, in terms of nutrient contribution and cost reduction could be selected by the tool.

Limiting Nutrients

A 'limiting' nutrient is defined as a nutrient that the software met the requirements for by just 100% (i.e. not exceeding it), which indicates that meeting them was challenging, which is likely due to limited availability and relatively high cost of good food sources of the specific nutrient.[6] For the greatest impact in reducing the cost of the SNUT diet, the cost of good food sources of these nutrients needs to be reduced. This could be accomplished by increasing availability in order to lower prices of existing foods that are rich in these nutrients, subsidising those foods, or providing vouchers to obtain them for free, or introducing new foods into the market that are rich in these nutrients, which could be natural foods as well as fortified foods.

A number of limiting nutrients were found when modelling the SNUT diets that did not yet include the fortified and nutritious foods listed in table 1. For the model household previously described (5 members for the Northern region, and 4 members in the BA region) pantothenic acid, vitamin B12 and iron were found to be key limiting nutrients. For more details, please see table 2.

Region	Target group	Protein	Vitamin A	Vitamin C	Vitamin B1	Vitamin B2	Niacin	Pantothenic acid	Vitamin B6	Folic acid	Vitamin B12	Calcium	Iron	Magnesium	Zinc
Brong Ahafo	PLW							X			X		X		
Brong Ahafo	Child 12-23 months							X			X				X
Northern	PLW							X			X		X		
Northern	Adolescent girl							X			X		X		
Northern	Child 12-23 months							X			X		X		

*TABLE 2: **Limiting Nutrients for Key Vulnerable Groups in Each Region using IANDA expanded food list (X indicates when the diet only just managed to fulfil the need for the nutrient by 100%). (Source: WFP Analysis)***

Note: All subsequent analyses for both regions are for the extended list of foods provided by IANDA. For further information, see Figures 25, 26 & 28 in the annex showing the differences in the cost reduction for the same interventions in the northern region comparing the previous food list and the new one.

[6] Note that in any modeling exercise, there will always be one or more "limiting nutrient".

Target Group: Children Under 2

The results indicate that in each region providing a daily portion of *Kidifeed* at zero cost, i.e. through a voucher or in-kind provision of the complementary food, is most effective in reducing the cost of the diet for children aged 12-23 months. SC+ CHAI shows similar effectiveness in reducing costs. This is a similar result as the previous analysis; for further detail please refer to Figure 25 in annex.

SQ LNS is also among the more effective Specialized Nutritious Foods (SNFs) for intervention with this target group (as shown in Figure 5), with the locally produced *Grownut* formulation being slightly less cost-efficient than the iLiNS formulation, as the latter has a higher content for several nutrients. The formulation of *Grownut* has been adapted to include the same premix as RUSF and LNS-MQ, which facilitates production by small local manufacturers, as premixes are expensive, have a short shelf life and a long lead time to order. The nutritional content per 100g of each product is displayed in tables 12.1 & 12.2 (in annex).

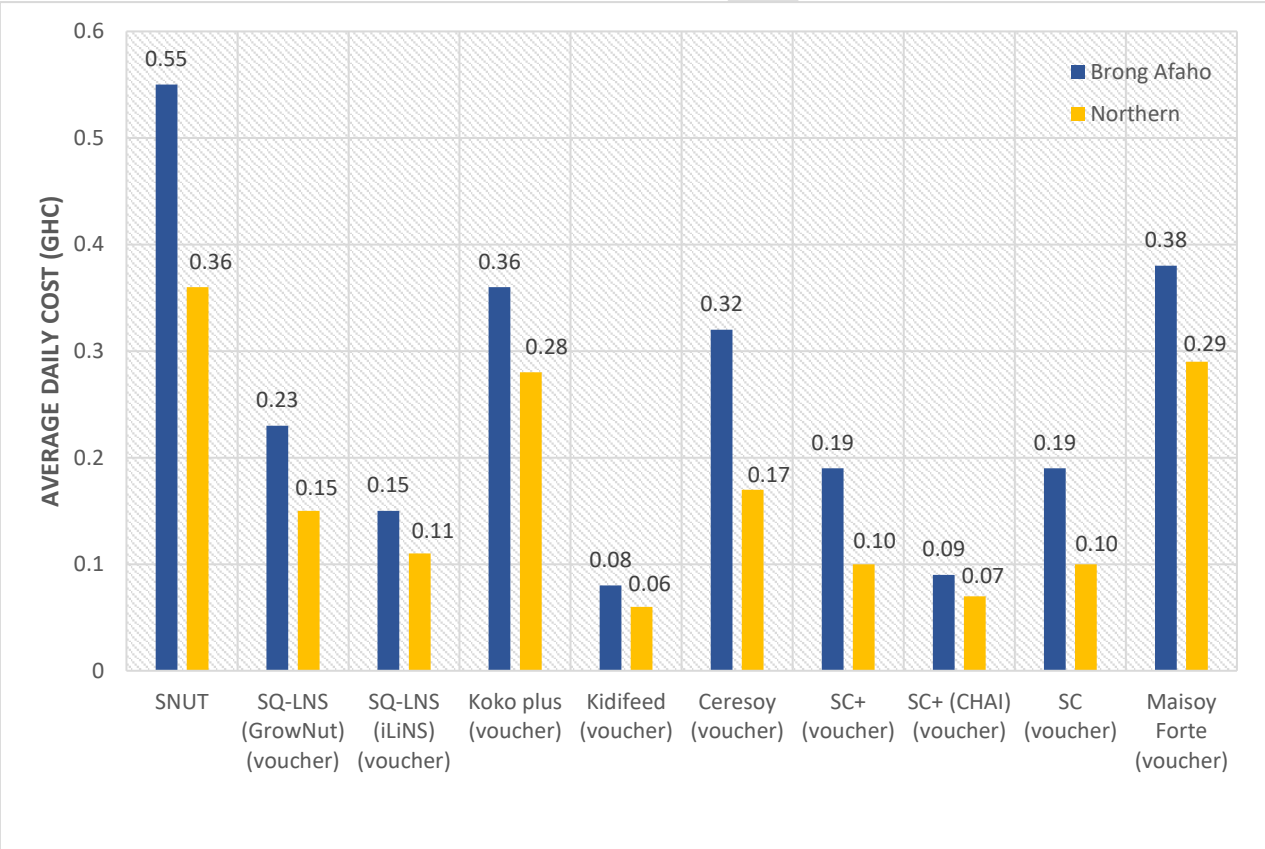


***FIGURE 5:* Comparison of the Average Cost of the Diet of a Child 12-23 months in the Brong Afaho and Northern regions with different interventions (Source: WFP Analysis), see table 3 for portion sizes modelled.**

	SQ-LNS (Grownut)	***SQ-LNS (iLNiS)***	***Koko Plus***	***Kidifeed***	***Ceresoy***	***SC+***	***SC+ (CHAI)***	***SC***	***Maisoy Forte***
Daily portion (g) provided for free	*20*	*20*	*15*	*80*	*62*	*62*	*62*	*62*	*62*

***TABLE 3:* Quantity provided of each supplement food for a child 12-23 months in the Brong Afaho and Northern regions (refers to Figures 5, 6 & 7) (Source: WFP Analysis)**

SC+, SQ LNS (Grownut) and Kidifeed, which are all locally available, result in a significant reduction of the Cost of the Diet of a Child 12-23 months when one portion/day is provided for free in the Brong Afaho & Northern regions. When modelling the same portion at market price, the cost reduction is still substantial in the BA region, but less so in the Northern region (see figures 6 and 7).

Also, the impact of SC+ on the cost reduction of the Cost of the Diet for the child 12-23 months in both regions is quite high. Indeed, if one portion per day (62g) is distributed for free (voucher), the cost decreases by 68% in BA region and 73% in the Northern region. If distributed through the market (at market price), then the cost decreases by 23% in BA region and 19.5% in the Northern region.

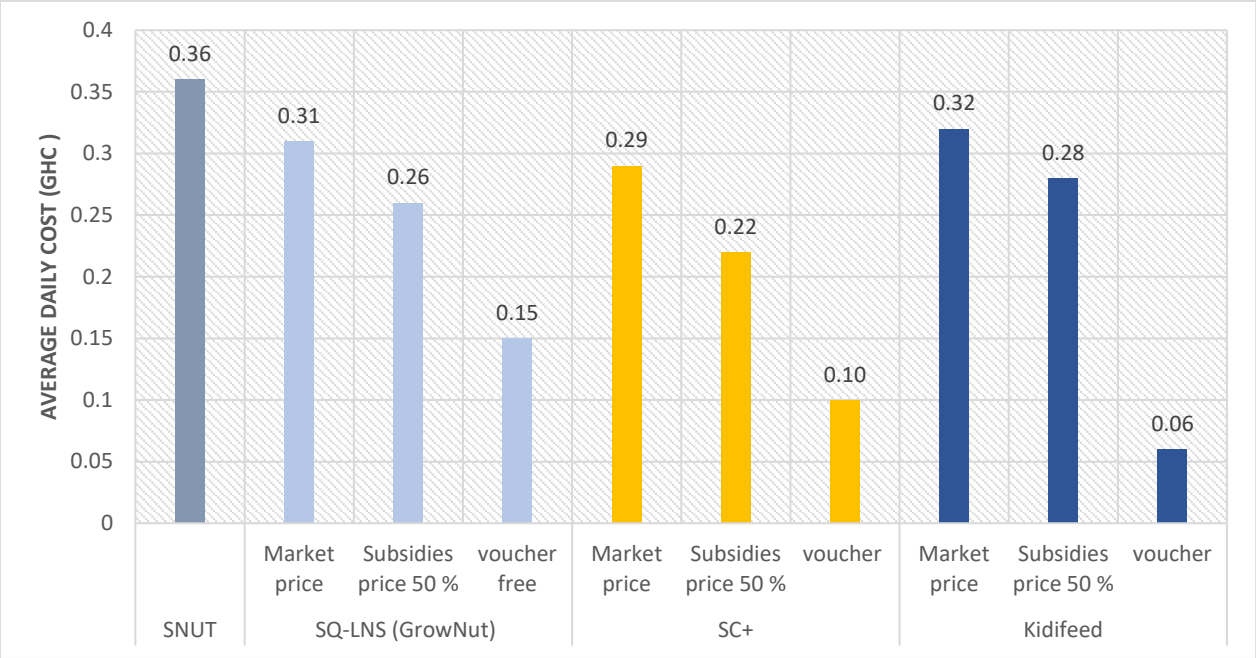


FIGURE 6: The Average Cost of the Diet of a Child 12-23 months in the Northern region with different interventions and modalities (Source: WFP Analysis)

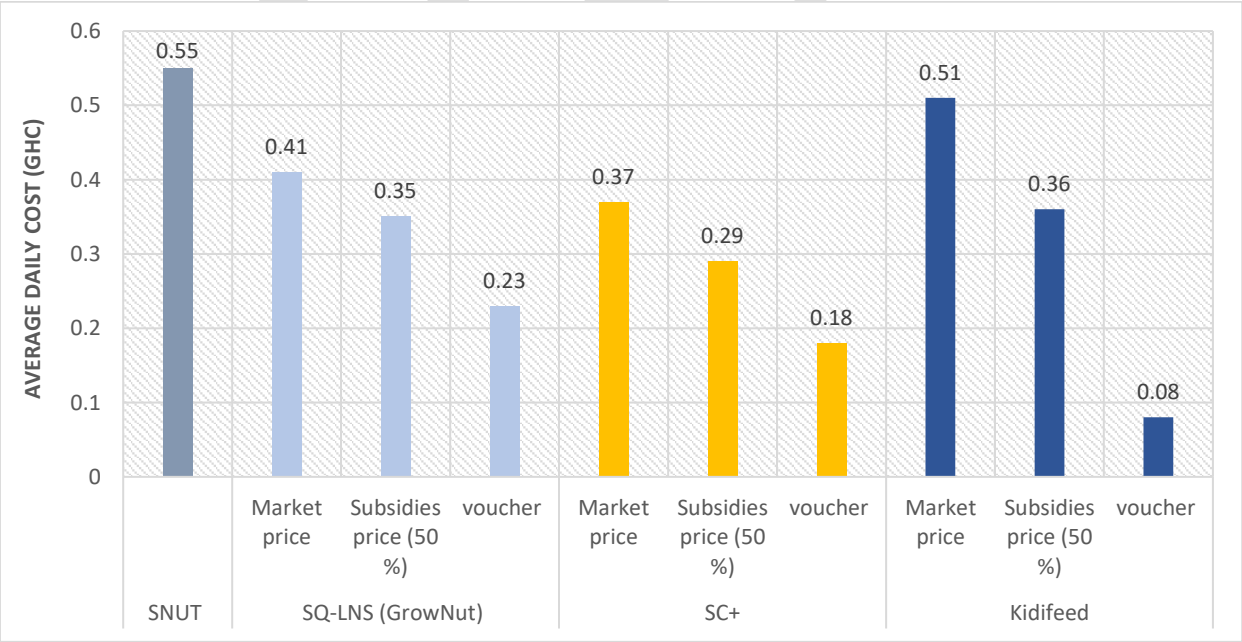


FIGURE 7: The Average Cost of the Diet of a Child 12-23 months in the Brong Afaho region with different interventions & modalities (Source: WFP Analysis)

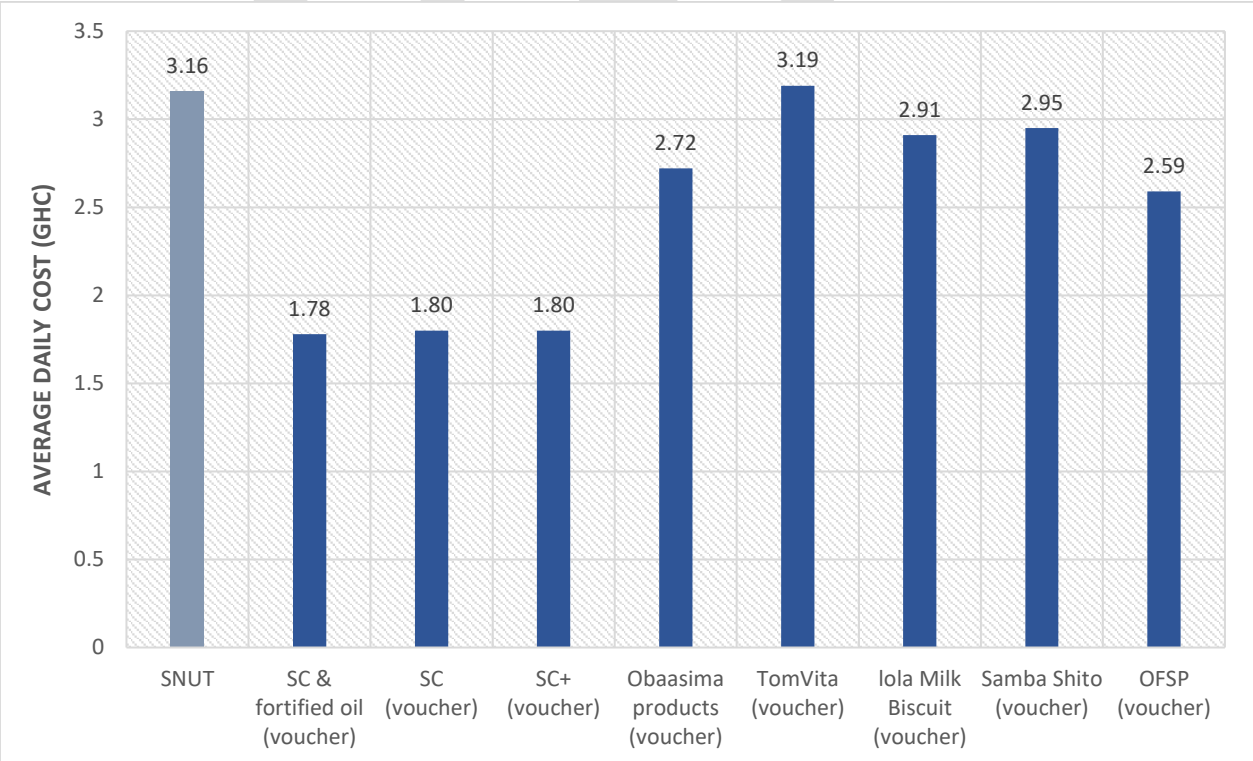
Target Group: Pregnant and Lactating Women

A lactating woman with a child aged between 6-23 months was the reference household member to represent the needs of PLWs. For both regions vouchers at zero cost were modelled for Obaasima products[7], Super Cereal (SC) and OFSP.

As shown in Figure 8 the provision of a daily portion of both Super Cereal (150g) and Fortified Oil (28.8g) at zero cost was the most effective in both regions at reducing the cost of the diet. However, the difference in the cost reduction is mainly due to the Super Cereal, which is fortified with several micronutrients whereas oil is only fortified with vitamins A and D. When looking at the cost for a SC (voucher) intervention and a SC & fortified oil (voucher) intervention, the difference is small. This analysis is done at a complete diet level, i.e. meeting all nutrient requirements. A food that is a good source of many nutrients, but not of one specific one, may not show good results, as the limiting nutrient still needs to come from other foods sources that may be relatively costly.

In fact, TomVita is a source of many nutrients (see table 12.2 in annex). However, as shown in Figure 8, the cost of the SNUT does not decrease when including a free portion/day of TomVita. When adding a TomVita daily portion in addition to the daily portion of maize and cassava already included within the SNUT the tool reaches the upper limit for some of the nutrients and for the energy requirement. So, the tool will have to select other food commodities to fulfil the other nutrient requirements and these foods are costly, so that the total cost of the diet that needs to complement the TomVita does not decrease compared to the cost of the diet without the TomVita.

When modelling the Obaasima products, the tool had the choice to include one daily portion of each of the 3 products in the diet. The diet included almost one full portion of Lola Milk biscuit (35g) and a full portion of Samba Shito (15g) when available for free (e.g. receiving a voucher and choosing for free on the market). In terms of programming, it might be interesting to think about a joint voucher for those 2 products.



[7] Obaasima products: TomVita, Lola Milk biscuit, and Samba Shito

FIGURE 8: ***Comparison of the Average Cost of the Diet of a PLW in the Northern region with different interventions (Source: WFP Analysis) (see table 4 for portion sizes used)***

Note: For a diet cost of 3,16 GHC (i.e. the SNUT price), the daily portion of TomVita should be 95g instead of 100g.

Also, the price of the OFSP was 0.35GHC/100g in the Northern region and 0.08GHC/100g in the BA region, which may explain the main differences in the cost reduction in figures 8 and 9.

	SC & fortified oil	***SC***	***SC +***	***Obaasima***	***Tomvita***	***Lola Milk Biscuit***	***Samba Shito***	***OFSP***	***Fruit & fish***	***Fruit & eggs***
Daily portion (g) provided for free (Northern region)	*150g SC 28.8g fortified oil*	*150*	*150*	*Lola milk biscuit 35g, Samba Shito 15g*	*100*	*40*	*15*	*230*		
Daily portion (g) provided for free (BA region)	*150g SC 28.8g fortified oil*	*150*	*150*	*Lola milk biscuit 40g, Samba Shito 15g, and Tomvita 12g*	*100*	*40*	*15*	*230*	*86g of palm fruit & 72g of fish*	*86g of palm fruit and 115g of eggs*

TABLE 4: ***Quantity provided of foods for different interventions for PLW in the Northern region (refers to figure 8 & 9) (Source: WFP Analysis)***

As shown in Figure 9 in Brong Afaho region a daily portion of SC & fortified oil provided for free was most effective at reducing the cost of the diet. When modelling Obaasima products the same way as for the Northern region, one full portion of Lola Milk biscuit (40g), Samba Shito (15g), and TomVita (12 g) were included in the diet by the tool. As per the stakeholders inputs, different fresh foods were also modelled for Brong Afaho region.

Note: The staple adjusted nutritious diet (SNUT) for both regions was modelled with one daily portion each of Maize and Cassava. However, reflecting the diet in the Southern regions, a SNUT diet has also been calculated with one daily portion each of Yam, Cassava and Plantain for the Brong Afaho region, which was 40% more expensive (data not shown).

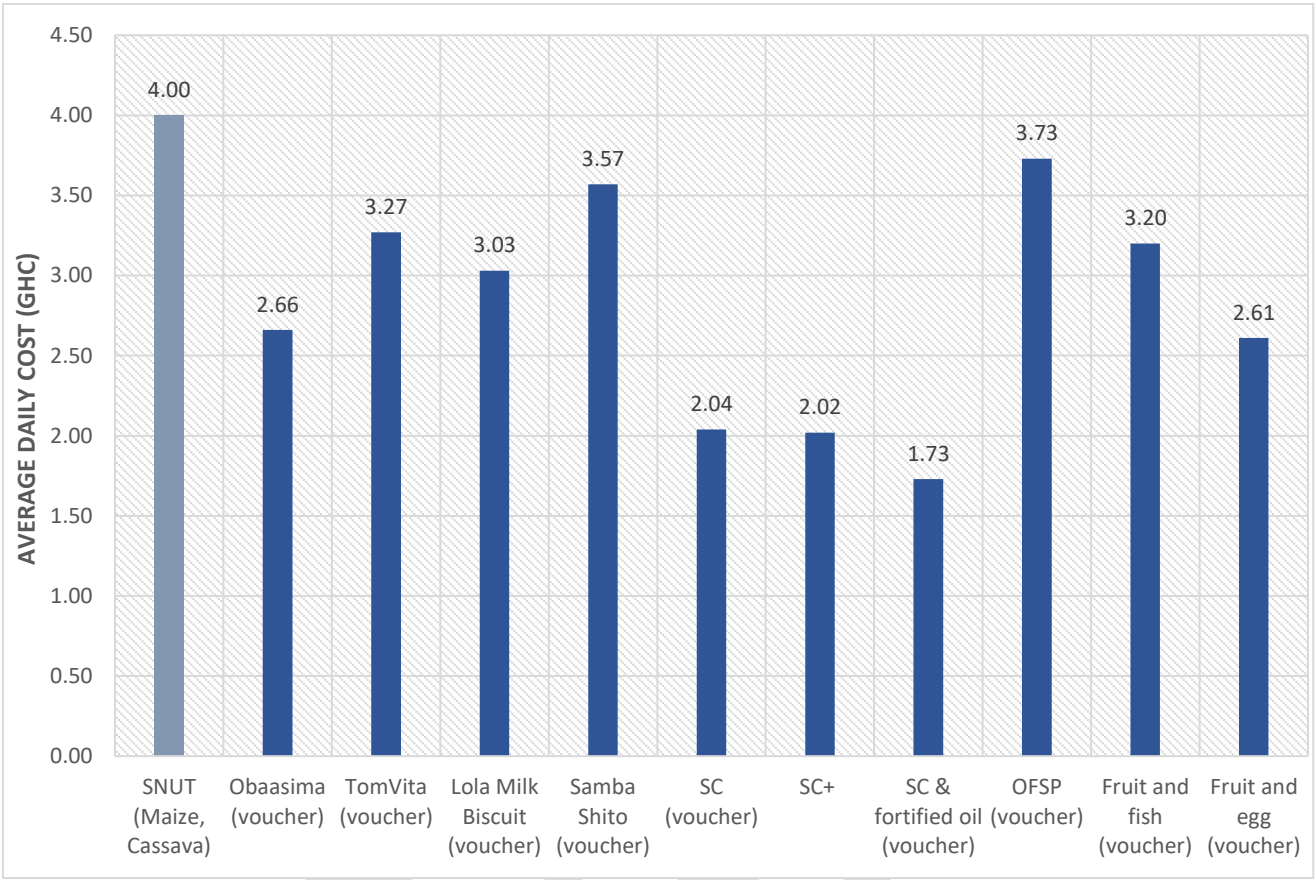


*FIGURE 9: **Comparison of the Average Cost of the Diet of a PLW in the Brong Afaho region with different interventions (Source: WFP Analysis) (see table 4 for portion sizes used)***

Figure 10 show the results for the analysis in which each Obaasima product was modelled with different modalities (market price, subsidised or voucher) for different women of reproductive age (not pregnant not lactating, pregnant or lactating) to see the impact on the cost reduction in the Northern region. Table 5 shows the quantities specified in the model. At market prices, none of the Obaasima products were included as part of the diet (thus costs are the same as of the SNUT diet, because foods selected remained the same), as each product was either too expensive or not nutritious enough for its price[8]. Even when providing one portion/day as voucher (free) the cost reduction is not huge.

In the Northern Region, The TomVita price would have to be 0.02 GHC/100g to be included in the diet by the tool (a market price decrease of 98%), and it was then included in a smaller amount than the recommended daily portion. At zero cost, the tool has included 84g of TomVita which leads to a 0.5% cost reduction (2 GHC cents). Samba Shito price would have to be 1.4 GHC/100g to be included in the diet by the tool (full portion 15g) (a market price decrease of 77%) which leads to a 0% cost reduction. That means that at the cost of 1.4GHC/100g Samba Shito is replacing the fresh food. However to have an impact in terms of reducing the diet's cost, the price has to be lower than that. At market price (0.7GHC/100g), Lola milk biscuit is selected as part of the diet for the women of reproductive age (just for a few grams, which reduced the cost by 1 cent).

As TomVita is intended to replace a portion of normally-consumed unfortified staple foods, the analysis was also done where only one serving of staple food was included so that the tool had a choice to include

[8] It should be noted, however, that this is based on an optimal, modelled diet that takes cost and nutrient content into consideration, but this may not reflect actual dietary habits and preferences for convenience, taste etc nor costs to obtain and prepare the foods.

TomVita also as a source of energy, in addition to its micronutrients (see Sensitivity Analysis section below, page 27.) The results based on this analysis were not substantially different. The result is the same at market price and subsidised price (50%), the tool has not included TomVita in the diet. However, at zero cost the tool included 92g of TomVita, and the diet's cost reduced by one cent (GHC).

In the BA Region, TomVita has been included in the diet at market price, leading to a 1 cent cost reduction. At zero cost, the software has included 89g leading to a 18% cost reduction. Where TomVita was modeled with just one serving of staple (see Sensitivity Analysis section below, page 27), the tool has not included TomVita at market price or subsidised price (50%). However, at zero cost the tool has included 92g of TomVita, and the cost reduced by 21% as compared to having two servings of staple and by 18% compared to having 1 serving of staple.

Note: Market prices were lower in the Northern region, so the cost reduction is much smaller than the one for the Brong Afaho region.

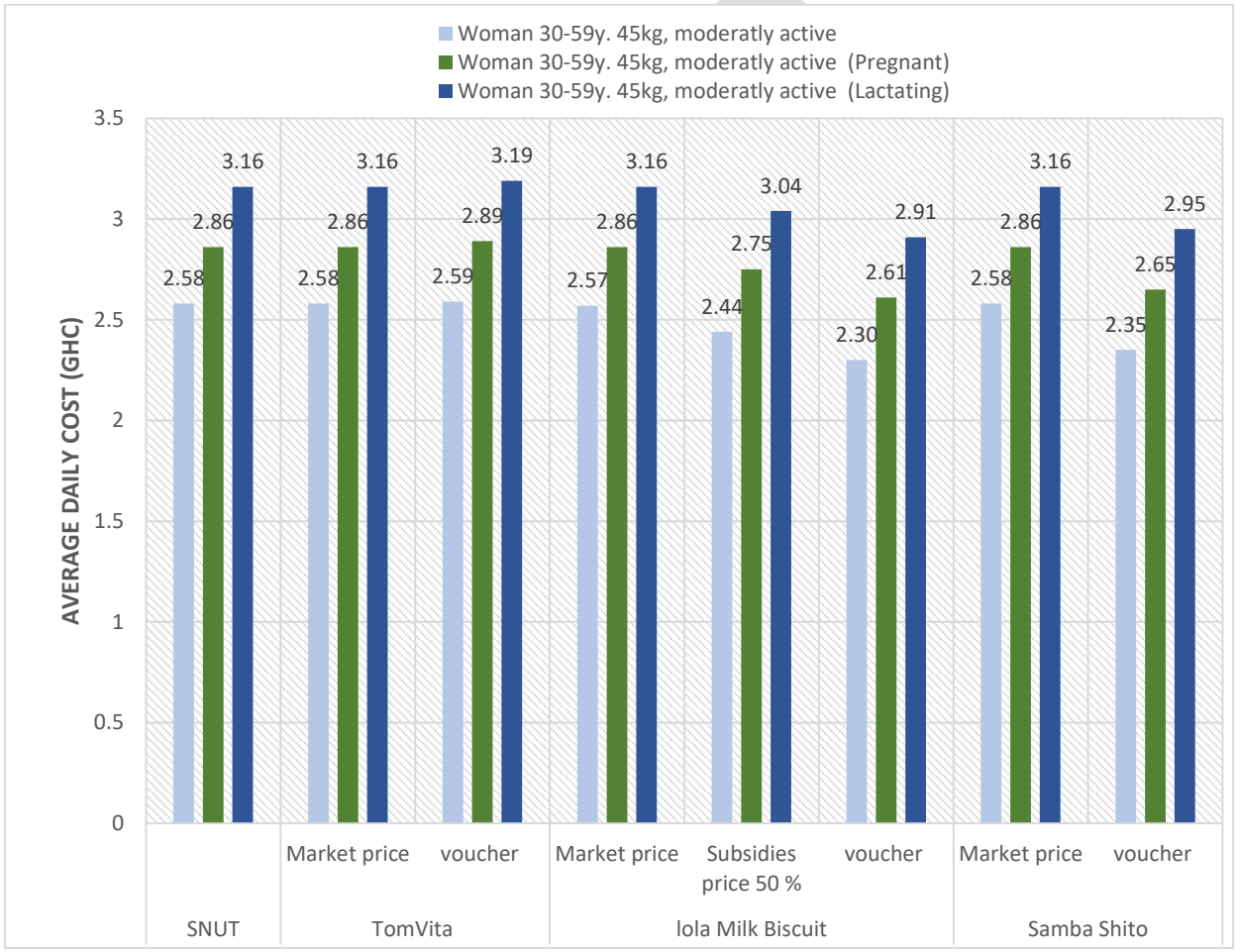


FIGURE 10: ***Average Cost of the Diet of a PLW in different states in the Northern region with different interventions (Obaasima Products) (Source: WFP Analysis) (see table 5 for amounts included)***

			Obaasima	TomVita	Lola Milk Biscuit	Samba Shito
Amount included (g)	Woman, 30-59y, 45g, moderately active	voucher	Lola Milk Biscuit 36g, Samba Shito 15g	100	40	15
		Subsidised price (50%)	-	-	40	-
		Market price	Lola Milk Biscuit 4g	0	4	0
	Woman, 30-59y, 45g, moderately active (pregnant)	voucher	Lola Milk Biscuit 35g, Samba Shito 15g	100	40	15
		Subsidised price (50 %)	-	-	39	-
		Market price	0	0	0	0
	Woman, 30-59y, 45g, moderately active (Lactating)	voucher	Lola Milk Biscuit 35g, Samba Shito 15g	100	40	15
		Subsidised price (50%)	-	-	39	-
		Market price	0	0	0	0

***TABLE 5:* Quantity provided of each Obaasima products for different interventions for PLW at different states (pregnant, lactating, non-pregnant & non-lactating) in the Northern region (refers to figure 10) (Source: WFP Analysis)**

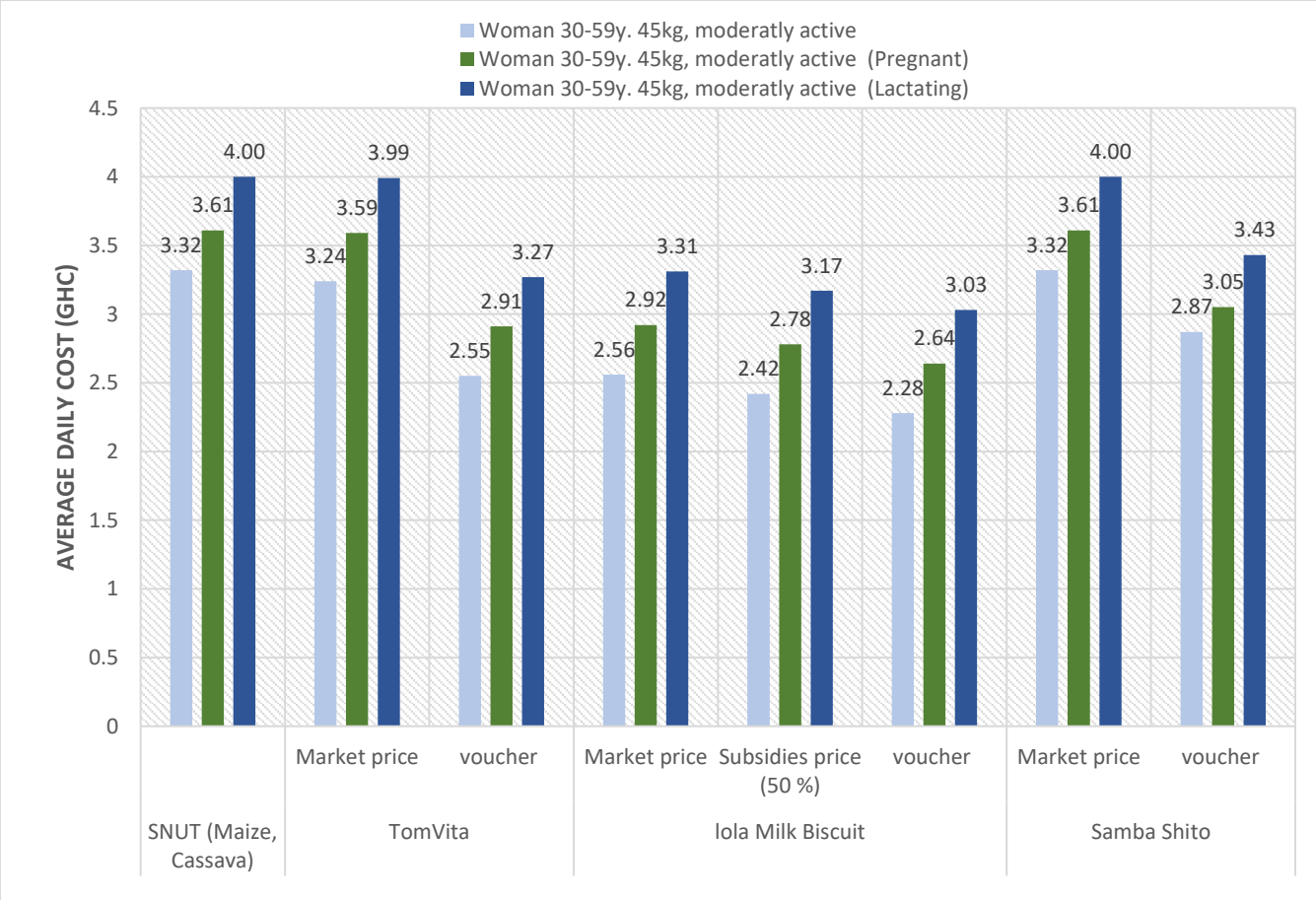


***FIGURE 11:* Average Cost of the Diet of a PLW in different states in the BA region with different interventions (Obaasima Products) (Source: WFP Analysis) (see table 6 for amount included)**

			Obaasima	TomVita	Lola Milk Biscuit	Samba Shito
Amount included (g)	Woman, 30-59y, 45g, moderately active	voucher	Lola Milk Biscuit 40g, Samba Shito 15g	100	40	15
		Subsidies price (50%)	-	-	40	-
		Market price	40g Lola Milk biscuit	58	40	0
	Woman, 30-59y, 45g, moderately active (pregnant)	voucher	Lola Milk Biscuit 40g, Samba Shito 15g, TomVita 4g	100	40	15
		Subsidies price (50 %)	-	-	40	-
		Market price	40g Lola Milk biscuit	56	40	0
	Woman, 30-59y, 45g, moderately active (Lactating)	voucher	Lola Milk Biscuit 40g, Samba Shito 15g, TomVita 12g	100	40	15
		Subsidies price (50%)	-	-	40	-
		Market price	40g Lola Milk biscuit, 4g TomVita	75	40	0

TABLE 6: Quantity provided of each Obaasima products for different interventions for PLW at different states (pregnant, lactating, non-pregnant & non-lactating) in the BA region (refers to figure 11) (Source: WFP Analysis)

Unlike in the Northern region, when Obaasima products were modelled with different modalities in the Brong Afaho region, a full portion of the Lola Milk biscuit was included in the diet even at market price. The TomVita and Samba Shito products were included in the diet at a subsidised price (50%) (less than a full portion of each was selected by the model; findings not shown). For more details regarding the cost reduction when modelling a free portion of Obaasima product, please refer to Figure 26 in the annex.

In Figures 12 & 13, SC and/or OFSP were modelled with different modalities (market price, subsidised price (50%), voucher). At market prices, SC is already part of the diet, which means that the cost decreases. Obviously, when modelling subsidized prices or vouchers for the same product, the cost reduction is even greater.

In the Northern region, when replacing the cassava by the OFSP as a staple, the price goes up. When modelling OFSP at subsidised prices (50% of the market price) the price of the SNUT decreases by a few cents. However, when modelling a daily portion of OFSP for free (voucher) the price of the SNUT decreases by approximately 30%. The current market price for OFSP is too expensive for the software to pick it up as part of the diet in this region. Including SC at market and subsidized prices for the Northern region had virtually no impact on the cost of the diet (results not shown). For the provision of SC through a voucher, see figure 8.

It should be noted that the OFSP provides mainly vitamin A, C and some folic acid, vitamin B12, B1, B2 and B3 which can also be found in green leafy vegetables at a lower cost. Also, these vegetables are an important source of calcium. This could explain the small impact of including OFSP in the diet in place of cassava.

Also, when modelling the OFSP as voucher (free), two separate analyses have been done. First, the OFSP has been modelled as one free portion per day to measure the impact of changing the staple cassava to OFSP. Second, the software was able to add to the diet up to 3 portions per day for free. The tool included around 2 daily portions of OFSP, which is equivalent to approximately 500g/day/person.

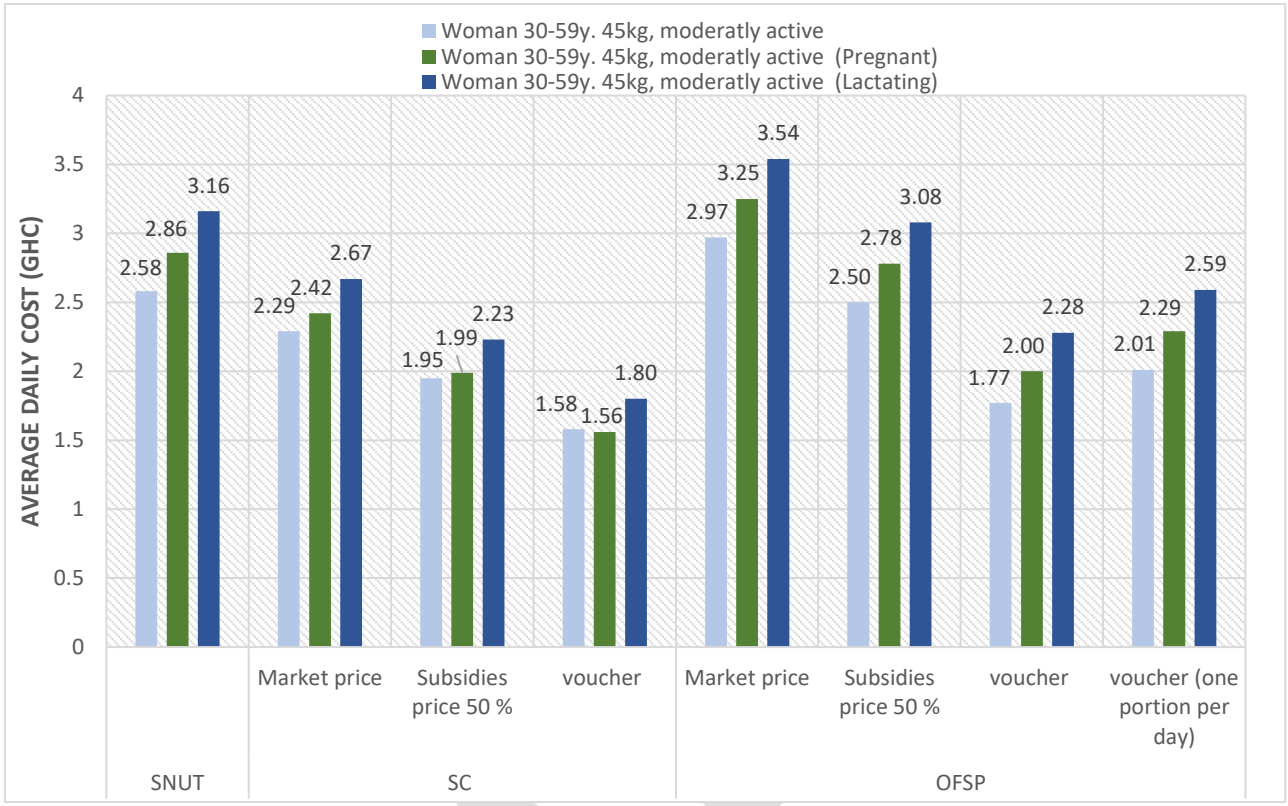


FIGURE 12: ***Average Cost of the Diet of a PLW in different states in the Northern region with different interventions (SC & OFSP) (Source: WFP Analysis)***

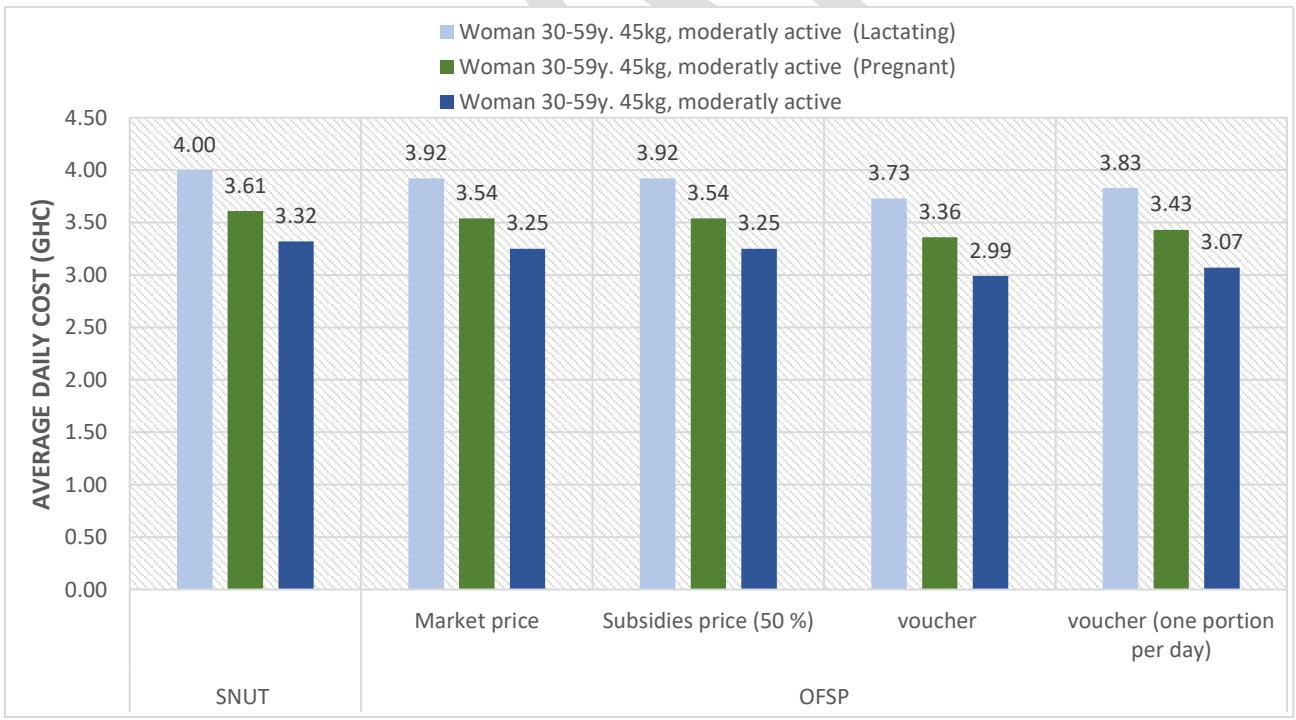


FIGURE 13: ***Average Cost of the Diet of a PLW in different states in the Brong Afaho region with OFSP intervention with different modalities of implementation (Source: WFP Analysis)***

In Figure 14, SC and Lola Milk biscuit were modelled with different modalities (market price, subsidised price (50%), voucher) for Brong Afaho region to see the impact on the cost reduction. At market prices,

both are included as part of the diet which means that both are amongst some of cheapest nutritious available food and the cost of the diet of the PLW decreases. Of course, when modelling subsidized prices or vouchers for the same product, the cost reduction is even greater. The SC is more effective at reducing costs than the Lola Milk biscuit. However, SC still has to be prepared which costs time and fuel, whereas the Milk biscuit is ready for consumption. The extent of sharing of both product types would also have to be assessed in order to estimate their contribution to meeting the nutrient needs of the woman.

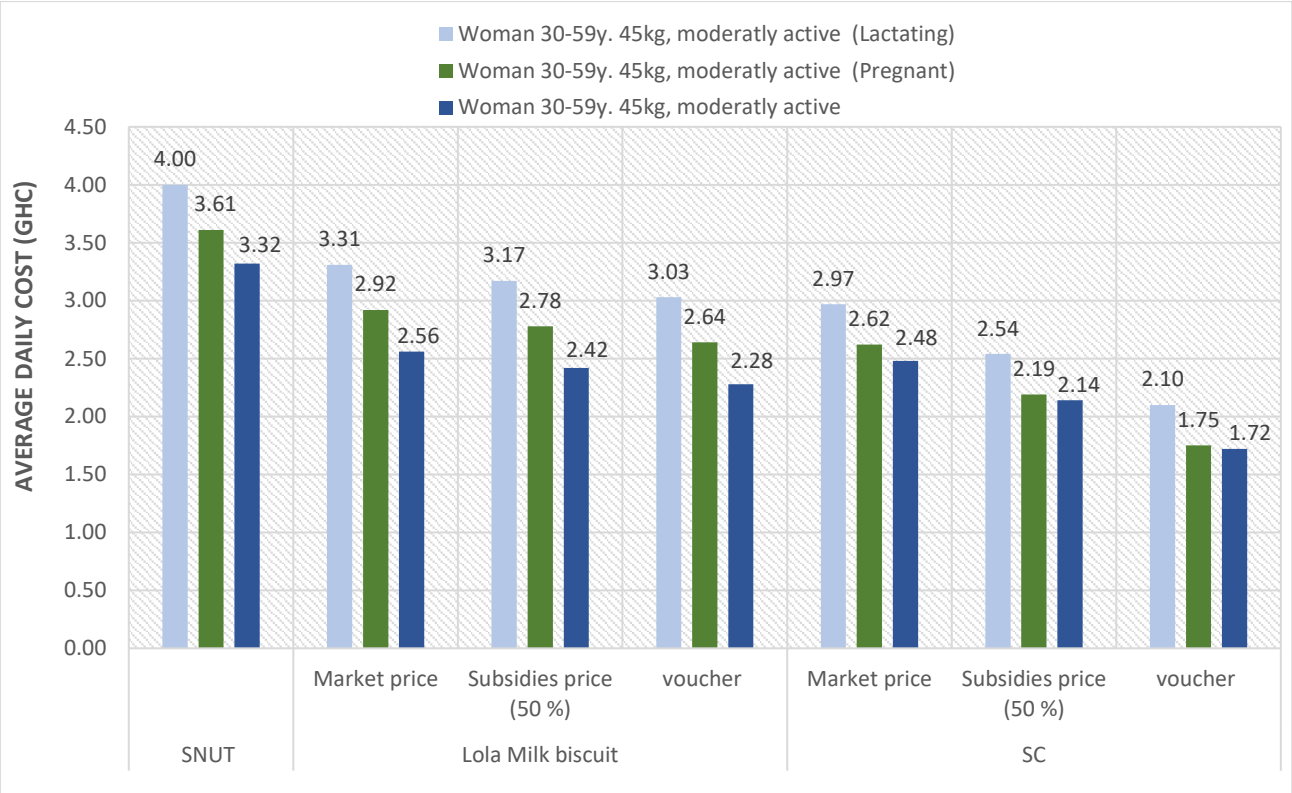


FIGURE 14: Average Cost of the Diet of a PLW in different states in the Brong Afaho region with Lola Milk biscuit & SC interventions with different modalities of implementation (Source: WFP Analysis)

Target Group: Adolescent Girls

The modelling of the adolescent girl (age 14-15) was done for the Northern and Brong Ahafo regions. Also modeled were the needs of adolescent girls in pregnancy and lactation, although a very small proportion of girls aged 14-15 are pregnant or lactating in Ghana. About one-fifth of Ghanaian women aged 25-49 (22 percent) reported to have given birth before reaching age 18, while nearly two-fifths (39 percent) had given birth by age 20. (DHS GHANA, 2014)[9]

The intervention that was most effective at reducing the cost of the diet of the 14-15 years old girl was the voucher for a daily portion of fruit and eggs. Both OFSP and Obaasima interventions showed similar effectiveness in reducing costs.

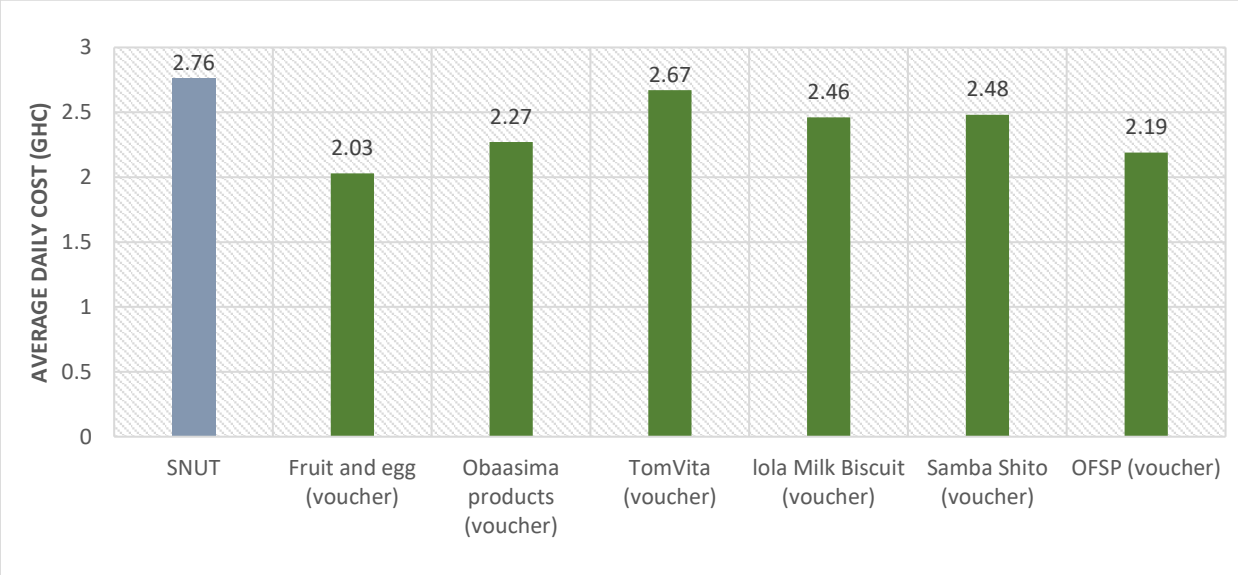


FIGURE 15: ***Comparison of the Average Cost of the Diet of an Adolescent girl 14-15 years in the Northern region with different interventions (Source: WFP Analysis) (see table 7 for portion sizes)***

	Fruit and eggs	*Obaasima*	*TomVita*	*Lola Milk Biscuit*	*Samba Shito*	*OFSP*
Daily portion (g) provided for free	92g of palm fruit and 122g of eggs (note: approx. 3 eggs)	*Lola milk biscuit 35g, Samba Shito 15g*	*100*	*40*	*15*	*245*

TABLE 7: ***Quantity provided of foods for different interventions for the adolescent girl in the Northern region (refers to figure 15) (Source: WFP Analysis)***

As shown in Figure 16, each Obaasima product was modelled with different modalities (market price, subsidised price (50%), voucher) to see the impact on the cost reduction. When modelling the Obaasima products at market prices, the cost reduction is very small[10] (or non-existent). A sensitivity analysis was done which modeled TomVita as a replacement rather than an addition to the daily portion of staples, and the cost results did not change significantly (see "Sensitivity Analysis" section below, page 27). When modelling at subsidized prices, the tool starts to include TomVita and Lola Milk biscuit into the diet and the cost begins to decrease. However, even when the price of Samba Shito is halved, it is not yet included in the diet.

[9] Demographic and Health Survey, Ghana, 2014, https://dhsprogram.com/pubs/pdf/FR307/FR307.pdf

[10] The Obaasima products were too expensive to be included in the diet. Combination of foods meeting all the nutrient requirements was found at cheaper cost without including the Obaasima products.

Note: The price of Samba Shito would have to be decreased by 70% to be added in the diet of the adolescent girl.

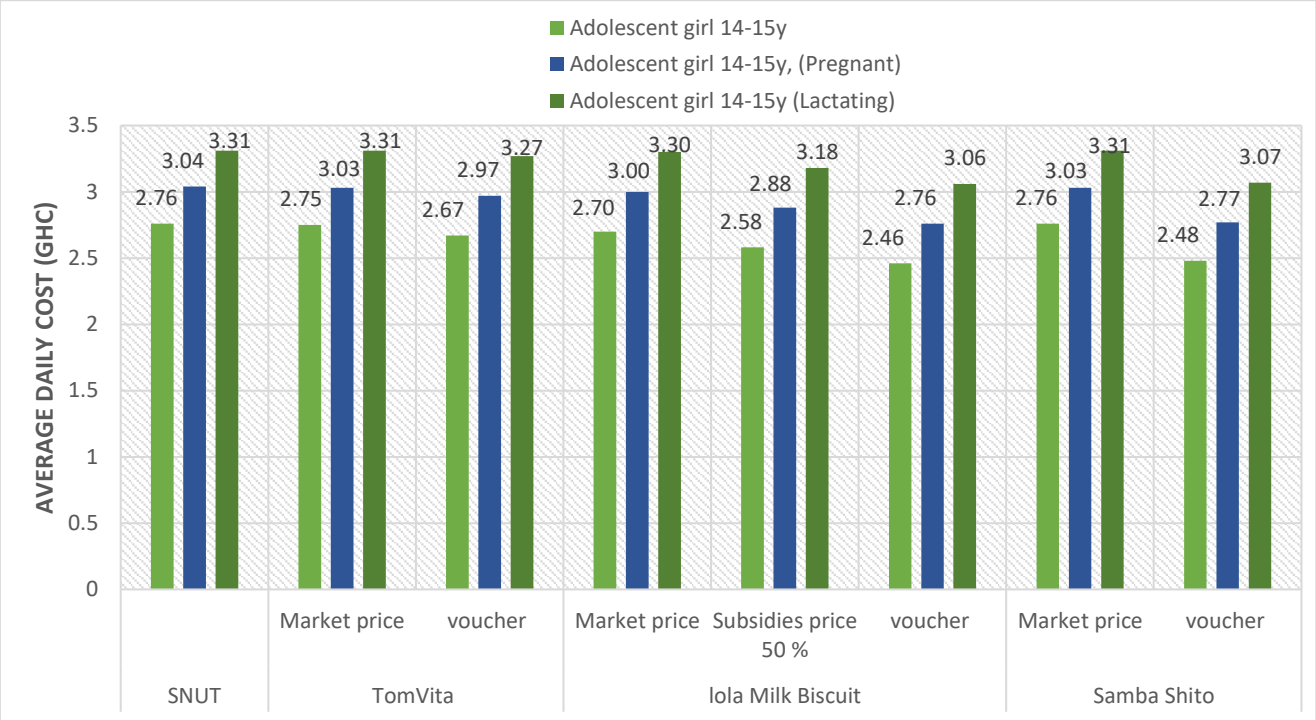


FIGURE 16: ***Comparison of the Average Cost of the Diet of an Adolescent girl 14-15 years in different states in the Northern region with Obaasima products interventions and different modalities (Source: WFP Analysis) (see table 8 for portion sizes)***

			Obaasima	*TomVita*	*Lola Milk Biscuit*	*Samba Shito*
Amount included (g)	*Adolescent girl (14-15y)*	*voucher*	*Lola Milk Biscuit 31g, Samba Shito 15g*	*77*	*35*	*15*
		Subsidies price (50%)	*-*	*0*	*35*	*0*
		Market price	*16g Lola Milk biscuit*	*0*	*16*	*0*
	Adolescent girl (14-15y) (pregnant)	*voucher*	*Lola Milk Biscuit 31g, Samba Shito 15g*	*75*	*34*	*15*
		Subsidies price (50 %)	*-*	*0*	*34*	*4*
		Market price	*16g Lola Milk biscuit*	*0*	*16*	*0*
	Adolescent girl (14-15y) (Lactating)	*voucher*	*Lola Milk Biscuit 30g, Samba Shito 15g*	*74*	*34*	*15*
		Subsidies price (50%)	*-*	*0*	*34*	*7*
		Market price	*27g Lola Milk biscuit*	*0*	*27*	*0*

TABLE 8: ***Quantity provided of each Obaasima products for different interventions for adolescent girl at different states (pregnant, lactating, non-pregnant & non-lactating) in the Northern region (refers to figure 16) (Source: WFP Analysis)***

In Figure 17, SC & OFSP were modelled with different modalities (market price, subsidised price (50%), and voucher) to determine the potential impact on the cost reduction. At market prices, SC is already included as part of the diet which means the cost of the diet for the adolescent girl decreases. As would

be expected, when modelling subsidized prices or vouchers for the same product, the cost reduction is even greater.

Similarly, when modelling OFSP intervention for the adolescent girl in the same way as it was done for the PLWs, the current market price for OFSP is too expensive (even at a subsidised price of 50%) for the food to be included by the software. However, when modelling as voucher (zero cost), the OFSP reduces the cost of the diet for the adolescent girl (14-15 years) by 18-20%.

Just as for the PLW, when modelling the OFSP as voucher (free), two separate analyses have been done. First, the OFSP has been modelled as one free portion per day to measure the impact of changing the staple cassava to OFSP. Second, the software was able to add to the diet up to 3 portions per day for free. The tool included around 2 daily portions of OFSP, which is equivalent to approximately 500g/day/person.

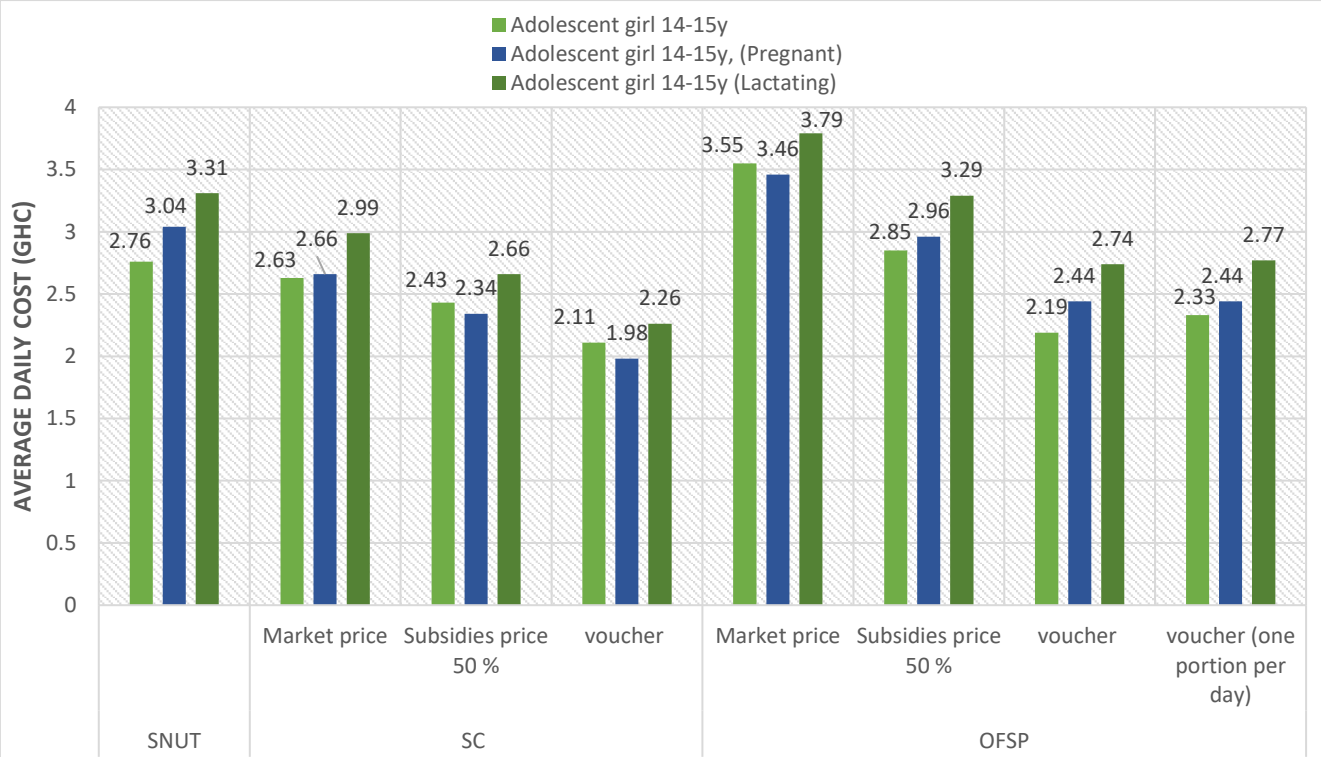


*FIGURE 17: **Comparison of the Average Cost of the Diet of an Adolescent girl 14-15 years in different states in the Northern region with SC & OFSP interventions and different modalities (Source: WFP Analysis***

Note: The adolescent girl was not part of the Household composition in the BA region because the average Household size was only 4 members (child 12-23m, child 6-7y, man 30-59y and PLW). However, as the adolescent girl is a specific targeted group in terms of programmes and policies, analysis have been done for Obaasima products, OFSP and SC in this region as well.

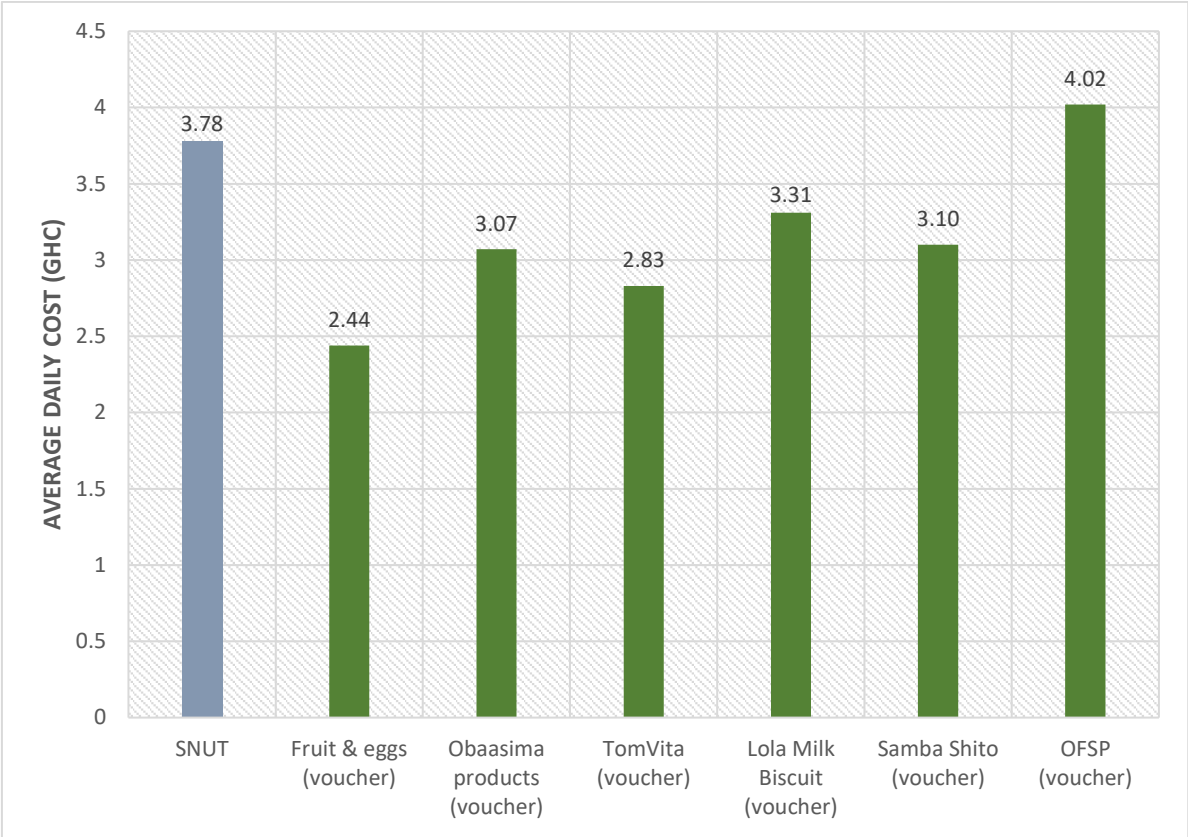


FIGURE 18: ***Comparison of the Average Cost of the Diet of an Adolescent girl 14-15 years in the BA region with different interventions (Source: WFP Analysis) (for portion sizes, see table 9)***

	Fruit and eggs	***Obaasima***	***TomVita***	***Lola Milk Biscuit***	***Samba Shito***	***OFSP***
Daily portion (g) provided for free	92g of palm fruit and 122g of eggs (note: approx. 3 eggs)	*Lola milk biscuit 35g, Samba Shito 15g*	*100*	*40*	*15*	*245*

TABLE 9: ***Quantity provided of foods for different interventions for the adolescent girl in the BA region (refers to figure 18) (Source: WFP Analysis)***

As in the Northern region, vouchers fruits and eggs was the most effective in terms of cost reduction, followed by the Obaasima products provided for free using a voucher. However, when modelling the OFSP (daily portion at free cost), the price of the diet increased by 6%. This result might seem strange but has an explanation. In fact, when modelling the adolescent girl in the BA region, the limiting nutrients are Pantothenic acid, Vitamin B12 & Iron. When modelling OFSP, the tool reaches the upper limit of vitamin A that the adolescent girl can consume on a daily basis. The software then has to change the rest of the diet to reach the requirements for the limiting nutrients without overpassing the UL for vitamin A. In order to do so, the software has to include more fish and replace eggs with bird meat which makes the diet more expensive. More details on the diet are shown in Table 10.

		Maize	Millet	Cassava	OFSP	Groundnut	Bird (meat)	mackerel (fish)	Egg (chicken)	Amaranth (leaf)	Coconut	Palm oil	**Total**
OFSP	Quantity (g)	199	186		245	25	38	95		424	154		1,366
	Price (GHC)	0.20	0.39		0.00	0.11	0.76	1.18		0.81	0.56		**4.02**
Cassava	Quantity (g)	199	182	184		46		84	43	510	43	13	1,303
	Price (GHC)	0.20	0.38	0.15		0.21		1.04	0.56	0.98	0.16	0.10	**3.78**
Comparison of prices		0.00	-0.01	+0.15	0.00	+0.10	-0.76	-0.14	+0.56	+0.17	-0.40	+0.10	**-0.24**

*TABLE 10: **Comparison of the Diet of an Adolescent girl 14-15 years in the BA region with different staples: Maize with Cassava or Maize with OFSP (Source: WFP Analysis)***

As shown in Figure 19, each Obaasima product was modelled with different modalities (market price, subsidised price (50%), voucher) to see the impact on the cost reduction. When modelling the Obaasima products at market prices, the average cost reduction is 14%.

In the BA region, the tool has included 67g of TomVita at market price (more than half a portion) leading to a 1% cost reduction. The cost starts to decrease when modelling the same product at the subsidised price (50%). At subsidised price (50%), the cost of the nutritious diet decreases by 9%. At zero cost, the tool has included 89g of TomVita leading to a 19% cost reduction. Where TomVita was modeled as a replacement of one of the two daily portions of staples, rather than an addition (see Sensitivity Analysis section below, page 27.) the results were not substantially different. The tool has included 64g of TomVita at market price with a cost reduction of 3.5%. At subsidised price (50%) and zero cost, the cost of the nutritious diet decreased respectively by 12% and 20%.

For all modelling interventions, Samba Shito price was always too high to be in the diet at market price or even at subsidised price. It might be worth considering decreasing the prices of the product or further increasing its nutritional composition.

Modelling Lola Milk Biscuit interventions found them, again, to be the most cost effective for this specific context. Even at market price, the impact on the cost reduction is high. The price decreased on average by 14%.

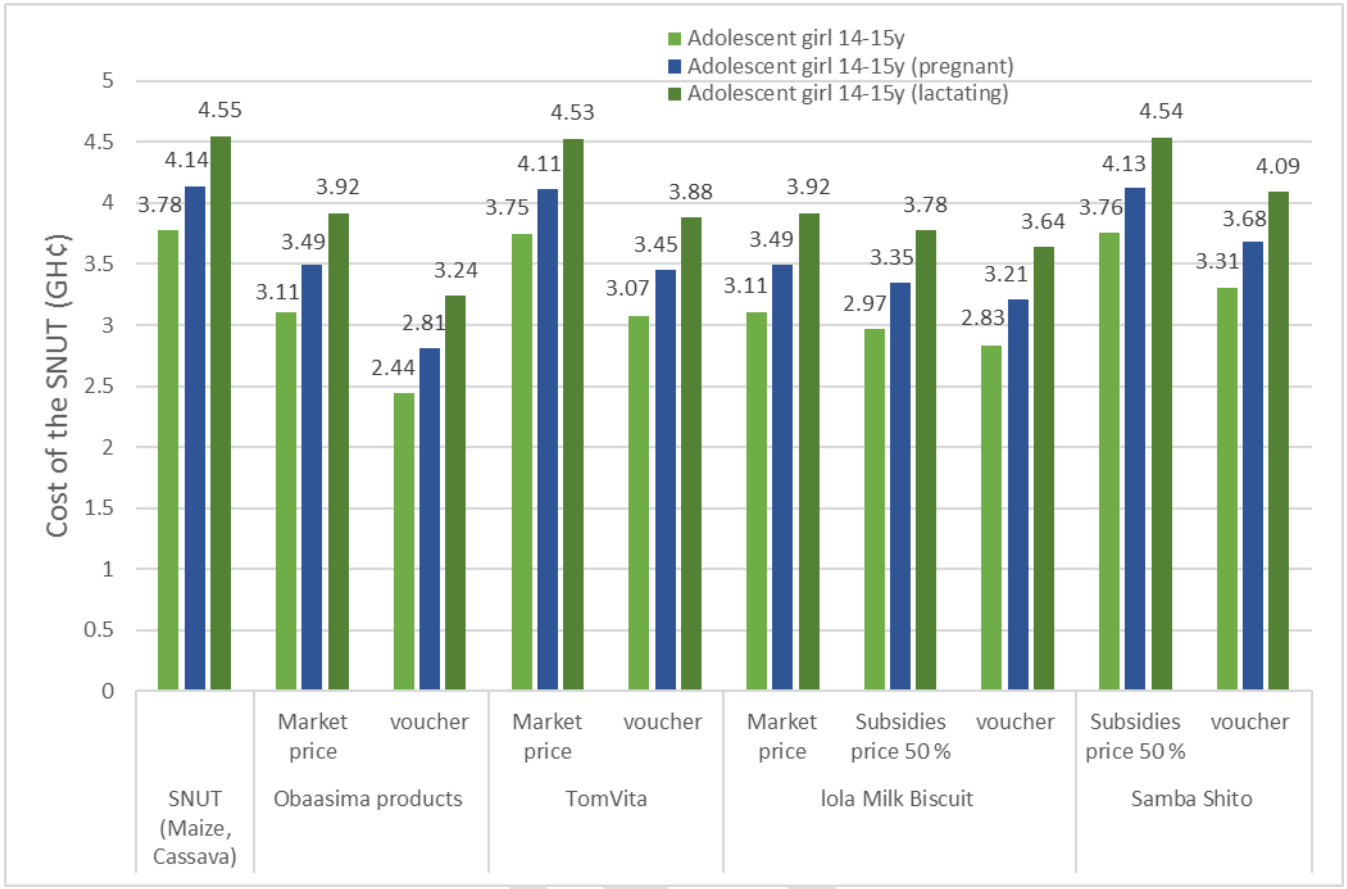


FIGURE 19: ***Comparison of the Average Cost of the Diet of an Adolescent girl 14-15 years in different states in the BA region with Obaasima products interventions and different modalities (Source: WFP Analysis) (see table 11 for portion sizes)***

			Obaasima	TomVita	Lola Milk Biscuit	Samba Shito
Amount included (g)	Adolescent girl (14-15y)	voucher	Lola Milk Biscuit 40g, Samba Shito 15g	89	40	15
		Subsidies price (50%)	-	-	40	15
		Market price	40g Lola Milk biscuit	67	40	0
	Adolescent girl (14-15y) (pregnant)	voucher	Lola Milk Biscuit 40g, Samba Shito 15g, TomVita 3g	100	40	15
		Subsidies price (50 %)	-	-	40	15
		Market price	40g Lola Milk biscuit	59	40	0
	Adolescent girl (14-15y) (Lactating)	voucher	Lola Milk Biscuit 40g, Samba Shito 15g, TomVita 12g	100	40	15
		Subsidies price (50%)	-	-	40	13
		Market price	40g Lola Milk biscuit	49	40	0

TABLE 11: ***Quantity provided of each Obaasima products for different interventions for adolescent girl at different states (pregnant, lactating, non-pregnant & non-lactating) in the BA region (refers to Figure 19) (Source: WFP Analysis)***

In Figure 20, SC & OFSP were modelled with different modalities (market price, subsidised price (50%), and voucher) to determine the potential impact on the cost reduction. At market prices, SC is already included as part of the diet which means the cost of the diet for the adolescent girl decreases. As would be expected, when modelling subsidized prices or vouchers for the same product, the cost reduction is even greater. The cost is even cheaper some times when the teenager is pregnant or lactating. This has the same explanation as earlier with the OFSP. The maximum intakes of vitamin A is reached, so the software has to purchase more expensive food to stay below this limit while still having to meet the requirements for other nutrients. The vitamin A requirement for the pregnant and lactating adolescent girls is higher than the non-pregnant/lactating one. So, the software can still purchase the cheaper food to fulfil other nutrient intakes.

Similarly, when modelling OFSP intervention for the adolescent girl in the same way as it was done for the PLWs, the current market price for OFSP is too expensive (even at a subsidised price of 50%) for the food to be picked up by the software. When modelling as voucher (zero cost), the OFSP slightly reduces the cost of the diet for the adolescent girl (14-15 years). As explained before, the cost of the diet for the OFSP (voucher) is even more expensive than the SNUT for the non-pregnant/lactating adolescent girl.

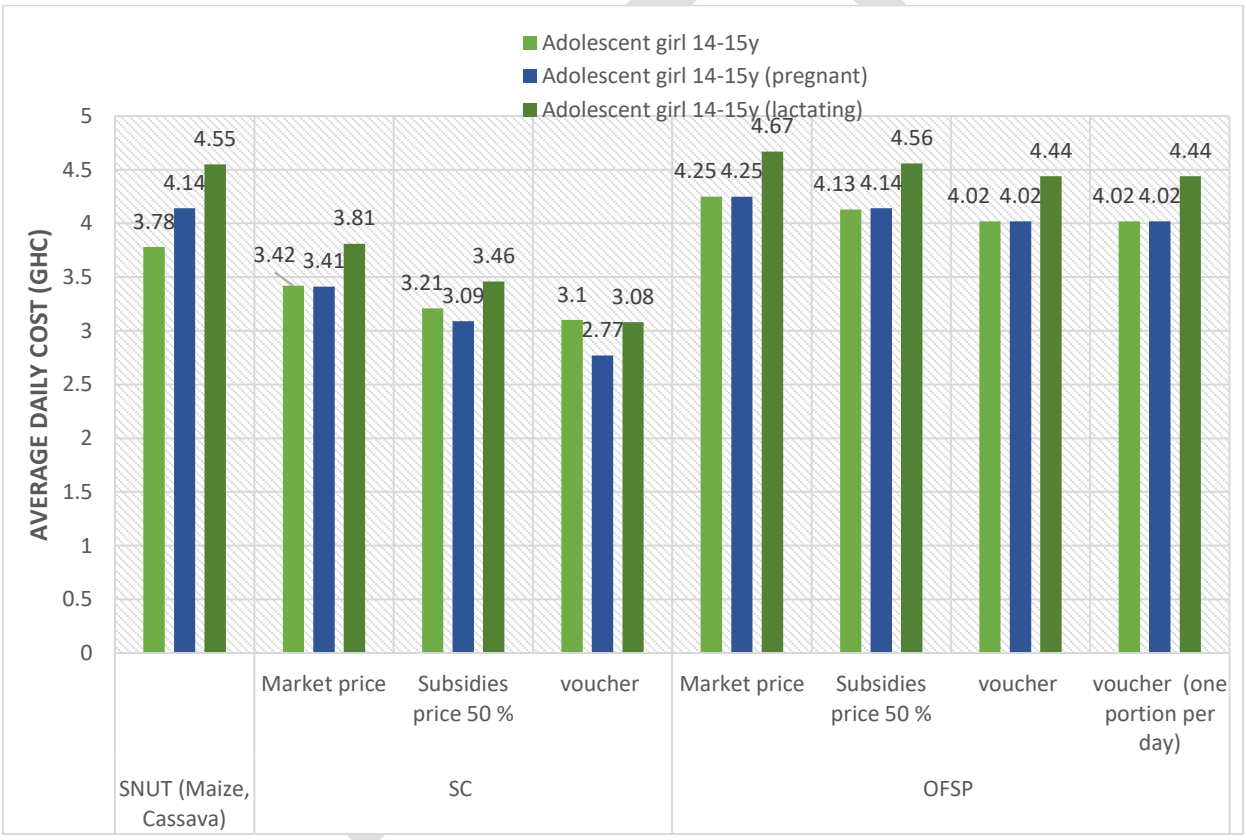


FIGURE 20: ***Comparison of the Average Cost of the Diet of an Adolescent girl 14-15 years in different states in the BA region with SC & OFSP interventions and different modalities (Source: WFP Analysis***

Sensitivity Analysis: TomVita & Super Cereal (SC) modelled as staple

In the following section, a sensitivity analysis has been done. In fact, in the results reported above, inclusion of the TomVita product did not result in much cost reduction. TomVita is a starchy food that is a meal in itself, rather than a complement to a meal or a between-meals snack, so when adding it to the daily diet that already contains two servings of staples (Maize & Cassava), the energy requirement is almost met. As a consequence, in order to fulfill all the remaining nutrient requirements, the tool has to include highly nutritious foods with low energy content, which are really expensive and may not even be available. For this reason, it was not cost-effective for the model to include TomVita in addition to a daily diet that already included two servings of staple foods.

Therefore, we also ran a model that included one serving of staple food in the daily diet when TomVita or SC were added and compared that to the model that included two servings of staple food. The methodology was the same as before except that only maize was included as one serving of staple food, and the tool was free to include other food as desired (including cassava, Tomvita/SC or more maize).

Results:

Figure 21 shows the results for the Northern region. The higher cost of SNUT (2 staples) than SNUT (1 staple), thus without the possibility of including SC or TomVita, is that SNUT (2 staples) includes a portion of maize and of cassava, whereas the SNUT (1 staple) only includes one portion of maize and the software is free to add any other foods to meet nutrient requirements, which it can do more cost-effectively when cassava is not part of the diet.

Figures 21 and 22 show that when modelling SC (voucher), the cost reduces by approximately 44% in both regions. The SC has the same proportional impact on the cost reduction whether the diet was forced to include 1 or 2 servings of staples (note that the software was free to choose the amount of SC to be between 0-1 portion). When modelling it at market price, the cost reduces by 15% (SNUT 2 staples) and 7% (SNUT 1 staple) in Northern region and 26-27% in the BA region (SNUT 1 and 2 staples).

From Figure 21 it appears that at market prices TomVita does not reduce the cost whether 1 or 2 staples are included in the diet. When modelling TomVita for free (voucher) almost a full portion is included in the diet (92g), but the cost reduction is only 1 cent. As explained above, the tool has to meet several micronutrient requirements. In this case, pantothenic acid is one of the limiting nutrients (nutrient which is hard to fulfill the requirement for and hence drives up the cost by having to include a relatively costly food source). TomVita doesn't contain pantothenic acid, so the tool has included a higher quantity of eggs. This combination of food (higher quantity of eggs and free cost TomVita) is 1 cent cheaper than the diet without TomVita. For the BA region, provision of TomVita for free lowers the costs by 18-19% compared to SNUT (1 or 2 staples) (Figure 22).

Two conclusions can be drawn from these results:

First, when comparing the TomVita (voucher-1 staple) with the original SNUT (2 staples), the cost reduces by 21-22%, which is more likely to be the actual situation as TomVita will replace a staple-based meal. When comparing the cost of SNUT (1-staple) to the cost of SNUT (1-staple + TomVita voucher), the latter is cheaper in BA but not in Northern region.

Thus, second, when looking at the impact of TomVita (voucher vs. market price – 1 staple), it appears that there is room to adapt TomVita further to the local context, because usually a product modelled at zero cost has a bigger impact on the cost reduction than when modelling it at market price. In this specific context, limiting nutrients are pantothenic acid, iron and vitamin B12. In order to increase its impact on

lowering cost of meeting all nutrient requirements, the nutritional composition of TomVita would have to be modified, including pantothenic acid and increasing the content of vitamin B12 and iron. However, even at the current composition, consuming TomVita instead of a non-fortified staple will improve micronutrient-intake, just not of all micronutrients, which is what the CotD analysis aims to achieve.

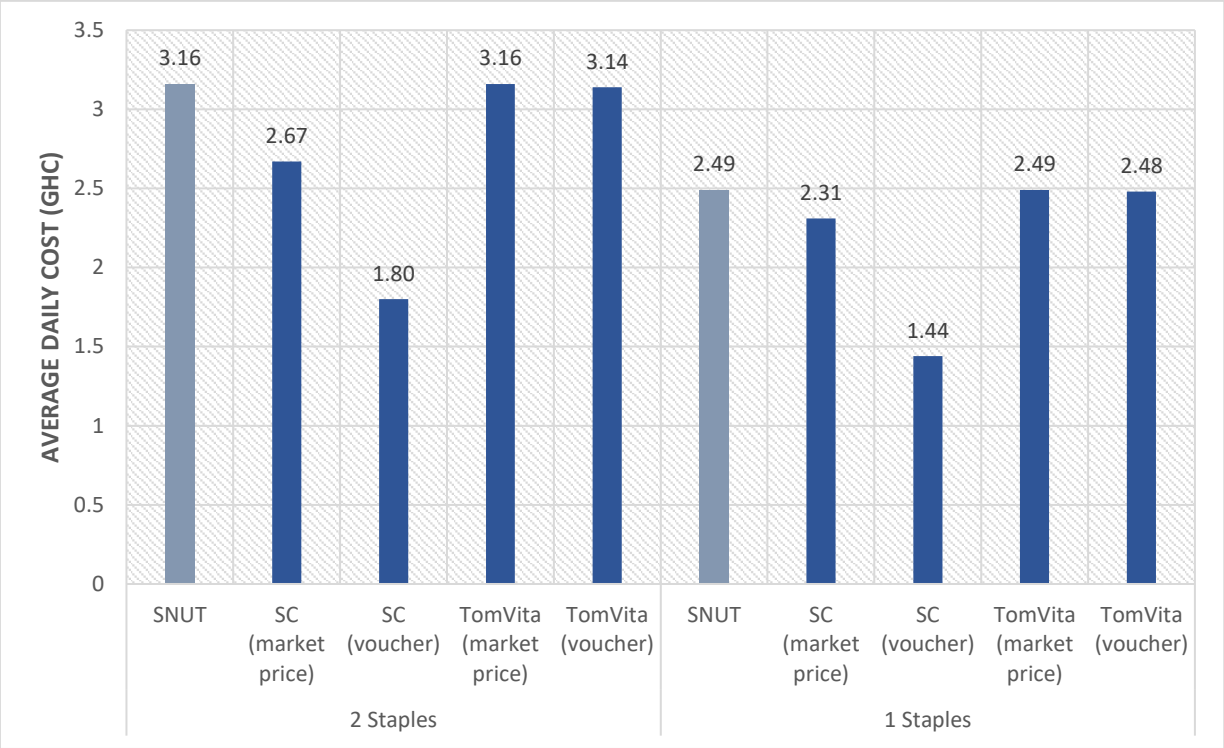


*FIGURE 21: **Comparison of the Average Daily Cost of the Diet of a PLW with 1 or 2 staples included in her diet, modelling SC & TomVita intervention in the Northern region (Source: WFP Analysis)***

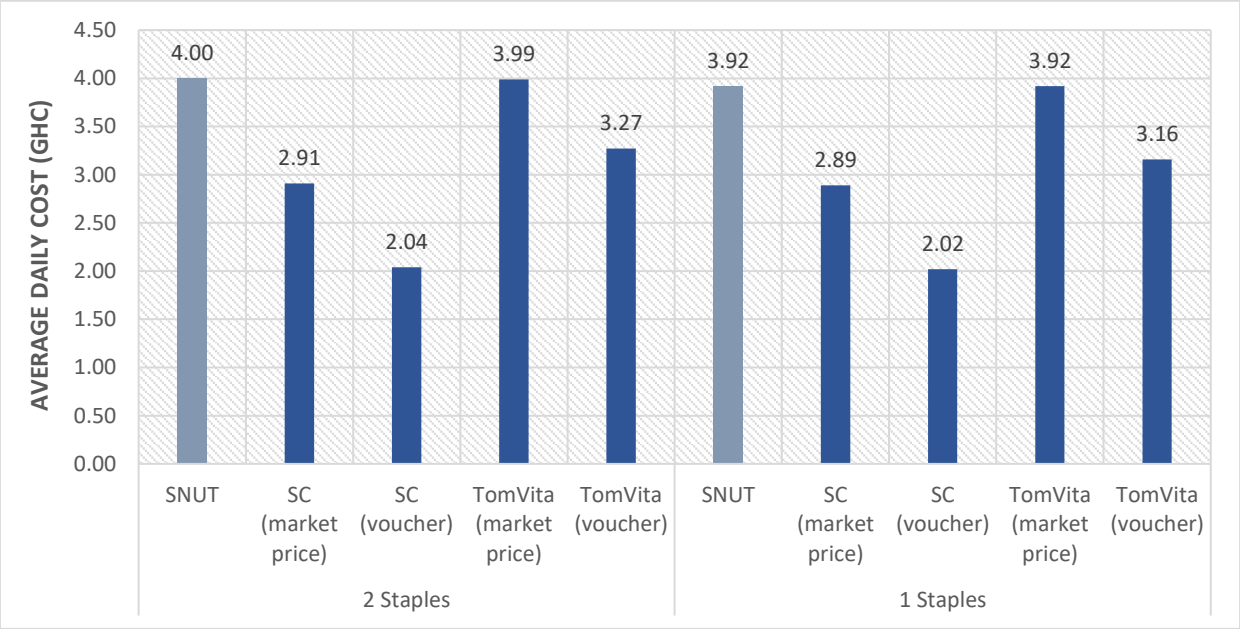


*FIGURE 22: **Comparison of the Average Daily Cost of the Diet of a PLW with 1 or 2 staples included in her diet, modelling SC & TomVita intervention in the BA region (Source: WFP Analysis***

Figures 23 & 24 show the results for the same analyses done for the adolescent girl (14-15 years). The result of modelling TomVita in the Northern region is the same as for the PLW. When modelling for free

(voucher), almost a full portion of TomVita is included in the diet (83g), and the cost decreases by 10 cents. The explanation is the same as above. The impact of SC (voucher- 1 staple), a cost reduction of 37%, is higher than of SC (voucher- 2 staples), with a cost reduction of 24%. Again, the impact of SC is higher when including only one staple in the diet, because the tool can include nutritious foods with a higher energy content.

In the BA region, the impact of SC & TomVita on the cost reduction is the same, whether 1 or 2 staples are included. This is similar to the results of the PLW analysis.

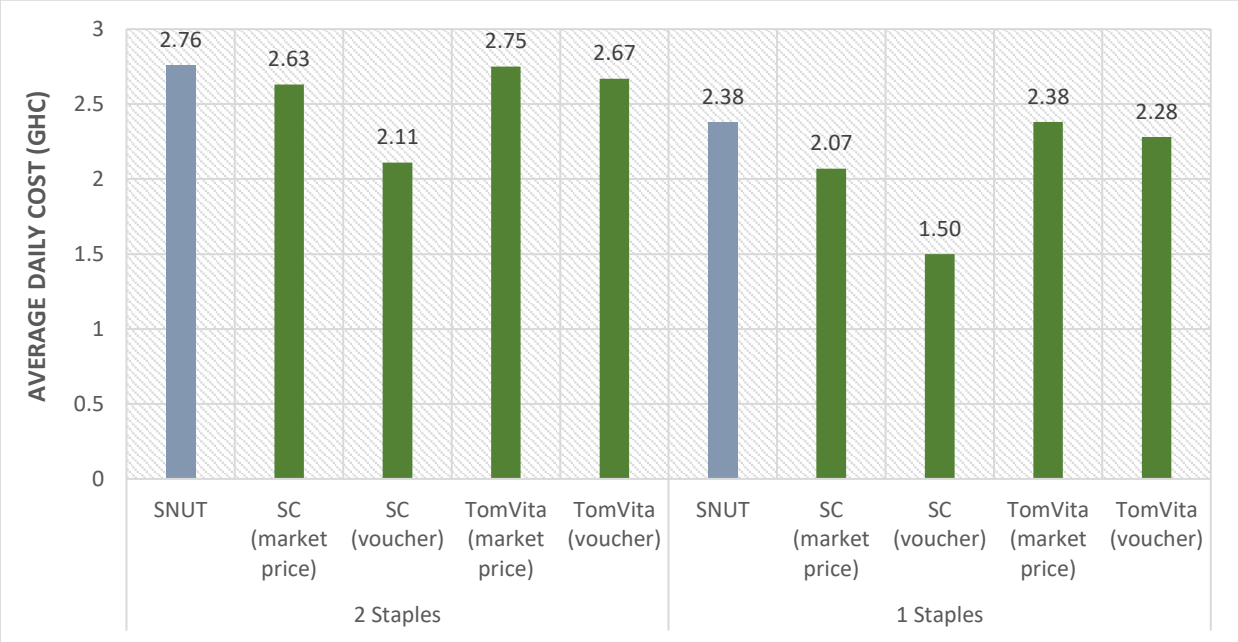


FIGURE 23: Comparison of the Average Daily Cost of the Diet of an adolescent girl (14-15 years) with 1 or 2 staples included in her diet, modelling SC & TomVita intervention in the Northern region (Source: WFP Analysis)

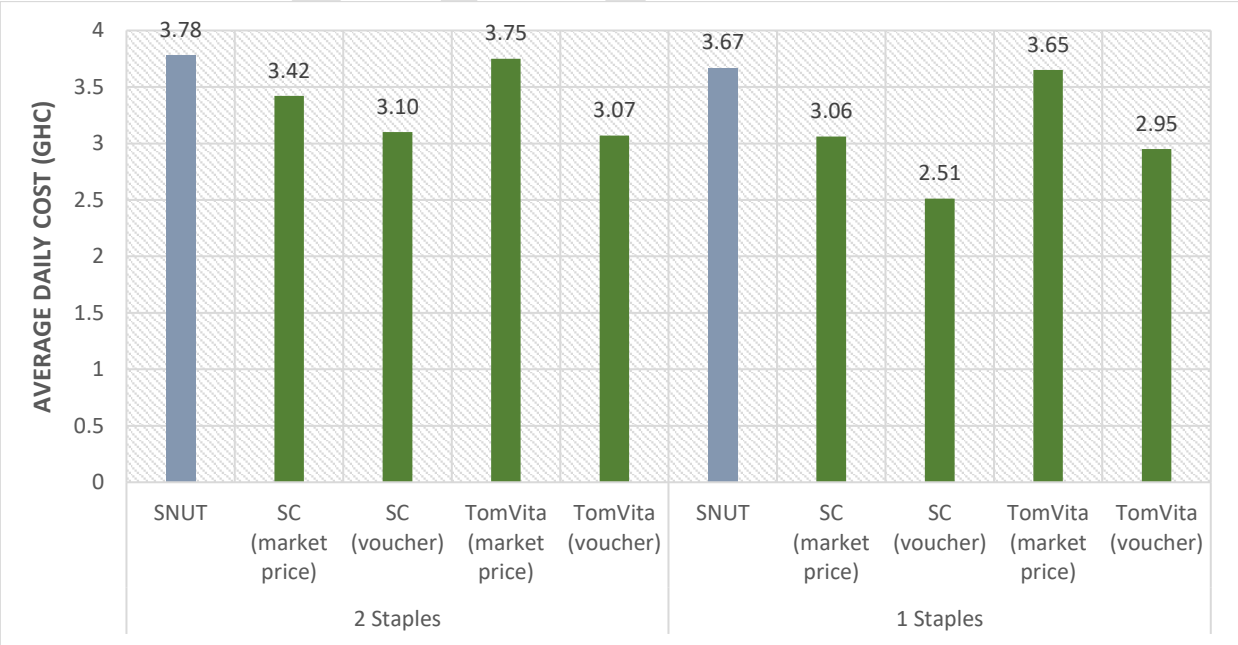


FIGURE 24: Comparison of the Average Daily Cost of the Diet of an adolescent girl (14-15 years) with 1 or 2 staples included in her diet, modelling SC & TomVita intervention in the BA region (Source: WFP Analysis)

Conclusions

Thanks to the data collected by the Ghana Ministry of Food and Agriculture (MoFA) in collaboration with IANDA, the impact of the food list on the estimated cost of a nutritious diet has been highlighted. Expanding the food list from 38 to 56 commodities, especially by adding more vegetables, fruits and legumes (out of 18 added foods, 6 are vegetables, 4 are fruits and legumes/seeds, 5 are fish and meat and 3 others), significantly changed the results of the modelling exercise: the cost of the nutritious diet (SNUT) was 30% lower with the diverse food list, compared to the original food list that did not include many of the most nutritious foods. This supports the decision of having a minimum list of close to 60 foods from diverse food groups for conducting Cost of the Diet analyses as one of the Fill the Nutrient Gap standards.

Also, the relatively high cost of a nutritious diet for adolescent girls and women, especially while pregnant or lactating, was highlighted. During pregnancy and lactation, some of the nutrient requirements are higher, which results in higher costs. For the child (6-23 months) provision of locally produced Kidifeed (voucher) and SQ-LNS (Grownut) (voucher) were the most effective in reducing the cost of a nutritious diet, respectively by an average of 84% and 60% in both regions, indicating that they are very good sources of essential nutrients. For the adolescent girl, the fresh food voucher for eggs and green leafy vegetables was the most cost-effective (average of 30% cost reduction in both regions), which is explained by their relatively high content of calcium, iron and B12, which are limiting nutrients. For PLW, SC interventions (SC, SC+ and SC with fortified oil) were the most cost-effective and even more so when SC was modelled by adding it to a daily diet that included one serving of staple food, rather than two. On average, provision of SuperCereal for free (using a voucher) reduced the cost of a nutritious diet for PLW by 50% in both regions.

For the Obaasima products, the analysis found them to be less cost-effective to meet nutrient requirements compared to other options, which is due to the fact that their content of specific nutrients, including panthotenic acid, iron and vitamin B12, was lower than that of the other fortified options included in the model. Among the three products, the Lola Milk Biscuit performed better, indicating that it was a more cost-effective source of essential nutrients. Besides nutrient content and cost, acceptability and actual amount consumed by the intended targeted group are also important determinants of whether a specific food will be able to make a good contribution to improving nutrient intake. Consumption of Obaasima products is likely to make a meaningful contribution to meeting nutrient intake requirements even when it has a lower content of certain micronutrients than other foods that consumers may or may not prefer over those products. Nevertheless, it would be good to consider increasing the content of the specific micronutrients for which content is relatively low.

Overall, the previous CotD analyses and those shared in this report have shown that the costs of a nutritious diet are relatively high compared to a diet that only meets energy needs, and that a substantial proportion of the population cannot afford these costs (about one third in the previous analysis, ranging from 12% to 78% across regions). Any strategy or intervention that increases the availability and lowers the costs of nutritious foods (i.e. those that have a high content of essential nutrients relative to energy content), whether from natural foods or fortified foods, can improve affordability of nutritious diets. Greater affordability translates to higher likelihood of increased consumption of nutrient-rich foods, and hence better meeting nutrient requirements among different target groups.

The examples analysed in this report compare the extent to which different foods and distribution modalities reduce the cost of a nutritious diet for specific target groups. The results can be used to select (combinations of) approaches and distribution channels for improving nutrition among specific groups or the population in general. Apart from selecting cost-effective options for improving nutrient intake, the acceptability and demand for the different foods by the target population should also be ensured.

ANNEX

SNF (100g)	SC+	SC	SC+ CHAI	SQ-LNS (iLiNS)	Maisoy Forte	Koko Plus	KidiFeed	Ceresoya
Portion size (g)	62 (child) / 150 (PLW)	62 (child) / 150 (PLW)	62	20	62	15	80	62
Price per 100g (GHC)	0.38	0.23	N/A	1.51	1	2.67	0.8	2
Energy (kcal)	410	380	400	540	404.84	452	400	439.65
Protein (g)	16	14	16	13	16.66	20.7	18.6	29.5
Fats (g)	9	6	10	35	8.04	-	11	12.8
Fiber (g)	2.9	4	-	-	4.9	11.9	-	2.1
RAE (mcg)	1039.0	1039.0	729.79	2000	499.7	298.5	400.3	784.38
C (mg)	90	90	60	150	48	211	96	100
B1 (mg)	0.2	0.2	0.6	1.5	0.13	2.38	1.2	0.13
B2 (mg)	1.4	1.4	0.8	2	0.45	1.68	1	0.45
Niacin (mg)	8	8	8	20	4.8	21	12	4.8
B6	1	1	0.6	2.5	-	0.96	1	1.7
Folate (mcg)	110	110	160	400	60	660.13	300	60
B12 (mcg)	2	2	1.4	2.5	1.2	4.33	1	2
Pantothenic Acid (mg)	1.6	1.6	3.6	9	-	-	4	6.7
Calcium (mg)	362	362	800	1400	100	1.42	400	109
Iron (mg)	6.5	6.5	5.4	30	8	53.5	15.2	24.2
Magnesium (mg)	-	-	-	200	-	115	-	-
Sodium (mg)	-	-	-	-	-	67.2	-	-
Zinc (mg)	5	5	17	40	5	15.8	16.8	-

TABLE 12.1: ***Nutrient Composition of SNFs used in Cost of Diet Modelling***

SNF (100g)	Tomvita	Lola Milk biscuit	Samba Shito	SQ-LNS (Grownut)
Portion size (g)	100 (PLW)	40 (PLW)	15 (PLW)	20 (child)
Price per 100g (GHC)	0.8	0.7	6.13	1.81
Energy (kcal)	400	477.3	509.36	510
Protein (g)	18.6	10.4	7.33	11
Fats (g)	11	18.5	56.6	26
Fiber (g)	-	-	-	-
RAE (mcg)	275.1	687.7	1833.8	705.7
C (mg)	70	175	466.7	200
B1 (mg)	1.2	3	8	3.25
B2 (mg)	1.2	3	8	5.75
Niacin (mg)	14	35	93.3	35
B6	1.6	4	10.7	5
Folate (mcg)	528.7	1321.8	3524.7	1147.5
B12 (mcg)	2.2	5.5	14.7	6.5
Pantothenic Acid (mg)	-	-	-	11
Calcium (mg)	200	500	1333.3	605
Iron (mg)	5.5	13.8	36.7	22.5
Magnesium (mg)	72.5	181.3	483.3	22.5
Sodium (mg)	-	-	-	-
Zinc (mg)	2.375	5.9	15.8	22.5

*TABLE 12.2: **Nutrient Composition of SNFs used in Cost of Diet Modelling***

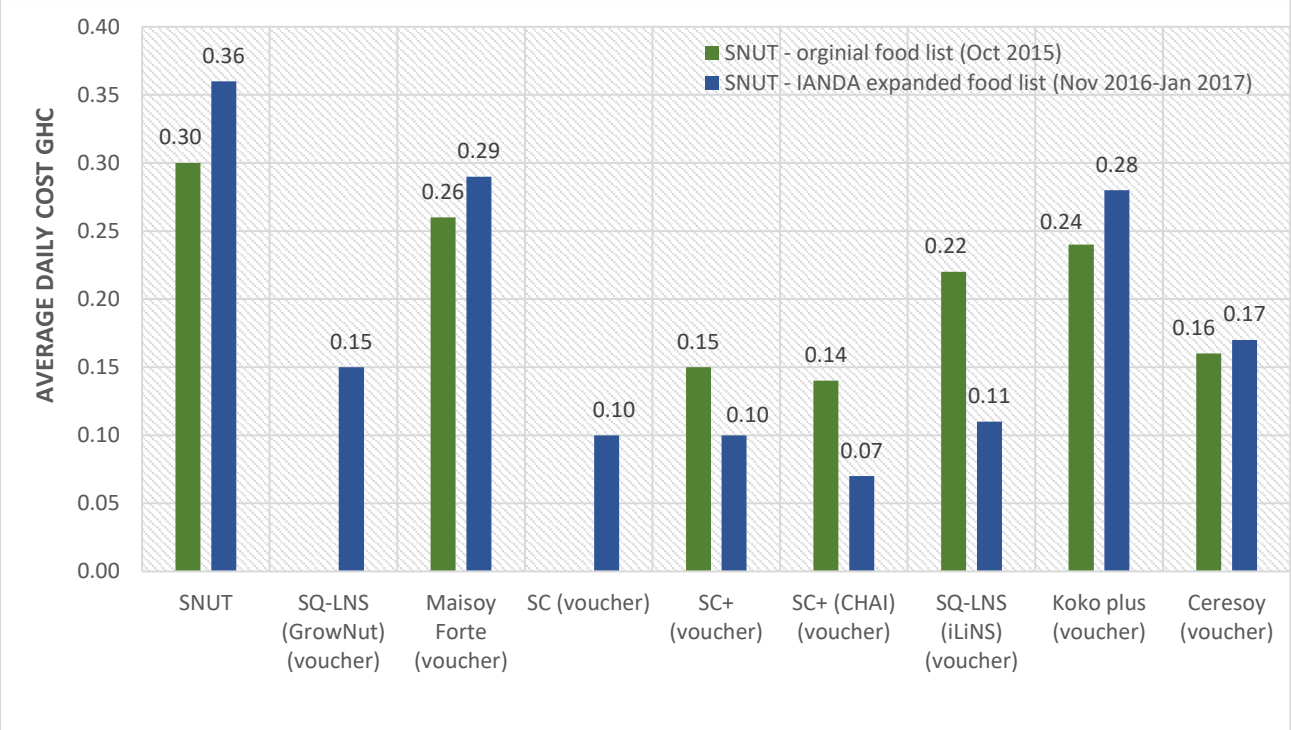


FIGURE 25: ***Comparison of the Average Cost of the Diet of a Child 12-23 months in the Northern region with different interventions (Source: WFP Analysis)***

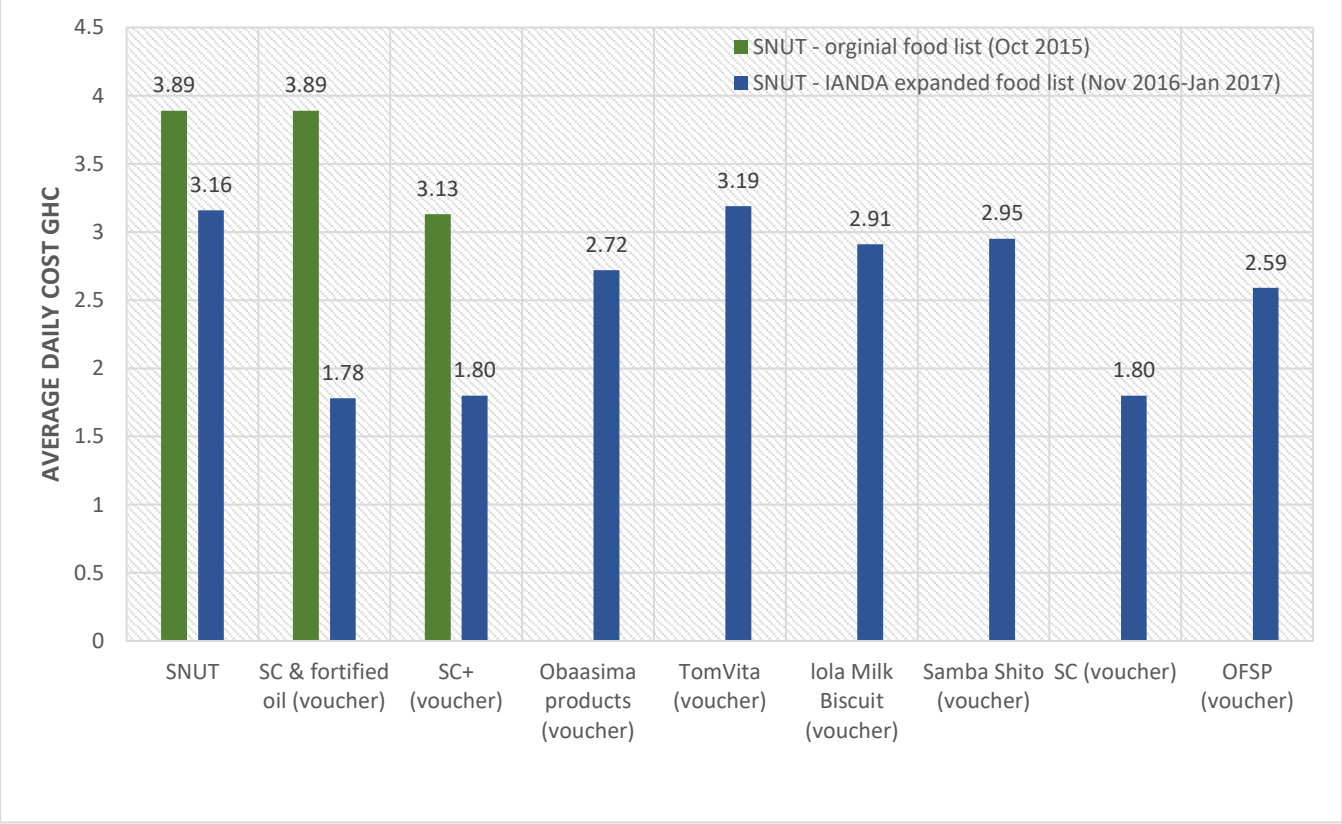


FIGURE 26: ***Comparison of the Average Cost of the Diet of a PLW in the Northern region with different interventions (Source: WFP Analysis)***

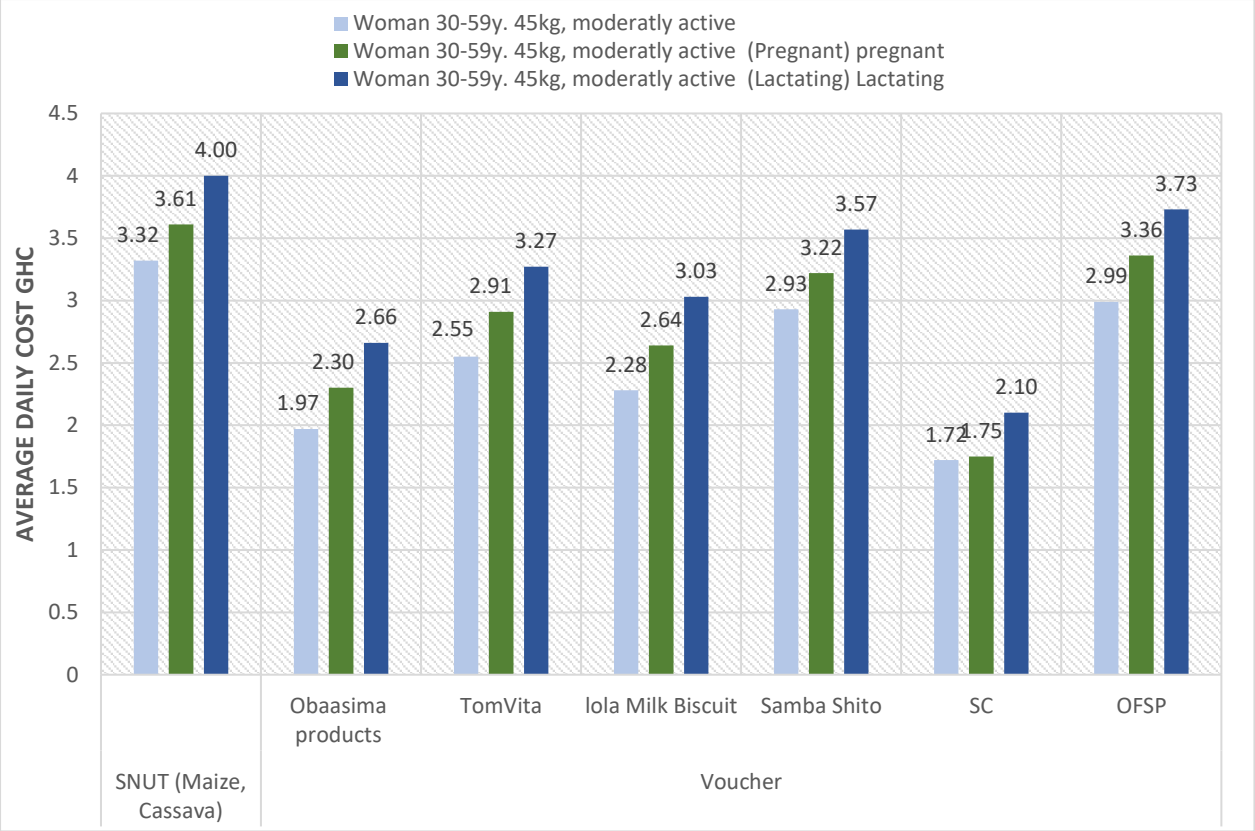


FIGURE 27: ***Average Cost of the Diet of a moderately active woman, non-pregnant non-lactating, pregnant or lactating in the Brong Afaho region with different interventions (Obaasima Product, SC & OFSP) (Source: WFP Analysis)***

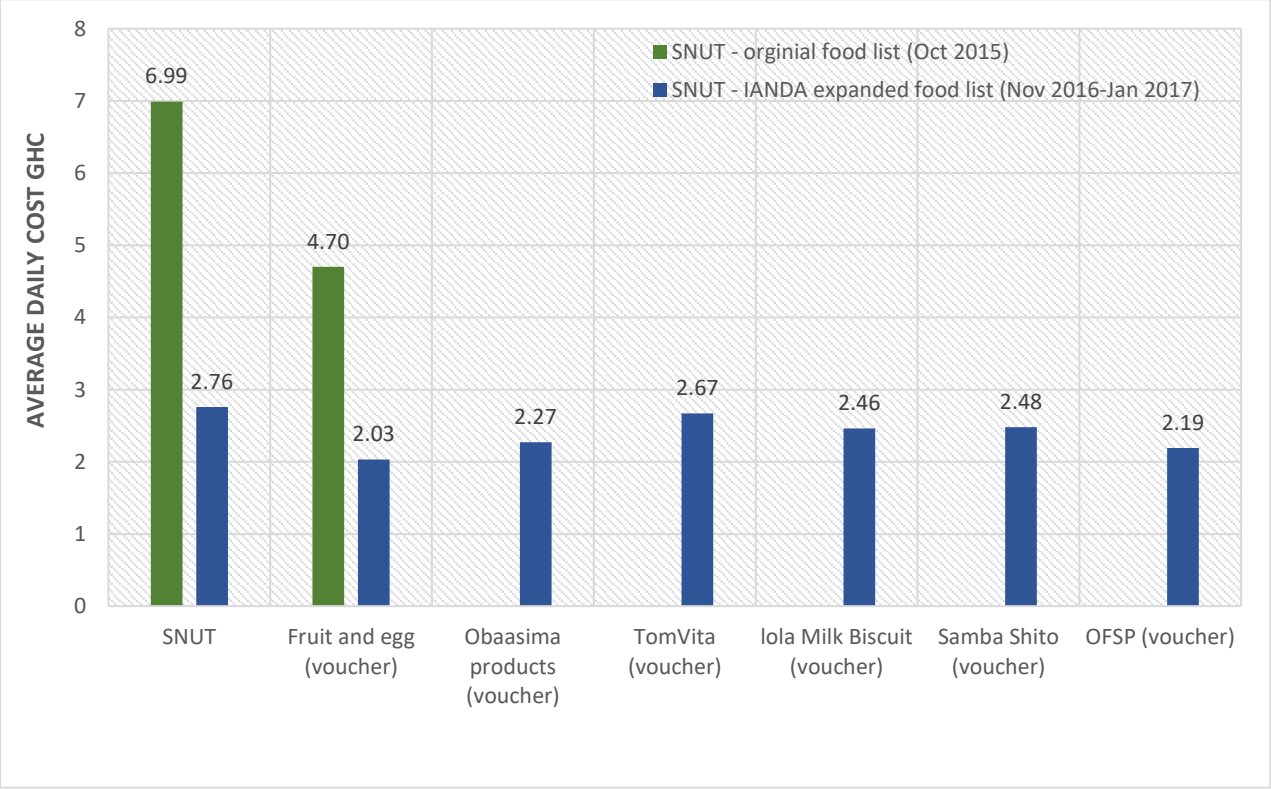


FIGURE 28: ***Comparison of the Average Cost of the Diet of an Adolescent girl 14-15 years in the Northern region with different interventions (Source: WFP Analysis)***