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Validation of Food-Based Recommendations Developed using Optifood for Groups at Nutritional Risk in the Western Highlands of Guatemala

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Contact Information

Food and Nutrition Technical Assistance III Project (FANTA)
FHI 360
1825 Connecticut Avenue, NW
Washington, DC 20009-5721
T 202-884-8000
F 202-884-8432
fantamail@fhi360.org
www.fantaproject.org

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Abbreviations and Acronyms

FANTA	Food and Nutrition Technical Assistance III Project
FBF	fortified-blended flour
FBR	food-based recommendation
FGD	focus group discussion
g	gram(s)
IFA	iron-folic acid
INCAP	Instituto de Nutrición de Centro América y Panamá (Institute of Nutrition of Central America and Panama)
MNP	micronutrient powder(s)
MSPAS	Ministerio de Salud Pública y Asistencia Social (Ministry of Public Health and Social Assistance)
oz	ounce(s)
PEC	Programa de Extensión de Cobertura (Program for the Extension of Coverage)
PLW	pregnant and lactating women
*Pro*PAN	Process for Promotion of Child Feeding
Q	Guatemala Quetzal
TIPs	Trials of Improved Practices
WHO	World Health Organization

Executive Summary

Extremely high chronic malnutrition puts Guatemalan children at an increased risk of mortality, infections, and chronic diseases, as well as long-term decreased earnings and productivity. To improve nutritional status, the World Health Organization recommends that food-based recommendations (FBRs) be used in social and behavior change communication to promote the consumption of nutrient-dense, diverse locally available foods, and promote the use of supplements only if necessary.[1] This report presents the results of a qualitative study undertaken in the Western Highlands of Guatemala to validate a set of FBRs for pregnant and lactating women (PLW) and children 6–23 months. The Food and Nutrition Technical Assistance III Project (FANTA) conducted this activity in partnership with the Instituto de Nutrición de Centro América y Panamá (Institute of Nutrition of Central America and Panama).

The activity began in 2012–2013, when a dietary survey of children 6–23 months of age and PLW, plus a market survey were completed in the Western Highland departments of Huehuetenango and Quiché. The most commonly consumed foods by both PLW and children 6–23 months included tortillas, potatoes, eggs, and black beans, as well as small quantities of onions and tomatoes, with generally low consumption of animal source foods, fortified-blended flour (FBF), and fruits and vegetables. Data were analyzed using the Optifood linear programming tool to identify the best combinations of local foods to optimize the diets of PLW and children under 2 years of age, within the observed acceptable dietary patterns and with the highest nutrient density and lowest cost.

For pregnant women, the results showed that micronutrient deficiencies persist in the diet even though the quantity of food consumed was adequate. Problem nutrients for pregnant women included iron, and in some cases, zinc and folate.[2] Micronutrient supplements would be needed to achieve iron adequacy for pregnant women. For PLW, vitamin B12 adequacy could not be achieved without the consumption of liver, and zinc and folate adequacy could not be achieved without the provision of FBF. For children 6–23 months, the Optifood study found that problem nutrients included iron, zinc, and calcium. For both PLW and children 6–23 months, the findings also noted that the consumption of animal protein was low relative to the total protein consumed from plant sources.

From this analysis, a set of FBRs was selected for each of the target groups to address nutrient gaps and optimize the diets of PLW and children 6–23 months, including the quantity and frequency (per week or day) with which they should be consumed to optimize the diet, assuming regular access to FBF and micronutrient supplementation (see Table A).[3] To validate the FBRs, mothers of children 6–23 months and PLW were asked to practice the set of FBRs during a 3-week period and participate in a 24-hour dietary recall, food frequency questionnaire, and a set of three interviews about the FBRs covering their intentions to put them into practice, perceived difficulties or barriers, and any changes and substitutes introduced. Focus group discussions were held with mothers, PLW, and families involved in agriculture. Key informant interviews were held with local leaders and health workers. A market survey was

[1] FBRs are dietary recommendations for members of a specified target group to promote consumption of specific foods or food groups. They may also include the recommended frequency of consumption of the foods or food groups in a 1-day or -week period (Food and Agriculture Organization of the United Nations/World Health Organization 2001).

[2] Problem nutrients, as defined in Optifood, are nutrients that are likely to remain low in diets due to the availability of and/or access to local food sources and existing dietary patterns.

[3] Optimize the diet means to select the best diet of all the possible diets (possible combinations) according to the list of available foods.

conducted of available products and prices. Although not generalizable due to the small sample size, findings provided insight into the feasibility and acceptability of the FBRs.

Table A. Summary of FBRs tested for PLW and children 6–23 months in the Western Highlands

Pregnant and Lactating Women	Children 6–11 Months	Children 12–23 Months
1. Drink a cup of thick fortified drink (*atole espeso*) made with Incaparina, Vitacereal, or fortified oatmeal every day. 2. Eat 4 servings of vegetables every day of the week. 3. Eat a large potato every day. 4. Eat beef or chicken liver once a week. 5. Eat an orange 3 times a week.	1. Give your child a medium-sized potato 3 times a week. 2. Give your child beans 3 times a week. 3. Give your child half a medium-sized egg (yolk and white) at least 3 times a week. 4. Give your child Incaparina or Vitacereal as porridge 5 times a week.	1. Give your child a medium-sized potato 4 times a week. 2. Give your child beans 4 times a week. 3. Give your child a medium-sized egg at least 4 times a week. 4. Give your child green leafy vegetables 4 times a week. 5. Give your child Incaparina or Vitacereal as porridge 4 times a week.

Based on the FBR trial findings, the recommended foods were considered acceptable, but putting the FBRs into practice with the recommended frequency and quantity was difficult. Challenges included financial limitations, seasonal price variation, difficulties in accessing and storing fresh foods, and the cost and time associated with transport to markets. Most interviewees said they would need to buy the recommended food for the whole family, increasing the cost. Lack of distribution of the FBF Vitacereal negatively impacted the FBRs that used the product.

Further Optifood testing was carried out to examine the impact of adjusting the FBRs to make their adoption more feasible, as well as combining the FBRs with different scenarios of micronutrient supplementation, multiple micronutrient powders (MNPs), and FBF. The new set of FBRs omitted the potato recommendation for children and PLW, omitted oranges for PLW, and limited the vegetable servings for PLW from 28 to 14 per week (see Table B). The analysis showed that when micronutrient supplements or MNPs are consumed along with a feasible set of FBRs that includes fortified blended flour, these combinations are capable of supplying most problem nutrients for PLW and children 6–23 months, provided the micronutrient supplements or MNPs are consistently available and consumed with the recommended frequency.

To promote the FBRs, it will be necessary to integrate them within the government's broader strategy that is focused on reducing stunting in these regions of the Western Highlands. It will also be necessary to ensure that the approach is integrated at multiple levels including the policy, program, community, household, and individual levels. The following recommendations were developed related to the FBRs.

Table B. New FBRs developed for PLW and children 6–23 months in the Western Highlands

Pregnant and Lactating Women	Children 6–11 Months	Children 12–23 Months
1. Drink a cup of thick fortified drink (*atole espeso*) made with FBF or fortified oats every day. *Serving size: 2 heaping tablespoons of dry FBF or fortified oats with a cup of boiled or treated water.* **2.** Eat 2 servings of vegetables every day of the week. *Serving size: 1 medium tomato, half a carrot, or 1 cup of chopped vegetables.* **3.** Eat beef liver or chicken liver once a week. *Serving size: 90 grams (3 ounces) of liver (chicken livers or beef liver).*	**1.** Continue to breastfeed on demand. **2.** Give your child fortified porridge 5 times per week, or as often as possible. *Serving size: 1 tablespoon of dry FBF mixed with 1/3 cup of boiled or treated water.* **3.** Give your child half an egg at least 3 times a week. *Serving size: 1/2 of a well-cooked, medium-sized egg (yolk and white).* **4.** Give your child beans 3 times a week. *Serving size: 2 tablespoons of cooked beans. Prepare mashed, pureed, or refried.*	**1.** Continue to breastfeed on demand. **2.** Give your child fortified porridge 4 times a week. *Serving size: 2 tablespoons of dry FBF mixed with 1/3 cup of boiled or treated water.* **3.** Give your child an egg at least 4 times a week. *Serving size: 1 well-cooked, medium-sized whole egg (yolk and white).* **4.** Give your child beans 4 times a week. *Serving size: 2 tablespoons of cooked beans. Prepare whole, mashed, pureed, or refried.* **5.** Give your child green leafy vegetables 4 times a week. *Serving size: 1/2 a cup of cooked green leafy vegetables, for example, Swiss chard, spinach, or macuy leaves.*

Nutrition Recommendations

- Promote the FBRs alongside broader infant and young child feeding practices and improved food hygiene and handwashing practices.
- Consider the FBRs as ideal practices to be promoted, recognizing challenges for ideal use.
- Prioritize the most nutrient-dense FBRs.
- Promote a simple preparation of fortified porridge.
- Identify and promote other local foods with similar nutrient profiles for seasonal accommodation.
- Target multiple decision makers within households (fathers, mothers-in-law, grandmothers, etc.).

Household Production Recommendations

- Prioritize nutrient-dense foods for production.
- Explore options for home processing of the recommended foods to make them more convenient to feed children.
- Support improved storage.
- Promote technical assistance for raising egg-laying chickens.
- Provide technical assistance to select and cultivate highly nutritious vegetables promoted by the FBRs.

Economic and Market Access Recommendations

- Explore options for the government's safety net programs to expand access to the recommended foods.
- Advocate for prioritization of household expenditures for the foods promoted in the FBRs.
- Promote economic access to an FBF (e.g., Incaparina) if an FBF is not being distributed.
- Support access to local markets or mobile vendors to ease transportation cost and time burden.

Policy and Programmatic Recommendations

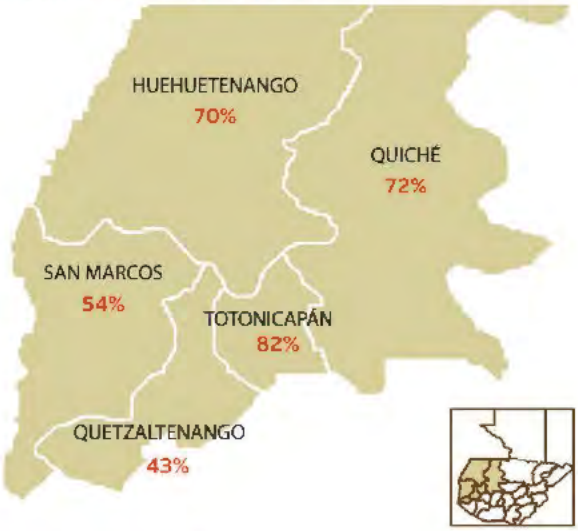
- Strengthen the national program for family agriculture.
- Ensure that micronutrient supplementation is appropriately targeted to the problem nutrients.
- Ensure procurement and distribution of micronutrient supplements.
- Support strategies to improve uptake of and compliance with supplementation programs.
- Consider an improved micronutrient powder for children 6–23 months and PLW, in place of an FBF.
- Support the formation of networks of small-scale producers to increase the production of local foods and promote food-based safety nets that support local production, such as vouchers for local eggs.
- Advocate for the creation of small scale private-public partnerships to increase access to the recommended foods.

1. Introduction

Guatemala is among one of 13 countries most vulnerable to chronic malnutrition globally (von Grebmer et al. 2014). Half of all children 6–59 months of age in Guatemala are chronically malnourished or stunted (low height-for-age) (49.8%). Figure 1 shows that the highest prevalence of stunting is found in rural, largely indigenous areas, particularly in the Western Highlands, where stunting is as high as 82% (Chaparro 2012; Ministerio de Salud Pública y Asistencia Social [MSPAS] 2010).

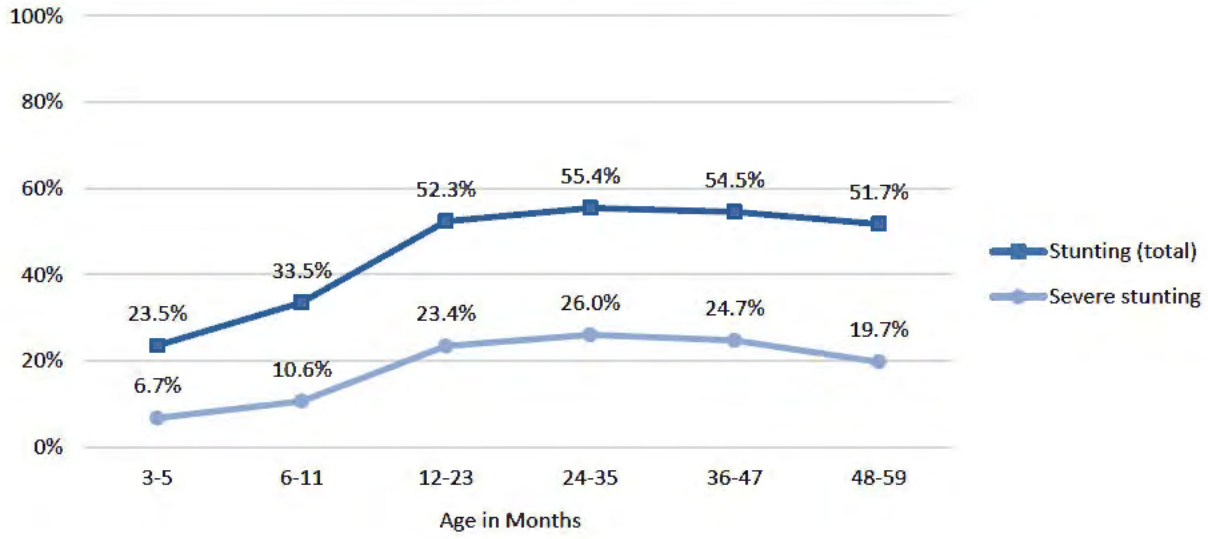
As shown in Figure 2, the majority of growth faltering occurs in the first 2 years of life in Guatemala. Poor nutrition and health outcomes experienced in the Western Highlands are the result of food insecurity; poor water, sanitation, and hygiene practices; lack of access to health and education services; and vulnerability to climate change and natural disasters (Chaparro 2012; Estrada et al. 2007). Specifically, inadequate infant and young child feeding practices are an important determinant of stunting.

Figure 1. Prevalence of stunting in children under 5 in the Western Highlands



Source: MSPAS 2010

Figure 2. Percent of children who are stunted (total) or severely stunted in Guatemala*



Source: MSPAS 2010

* Stunted (total) = height-for-age < -2 standard deviations from the median of the 2006 World Health Organization (WHO) Child Growth Standards; severely stunted = height-for-age < -3 standard deviations from the median of the 2006 WHO Child Growth Standards.

Consequently, stunted children are at an increased risk of mortality and infections, and once they reach adulthood, may be more likely to develop chronic diseases (Black et al. 2013; MSPAS 2010). Stunting impairs cognitive ability in children and delays learning how to sit, stand, and walk (Mendez and Adair 1999; Miller et al. 2015; Cheung et al. 2001; Kariger et al. 2005; Gibson et al. 2009; Kulkarni et al. 2012). They then enroll in school later, perform worse, and are more likely to drop out than well-nourished children, which at an aggregate level, results in reduced human capital and economic productivity (Grantham-McGregor et al. 2007; Hoddinott et al. 2008; Maluccio et al. 2009). Malnourished children who are stunted and poor lose more than 4 years of schooling compared to their better-off peers (Grantham-McGregor et al. 2007). The economic impact of chronic malnutrition is significant. Follow-up studies of a randomized controlled nutrition intervention trial conducted in Guatemala during the 1960s to 70s showed that improved nutrition by age 3, but not after age 3, had long-term positive effects on education and wages (Dewey and Begum 2011; Victora et al. 2008).

Research evidence shows that the period from pregnancy through the first 2 years of life (known as the first 1,000 days) is a critical window of opportunity for the prevention of malnutrition, as after a child's second birthday it becomes increasingly difficult to reverse growth faltering (Victora et al. 2010; Martorell et al. 1994). The majority of a child's brain growth is complete by age 2 and malnutrition during this time increases the risk of developmental and cognitive delays in children. Specifically, children are most vulnerable to stunting during the period of 6–11 months of age (Shrimpton et al. 2001) when exclusive breastfeeding is no longer enough to meet nutrient requirements and complementary feeding begins. However, age-appropriate complementary feeding is a challenge in most contexts as the frequency of feeding, quantity of food, and the variety of foods offered are low. Additionally, the onset of complementary feeding itself coupled with the increased mobility of the child results in greater exposure to environmental food and water-borne pathogens, which significantly increases the risk of infection in children of this age (Dewey and Adu-Afarwuah 2008).

In Guatemala, national survey data shows that by 6–11 months of age nearly 34% of children are stunted, and from 12–23 months up to 59 months of age the prevalence of stunting remains consistently greater than 50% nationally (MSPAS 2010) (see Figure 2). The data also show that by 6–11 months of age nationally, 76% of children receive some form of complementary feeding. However, smaller surveys and studies from the Western Highlands of Guatemala indicate that far fewer children receive the minimum acceptable diet that consists of adequate frequency of feeding and variety of foods offered, which indicates that the diet quality for children under 2 is poor (a Feed the Future survey found 40% of children under 2 received a minimum acceptable diet [MEASURE Evaluation 2014], and a Food for Peace baseline survey found 20% of children under 2 received a minimum acceptable diet [USAID 2013]).

The promotion of appropriate complementary feeding has been identified as one of the most effective strategies for reducing stunting and the associated burden of disease (Bhutta et al. 2008). Improving infant and young child feeding however, encompasses a set of complex practices that need to occur simultaneously. Adequate infant feeding depends on: continued breastfeeding and frequency of feeding complementary foods; responsive feeding; food hygiene and handwashing practices; and quantity, quality, and variety of foods offered in the diet overall and of each meal.

In addition to the set of infant and young child feeding practices, the World Health Organization (WHO) recommends that food-based recommendations (FBRs) be used in social and behavior change communication to promote the consumption of nutrient-dense, diverse locally available foods to the extent possible, and promote the use of supplements only if they are necessary to address critical nutrient

gaps (WHO 2008).[4] However, meeting the nutrient requirements of complementary feeding using only locally available foods, particularly in the Western Highlands region of Guatemala, is challenging in poor communities where families earn very little income, have limited access to land for food production, and have many dependents to feed. While dietary beliefs and established practices are also a factor, the choice is often quantity over quality, with lower cost nutrient-poor staples being selected over higher cost nutrient-dense foods. Given this context, Guatemala has had a favorable policy environment that promotes fortification and access to fortified foods, such as fortified-blended flour (FBF). While current government policy in Guatemala stipulates that pregnant and lactating women (PLW) and children 6–23 months receive FBF (e.g., Vitacereal) and micronutrient supplements, distribution has not been consistent.[5]

Given both the scale of chronic malnutrition in the Western Highlands and the far-reaching consequences for Guatemalan children both now and in the future, targeting nutrition-specific and nutrition-sensitive interventions to the first 1,000 days are a critical and essential investment for Guatemala. Through its Zero Hunger Plan, which is focused on the first 1,000 days, the Government of Guatemala has set a goal of reducing chronic malnutrition in children under 5 years by 10% by 2016 and by 24% by 2022 (Government of Guatemala 2012). The nature of stunting and the pattern of onset strongly suggest that improving maternal micronutrient status, infant and young child feeding practices, and hygiene and sanitation practices could significantly reduce the prevalence of stunting. But a more in-depth understanding of the challenges to improving infant feeding practices in the Western Highlands region is needed to develop targeted social and behavior change, strengthen the enabling environment, and develop more intensive nutrition-specific and nutrition-sensitive interventions targeted to the 1,000 days.

This report presents the results of a qualitative study undertaken in the Western Highlands of Guatemala to validate a set of FBRs for PLW and children 6–23 months in these regions. It is the third phase of a study that follows from an earlier Optifood study by FANTA, *Development of Evidence-Based Dietary Recommendations for Children, Pregnant Women, and Lactating Women Living in the Western Highlands of Guatemala*, which was completed in 2014.

[4] FBRs are dietary recommendations for members of a specified target group to promote consumption of specific foods or food groups. They may also include the recommended frequency of consumption of the foods or food groups in a 1-day or -week period (Food and Agriculture Organization of the United Nations/World Health Organization 2001).

[5] FBF refers in this case to Vitacereal or Incaparina, which are corn-soy blend products or packaged oats, fortified with iron. Other locally available FBFs, such as Bienestarina and Mi Comidita, could also be used.

2. Study Background and Objectives

Given that stunting is a pervasive problem in Guatemala, it is essential to understand whether available local foods and acceptable dietary practices are capable of meeting the dietary needs of PLW and children under 2 years of age during the critical 1,000-day period. To gain a better understanding of how the local diets of PLW and children 6–23 months can be optimized, the Food and Nutrition Technical Assistance III Project (FANTA) in partnership with the Instituto de Nutrición de Centro América y Panamá (INCAP) (Institute of Nutrition of Central America and Panama) conducted this activity in several phases (see Figure 3).

In the first phase completed in 2013, a dietary survey of 381 children 6–23 months and 154 PLW, plus a market survey were completed in the Western Highland departments of Huehuetenango and Quiché. The results of the dietary surveys (see Figures 4 and 5) show that the most commonly consumed foods by both PLW and children 6–23 months of age were similar for both groups and predominantly included tortillas, onions, potatoes, tomatoes, eggs, and black beans. Consumption of animal source foods, FBF, and fruits and vegetables were low (FANTA 2014).

Figure 3. Phases involved in the process of using Optifood to develop and promote FBRs in the Western Highlands of Guatemala

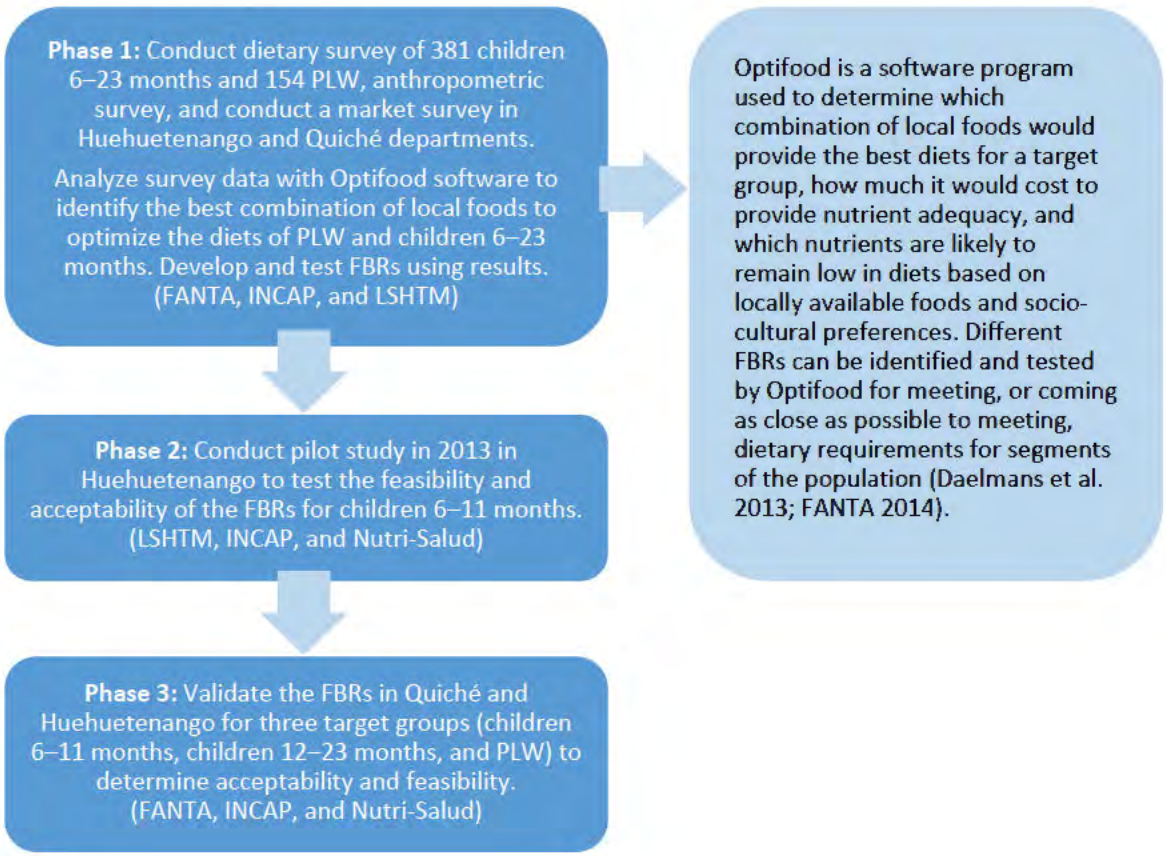
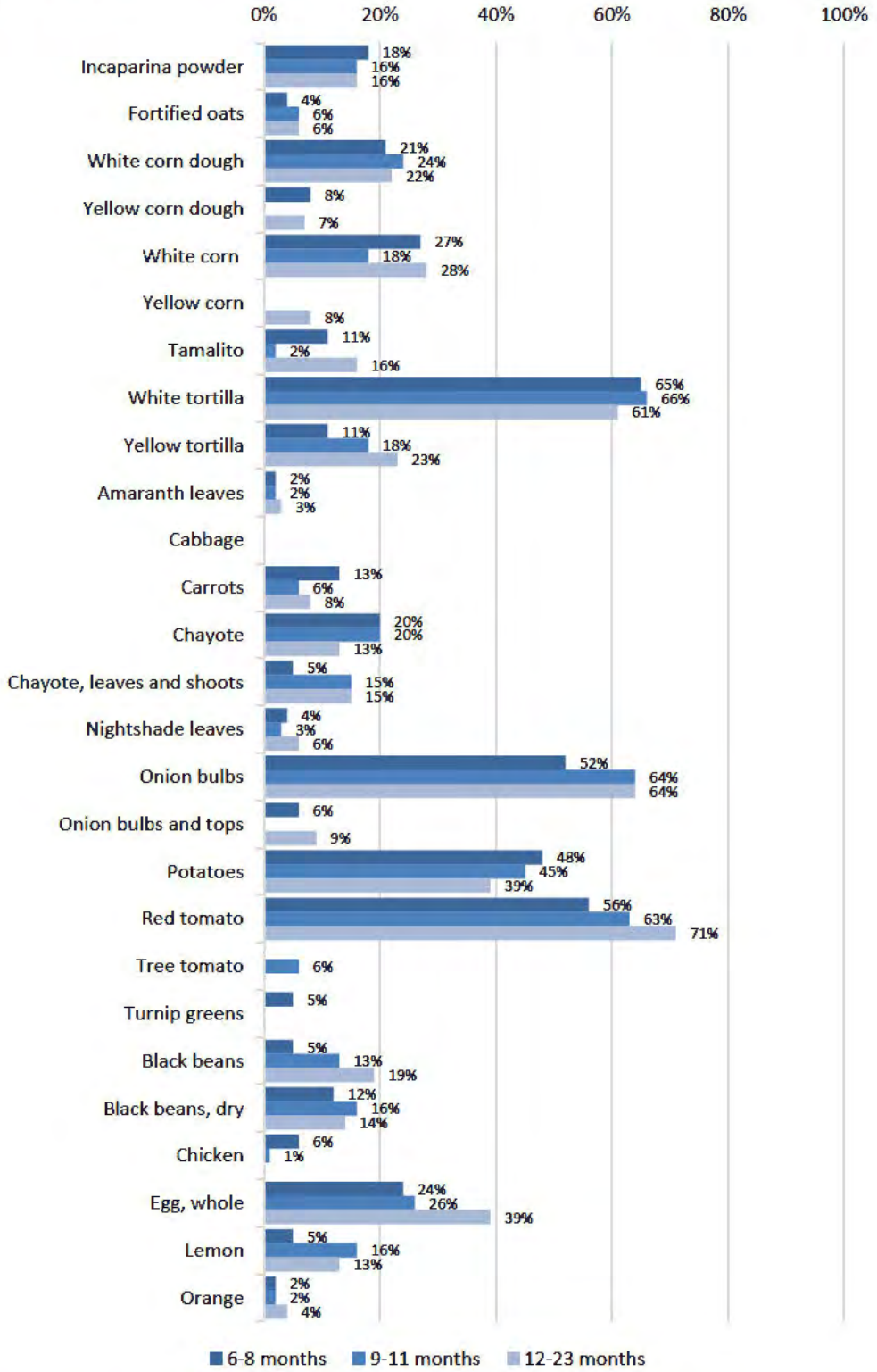
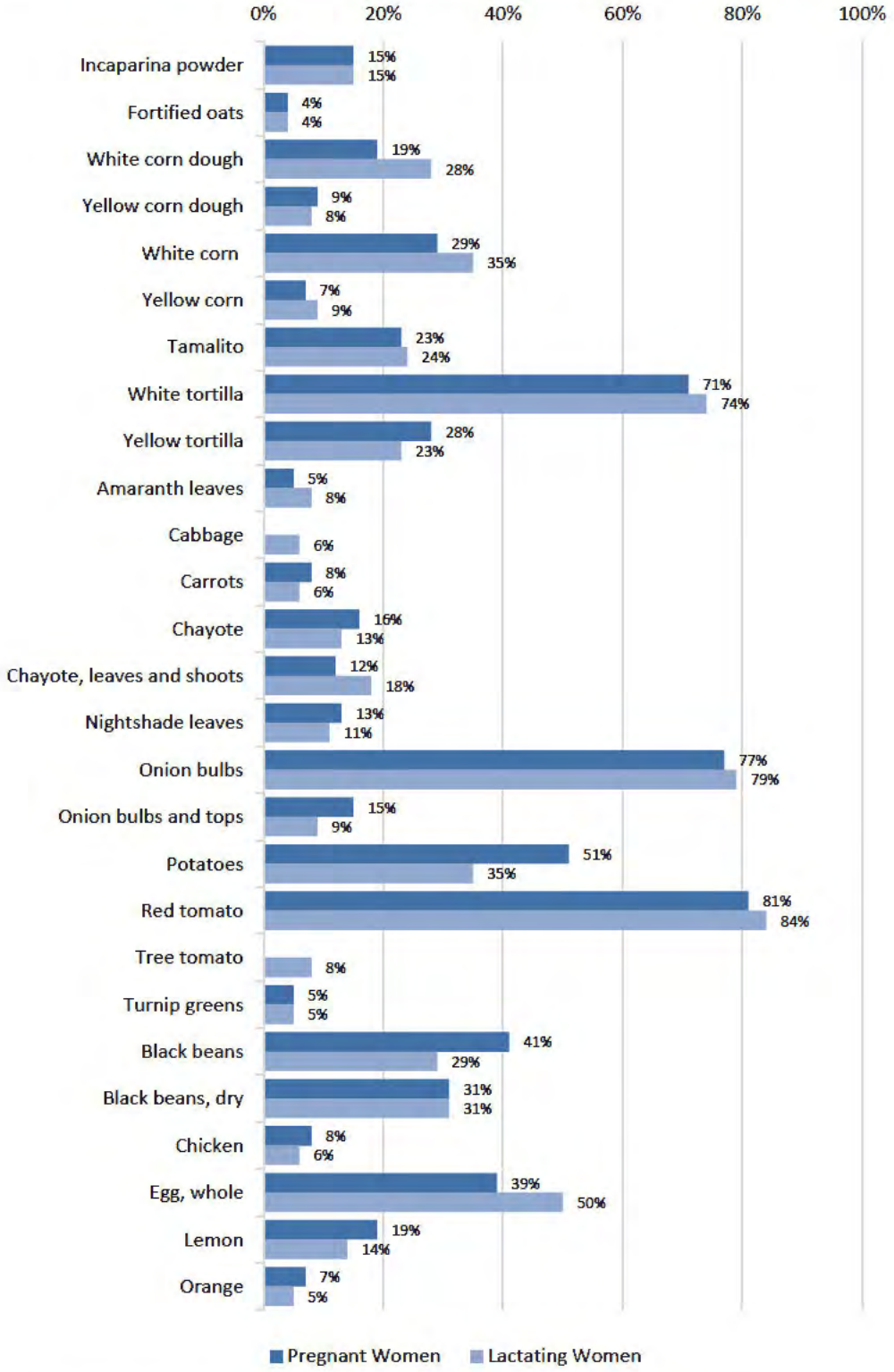


Figure 4. Foods consumed in the previous 24-hour period by children 6–23 months (2012 baseline dietary survey)



Note: "Black beans" refers to cooked black beans as reported in the 24-hour diet recall, while "Black beans, dry" refers to dry black beans reported in the diet recall.

Figure 5. Foods consumed in the previous 24-hour period by PLW (2012 baseline dietary survey)



Note: "Black beans" refers to cooked black beans as reported in the 24-hour diet recall, while "Black beans, dry" refers to dry black beans reported in the diet recall.

Data from the dietary and market surveys were analyzed using Optifood to identify the best combinations of local foods to optimize the diets of PLW and children under age 2. This analysis sought to identify the best possible diets, within the observed acceptable dietary patterns, with the highest nutrient density at the lowest cost. The analysis identified certain problem nutrients in the diets of pregnant women and children 6–23 months.[6] For pregnant women, the results showed that micronutrient deficiencies persist in the diet even though the quantity of food consumed was adequate. Problem nutrients for pregnant women included iron, and in some cases, zinc and folate. Iron needs could not be met for pregnant women with diets based on local foods, even if fortified foods were used, indicating that micronutrient supplements would be needed to achieve adequacy. For PLW, vitamin B12 adequacy could not be achieved without the consumption of liver, and zinc and folate adequacy could not be achieved without the provision of FBF.

For children 6–23 months, the Optifood study found that problem nutrients included iron, zinc, and calcium. For both PLW and children 6–23 months, the findings also noted that the consumption of animal protein was low relative to the total protein consumed, which was largely plant-based due to the high consumption of maize as the staple food. In addition, the largely plant-based diet likely inhibits the absorption and bioavailability of micronutrients in the foods consumed.

From this analysis, a set of FBRs was selected for each of the target groups to address nutrient gaps and optimize the diet of PLW and children 6–23 months. The process of developing the FBRs took into account the best local food sources of multiple micronutrients for each target group, compatibility with existing dietary patterns, expected feasibility and acceptability of consuming the recommended foods, and cost of buying these foods. While the final FBR sets decided upon were considered most appropriate at the time of this analysis, it was acknowledged that community-based trials were needed to take the current local context into account and that the FBRs may be altered as a result.

Each FBR was intended to be validated during household trials to ensure its feasibility and acceptability and to be promoted alongside government micronutrient supplementation. For each recommended food, the FBRs specified the quantity and frequency (per week or day) with which they should be consumed to optimize the diet, and in the case of the FBF, the preparation was also specified. For the FBRs that were tested, it was assumed that families had regular access to FBF (Vitacereal) through the government distribution system and that they received micronutrient supplements (micronutrient powder for children and folic acid and iron supplements for women).[7] The FBRs also assume that children will continue to be breastfed during the first 2 years. During the first phase of the study breast milk intake was estimated by taking the difference between average energy requirements for each age group and the median energy intake from complementary foods from the 24-hour dietary recall data. However, only 66% of children under 6 months of age are exclusively breastfed in the Western Highlands [MEASURE Evaluation 2014] and the median duration of breastfeeding within the Western Highland departments also varies greatly, ranging from a low of 0.4 months in Huehuetenango to a high of 5.7 months in Quiche [MSPAS 2010]. This may indicate that continued breastfeeding may also not be optimal in this population, although more data on quality of breastfeeding is needed. It is important that the FBR results be considered within this context as children may already be underweight and stunted due to poor breastfeeding practices when they begin complementary feeding. The FBRs include recommendations for continued breastfeeding on

[6] Problem nutrients, as defined in Optifood, are nutrients that are likely to remain low in diets due to the availability of and/or access to local food sources and existing dietary patterns.

[7] The government mandates provision of the FBF Vitacereal for children 6–23 months, pregnant women, and lactating women with a child under 6 months. In addition, children should also receive multiple micronutrient powders and PLW should receive iron and folic acid supplements.

demand, and it will be important to emphasize optimal breastfeeding in addition to the specific food-based recommendations.

Following the development of the FBRs for each of the target groups, a pilot activity (considered phase two) was undertaken in Huehuetenango by the London School of Hygiene and Tropical Medicine, INCAP, and Nutri-Salud in 2013 to test the feasibility and acceptability of the FBRs for children 6–11 months (Knight 2013). Key findings were that mothers of these children in Huehuetenango were already practicing breastfeeding on demand and giving their children maize products (tortillas or *tamalitos*) and potatoes, and were open to trying some of the FBRs, particularly the preparation of thick porridge. Other FBRs were more challenging to implement, such as daily consumption of beans, meat, poultry, or eggs. Mothers did not previously know how to prepare cereals as porridge (as opposed to watery broths or *atoles*) and household demonstrations were recommended to improve knowledge and increase use.[8]

While this pilot activity provided initial insights on the feasibility and acceptability of a set of FBRs for the youngest target group in one department, further validation was essential to ascertain whether the recommendations developed from Optifood were feasible and acceptable for all target groups studied, and whether they needed to be modified to increase the likelihood that they would be accepted and put into practice. For this reason, phase three sought to test the FBRs provided in Table 1 for the three target groups (children 6–11 months, children 12–23 months, and PLW), the results of which are provided in this report. Given the potential variation in the acceptability and feasibility of these sets of FBRs across different regions, participants for this FBR validation activity were selected from both Quiché and Huehuetenango departments.

Study Objective

To validate the feasibility and acceptability of a set of FBRs to improve the nutritional intake of children 6–23 months and PLW in Quiché and Huehuetenango.

Hypothesis

The set of FBRs developed using Optifood are acceptable and feasible for implementation by families with children 6–11 and 12–23 months of age and PLW living in Huehuetenango and Quiché in the Western Highlands of Guatemala.

Conceptual Framework for FBR Trials

A conceptual framework, as shown in Figure 6, was adapted from the *Pro*PAN resource for this phase of the study to identify factors that may influence feasibility and acceptability of the FBRs among study participants.[9] The conceptual framework reflects the hypothesis that putting the set of FBRs into practice would depend on factors such as feasibility, acceptability, availability, enabling environment, and dietary practices.

[8] Atole is a traditional cereal-based hot beverage. It is usually prepared with water, sugar, and a grain/flour base/cereal blend in a diluted form and is the most common and accepted way of preparing Incaparina and Vitacereal (Estrada et al. 2007).

[9] The Process for Promotion of Child Feeding (*Pro*PAN) resource, which incorporates the Trials of Improved Practices (TIPs) methodology, can be used to evaluate whether Optifood-generated FBRs are feasible and acceptable by exploring intention to use and use of FBRs as well as identifying barriers to putting them into practice and motivations for their use (Daelmans et al. 2013; Dickin et al. 1997; Lutter et al. 2013).

Table 1. FBRs developed and tested for PLW and children 6–23 months in the Western Highlands

Pregnant and Lactating Women	Children 6–11 Months	Children 12–23 Months
1. Drink a cup of thick fortified drink (*atole espeso*) made with Incaparina, Vitacereal, or fortified oatmeal every day. *Serving size: 2 heaping tablespoons of dry Vitacereal, Incaparina, or fortified oatmeal with a cup of boiled or treated water.* 2. Eat 4 servings of vegetables every day of the week. *Serving size: 1 medium tomato, half a carrot, or 1 cup of chopped vegetables.* 3. Eat a large potato every day. *Serving size: 1 large potato the size of an adult woman's fist.* 4. Eat beef or chicken liver once a week. *Serving size: 90 grams (3 ounces) of liver (chicken livers or beef liver).* 5. Eat an orange 3 times a week. *Serving size: 1 large or 2 small oranges. Also, try adding lemon juice to your meals.*	1. Give your child a medium-sized potato 3 times a week. *Serving size: 1 medium or small potato.* 2. Give your child beans 3 times a week. *Serving size: 2 tablespoons of cooked beans. Prepare mashed, blended, or refried.* 3. Give your child half a medium-sized egg at least 3 times a week. *Serving size: 1/2 a well-cooked, medium-sized egg (yolk and white).* 4. Give your child Incaparina or Vitacereal as porridge 5 times a week. *Serving size: 1 tablespoon of dry Incaparina or Vitacereal mixed with 1/3 cup of boiled or treated water.*	1. Give your child a medium-sized potato 4 times a week. *Serving size: 1 medium or small potato.* 2. Give your child beans 4 times a week. *Serving size: 2 tablespoons of cooked beans. Prepare mashed, blended, or refried.* 3. Give your child a medium-sized egg at least 4 times a week. *Serving size: 1 well-cooked, medium-sized whole egg (yolk and white).* 4. Give your child green leafy vegetables 4 times a week. *Serving size: 2 raw large Swiss chard leaves or 1/2 a cup of cooked green macuy leaves.* 5. Give your child Incaparina or Vitacereal as porridge 4 times a week. *Serving size: 2 tablespoons of dry Incaparina or Vitacereal mixed with 1/3 cup of boiled or treated water.*

Figure 6. Conceptual framework for FBR trials

GOAL: Caregivers and women adopt a set of food-based recommendations				
Themes that would influence adoption of behaviors				
Access/Economic Feasibility	**Acceptability**	**Availability**	**Enabling Environment**	**Dietary Practices**
***Pro*PAN criteria:** • **Cost in terms of economic resources** • **Cost in time and effort to access and prepare foods** • **Material resources needed and access** **OTHER:** • **Opportunity cost**	***Pro*PAN criteria:** • **Compatibility with existing beliefs and knowledge** (prior experience, cultural beliefs, taboos, approval of others, priorities) • **Child/mother acceptability** (food, preparation, frequency, taste, and texture) • **Perceived positive consequences** • **Compliance** (FBR use, frequency, preparation)	• **Current market/store availability** of FBR foods • **Past and current home production** of FBR foods • **Seasonality of production** • **Potential of keeping produce for consumption** • **Potential of starting/ increasing production** and land availability/willingness to use land for this purpose • **Access to/need for capital resources and technical support**	• **Household and peer support** or discouragement for FBR practices and use of resources (including Vitacereal) • **Health system support** for FBRs (community, municipal, and facility) • **Material support** present or needed, such as fortified food and micronutrient supplements	• **Current dietary practices** and whether FBRs already being followed • **Proposed portion sizes** • **Proposed frequency of consumption** • **Proposed texture** • **Proposed complexity of preparation and required knowledge** • **Seasonal influence on time to prepare and eat/feed recommended food** • **Dietary diversity**, especially related to age of child
Issues that cross-cut several themes				
• Time to purchase FBR foods	• Perceived time for preparation	• Time for production of recommended foods		• Time to prepare individual and full set of recommended foods
• Motivation to use resources for FBRs	• Acceptability of FBRs and prioritizing child/PLW feeding	• Interest in producing FBR foods • Interest in replacing current production with FBR foods	• Others in household interested in using household resources for FBRs	• Motivation to prepare foods as recommended and with recommended portions and frequency. Realistic? Overwhelms?
• Gender implications of access to the resources needed for each FBR	• Gender implications of prioritizing women's nutrition	• Gender constraints around women's production and use of produce	• Male support needed and/or present	• Male support needed and/or present for optimal behaviors
• Sustainability of maintaining FBR use		• Sustainability of production		• Possible to sustain effort for each practice and set of FBRs

3. Methods

Study Areas

The FBRs were developed based on dietary data collected in two ethnolinguistic regions of the Western Highlands: the Mam area of the Huehuetenango Department (specifically the municipalities of San Sebastián Huehuetenango, San Pedro Necta, Chiantla, and Todos Santos Cuchumatán) and the Ixil/Quiché regions in the Quiché Department (specifically the municipalities of Cunén, Nebaj, Chajul, Sacapulas, and San Juan Cotzal), shown in the shaded area in Figure 7. The validation activity was also carried out in these two regions. One municipality in each department (Sacapulas in Quiché and Todos Santos in Huehuetenango) and three communities within each of those two municipalities were selected for data collection. The communities are located in priority areas for the Zero Hunger Plan and the U.S. Global Health Initiative, and within the implementation area of the Nutri-Salud project. The six selected communities have key characteristics of interest that include a low socioeconomic profile, different ethnicities, and varying remoteness.

Figure 7. Departments and municipalities of Huehuetenango and Quiché where data were collected

Study Design and Sampling Methods

The target groups for this activity were children 6–11 months and 12–23 months, pregnant women, and lactating women with children under 6 months. The design of this study assumed that mothers are generally responsible for feeding small children and themselves, and as such, mothers were selected for the interviews. Qualitative methods were used, specifically the Trials of Improved Practices (TIPs) methodology, which is designed to test the feasibility and acceptability of improved practices (Dickin et al. 1997). This methodology consists of informing participants about the improved practices that are to be tested, and if participants agree to participate, negotiating their trial of the FBRs. After a first visit, which includes an interview, two additional visits with interviews are conducted over 3 weeks. A market prices survey using a quantitative tool was also conducted to determine local food availability and prices.

Participants were selected using convenience and purposive sampling. Participants were purposively selected from predefined client lists provided by Nutri-Salud. The inclusion criterion for participants was that they belong to one of the three target groups. Additionally, participants for focus group discussions (FGDs), participants for agricultural observations, and key informants for individual interviews were selected based on their ability to provide information about a specific issue, for example, by being a mother, a health provider, a community leader, or a farmer, or by being engaged in livestock production. The data collection methods included:

- Short, semi-structured interviews to field-test which FBRs should be validated

- Semi-structured key informant interviews
- Semi-structured FBR trial interviews with mothers of children 6–11 months, with mothers of children 12–23 months, and with pregnant women and lactating women with children under 6 months
- FGDs with mothers and agricultural families
- Observation of agricultural practices and animal-raising practices
- A market survey of local food availability and prices

Table 2. Total number of study participants by method in both departments

Method	Participants					
	Mothers of children 6–11 months	Mothers of children 12–23 months	PLW	Households with a child under 5 that participate in agricultural activities	Key informants	Local markets and small stores visited
Field-test semi-structured interviews to determine which FBRs should be validated	6	6	6			
Semi-structured key informant interviews					7	
Semi-structured interviews conducted in 3 visits	11	19	21			
FGDs on FBRs (8–10 participants each)	2		3			
FGDs on agriculture and livestock (8–10 participants each)				3		
Observations of agriculture and livestock practices				5		
Market prices survey						5

Ethical Approval, Local Permission, and Consent

This activity received ethical approval from the FHI 360 and INCAP Human Research Ethics Committees. Informed consent was obtained from all study participants who were willing to participate in this activity.

Interviewer Training

Field staff were trained on the specific methodology of the project, focusing on qualitative methods using data collection instruments developed for this project. Although staff were qualified nutritionists, had been previously trained in 24-hour recall methods, and had experience using these methods in field-based settings, the training included a review of the recall tool and interview simulations.

Data Collection

Before beginning the validation trial, a field-test of the FBRs was undertaken by interviewing six women from each target group to determine which FBRs to test and whether any of the recommendations needed

modification before asking a larger sample of families to attempt them. The results from the field-test were triangulated with the dietary survey data collected for the Optifood survey in the first phase to determine the final set of FBRs to test.

Data collection took place July 1, 2014 to August 30, 2014, during the lean or hungry season in Guatemala (Mazariegos and Méndez 2012). Local staff from the Programa de Extensión de Cobertura (PEC) (Program for the Extension of Coverage)/Ministry of Health provided support identifying potential participants and invited them to community meetings to share information about the activity. With the support of Nutri-Salud staff previously trained in the methodological aspects of the household trials and local PEC community health workers, the potential participants were informed about the objectives, procedures, demands, risks, and benefits of the study. Those interested and willing to participate were registered as potential participants and according to their availability and location, a date for a home visit was scheduled. A calendar of household visits allowed three home visits a day per field staff.

At each interview a simple, non-quantitative 24-hour recall and food frequency questionnaire was used to provide a list of foods consumed by target group members and assess whether recommended foods were being consumed, and if FBRs were followed consistently. At the first semi-structured interview, a baseline questionnaire was administered to collect data on socioeconomic status, illness, feeding practices, food preparation, and food hygiene practices. Following this, participants were introduced to the FBRs for their relevant target group (children 6–11 months, children 12–23 months, or PLW) and asked if they could try them for 3 weeks. Techniques for discussing the new feeding practices as outlined in the TIPs and *Pro*PAN guides were used to facilitate these discussions, which included short cooking demonstrations for preparing FBF as a porridge (for children) or a thick fortified atole for women. Following this, interviews were used to discuss initial thoughts about the FBRs, intentions to put them into practice, and perceived difficulties or barriers. The second semi-structured interview was conducted a week later and consisted of an interview to explore actual use, barriers, and difficulties related to the FBRs introduced at the first visit and any changes and substitutes introduced. At the end of the visit, the Latin American and Caribbean Household Food Security Scale (Food and Agriculture Organization of the United Nations 2014) questionnaire was administered.

At the final household visit, an interview explored women's attempts to practice the FBRs, as well as their intention to continue/discontinue putting the FBRs into practice, understanding of the FBRs, involvement and support from others, and any difficulties experienced. Mothers were again asked if they had put any FBRs into practice and, if so, what their experience had been or if not, why. This final interview also explored whether women had or would recommend the FBRs to other mothers and if they thought the FBRs should be modified in any way. Women were also asked about potential factors affecting the availability of and access to certain foods included in the FBRs such as cost and seasonality.

A total of 60 participants completed the baseline assessment and the introduction of the FBRs. A total of 51 out of the 60 participants successfully completed all three household visits. The main reasons for missing visits were because participants were unavailable for the scheduled time. In some cases, interviewers returned to these households on a different day to complete an interview with the participant if they were available.

A total of five focus group discussions were completed at the community level to further explore themes raised in the FBR trials, understand community norms, and to discuss the feasibility and acceptability of the FBRs with other community members. The discussions sought to explore participants' perceptions about feeding young children or food practices of PLW, changes to diets over time, and challenges faced in feeding children and themselves. Separate focus groups with men and women were also held in each department to discuss the feasibility of the FBRs with people involved in local agricultural and livestock

production. These discussions explored the feasibility of putting the FBRs into practice with particular reference to production, cost, availability, and seasonality of the promoted food items. During the FGDs, participants were also asked to construct a seasonal calendar of food production and local food availability at the community level. Key informant interviews with local health providers and leaders were held to further explore any themes about which the participants had specialized knowledge in regards to food production and preparation and feeding practices in the community.

Markets frequented by families (including those outside the community) and small shops in communities were visited to understand variation in prices and availability of the main FBR foods. Data collection took place on market days and focused on documentation of prices and seasonal availability of foods of interest. In addition, a few observations of agriculture and livestock practices were undertaken to better assess the feasibility of implementing the FBRs. These observations, conducted during visits by FANTA's Technical Advisor, focused on production, seasonal availability of food, livestock practices, and access to water and other resources.

All interviews were carried out in Spanish with a local interpreter present during household visits, FGDs, and interviews to translate questions/responses into the local indigenous language as needed. When permission was given, responses to interviews from all participants were recorded simultaneously using a voice recorder and note-taking on paper. During agricultural observations, responses were recorded and notes were taken on paper.

Tools that were used to fulfill the specific aims of the study included: question guide to field-test the FBRs; a socio-demographic and health questionnaire to collect data on socioeconomic status, demographics, and health; a 24-hour dietary recall tool and food frequency questionnaire to collect dietary data; question guides for household visits as part of the FBR trials; FGD guides; guides for the semi-structured interviews; a market survey; and the agricultural observation tool. Additionally, a set of visual cards depicting each FBR food, serving size, and frequency, were left with the families during the trial period to help them remember the FBRs (shown in Figure 8). A weekly calendar was also provided with examples of how the FBR foods could be consumed over the course of the week.

Figure 8. Example of FBR cards for children 6–11 months

The data collection instruments employed during this project combined elements from both the TIPs and *Pro*PAN guides adjusted to fit the local context and the objectives of this project. All tools were developed in English, translated into Spanish, and translated back into English to ensure accuracy. Prior to translation, data collection instruments were reviewed by staff at INCAP and Nutri-Salud to ensure that they were appropriate for the Guatemalan situation.

Semi-structured interviews were conducted by Nutri-Salud nutritionists trained and experienced in nutrition counseling, interview techniques, and working with the target group. The nutritionists were assisted by a field assistant who spoke the local language and was able to provide interpretation if necessary. A member of the INCAP and FANTA project support team also attended first household visits to support the field team and ensure that FBRs were introduced in a uniform manner. Key informant interviews and FGDs were led by FANTA and INCAP supervisors with experience in qualitative research. Agricultural observations were carried out by the FANTA Technical Advisor, with support from local informants.

Data Management, Coding, and Analysis

The recorded interviews and field notes were transcribed into final transcripts in Spanish. The semi-structured interviews that took place over three visits were included in one final transcript to facilitate data analysis. All transcripts were de-identified of any personal identifiers to protect the confidentiality and privacy of the participants. Translators with knowledge of both local languages and Spanish translated the data as needed.

After coding in Atlas Ti, the transcripts were grouped by geographic region and by target group. Analysis was completed by two to three analysts and was undertaken separately for each target group. The primary focus of the data analysis was to analyze the semi-structured interviews first, and then triangulate with the FGDs and key informant interviews. Interview data were analyzed first within interviews, second within target groups, third within departments, and finally across departments. A main focus of the analysis was to determine if the sets of FBRs could be achieved in any case, and subsequently, to determine which FBRs were most or least feasible and acceptable, and why.

Limitations

As is consistent with a qualitative study, the sample size is small and hence the findings from this study are not representative or generalizable. Nonetheless, the methods selected and scale of the study were suited to the main research question to test the feasibility and acceptability of the FBRs. There were challenges with regard to data collection as some participants were not available for the second and third interviews. In addition, testing a set of FBRs simultaneously was challenging as it was difficult to discuss and interview participants on this range of practices and it also required a lot of effort from each of the participants to try to follow and accomplish the complete set of FBRs in the 3-week time frame. An additional constraint was the fact that some foods are produced seasonally and/or at an additional cost during part of the year, while the FBR trials captured only one point in time. Finally, due to the broad range of issues addressed during the interviews and the length of time required for discussions, it was challenging to fully explore all the relevant issues.

4. Participant Characteristics, Dietary Patterns, and Field Test Results

Sample Background Characteristics

Table 3 shows the number of study participants by target group. The average age of the study participants that were interviewed (mothers and PLW) was 25 years, most of whom had two children. About two-thirds of the study participants reported having access to piped water, and among those who had access to piped water, most had access to water every day.

Table 3. Characteristics of women or mothers who received household trial visits

Characteristics	Total
Mothers of children 6-11 months (n)	19
Mothers of children 12-23 months (n)	20
Pregnant and lactating women (n)	21
Mean age of women	24.8
Mean number of children for each mother	2.3
Number of mothers who are literate	44
Number of women who are married	56
Number of women employed in paid work	21
Total number of women or mothers who received household trial visits	**60**

Among pregnant women, more than half reported taking iron-folic acid (IFA) tablets. Only about a third of children reportedly consumed the micronutrient powder Chispitas on the previous day, which was understandable given that Chispitas was not being consistently distributed by the government at the time of data collection. The baseline questionnaire included the Latin American and Caribbean Household Food Security Scale food access score, and the results indicate that about one-sixth of the study participants reported having experienced a time when they had no food in the household in the past 3 months and about one-third had a limited variety of foods, both due to a lack of resources. The majority of the study participants reported that their families purchased foods at the municipal markets while less than half reported purchasing foods at local markets located closer to their homes. Only a third of the study participants reported that they themselves were in charge of decisions related to food purchases. In the majority of cases these decisions were made by husbands or mothers-in-law with or without the daughter-in-law's participation.

Access to Land and Food Production

The majority of the study participants reported that their family owned some land, and among those who owned land, home production of vegetables, animals, and maize was common. About half of the families who produced food would reportedly sell part of it for income and keep the rest for their own consumption, while the other half kept all the food they grew for home consumption. A majority of families raised some livestock, with most reporting that they have chickens and nearly half also had pigs. Half the study participants who owned livestock reported selling some and consuming the rest. The other half who owned livestock reported keeping meat and eggs for household consumption only. About half of the study participants reported that they had access to eggs through the poultry they owned and that they

consumed the majority of these eggs within their households, but egg production was low. The most common crops grown included maize and black beans, and in Huehuetenango, potatoes. Few study participants reported growing other fruits and vegetables.

Overview of the Dietary Patterns for Each Target Group

The majority of the children in the sample were breastfed at the time of the study; however, less than a third received the minimum diversity of foods from four or more food groups. More than half were reported to have adequate meal frequency according to WHO standards, but overall only three children in the sample at baseline had a minimally acceptable diet (a combination of adequate variety and frequency of feeding). A few PLW noted that there were some foods that should not be consumed during pregnancy or lactation. The foods mentioned were beef, pork, fish, seafood, chicken liver, and beans.

The results of the diet recall and food frequency data for the three target groups were consistent with the earlier dietary survey data completed in the first phase of the Optifood study (FANTA 2014) (see Figures 4 and 5, previously). In general, there was little variation or difference between whole family diets and what the PLW and children consumed. Also there was consistent concordance between the diet recalls and food frequencies. For children 6–11 months from the first to the third household visit during the FBR trials there was little variation, and the most commonly consumed foods included tortilla, atole made of maize, potatoes, tomatoes, chayote, fortified oats, and coffee. Offering children green leafy vegetable broth, black beans, chicken, Vitacereal, and eggs were more common by the third visit. Foods that were consumed a few times a week (but less than six times a week) included eggs, fruit, powdered soup, black beans, instant noodles, tamalito (made of maize), and Incaparina. For children 12–23 months, there was little variation from the first to the third visit, and the most commonly consumed foods included tortilla, atole made of maize, black beans, potatoes, coffee, sugar, and green leafy vegetable broth. Offering children eggs and Incaparina was more common by the third visit. Notably, all children were commonly given sugary drinks, candies, sweets, and similar nutrient-poor foods. For PLW, from the first to the third visit in the interviews there was little variation, and the most commonly consumed foods included tortilla, coffee, sugar, tomatoes, atole made of maize, black beans, potatoes, rice, and onion. Foods that were consumed a few times a week included powdered soup, fruit, green leafy vegetables, bread, fortified oats, Incaparina, and tamalito made of maize. Animal products were rarely consumed. Foods like black beans, eggs, fortified oats, Incaparina, and beef were reported as being consumed more frequently by the third visit.

Key Findings from the Field-Test Interviews

Initially, the FBRs to be tested for each target group also included recommendations to promote continued breastfeeding on demand and consumption of tortillas and meat. However, the field tests revealed that good breastfeeding practices were already occurring and tortilla consumption was ubiquitous in the study areas. The consumption of chicken or beef was found to be uncommon and difficult to accomplish. Therefore, these three recommendations were dropped from the FBR trials. Additionally, the field-test interviews confirmed that almost all families consumed atole every day, even several times per day, but that it was usually made with maize meal, not FBF such as Incaparina (available for purchase) or Vitacereal (designated as a product to be provided free by the government to children 6–23 months and PLW). Some households had access to micronutrient supplements (such as iron and folic acid tablets or as a micronutrient powder), and consumption by children and PLW was reported. Children did not access foods other than those consumed by the rest of the family, nor did they eat any special foods. Also, children generally ate when the rest of the family ate (usually three times per day, and in some cases four times). While the foods consumed by the family and children were the same, the texture of the foods

offered to children differed. When the family ate soup, small children were offered the broth, not the cooked vegetables or chicken meat, based on the common belief that when foods are cooked in water, nutrients diffuse into the broth. Parents believed that children under 2 years will receive nutrients from the broth without needing to eat the food itself (vegetables, meat, or beans). Mothers also felt that particular foods or foods prepared a certain way should only be given to children at a specific developmental stage. For example, some mothers noted a concern that cooked green leafy vegetables could get stuck in children's throats and that giving only broth would be safer until the children had teeth.

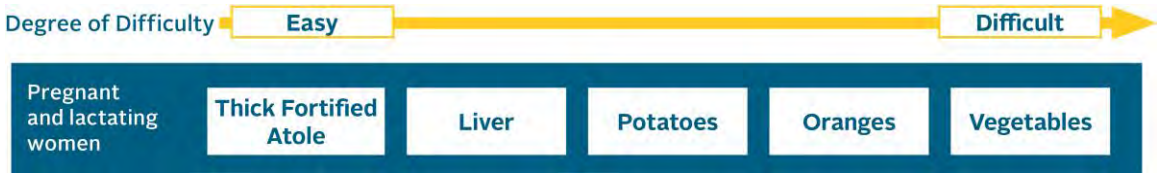
5. FBR Trial Findings for Pregnant and Lactating Women

Over the course of the trials, PLW were asked to practice a set of five food-based recommendations during a 3-week period. The foods recommended for consumption were found to be generally acceptable by PLW and other family members; however, the feasibility of putting the FBRs into practice with the recommended frequency and quantity was difficult. In general, for PLW, it was not possible to put the complete set of FBRs into practice as recommended. The recommendations of consuming thick fortified atole and liver were more achievable overall than those for potatoes, oranges, and vegetables, as shown in Figure 9 (detailed findings are shown in Tables 4 and 5).

The key challenges identified in implementing the FBRs included financial limitations, seasonal variation in food prices, access to money, difficulties in accessing and storing fresh foods, and the cost and time associated with transport to markets. While some of the FBR foods were not considered expensive, PLW reported that in order to put the recommendation into practice they would need to buy enough to give to the whole family, making it a much more costly practice than anticipated. Vitacereal was not being distributed in any of the study communities at the time of data collection, which strongly impacted families' ability to put the fortified porridge FBR into practice.

The influence of grandmothers, mothers-in-law, and partners/husbands on FBR use was significant. In many cases, other family members controlled women's access to money and decided whether FBR foods would be purchased or not and how they would be used. This was especially the case for young parents who lived with the husband's family until they could afford their own home. Despite these challenges, the PLW involved in the trials displayed a strong willingness to try the FBRs and they were generally supported by their family to put the recommendations into practice and improve their nutritional status.

Figure 9. Scale of difficulty of food-based recommendation implementation



Key Findings for Pregnant and Lactating Women

- The recommended foods were generally acceptable to PLW, but the feasibility of trying each FBR at the recommended frequency and quantity was more challenging.
- Overall, PLW were not able to implement the full set of FBRs. However, most reported that they were able to practice the FBRs of thick fortified atole and liver as recommended, in terms of frequency and quantity.
- Challenges to implementing the FBRs included financial constraints, inability to store perishable foods, cost of traveling to markets, and lack of regular access to markets to buy fresh foods. Also, many women reported that recommended foods would have to be purchased and prepared for the whole family. Due to large family sizes, the quantity they would have to purchase made the food too expensive to consume as recommended by the FBRs.
- Many PLW reported that they felt motivated to try the FBRs because they perceived there would be a benefit to their own and their child's well-being.

Table 4. Summary of PLW who reported consuming the FBR foods at the three household visits

Cases by Type and Region		Thick Fortified Atole			Liver			Potatoes			Oranges			Vegetables		
		Visit 1	Visit 2	Visit 3	Visit 1	Visit 2	Visit 3	Visit 1	Visit 2	Visit 3	Visit 1	Visit 2	Visit 3	Visit 1	Visit 2	Visit 3
Quiché	PL	√	√	√			√		√	√	√	√	√			√
	Pr	√	√	√		√	√	√	√	√	√	√	√	√		√
	Pr		√	√				√		√		√	√		√	
	Pr		√			√	√		√	√						√
	Pr	√	√	√		√			√	√	√	√	√		√	√
	Pr		√	√		√		√	√	√						√
	PL		√	√	√	√	√	–	√	√		√	√	√		√
	L	√	√	√	√		√	–	√	√	√	√	√			
	Pr		√	√	√	√		–	–	–	√					
Huehuetenango	Pr		√	√		√	√	√	√	√	√	√	√			√
	Pr		√	√		√			√	√	√	√	√			
	Pr	√	√	√	√		√			√	√		√		√	√
	L			√			√	√	√	√	√		√			√
	Pr	√	√	√		√	√		√	√		√	√			
	Pr		√	–				√	–	–	√				–	–
	Pr		√	√		√	√		√	√	√	√	√		√	√
	Pr		√		√	√	√		√	√	√		√			√
	Pr		√	√		√	√		√	–	√	√	√		√	√
	Pr		√	√	√	√	√	√	√	√	√	√	√			
	Pr			√	√	√	√	√	√	√	√	√	√		√	√
	Pr		√	√		√	√	√	√	√						
OF 21 TOTAL CASES		6	19	18	7	15	15	9	17	18	15	13	16	2	6	13

Key:

√ = Food eaten at least once either prior to the first visit or by the second or third visit, as validated using 24-hour recall data/food frequency questionnaire. However, for thick fortified atole visit 1, a checkmark is only present if women reported eating FBF prepared as thick fortified atole. For vegetables, if women were eating more than one type of vegetable per day in the 24-hr recall/food frequency questionnaire then it was considered they were doing part of the FBR.

Blank = Food not consumed

– = No data available

Pr = Pregnant, **PL** = Pregnant and lactating, **L** = Lactating

Table 5. Summary of compliance with recommended frequency, quantity, and preparation of FBR foods across the three household visits

Cases by type and region		Thick Fortified Atole							Liver					Potatoes					Oranges					Vegetables				
		F		Q		P		C	F		Q		C	F		Q		C	F		Q		C	F		Q		C
		V2	V3	V2	V3	V2	V3		V2	V3	V2	V3		V2	V3	V2	V3		V2	V3	V2	V3		V2	V3	V2	V3	
Quiché	PL		√	√	√	√	√	Y		√		√	Y			√	√	N	√		√	√	Y		√		√	Y
	Pr		√	√	√	√	√	Y	√	√	√	√	Y	√		√	√	Y	√	√	√	√	Y	√	√		√	Y
	Pr	√	√	√	√	√	√	Y		√			N	√	√		√	Y	√	√	√	√	Y			√		N
	Pr	√		√	√	√		Y	√	√	√	√	Y		√		√	Y					N				√	N
	Pr	√	√	√	√	√	√	Y	√	√	√		Y			√	√	N	√	√	√	√	Y	√		√	√	Y
	Pr	√	√	√	√	√	√	Y		√		√	Y	√		√	√	Y					N		√		√	Y
	PL	√	√	√	√	√	√	Y		√		√	Y	–	–	–	–		√	√	√	√	Y				√	N
	L	√	√	√	√	√	√	Y	√	√	√	√	Y	–	–	–	–		√	√	√	√	Y	√	√			N
	Pr	√	√	√	√	√	√	Y		√		√	Y	–	–	–	–						N					N
Huehuetenango	Pr	√	√	√	√	√	√	Y	√	√	√	√	Y	√	√	√	√	Y	√	√	√	√	Y				√	N
	Pr	√	√	√	√	√	√	Y	√		√		Y	√	√	√	√	Y		√	√	√	Y	√	√			N
	Pr	√	√	√	√	√	√	Y		√		√	Y	√	√	√	√	Y				√	N			√	√	N
	L	√		√		√		Y		√		√	Y	√	√	√	√	Y	√		√		Y	√		√		Y
	Pr	√	√	√	√	√	√	Y		√		√	Y	√	√	√	√	Y			√	√	N					N
	Pr	√	–	√	–	√	–	Y					N	–	–	–	–						N					N
	Pr	√	√	√	√	√	√	Y	√	√	√	√	Y	√	√	√	√	Y		√	√	√	Y		√	√	√	Y
	Pr	√		√	√	√	√	Y	√	√	√	√	Y	√	√	√	√	Y		√		√	Y		√		√	Y
	Pr	√	√	√	√	√	√	Y	√	√	√	√	Y	√	–	√	–	Y		√		√	Y		√			N
	Pr	√	√	√	√	√	√	Y	√	√	√	√	Y	–		–	√	N	√	√	√	√	Y	√	√			N
	Pr	√	√	√	√		√	Y	√	√	√	√	Y	–	√	–	√	Y		√		√	Y	√	√	√	√	Y
	Pr	√	√	√	√	√	√	Y	√	√	√	√	Y	√	√	√	√	Y					N					N
OF 21 TOTAL CASES		19	17	21	19	20	18	21	12	19	12	17	19	12	11	13	16	14	9	12	12	15	14	7	10	6	11	8

Key:

F = Frequency
Q = Quantity
P = Preparation
C = Compliance
V2 = Visit 2
V3 = Visit 3

√ = FBR put into practice with recommended F/Q/P
Blank = FBR not put into practice as recommended
– = No data available
Y = Compliance achieved (defined as FBR put into practice with recommended F/Q/P at least once during trial period)

N = Compliance not achieved
Pr = Pregnant, **PL** = Pregnant and lactating, **L** = Lactating

FBR 1: Thick Fortified Atole

Table 6. Details of the thick fortified atole FBR validated during the household trials

Quantity (g)	Frequency (servings/week)	Recommendation used	Serving size
30	7	Consume thick atole made from Vitacereal, Incaparina, or fortified oats every day	Two heaping tablespoons of dry mix with one glass of boiled or treated water

A. Successful Implementation of the Thick Fortified Atole FBR

PLW's experience with the thick fortified atole FBR during the trial period is shown in Tables 4 and 5. By the third household visit, all women reported consuming FBF as a thick fortified atole at least once. Table 5 shows the women's compliance in putting the FBR into practice across the trial period in terms of using the recommended amount of FBF to prepare the thick fortified atole and doing so at the recommended frequency, allowing for greater exploration of the barriers faced in each of these areas. By the third household visit, nearly all women consumed a thick fortified atole with the recommended quantity of FBF on a daily basis during the test period.

Quantity, frequency, and preparation: Using FBF to make a thick fortified atole was already an established practice for some trial participants, as nearly half of women from Quiché and a few from Huehuetenango reported trying it or normally preparing atole in this way at baseline. By the third visit, almost all women reported consuming the recommended quantity of one cup of thick fortified atole daily (although a few noted that daily consumption could get monotonous). Preparation was reported to be easy, and by the third visit nearly all women reported preparing the thick fortified atole as recommended.

Intra-household distribution/sharing: Over the course of the trial, when putting this FBR into practice, most PLW described making a thicker than usual atole for the entire family in a large vessel. This was generally done each morning to last for the entire day. Only a few women mentioned that they purchased and prepared Incaparina as a thick fortified atole for themselves during the trial in order to put this FBR into practice.

> *Interviewer: When you buy Incaparina, do you buy it for yourself or buy it for the whole family?*
>
> *Woman: Well, half of it is for me and half for my family. But for myself, I prepare it separately. I make a jug of it for everyone (else).*

Main constraints and facilitators: Easy preparation, good taste and texture, lack of adverse reactions, and perceived health benefits for PLW and their children were mentioned by most women as reasons for being able to practice the thick fortified atole FBR or why they were motivated to do so. Constraints included the cost of purchasing Incaparina, given that Vitacereal was not available, as well as some pressure to prepare the atole for the whole family.

B. Acceptability

Women mentioned perceived benefits of consuming thick fortified atole made with Incaparina, such as greater supply of breast milk, increased growth of children, and prevention of malnutrition. Additionally, women noted that benefits for their own health motivated them to consume thick fortified atole, such as

greater strength during pregnancy and labor, weight gain, vitamin content, and reduced nausea and headaches.

> *Woman: Truthfully, it's worth it because it's for our own well-being during pregnancy, and for the children who need it also. And to prepare it doesn't cost too much.*
>
> *Mother-in-law: Yes, it's a good food, not only for her. It helps her milk come for her child.*

A few women reported not liking the texture of thick fortified atole and thus not wanting to follow the recipe, and one woman did not like the taste of Incaparina. A few women also thought that eating either Incaparina or fortified oats would cause nausea or diarrhea during their pregnancy. One woman reported that she had not heard of Incaparina before and did not know where to access it. Some women also noted a desire for greater variety as a reason for not wanting to put this FBR into practice every day.

> *Moderator: Why couldn't you do it every day as recommended each day?*
>
> *Woman: ...Because sometimes we only want fresh water and sometimes we would like a cup of coffee so this is why...*

Social/family support/enabling environment: Generally women mentioned receiving support from their family and community to prepare and consume the thick fortified atole. Most women noted that health staff and their families told them that thick fortified atole was good for them. Many said they discussed the recommendation with their husbands or mother-in-law who agreed that it was important. Among their reasons, women mentioned that atole would provide strength for childbirth and increase milk supply.

> *Woman: Yes, at the health center they say to eat well to have good development. And my father tells me to eat well, nourish myself well, that the things sold in the store aren't good.*
>
> *Interviewer: Who else has told you, your family? Your mother?*
>
> *Woman: My mother-in-law. She tells me to drink atole (made from Incaparina) so I have milk for my baby.*

C. Feasibility

As Vitacereal was not available in the study communities during the trial, the ability to purchase Incaparina or fortified oats was an important component of discussions with informants. Women reported that the price of Incaparina ranged from Q9.50–Q17 per bag ($1.25–$2.25) and was considered expensive given the equivalent spending could purchase much more maize atole. The highest price per bag of Incaparina reported in the market survey was Q10.00 ($1.30). About half of the women said they already purchased Incaparina so it would not imply a significant increase in spending. Only one woman mentioned that buying Incaparina would mean that her family would have to limit other purchases. However, many informants said that their ability to make thick fortified atole depended on whether they had money that week. Some women said that at different times of the year families may have more or less money available, depending on family production or seasonal work. Many participants thought that even if women could afford to purchase a bag of Incaparina, it would not last long enough to be able to make thick fortified atole for themselves every day, especially as they usually made atole for the entire family. A few women said that they would prepare atole every other day in order to make the bag of Incaparina last longer.

> *Woman: Well, money is what has to be spent to buy (it), perhaps consuming it some days and not others. In contrast the Vitacereal that was being given, we only had to prepare it and it was easier to get and feed them.*

The majority said that Incaparina could be purchased year-round at small community stores, but most preferred to purchase it at weekly markets for a better price and because it was less likely to be old. Although the majority of women said money for purchasing food came from either their husband or mother-in-law as they were not directly involved in paid work themselves, only a few said that they would have to ask direct permission to buy Incaparina.

FBR 2: Liver

Table 7. Details of the liver FBR validated during the household trials

Quantity (g)	Frequency (servings/week)	Recommendation used	Serving size
90 (3 oz)	1	Consume beef or chicken liver once per week	90 g of chicken liver or beef liver

A. Successful Implementation of the Liver FBR

The recommendation promoting the preparation and consumption of liver once a week was generally accepted and put into practice by PLW who participated in the FBR trial. Table 4 shows that at the time of the first visit about a third of women reported consuming liver, but by the third visit almost all women had consumed liver at least once. Table 5 summarizes compliance with putting the FBR into practice across the trial period with reference to consuming it with the recommended quantity and weekly frequency. Nearly all women put the FBR into practice as recommended (quantity y frequency) by the final household visit.

Quantity: Women were asked to eat 3 ounces of liver (one large piece of beef liver or two chicken livers) per week. Trial participants were twice as likely to report eating chicken livers than beef liver. At the end of the trial, most women reportedly succeeded in eating the recommended quantity of liver, while two pregnant participants said that eating large portions made them feel sick (nausea and increased heart rate) so they would only be able to consume small amounts.

Frequency: At the final household visit, nearly all women were consuming chicken liver at the recommended frequency.

Preparation: Most women added liver to broth/soup, alone, or with vegetables. Some women said that they grilled or fried their liver with oil and ate it with lemon or tomatoes. A few women used liver to make *recado*, a stew based on traditional spices. Some of the pregnant participants said that they did not like eating liver in soup as it made them feel nanseous. Nearly all women said that liver was easy to prepare, however, some who usually only ate beef liver said that they were not sure how to prepare chicken livers and vice versa.

Intra-household distribution or sharing: All women in the trial who prepared liver did so for the entire family, often prepared in a soup, which could make it difficult to distinguish the serving size of the liver itself for the PLW. Preparing foods in a soup as a family meal was common and the FBR trial interviewers did not suggest any changes to a family's meal preparation during the trials. One woman said that she would make a small portion of liver for herself if only a small amount was available or if there was not a lot of money, but that she would rather cook for everyone. As with the other FBRs, preparing the FBR food for additional family members implied an additional cost well above the cost for the PLW.

Constraints and facilitators: Facilitators to implementing this FBR were generally ease of access to purchasing liver, as well as women's positive reaction to liver as a food. Most of the women in the sample said they already ate liver regularly and that they liked eating it. While most participants considered that it would be easy to put this FBR into practice, a number of constraints to accessing, preparing, and consuming liver were mentioned. Liver was not considered a very expensive food by most of the participants and many said that it was already part of their weekly food expenditure, although some considered it expensive. Liver was reportedly accessible at the local market for all participants as well in the community through local production or by visiting butchers. Participants also mentioned that liver was easy to prepare and could be enjoyed by the entire family.

B. Acceptability

Liver was considered to be a normal food, eaten by most of the women in the study prior to the FBR trials, but not always in the recommended frequency and quantity, although women were willing to try it. PLW and their families thought that this FBR was a beneficial practice for both the health and well-being of PLW as well as their children.

Liver was considered to be a good, nutritious food and a number of PLW reported that they felt good after putting the FBR into practice. A few women said that they did not like eating liver, either because of the taste or the texture (too hard or sticky). Most of the women who mentioned this, however, said that they would eat liver anyway because they knew that it was good for them. Some of the pregnant women in the sample said that they could not eat liver, either because it made them feel nauseous or dizzy. Facilitators discussed a number of alternative preparations for liver in an attempt to overcome this problem, but the participants said that it would not make a difference and that they would not be able to eat liver without feeling sick until after their births.

Social/family support/enabling environment: Only two participants said that they had been told previously by health workers that they should eat liver when pregnant or lactating. Many women said that they had not previously known that it was a good food to eat and would be more likely to eat it now. Family members of PLW were generally supportive of the FBR and a few pregnant women were told by older women in their family that they should eat liver.

> *Woman: When your colleagues came to visit me last week, I didn't know that liver was okay, or that it's good for… me, as I am pregnant, but they explained to me that it was good, I had no idea.*
>
> *Woman: Everyone told me to buy liver (mother-in-law, niece, brother-in-law, and husband).*

C. Feasibility

Cost: Although chicken liver or beef liver have a lower price and seem more affordable compared to beef or chicken meat, it still represented a challenge for some families. A few participants considered liver to be an expensive food, although others said that they usually spent some money on meat each week so putting this FBR into practice would not incur extra cost. Women in Quiché reported slightly higher prices per pound for beef liver compared to chicken liver, while it was found that chicken livers were more expensive than beef liver in Huehuetenango. Also, it was noted that the recommended frequency of only once per week made it less costly than other FBRs with higher frequency. In two cases, women did not put the FBR into practice as they did not have any money to buy liver. Similarly to other FBR foods, some women said that access to money to purchase liver could change depending on the season and at certain times of year when there was no agricultural work, they may not be able to afford to put this FBR into practice. In terms of accessing the money to purchase liver, many women relied on their husbands and a few on their mother-

in-law. Most women in the sample said that they did not have to ask permission in order to buy and prepare liver for themselves, although a few mentioned that they had asked their husband or mother-in-law.

Availability: Only a few women noted home production as a source of liver and animals were generally valued for their milk/egg-giving potential rather than as a source of meat. Only one family in the sample kept a cow, and although many families raised chickens, most were laying chickens not for consumption of their chicken livers. One women said that she would ask that the livers be kept for her the next time that the family killed a chicken. One woman from Huehuetenango said that her family regularly killed a chicken for eating but usually discarded the liver because they did not like eating it.

Some women mentioned that chicken livers and beef liver were available at the larger markets at a steady price all year round. Other women and key informants said that liver was often available for purchase within the community, either at a small local store or from local butchers, although some noted that availability was not consistent. In a few cases, participants were not able to put the FBR into practice as they had either not been to the market to buy liver or becanse the local butcher who visited the community to sell meat had not been by or had not brought any liver.

> *Moderator: Do you have a way to get liver here in your community?*
>
> *Woman: Not frequently. The carniceros (local butchers) come, but sometimes they don't bring it. Often I would like to buy liver, but there isn't any.*

FBR 3: Potatoes

Table 8. Details of the potato FBR validated during the household trials

Quantity (g)	Frequency (servings/week)	Recommendation used	Serving size
150	7	Eat a large potato every day	A large potato the size of an adult woman's fist

A. Successful Implementation of the Potato FBR

Table 4 shows that about half of pregnant and lactating women were already eating potatoes at the time of the first household visit, and by visits 2 and 3, virtually all women ate potatoes at least once. Table 5 provides more details on the experience of trying to put the full potato FBR into practice with the recommended quantity of one large potato and daily frequency, which was achieved by more than half of the PLW by the end of the three visits.

Preparation, quantity, and frequency: The majority of the women could eat the recommended quantity of potato in a sitting but many struggled to do this every day. The overwhelming majority added potatoes to soups, sometimes with meat and other vegetables. A number of women also ate plain boiled or baked potatoes while some cooked them as *recado* (traditional stew-like dish).

Intra-household distribution or sharing: Almost all women said that when they practiced the potato FBR they had to buy and prepare potatoes for the entire family, which increased the cost.

> *Woman, Quiché: It's very expensive because to buy potato I have to buy 8 pounds, for all the family.*
>
> *Interviewer: Eight pounds for all the family, how many are there?*

Woman: We are eleven.

Some women reported eating less than the recommended quantity if they were preparing potatoes for the entire family as they would make soup and only take a small bowl. However, a few women were able eat a potato by separating one from the family portion. A pregnant woman from Huehuetenango said she served herself an additional potato, but felt uncomfortable taking extra food. When it was suggested that women prepare potatoes when alone in the house many said that this was not possible as they were always with others.

Woman: …one potato in our soup was not for the whole family, I served myself.

Interviewer: …is it difficult to separate food for yourself? Do you have to give it to everyone?

Woman: Yes, it's difficult, I don't like to do it.

Moderator: What if you said to your mother-in-law, 'Do me a favor and buy a pound of potatoes just for me?'

Woman: She told me, 'If you have potatoes, your children will want some.'

Moderator: Could you cook them when your children aren't around?

Woman: It's just that I am never alone.

Constraints and facilitators: Main barriers faced for this FBR in both departments were problems affording potatoes and access to the markets that sold them, influenced by low seasonal access during the rainy season (May to October) when the household visits took place. A key issue for most women was that potatoes were not considered a food that they could prepare for themselves only and that putting this FBR into practice would mean buying enough to prepare for the entire family. Infrequent market access was also mentioned as a problem, as the potatoes might not last a week.

B. Acceptability

Potatoes were a common and acceptable food in both departments, consumed by nearly half of PLW in Quiché and the majority of women in Huehuetenango in the baseline 24-hour recall, and reportedly consumed at least once per week in the baseline food frequency questionnaire. FGD participants in Quiché said they generally ate potatoes once per week, while those in Huehuetenango said that they ate potatoes more regularly, often every day.

Man, Huehuetenango: When there isn't anything to eat, the people around here…eat only potatoes.

Some women suggested preparing potatoes only once or twice per week, as they thought that it would be too repetitive to eat potatoes every day and their family would become bored, despite different preparations (e.g., in soup, baked, and fried).

Woman, Huehuetenango: Not every day, no that doesn't happen. It's boring.

Moderator: It's boring you say?

Woman: Once a week, or every now and then I eat them and enjoy them. Because…when I cook potatoes I make them for everyone, and so, to give them potatoes every day? No!

Social/family support/enabling environment: A few women said their families might not recognize potatoes as a nutritious food and therefore wouldn't give their support to purchase it. Also, similar to

other FBRs, some women from Quiché were not able to practice this due to dietary restrictions after giving birth.

> *Woman, Quiché: I only ate potatoes once, because my baby isn't 30 days old yet. When 30 days have passed I will eat them (potatoes) every day.*

C. Feasibility

Cost: Many women, especially in Quiché, said they lacked money to buy potatoes during the trial due to the expense per pound, as well as the quantity needed for the whole family. It is important to note that at the time of data collection prices were reported to be higher than at other times of the year as potatoes were not in season. Participants said that at other times of the year they would be able to buy and eat potatoes more easily.

> *Woman: I'm not eating them (potatoes) at the moment because I went to the town the day before yesterday and I didn't have enough for a pound of potatoes…So I've gone three days without eating potatoes. Sometimes, even though I want potatoes, there aren't any.*
>
> *Woman: We are a big family, a pound of potatoes doesn't go far. There's 18 of us!*

Regarding the time and effort required to cook the potatoes, the women interviewed generally agreed that making potatoes was easy and quick and that very little effort would be required to put this FBR into practice.

> *Moderator: Does it take much of your time?*
>
> *Woman: No, only put it on the fire and it prepares itself.*

Availability: As potatoes were not in season during the time of data collection, this lead to limited availability of home grown potatoes, as well as higher prices. About a quarter of women from Huehuetenango reported consuming potatoes grown at home (presumably from a stored crop), but no women from Quiché reported using home crops, as potatoes were not grown in Quiché. Many women in Huehuetenango said that at other times of the year this FBR would be easier to put into practice because they would have their own potatoes and eat potatoes more regularly.

> *Woman: At the moment they are expensive, you end up spending more because potatoes are so expensive. When they're cheap you can have plenty.*
>
> *Moderator: When do the prices go up? Which month?*
>
> *Woman: Right now.*
>
> *Moderator: July? August?*
>
> *Woman: September, October, and then in November the price drops down again.*
>
> *Moderator: So from July to November there is no harvest?*
>
> *Woman: No. Here from January until April we harvest potatoes, in other parts of the country they harvest them from July to December.*

Even for purchase, most women said that potatoes were not readily available within communities or local markets at the time of data collection, although they were sold at larger markets in municipal capitals, where families would shop only once per week. Some women mentioned potatoes would not last long enough to eat every day if they were purchased once per week at the market.

Moderator: Is there a way to access potatoes here?

Woman: Only on Friday, in the market, nowhere else.

Woman: They go bad sometimes. Often, like now, potatoes are really expensive, sometimes I try to keep them for a few days, so we can eat them over three days, but they go hard, I cook them but they don't get 'cooked.' They just go really hard, all of them.

Most women said that they did not need permission to buy potatoes but that the money to do so came from their husbands or fathers/mothers-in-law, some of whom were less supportive of this FBR because it was expensive to put into practice. Often the person shopping was the husband or mother-in-law. A few women said that they had difficulties negotiating purchases with their mother-in-law and had little control over what would be brought home. These women said that this was the custom in their area and that they would not be able to change purchasing decisions.

Woman: She (her mother-in-law) says, 'I'm the one that decides what to buy and you don't tell me what to do. You don't make the decisions; it was exactly the same way for me when I lived with my mother-in-law' she says.

Woman: If there was left over money I would buy them, but as things are it's not possible and I can't do it. It's up to her (mother-in-law), what she buys is what she decides. We just receive what she brings, sugar, salt, soap, she shares it with us and we use it.

FBR 4: Oranges

Table 9. Details of the orange FBR validated during the household trials

Quantity (g)	Frequency (servings/week)	Recommendation used	Serving size
205	3	Eat an orange three times per week	1 large orange or 2 small ones Squeeze lemon juice on your food

A. Successful implementation of the orange FBR

If women were unable to access oranges or did not want to consume oranges, it was suggested to use lemon for juice drinks or to flavor their food. While lemon was consumed by some participants during the trials, the results in Tables 4 and 5 refer to use of oranges only. Table 4 shows that roughly two-thirds of women reported eating oranges at each household visit. Table 5 shows that by the third visit, more than half of the participants were able to put the FBR into practice with the recommended quantity and frequency.

Preparation: Most women prepared oranges by peeling and eating them whole or in slices. A few women also added ground squash seeds (*pepita),* salt, and chili, which is a typical Guatemalan preparation for some fruits. Some women made orange juice or a juice drink mixing oranges, water, and sugar (*naranjada*), and a few women made lemon juice drinks with water and sugar (*limonada*). One woman reported using lemon juice squeezed over salad and meat. In Huehuetenango two pregnant women mentioned the practice of consuming orange juice with raw egg, a drink commonly sold in marketplaces in some Western Highlands' departments, although consuming raw egg would not be encouraged due to the risk of salmonella.

Intra-household distribution or sharing: Most women said that when they purchased oranges, they bought enough to share with either the entire family or at least their children. Some women said that if they did not have enough money, they would buy smaller quantities of oranges only for themselves. However, they would rather be able to share.

> *Moderator: And if you need to buy the orange, for example, and you don't have sufficient money? What would you not buy in order to buy oranges?*
>
> *Woman: If I don't have much money, I would buy (them) only for myself.*
>
> *Moderator: How do you feel about being able to buy only for yourself and not for the children?*
>
> *Woman: Bad.*

Main constraints and facilitators: Almost all women liked eating oranges and/or lemon juice and wanted to put this FBR into practice because they considered oranges to be a nutritious food. However, a number of pregnant women hesitated to try the FBR due to concerns of feeling nauseous during pregnancy. Many women interviewed also considered oranges to be generally affordable and easy to access, but some women reported difficulties affording oranges or accessing them in markets. A facilitating factor mentioned by some women was that oranges would last for a few days without going bad, in contrast to other FBR foods such as vegetables and liver. Some women did not understand that lemon juice could be used on food if orange was not available. Even if they had access to lemons, these women did not use them during the trial.

B. Acceptability

Oranges were eaten by most families before the FBR trials and all women said that they liked eating them. Nearly half reported consuming oranges at least once per week in the baseline food frequency questionnaire, but only two were doing so at the recommended frequency of three times per week and only one woman reported consuming orange in the baseline 24-hour recall period. Most women had continued eating these foods into their pregnancy and considered this safe and easy to do.

> *Moderator: What did you think when you ate orange?*
>
> *Woman: I liked it.*
>
> *Moderator: Yes, because there are some pregnant women who say that they have doubts if they can or cannot consume these foods.*
>
> *Woman: No, it's okay because they are sweet.*

Most of the women interviewed said that they normally ate lemon, but some said that they were reluctant to use lemon juice as it was too sour or bitter. However, some pregnant women said they were unable to eat oranges or other citrus fruits during the first few months of their pregnancy due to concerns about nausea.

> *Woman: It doesn't do anything bad (to you) if you eat lemons?*
>
> *Assistant: No, it doesn't do anything.*
>
> *Woman: Oh, I think it does do something bad.*

Social/family support/enabling environment: Many women in the sample had been told previously that they should eat oranges, either by their family or by health staff.

Woman: My family has told me that orange is good, that it's vitamin…

However, a few women said that they heard oranges should not be given to pregnant women, including from a local doctor and mother-in-law. The mother of another pregnant woman said clearly it wasn't important to eat oranges as she successfully raised six children without oranges.

Moderator: What did your mother say?

Woman: She just said I have six children, and they are fine without orange. It's not necessary.

Mother: There are many people who say that lemon can cut your blood, for this reason they don't eat them, but also there are a lot of young people that do eat them with salt.

C. Feasibility

Access to resources: Oranges were considered affordable by most of the participants, reported as Q1–Q1.5 each ($.13–$.20) at local stores/markets. Even if prices fluctuated some women reported they would continue buying oranges as they were a good food to eat.

Moderator: And to buy the oranges, is it a lot of money to buy three oranges for the week?

Woman: It's little money.

Moderator: You don't spend a lot then?

Woman: No, they are cheap.

Availability: Oranges were available seasonally for participants in Huehuetenango and Quiché. While some participants, mainly in Huehuetenango, reported being able to access locally-grown oranges, this was not common and not the case for families in Quiché. Only a few women reported home production of oranges, lemons, or limes, but some were able to access these foods from family members who produced them.

The majority of participants said that they would be able to access oranges at the local market. One woman said that oranges were sold by passing vendors or in the local store within the community. Some women said that their local markets did not always have oranges and that they would need to travel further to purchase this food. Many participants noted that the wet season (June–July) at the time of data collection was a period of very low availability of oranges in markets. Some women said that they could purchase oranges from different parts of the country (coastal regions mentioned), but that this supply was not always reliable. Some women who visited larger towns regularly said that they had seen oranges in markets or *despensas,* but that they were not able to buy these regularly enough to meet the FBR requirement.

Woman: Well, the truth is that I haven't eaten any. Since the first time that they told me I haven't eaten it because here there is no orange and you can't get oranges. To get oranges, you have to travel all the way to Quiché.

Lemons were reported to be easier to find in markets, and a key informant from Quiché who was familiar with local crops reported that a type of lemon was growing in the area.

Social/family support/enabling environment: Most women said that they would not have to ask permission to purchase oranges. However, a number of women in the trial did discuss this FBR with their mother-in-law or husband, who were generally supportive and further encouraged women to put this into

practice. In comparison to several other FBR foods, oranges were not seen as a "special" food requiring permission.

> *Interviewer: Can you put this recommendation into practice or do you need to consult with anyone before?*
>
> *Woman: It's not necessary, as it's a fruit.*

FBR 5: Vegetables

Table 10. Details of the vegetable FBR validated during the household trials

Quantity (g)	Frequency (servings/week)	Recommendation used	Serving size
85	28	Consume four portions of vegetables each day of the week	1 medium-sized tomato, half a large carrot, or 1 cup of chopped vegetables

A. Background on use of the FBR food

Prior to commencing the trial, all women in the sample had previously eaten vegetables but only a quarter were doing so every day. A variety of vegetables were mentioned during the trial, including carrots, cabbage, broccoli, tomatoes, cucumber, pumpkin, chayote, sweet corn, radishes, and cultivated and wild green leafy vegetables such as nightshade, white turnip (*hierba blanca* or *Brassica napus*), and amaranth leaves. In the baseline food frequency questionnaire, the majority of participants reportedly ate green leafy vegetables and chayote at least weekly. Further, in the baseline 24-hour recall, half of the women in Huehuetenango and one woman in Quiché reportedly ate green leafy vegetables.

B. Successful Implementation of the Vegetable FBR

Of all the FBRs, the vegetable FBR for women had the highest recommended daily frequency of four portions per day, which potentially made it more challenging to implement. Table 4 shows that at the time of the first household visit very few women reported consuming vegetables, but over the course of the three visits, more than half of the women were consuming vegetables. This represents a considerable dietary change and willingness to try a new dietary practice. However, Table 5 shows a summary of compliance across the trial period in terms of recommended amount and frequency. When these aspects were included, about a third of the women in the trial were able to put the FBR into practice as recommended by the final household visit, with both quantity and frequency showing up as equally challenging.

Quantity: Women were asked to consume four servings of vegetables daily (with each equivalent to the size of a medium tomato, several large leaves from green leafy vegetables, half a carrot, or one cup of chopped vegetables). At the end of the trial, half of the participants reported that they had succeeded in preparing and eating four servings of vegetables in a day. Many women thought that this quantity was difficult and felt that two to three servings was more achievable.

Frequency: Most women who tried the vegetable FBR did not think they would be able to do consume it at the recommended daily frequency, and only about half succeeded in doing so by the last household visit. A third of the women interviewed said that they would be able to prepare and eat four servings of vegetables per day. The remaining women indicated that they would try to increase their vegetable consumption but that they would not be able to follow the FBR to the recommended frequency. Some

women said that they would follow the FBR every two or three days and others said that they would simply try to eat more vegetables.

Preparation: All trial participants said that cooking the vegetables was easy and that they enjoyed eating them. The most commonly mentioned preparations for vegetables during the FBR trials were soup/broth with or without meat, salad, and as an accompaniment to potato or egg. In particular, when vegetables are prepared as soup, it is difficult to ensure that women are able to consume the recommended portion size and the nutrient value of the vegetables may be compromised when they are boiled during soup preparation.

Intra-household distribution or sharing: Despite challenges in accessing and buying vegetables, almost all women interviewed said that they purchased and prepared vegetables for the entire family. One woman reported preparing vegetables for herself only if there was not enough to make a dish for everyone. Another woman said that it was much more affordable to follow this FBR if she bought only enough vegetables for herself as opposed to purchasing them for others in the household.

Main constraints and facilitators: Many women considered this the most difficult FBR to put into practice. Given the distance from the market of most communities, the cost involved in travelling to markets, and the fact that markets were not held daily presented a significant barrier to following this FBR. Compounding factors mentioned were the need to access enough vegetables to provide for all family members and the concern that if excess vegetables were purchased they would spoil quickly.

C. Acceptability

There was wide acceptability of the vegetable FBR, given that women mentioned they were accustomed to eating vegetables, found them tasty and easy to prepare, and believed that vegetables were a good food. Many of the women interviewed had previously been told by health staff or family members that vegetables were a good food for PLW because they had vitamins, helped anemia, resulted in strong babies, and increased breast milk supply. However, women said that they would rarely eat four servings per day.

Dietary restrictions were mentioned in the Sacapulas communities, as some women explained a local custom of limiting the diet of a woman for the 15–20 days following the birth of a child, which is believed to avoid illness of the mother or baby. During this time, vegetables and a number of other foods such as black beans are not eaten, although they are permitted to eat eggs, tortillas, coffee, chili, chicken/beef broth, white beans, and a native green leafy vegetable during this time, but only small amounts.

D. Feasibility

Many families grew at least one vegetable (especially green leafy vegetables) and were able to access some of the recommended foods. According to the baseline survey used during the household surveys, at the time of the survey only four families in Huehuetenango and one in Quiché grew green leafy vegetables, with most doing so exclusively for home consumption. Some families also grew broccoli, radishes, carrots, cabbage, green beans, beets, and turnips. One constraint mentioned by three key informant interview participants was that although many families in the study areas produced vegetables, much of the production was for sale or export only and not consumption. It was suggested that greater efforts needed to be made to communicate to other family members that these foods are important for the nutrition of PLW and that it is worth saving some of the produced foods for their consumption.

> *Key informant interview participant: Unfortunately, they don't eat what they produce, many say that it's because they don't know any better but really for them to eat cauliflower, lettuce, or some carrots represents a loss.*

Despite some home production of vegetables, all women said that they would also need to access a market to be able to put this FBR into practice, as either they did not produce enough vegetables or did not feel that they produced enough variety. While some women did not consider vegetables to be expensive, many thought that it would be expensive to put this FBR into practice because of the quantity required. In most cases, vegetables were only available at markets outside the community, which were often far away and difficult to access. Women said that they or their partners would only usually visit the market once per week or two weeks and that transport was costly. In Quiché, FGD participants said the bus trip could cost between Q5–Q20 each way to travel to the Sacapulas or Aguacatán market, depending on the distance. It was cheaper to visit smaller, closer markets but these were not as frequent. As a result, many women said that they could not practice the FBR because they had not been to the market.

Women also said that purchased vegetables would only last one to two days without refrigeration, so the FBR would require visiting the market multiple times each week. However, participants were accustomed to cooking a variety of vegetables and did not require any extra skills or knowledge to be able to do so.

6. FBR Trial Findings for Children 6–23 Months

A set of four or five FBRs were introduced to caregivers of children 6–23 months of age, who were requested to attempt these practices and provide feedback to interviewers during the 3-week trial period. In addition to trying to give these foods to their children, mothers were also asked to give foods in a certain quantity and frequency and, in some cases, prepare foods in a particular way. While the foods themselves were found to be generally acceptable by children 6–23 months of age, as well as their mothers and other family members, many families faced a variety of challenges related to frequency, quantity, and sometimes preparation in the case of fortified porridge. Overall, the FBRs for potatoes, eggs, and beans were easier to implement than those for green leafy vegetables and fortified cereal porridge (see Figure 10, detailed findings are provided in Tables 11–14).

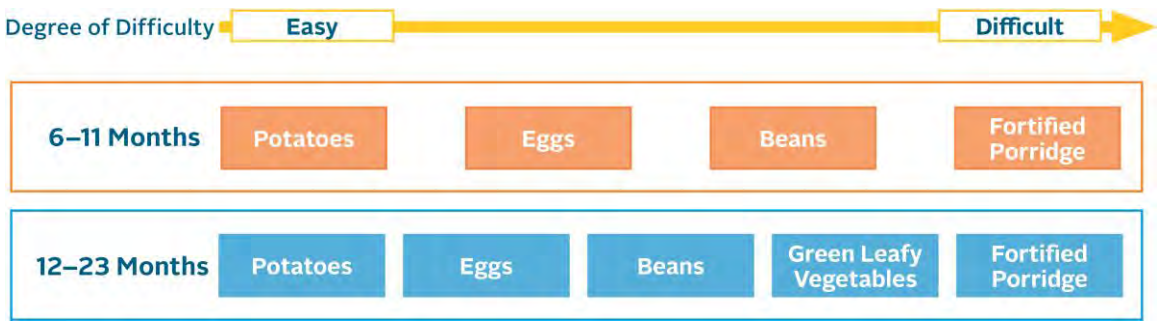
Challenges identified in implementing the FBRs included financial limitations, seasonal variation in food prices and access to money, difficulties in accessing and storing fresh foods, and the cost and time associated with transport to markets. While individually the FBR foods were not considered expensive, mothers reported that in order to put the recommendation into practice they would need to buy enough to give to the whole family, making it a much costlier practice than anticipated. Vitacereal was not being distributed in any of the study communities at the time of data collection, which strongly impacted families' ability to put the porridge FBR into practice and meant that money that could have been spent on other foods would have to be used to buy Incaparina.

The preference for giving young children heavily diluted, nutrient poor foods such as broth and watery atole was documented throughout the study. FBF was usually prepared as atole rather than porridge and often given in a baby bottle. Even in households where women succeeded in making the recommended porridge recipes, the practice of giving atole continued.

Certain beliefs about the appropriateness of the FBR foods for small children were documented. In a few households, eggs and/or beans were considered potentially harmful for children less than a year old, resulting in delayed introduction of these foods. In spite of this, many of the mothers were willing to try giving these foods to their children and did so during the trial.

The influence of grandmothers, mothers-in-law, and husbands on FBR use was significant. In many cases, families controlled women's access to money and decided whether the recommended foods could be purchased and how they were used. This was especially the case for young parents who lived with the husband's family until they could afford their own home. Despite these challenges, the mothers involved in the trials displayed a strong willingness to try the FBRs and they were generally supported by their families to put the recommendations into practice and improve the nutritional status of their children.

Figure 10. Scale of difficulty of food-based recommendation implementation



Key Findings for Children 6–23 Months

- The foods recommended in the FBRs were generally acceptable to mothers and other family members, but feasibility of trying each of these FBRs at the recommended frequency and quantity was more challenging. Providing children with the recommended quantity of food at one meal appeared more feasible than feeding the food regularly with the required frequency. In several cases when children initially rejected certain FBR foods such as fortified porridge made with Incaparina, mothers were quick to conclude that their child did not like the food, rather than considering that the child may need encouragement to try it a few times to develop a preference for it.
- Overall, mothers of children under 2 were not able to implement the full set of FBRs together. While the extent to which mothers could implement each FBR varied, the findings suggest that among children under 2, providing potatoes, eggs, and beans was slightly more feasible than providing micronutrient fortified porridge as recommended. For children 12–23 months, feeding green leafy vegetables was moderately feasible as mothers reported they could access native varieties of green leafy vegetables that grew close to their homes at that time of the year.
- It is common to feed young children broth (*caldo*) made from cooking FBR foods such as beans or vegetables, instead of the food itself, as well as feeding atoles (very watery hot gruel drinks) rather than porridges, which meant that children do not receive a high density of calories and nutrients from these foods. Additionally, mothers expressed concerns over the safety of certain foods such as eggs and mashed whole beans being offered to young children. Some felt the portion sizes and overall quantity of food being recommended would be too much for young children.
- Despite these challenges, mothers of children under 2 in the trial demonstrated a strong willingness to try the recommended FBRs, and families were supportive of efforts to improve children's nutrition. Some of the recommended foods have also been promoted for children's consumption by health providers in the area.
- Challenges to implementing the FBRs included financial constraints, variable income in different seasons, inability to store perishable foods, and cost of traveling to and inability to access markets often enough to buy fresh foods. Also, many women reported that they felt most foods would have to be purchased and prepared for the whole family, and since family sizes are often large, the quantity they would have to purchase made the food too expensive to consume as recommended by the FBRs. For example, providing children with the recommended frequency of beans in several cases was challenging due to cost. Certain foods such as Incaparina were considered to be particularly expensive.
- Vitacereal was not being distributed at the time of data collection in any of the study communities, and Chispitas (a micronutrient powder) was not provided or consumed regularly. Lack of Vitacereal negatively affected families being able to put the FBR for porridge into practice, as Incaparina then needed to be purchased to make the porridge.
- Influence of grandmothers, mothers-in-law, and husbands was significant. In many cases these family members controlled mothers' access to money for purchasing the recommended foods and determined which foods were purchased for family consumption and how they were used. This was especially the case for younger parents. However, several young mothers checked with their mothers or mothers-in-law before trying a FBR and then received encouragement for the practice.

Table 11. Summary of feeding of FBR foods to children 6–11 months as reported by caregivers participating in FBR trials

Dept.	Case ID	Potatoes			Eggs			Beans			Fortified Porridge		
		Visit 1	Visit 2	Visit 3	Visit 1	Visit 2	Visit 3	Visit 1	Visit 2	Visit 3	Visit 1	Visit 2	Visit 3
Quiché	Q1	√	√	√		√	√		√	√		√	√
	Q2	√	√	√	√	√	√	√	√	√			
	Q3	√	√	√		√	√		√	√		√	
Huehuetenango	H1	√	√	√			√			√		√	√
	H2	√	√	√	√	√	√	√	√	√		√	√
	H3	√	√	√			√			√		√	√
	H4		√	√		√	√		√	√		√	√
	H5	√	√	√			√			√			
	H6	√	–	√	√	–	√	√	–	√	√	–	√
	H7		√	√	√	√	√	√	√	√		√	√
CASES	10	8	9	10	4	6	10	4	6	10	1	7	7

Key:

√ = FBR food fed to child at least once either prior to the first visit or by the second or third visit

Blank = FBR food not fed to the child

– = No data is available

Table 12. Summary of feeding of FBR foods to children 12–23 months as reported by caregivers participating in FBR trials

Dept.	Case ID	Potatoes			Eggs			Beans			Green Leafy Vegetables			Fortified Porridge		
		Visit 1	Visit 2	Visit 3	Visit 1	Visit 2	Visit 3	Visit 1	Visit 2	Visit 3	Visit 1	Visit 2	Visit 3	Visit 1	Visit 2	Visit 3
Quiché	Q4	√				√		√			√	√	√		√	
	Q5	√	√	√	√	√	√	√	√		√	√		√	√	√
	Q6		√	√			√	√	√	√	√	√			√	√
	Q7			√			√		√	√			√		√	√
	Q8			√	√		√		√	√	√	√	√		√	√
	Q9	–	–	–		√			√		√	√			√	
Huehuetenango	H8	√	√	√	√	√	√		√	√	√	√	√		√	√
	H9	√	√	√	√	√	√	√	√	√	√	√			√	
	H10	√	√	√	√	√	√		√	√	√	√	√	√	√	√
	H11	√	√	√				√				√		√	√	
	H12	√	√	√		√	√		√	√	√	√	√		√	√
	H13	√	–	√	√	–	√		–	√	√	–	√		–	√
	H14	√	√	√		√	√		√	√	–	√	√			
	H15	√	√	√		√	√	√		√	√	√	√			√
	H16	√	√	√	√	√	√	√	√	√	√	√	√	√		√
	H17	√	√	√	√	√	√	√	√	√	√	√	√		√	√
	H18	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
CASES	17	13	12	15	9	12	14	9	13	13	14	15	12	5	13	12

Key:
√ = FBR food fed to child at least once either prior to the first visit or by the second or third visit
Blank = FBR food not fed to the child
– = No data is available

Table 13. Summary of caregivers' compliance with recommended frequency, quantity, and preparation of FBR foods for children 6–11 months

Dept.	Case ID	Potatoes					Eggs					Beans					Fortified Porridge						
		F		Q		C	F		Q		C	F		Q		C	F		Q		P		C
		V2	V3	V2	V3		V2	V3	V2	V3		V2	V3	V2	V3		V2	V3	V2	V3	V2	V3	
Quiché	Q1	√	√			N	√	√		√	Y	√	√			N						√	N
	Q2			√	√	N		√	√	√	Y	√	√	√	√	Y							N
	Q3	√	√	√	√	Y		√			N		√	√	√	Y						√	N
Huehuetenango	H1	√	√	√		Y		√	√		Y		√		√	Y		√	√	√	√	√	Y
	H2	√	√	√	√	Y	√	√	√	√	Y	√	√	√	√	Y					√	√	N
	H3					N	√	√	√	√	Y					N					√	√	N
	H4	√	√	√		Y	√	√		√	Y					N		√	√	√	√	√	Y
	H5	√	√		√	Y		√	√	√	Y		√		√	Y							N
	H6	– *	√	–	√	Y	–		–	√	N	–		–		N	–		–	√		√	N
	H7	√		√	√	Y		√		√	Y			–	–	N			√	√	√	√	N
CASES	10	7	7	6	6	7	4	9	5	8	8	3	6	3	5	5	0	2	3	4	5	8	2

Key:

F = Frequency
Q = Quantity
C = Final compliance with FBR
P = Preparation
V2 = Visit 2
V3 = Visit 3
√ = FBR put into practice with recommended F/Q/P
Blank = FBR not put into practice as recommended
Y = Compliance achieved (defined as FBR put into practice with recommended F/Q/P at least once during trial period)
N = Compliance not achieved
– = No data available
***** = No 24-hour recall or visit 2

Table 14. Summary of caregivers' compliance with recommended frequency, quantity, and preparation of FBR foods for children 12–23 months

Dept.	Case ID	Potatoes					Eggs					Beans					Green Leafy Vegetables					Fortified Porridge						
		F		Q		C	F		Q		C	F		Q		C	F		Q		C	F		Q		P		C
		V2	V3	V2	V3		V2	V3	V2	V3		V2	V3	V2	V3		V2	V3	V2	V3		V2	V3	V2	V3	V2	V3	
Quiché	Q4					N	√		√		Y					N	√	√			N	√		√		√		Y
	Q5		√	√	√	Y	√	√	√	√	Y	√		√		Y	√	–	√	–	Y	√	√				√	N
	Q6	√	√		√	Y		√		√	Y	√	√	√	√	Y	–	√	–		N			√	√	√	√	N
	Q7		√		√	Y		√		√	Y	√	√	√	√	Y		√		√	Y			√	√	√	√	N
	Q8	–	–	–	–		√	√	√	√	Y	√	√	√	√	Y	√	√	√	√	Y	√	√	√	√	√	√	Y
	Q9	–	–	–	–		√	–	√	–	Y	√	–	√	–	Y	√	–	√	–	Y	√	–	√	–	√	–	Y
Huehuetenango	H8	√	√	√	√	Y					N					N	√	√		√	Y			√	√	√	√	N
	H9	√		√	√	Y	√	√	√	√	Y	√		√	√	Y	√		√		Y	√		√		√		Y
	H10	√	√	√	√	Y		√	√	√	Y	√	√		√	Y	√	√			N		√		√	√	√	Y
	H11	√	√	√	√	Y					N		–		–	N		–	√	–	N			√		√		N
	H12		√	√	√	Y			√	√	N		√	√	√	Y	√	√	√	√	Y			√	√	√	√	N
	H13	–	√	–	√	Y	–		–	√	N	–		–	√	N	–		–	√	N	–		–	√	–	√	N
	H14	√	√	√	√	Y		√	√	√	Y			√	√	N			√	√	N							N
	H15	√	√	√	√	Y		√	√	√	Y	–		–	√	N		√	√	√	Y		√		√		√	Y
	H16	√	√	√	√	Y			√	√	N			√	√	N			√	√	N				√		√	N
	H17	√	√	√	√	Y		√	√	√	Y		√	√	√	Y		√	√	√	Y		√	√	√	√	√	Y
	H18	√	√	√	√	Y		√	√	√	Y		√	√	√	Y			√	√	N		√	√	√	√	√	Y
CASES	17	10	13	11	14	14	5	10	12	13	12	7	7	11	12	10	8	9	11	10	9	5	6	11	11	12	12	8

Key:

F = Frequency
Q = Quantity
P = Preparation
C = Final compliance with FBR

V2 = Visit 2
V3 = Visit 3
√ = FBR put into practice with recommended F/Q/P
Blank = FBR not put into practice as recommended
– = No data available

Y = Compliance achieved (defined as FBR put into practice with recommended F/Q/P at least once during trial period)
N = Compliance not achieved

FBR 1: Fortified Porridge

Table 15. Details of the porridge FBR validated during the household trials

Target group	Quantity (g)	Frequency (servings/week)	Recommendation used	Serving size
Children 6–11 months	20	5	Give your child Incaparina or Vitacereal as porridge 5 times a week	1 tablespoon of dry Incaparina or Vitacereal mixed with 1/3 cup of boiled or treated water
Children 12–23 months	30	4	Give your child Incaparina or Vitacereal as porridge 4 times a week	2 tablespoons of dry Incaparina or Vitacereal mixed with 1/3 cup of boiled or treated water

A. Background on Findings

The Optifood recommendation specified that caregivers feed children porridge (*papilla*) that was made from one to two tablespoons of FBF. Given that Vitacereal was not being distributed at the time of data collection, this FBR was generally discussed with reference to Incaparina. The recommended frequency was five times per week for children 6–11 months and four times for children 12–23 months. Caregivers, who were always the children's mothers, but included other family members as well, were shown how to prepare the FBF porridge with optional ingredients such as eggs, potatoes, beans, and fruit.

B. Successful Implementation of the Fortified Porridge FBR

Tables 11 and 12 provide a summary of whether caregivers of children 6–11 months and 12–23 months were able to feed the recommended food at some point during the trial period while Tables 13 and 14 summarize whether caregivers were able to put the full FBR into practice according to the recommended quantity of ingredients used to prepare the food (and consumed by the child), preparation as a porridge, and frequency (number of servings per week).

By the second and third household visits, nearly all children had been fed fortified porridge at some point, but only a third of caregivers in the 12–23 month group and two caregivers in the 6–11 month group were able to do so as frequently as recommended. Most women considered the porridge recipe easy to prepare but thought that doing so four to five times per week was difficult without access to Vitacereal or money to purchase Incaparina.

Preparation: Mothers were not used to making porridge with FBF, preferring to prepare FBF (Incaparina or Vitacereal) as a watery drink, atole. However, over the three FBR trial visits, most caregivers used at least one of the two recipes provided during the trials (see Annex 1 of recipes showing preparation steps). Most caregivers said although they had never made porridge before, it was easy to prepare. Despite written and visual instructions to prepare the porridge, during follow-up visits, a few caregivers said that they did not know how to prepare the porridge.

Quantity: Some caregivers, especially those with younger children, thought the portion sizes were too large, particularly when several ingredients were used in addition to the FBF.

Intra-household distribution/sharing: Most caregivers explained that atole is typically prepared in a large quantity for the entire family, but during the trial many caregivers made FBF porridge for their one child 6–23 months only.

Moderator: You made it (porridge) just for him?

Mother: Yes, just a little bit, just for him.

Constraints and facilitators: The ease of preparation of the porridge, the taste and texture, and lack of adverse reactions were frequently mentioned as reasons for being able to put this FBR into practice or why they were motivated to do so. However, some mothers forgot the recipe or could not use the recipe card because they were illiterate. Other important challenges included preferences for atole drinks over porridge, especially for younger children, and some children's rejection of porridge. Acceptance of the porridge improved between visits two and three. As mentioned, financial access to Incaparina was noted as a common barrier.

Moderator: Why didn't you give it (porridge) five times? What happened?

Mother: The Incaparina ran out.

C. Acceptability

In general, FBF was considered to be a good food for young children. Although most caregivers expressed a willingness to try to make the porridge, many reported both their own and their child's preference for atole instead of porridge:

Moderator: How would you prefer to give it? As porridge or atole?

Mother: As atole. She likes to drink atole from her bottle, so I give her half a bottle.

However, after trying the porridge, some caregivers said that porridge was "healthy" and "good" for their children, had vitamins, and helped children grow.

Moderator: Do you think it is a good food?

Woman: Yes, it is good because before I wasn't giving it, and now I am giving it (porridge) and she (child) likes it.

Social/family support: Most mothers who discussed this FBR with family members said they were supportive. One woman said that her husband had heard that Incaparina was good for avoiding illness, and encouraged her to feed it to their son. Another woman said that her husband tried the porridge and did not like it, so asked her not to make it again for the child.

Beliefs and preferences: When the porridge FBR was introduced at the first visit, the majority of caregivers were happy to try it. In general, caregivers thought Incaparina was appropriate for their child. Only one caregiver (of a child 7 months of age) felt that the child was too young. Children's preferences for the porridge recipes' taste and consistency were reported by caregivers based on the child's reaction. Some mothers said that their child rejected some or all of the porridge recipes. Two women decided to make atole instead as it was easier to feed their children. Two mothers said that because their child vomited the porridge they would not make it again.

Moderator: Do you believe that the baby didn't like the porridge?

Woman: It had a lot of oil, she doesn't eat a lot of oil.

Key informant interview participants noted the preference for giving liquid foods to young children was due to the belief that children without teeth cannot eat solids. They mentioned that health centers recommend foods be well mashed.

> *Doctor: Our people are used to giving more liquid foods to a child when they are little because they don't have teeth and can't chew. We recommend the same, that everything be well mashed when given to the child.*
>
> *Nurse: Obviously it (atole) is a lot easier for children, it's easier than giving something like porridge.*

If caregivers perceived that the child did not like the porridge, they generally did not prepare it with the recommended frequency. Therefore it was unclear whether the child did not like it or only required additional tastings to feel comfortable eating it. In contrast, some respondents reported that the child liked the porridge, and in one case, a caregiver said her family liked the recipe so much that she prepared it for everyone.

Perceived difficulties, constraints, and facilitators: The high cost of Incaparina and lack of access to free Vitacereal were frequently mentioned as a primary impediment to preparing porridge or doing so the recommended number of times. Although Incaparina is generally a highly acceptable food, prior family consumption was not a clear facilitator for the FBR since it is typically prepared as a sweet drink fed in a bottle. Therefore, the porridge represented a different taste and mode of feeding for children. Most caregivers who successfully made the porridge had another source of information or support, such as having heard prior advice at the health center (even if they never tried the recipe), or having a supportive family member (often the mother or mother-in-law).

D. Feasibility

Access to resources: Some caregivers did consider Incaparina to be affordable and said that they did not mind spending money to buy this product because it would help the child grow well. However, many families repeatedly mentioned throughout the visits and FGDs that cost would limit the purchase of Incaparina. Many informants discussed being able to put this FBR into practice only when they "had cash" or were receiving Vitacereal. Caregivers also stressed that a bag of Incaparina goes quickly within their large households and could only be purchased when money is available.

> *FGD Participant: There's just no money to buy Incaparina, I'm missing it, but I don't buy it.*
>
> *FGD Participant: Corn atole never runs out, I have plenty because we eat it every day, but Incaparina is difficult.*
>
> *Mother: I would love to (put the FBR into practice) but I don't have money to buy Incaparina.*
>
> *Mother: I didn't do it because there wasn't any Incaparina or Vitacereal, if there had been Vitacereal I would have done it.*

Health staff interviewed said that families were used to buying the cheapest atole flour available, usually *atole de masa*.

> *Doctor: This is what they buy, the cheapest one possible.*

Women said that the Incaparina packages were smaller than the bags of Vitacereal that were distributed. Women participating in the FGD said that a pound bag was only enough to make one pot of atole for four children and two adults. Some women thought that a recommendation of giving two to three servings of porridge per week would be more feasible.

FGD Participant: There's only enough Incaparina in a packet to serve it once. I have four children then with the two of us a pound is only enough for one meal. For only one time exactly, it doesn't last like the Vitacereal.

Although families mentioned that most foods were purchased for the entire family (not individual family members), a few caregivers said that they could purchase Incaparina for only the child 6–23 months, which would limit the cost to only the child's portion.

Moderator: Did you buy it (Incaparina) for everyone or just for the child?

Father: Just for him.

Fuel to cook porridge was not cited as a challenge, perhaps due to the relatively fast cooking time. Most participants considered the porridge easy and quick to prepare, although a few noted the additional burden to include recommended ingredients such as beans, potatoes, or eggs to make the sample porridge recipes (provided in Annex 1). Interviewers observed that some families said they did not prepare the porridge since they lacked one or more ingredients to complete the recipes. The promotion of plain porridge recipes (with the option to add extra foods) could have greater adoption rates.

Availability: At the time of the household trials, free Vitacereal was not being distributed. Instead, Incaparina was reportedly available for purchase year-round in small local stores or markets, although mothers in the FGD noted stock-outs or expired products.

Enabling environment: The majority of mothers said that they accessed money for purchasing Incaparina from their husband, father, or mother in-law since they didn't have paid work themselves (except for occasional weaving or day labor). A few women said they would not have to ask permission to buy Incaparina, but many recalled lack of money as a reason why they were not able to feed it to their child. Two women said that their husbands would only be able to give them money to put this FBR into practice when there was money available and several commented that family members told them that Incaparina was an expensive item to purchase.

FBR 2: Eggs

Table 16. Details of the egg FBR validated during the household trials

Target group	Quantity (g)	Frequency (servings/week)	Recommendation used	Serving size
Children 6–11 months	25	3	Give your child half a medium-sized egg at least 3 times a week	1/2 of a well-cooked, medium-sized egg (yolk and white)
Children 12–23 months	50	4	Give your child a medium-sized egg at least 4 times a week	1 well-cooked, medium-sized whole egg (yolk and white)

A. Background on Findings

For this FBR, caregivers were asked to give half an egg three times per week to children 6–11 months or a whole egg four times per week to children 12–23 months. The recommendation specified giving both the white and yolk parts of the egg and cooking thoroughly either by frying, boiling, or scrambling.

B. Successful Implementation of the Egg FBR

Caregivers' reported experience feeding eggs to their child is shown in Tables 11 and 12. At the beginning of the trial, only about half of the children in the sample were eating eggs regularly. By the third visit, all but one caregiver reported feeding eggs to their child at least once. Tables 13 and 14 show a summary of caregiver experience trying the egg FBR with the recommended frequency and quantity by age group.

Frequency: Some caregivers considered it difficult to afford to purchase eggs so frequently and suggested that two times per week would be more feasible.

Quantity: The portion sizes were considered acceptable by most caregivers, although reportedly, not all children finished the full portion. A number of women were concerned that a whole egg may be too large a serving for a child 12–23 months and gave half an egg or egg yolk only.

Preparation: The most commonly mentioned methods of preparing eggs were scrambled or hard boiled, sometimes in broth (*caldo*), and mashed. Some families preferred to scramble or fry eggs with oil, while several families mentioned that they preferred to feed soft-boiled eggs (*huevo tibio*), especially to younger children.[10] Scrambled eggs or cooked eggs mixed with vegetables were considered to be more likely to be accepted by children than hard boiled eggs:

> *FGD Participant: I give them (eggs) to her but she doesn't eat a lot. When I make her scrambled eggs yes, but when I do boiled eggs she only eats the egg white. I prefer to make it scrambled with sausage or with tomato and onion.*

Intra-household distribution/sharing: Most families reported preparing eggs for the entire family when they prepared it for the child, and repeatedly mentioned that they would not be comfortable giving this food to their young child only. Some of the caregivers were asked who within the household would be given an egg if there was only one available. A few informants said that they would wait until they had enough eggs and prepare a meal to share as opposed to prioritizing the nutrition of one child or adult in particular. Only one mother said that she would purchase and prepare eggs for her 12–23 month child only.

> *Moderator: Talking about eggs, do you buy them for the whole household?*
>
> *FGD Participant: Yes, as now we're living here with my mother-in-law, I hardly realize how much I spend since they give it, but we are so many, about 10 in the family all together.*
>
> *FGD Participant: We grew up with 17 people in one house, so it was a little bit for everyone and they had to be happy with their little bit you know, so in my house I am used to that, I eat my part as that's the way it has to be—equal for everyone without differences, even though it's a little.*

Constraints and facilitators: The fast and easy preparation, soft texture, and young children's affinity for the taste of eggs were noted as reasons for being able to put this FBR into practice or why caregivers were motivated to do so. Having home production of eggs was mentioned as an important facilitating factor. Several caregivers had concerns about feeding egg whites to young children less than 1 year, or feeding eggs to young children in general, despite some local health staff reportedly promoting the

[10] Soft-boiling eggs was discouraged during household visits due to concerns about the risk of salmonella infection when using undercooked eggs.

benefits of feeding eggs to children on a regular basis.[11] The main challenge mentioned by caregivers was difficulty affording eggs since home egg production was too low to support the frequency of eggs in the FBR.

C. Acceptability

Dietary practices: Egg was added to the Vitacereal or Incaparina porridge suggested as part of the "porridge FBR." Despite the recommendation to fully cook eggs to prevent salmonella contamination, families commonly mentioned that they preferred to feed soft boiled eggs (*huevo tibio*), which they considered the most acceptable preparation due its soft texture.

> *Moderator: Is it okay for him (the baby)?*
>
> *Mother: It's good, because it's soft boiled.*

Additionally, many caregivers were giving only egg yolks to their child, which they mentioned was a practice recommended by their family as well as by the health center staff. However, after interviewers encouraged them to give both parts of the egg, caregivers were generally willing to try feeding egg whites as well.

Acceptability by children was variable, with many children eating the entire portion, but some children (particularly in the younger range of 6–11 months), eating only part of the portion or spitting all of it out. One caregiver reported that it made her child sick. Several caregivers noted their perception that the child didn't like one way of cooking eggs, so they tried a different preparation, which was then eaten by the child.

> *Mother: Now, boiled eggs, she doesn't really like them, only scrambled.*

Enabling environment: Eggs were considered a good complementary feeding food and some of the informants said that this was common knowledge in their communities. Many women had previously been told to give eggs to their child at the health center. Benefits associated with feeding children eggs were increased growth, less sickness, and overall good health.

Some of the health staff participating in the key informant interviews indicated that although they usually encouraged women to give eggs to their children, they warned them not to give egg whites as it could make their children sick. The beliefs and practices of local health staff would require addressing in a social and behavior change strategy promoting whole eggs.

> *Doctor: I tell them that they have to give the yellow part of the egg, the yolk, not necessarily the white because the white has a lot of proteins that the child can't digest, so it's better to give the yolk only.*
>
> *Moderator: Until what age?*
>
> *Doctor: Until they are 1, then they can start to eat the whole egg.*
>
> *Health Educator: They are scared of giving the egg white…as sometimes it can cause an allergic reaction. They believe this because the children are so small. But we currently advise them to give both the white and the yolk.*

[11] Ministry of Health materials promote only egg yolk for children 6–12 months, although the *Guiding Principles for Complementary Feeding of the Breastfed Child* (PAHO 2003) mentions egg whites and yolk starting at 6 months.

Beliefs and preferences: During the FGD it was clear that not all mothers feed eggs to their young children, especially before 9 months of age. Several women reported that family members (mother, grandmother, or husband) encouraged them to try the egg FBR for their child, while others mentioned that family members (in-laws) warned them of ill effects, such as causing harm to the eyes or giving children worms.

Perceived difficulties, constraints, and facilitators: Eggs are an acceptable complementary food, easy to prepare, and generally likeable to young children with one preparation or another, but typically introduced around 9 months of age, several months later than the FBR. Efforts to promote children's egg consumption must recognize the culture of sharing food equally among family members and raise awareness about children's special needs for nutrient-dense foods.

D. Feasibility

Cost in terms of economic resources: Many caregivers said that they would need more money to put this FBR into practice properly. Individually, eggs were not considered to be expensive but this was raised as a barrier when multiple eggs had to be purchased within a week to meet the recommended frequency and if more than one person in the household was to be eating eggs. However, a few caregivers mentioned that they would try to buy eggs for their young child even if they could not afford it for the whole family. Key informant interview participants thought that while buying an egg once or twice may be feasible, buying multiple eggs every week could become quite difficult.

> *Moderator: And you can buy eggs all year round? There's enough money?*
>
> *Woman: Sometimes not, but there's always enough to buy at least one egg, just for her (child).*
>
> *Father: I don't believe it would be that easy for people who don't have chickens, they would have to buy, buy, buy eggs.*

Availability: Around half of households in the trial kept chickens that laid eggs, but many participants said that they would not produce enough eggs to give to their child four times per week as well as feed others in the household. The number of chickens kept by participating families ranged from 2–10 and the level of production ranged from 7–10 eggs per week per household. Recent chicken deaths due to sickness were mentioned by many families.

Participants said that eggs could be purchased locally at small shops and only a few mentioned needing to travel to a larger market to purchase eggs. A few expressed a preference to purchase eggs for their young children from native chickens (*huevos de criollo*), rather than improved farm chickens (*huevos de granja*). During the FGD, egg prices were noted to vary seasonally, with lower prices during the rainy season.

Social/family support: Most caregivers said that they would not be in charge of decision making regarding the purchase of extra eggs to meet this FBR. Some women said that they would need to ask their in-laws or husband for money to buy eggs. In a few cases, women would ask their husband who, in turn, would ask his parents for money. Three women interviewed were confident that they had enough money and would not need special permission to buy eggs.

FBR 3: Potatoes

Table 17. Details of the potato FBR validated during the household trials

Target group	Quantity (g)	Frequency (servings/week)	Recommendation used	Serving size
Children 6–11 months	60	3	Give your child a medium-sized potato 3 times a week	1 medium or small potato
Children 12–23 months	60	4	Give your child a medium-sized potato 4 times a week	1 medium or small potato

A. Successful Implementation of the Potato FBR

Caregivers were asked to put this FBR into practice by giving their children potato either three or four times per week. Mothers were shown how to add cooked potato into a savory porridge as well as told that they could give their children mashed potato, pureed potato, or small pieces of cooked potato (older children only). A summary of compliance with this FBR is presented in Tables 11–14. At baseline, only half of the Quiché caregivers participating in the trials said that they were feeding their child potatoes and most caregivers in Huehuetenango were already feeding their children potatoes three to four times per week. Potatoes were considered to be a normal food for small children in Huehuetenango, with most mothers saying that they had started giving this food to their child when they first started to eat.

> *Key informant interview participant, Huehuetenango: With the potatoes, no problem, I already give them every day.*
>
> *Mother, Huehuetenango: I started giving potatoes when he started to eat, three times a week in broth with carrot.*

Looking at the two departments combined, all but one caregiver fed potato to their child during the trial and most were able to do so with the recommended quantity and frequency. Despite reported difficulties in accessing potatoes, nearly all caregivers in Quiché put this recommendation into practice at least once during the trial and about half were able to do so at the recommended frequency and quantity. All caregivers in the 12–23 month group and all but one of those in the 6–11 month group in Huehuetenango complied with the FBR by continuing their existing practices.

Preparation: Children were fed potato in a variety of preparations during the trial, including as small pieces, mashed, in broth, in soup with tomato, and fried in oil. All preparations were generally acceptable to children.

Quantity: Caregivers reported that most children were able to finish one small or medium-sized potato, while several of the children 6–11 months only finished about half a potato. One caregiver accommodated to the quantity of the FBR by feeding a smaller amount nearly every day. When the potato was used in the porridge recipe, it was harder to determine if the child finished the entire potato if an amount of porridge was left over.

Frequency: It was common in Quiché for families to reduce the frequency of the FBR to one to two times per week, close to the typical family consumption of potatoes. Several families expressed willingness to achieve a higher frequency, but in the end said the financial constraints made it impossible. In Huehuetenango, most caregivers felt that three times per week was a reasonable frequency, and some fed potato daily or multiple times per day.

Intra-household distribution/sharing: As with other FBRs, potatoes were generally purchased and prepared for the entire family with a small portion set aside for the infant. One participant in Huehuetenango said that she would sometimes cook a potato quickly if her one-year-old didn't want to eat the same food as the rest of the family. However, some families did purchase and prepare FBR foods separately for young children, particularly when ingredients, including potato, were used to make the FBF porridge.

> *Moderator: Does she (the baby) like potatoes?*
>
> *Woman: Yes, sometimes we're eating something else that she doesn't want to eat, so I put a potato on to cook quickly to give to her.*

Constraints and facilitators: The main reason for being unwilling or unable to put this FBR into practice was the economic constraint of purchasing potatoes (as mentioned both in Quiché and Huehuetenango). Although potatoes were considered easy to prepare and feed, access was limited in Quiché. While potatoes were produced by most families in Huehuetenango, they reportedly did not grow in some of the study areas in Quiché and would need to be purchased. This was not considered feasible to many informants in Quiché given issues accessing the market as well as the high price of purchasing potatoes. Women participating in the FGD in Quiché explained that in addition to the cost of purchasing food, they would need to spend money on transport to the market in order to put this FBR into practice. Passage on a shared bus to and from the market ranged from Q15–20 ($2.00–$2.65) each way.

> *Mother: For me it's really difficult, I would like to go, but the bus fare is too expensive, almost 20 Quetzales and then I don't have enough money to buy vegetables. Sometimes when no one in the family goes, we ask a favor of someone we know who is going to go. So here, the barrier is that the bus fare costs more than the food. It's not the cost of the vegetables, it's the transport.*

In contrast, most caregivers in Huehuetenango considered this an easy FBR to put into practice because they had plenty of access to potatoes and were used to feeding them to their children and eating them themselves.

> *Moderator: Would this be difficult to do or easy?*
>
> *Mother: It's easy. I'm not worried at all, because we grow potatoes.*

B. Acceptability

Enabling environment: Several caregivers had heard from health personnel that potato was a nutritious food for children, and others noted that their mothers or mothers-in-law gave them this advice. Despite the general acceptability of potato as a complementary food, this FBR was not widely supported by family members of the Quiché caregivers interviewed because of poor access. Women listed permission from their husbands/mothers-in-law as a constraint to putting this FBR into practice.

C. Feasibility

Access to resources: Reported potato prices ranged from a low of Q1 ($.13) per pound (noted in the Huehuetenango FGD) to Q3 ($.40) per pound (mentioned by a family from Quiché), depending on location and time of year. Women from Quiché said that they/their husbands would buy potatoes to eat sometimes (usually no more than once per week), but not always and that they would need more money to be able to put this FBR into practice regularly. Caregivers from the households that managed to put the FBR into practice over the course of the trial said that they had to spend more money than usual to make this happen.

Many informants from Huehuetenango said that they grew enough potatoes to sell as well as for their own consumption. However, at the time of the FBR trials (July and August during the rainy season), most families needed to purchase potatoes. They noted that prices were highest at the time of the interview (July) and that prices would drop lower in a few months (October–November).

Nearly all caregivers mentioned that to put this FBR into practice they would need to prepare potatoes for the rest of the family as well. Although potatoes were not considered a very expensive food, the volume of potatoes (and therefore expenses) needed to supply the FBR food for the entire family was quite large versus only the child's portion.

Social/family support: When discussing this FBR, all of the women interviewed said that they would not be able to make the decision themselves to purchase potatoes to give to their child. Six women said that they would need to ask their husband for the money needed to buy potatoes and one woman said she would need to ask her mother-in-law. One caregiver said that she was not able to put the FBR into practice over the course of the trial as her husband had not agreed to purchase potatoes.

FBR 4: Black Beans

Table 18. Details of the bean FBR validated during the household trials

Target group	Quantity (g)	Frequency (servings/week)	Recommendation used	Serving size
Children 6–11 months	25	3	Give your child beans 3 times a week	2 tablespoons of cooked beans (mashed, blended, or refried)
Children 12–23 months	25	4	Give your child beans 4 times a week	2 tablespoons of cooked beans (mashed, blended, or refried)

A. Successful Implementation of the Bean FBR

This FBR asked caregivers to feed two tablespoons (about 25 g) of black beans three or four times per week, specifically addressing the importance of feeding the bean itself, rather than bean broth. At baseline few of the children 6–11 months had previously tried beans given whole, mashed, or as a puree, although it was common to feed young children the broth that beans were cooked in (*caldo de frijol*). About half of the children 12–23 months were eating beans before the trial but consumption of broth was still more common than giving the food itself. Despite this, most caregivers were able to give their children beans during the trial and half were able to do so with the recommended frequency and quantity. A summary of the compliance of putting this FBR into practice across the trial is given in Tables 11–14.

Quantity and frequency: Most of the caregivers of children 12–23 months were able to give their child the recommended quantity of beans in one serving at least once during the trial, but fewer were able to follow the recommended frequency (four servings/week) for at least one week. Half of the caregivers of children 6–11 months were able to give the recommended quantity of beans in one serving at least once, but many mentioned favoring a smaller portion. Half of the caregivers of children 6–11 months were able to follow the recommended frequency of servings per week for at least one week, while many caregivers mentioned that feeding beans twice per week would be more feasible.

Preparation: As mentioned, during the initial visit the most frequently mentioned method of preparing beans for children was to give children the broth that was produced when cooking beans. However, some mothers were also giving their children mashed or pureed cooked beans. At the second and third

household visits, many caregivers mentioned having tried these semi-solid preparations. Despite this, the practice of giving children beans as broth was still mentioned by a few women during the second and third visits. Several caregivers also reported adding pureed or mashed beans to one of the recipes promoted to prepare the Incaparina/Vitacereal porridge FBR.

FGD participants in both departments said that it would take roughly half a day to cook beans and that the family would eat them for at least two meals, often in different preparations. In some cases, leftover beans would be fried and eaten the next day for breakfast.

> *Moderator: If you make beans today and there is some leftover, do you eat them tomorrow as well?*
>
> *Woman 1: Yes, until they are finished.*
>
> *Woman 2: In my case we cook them today knowing that we'll have beans for the next day's breakfast also.*

Intra-household distribution/sharing: All caregivers in Quiché and all but two caregivers in Huehuetenango prepared beans for the entire family and gave a small portion to their child in order to follow this FBR. Many caregivers said that they would need to make enough beans for the entire family if they were going to put this FBR into practice. Reasons given for this were that it would be easier to prepare one meal only and that it would not be fair to make the rest of the family go without. Only one woman in Huehuetenango said that she purchased beans for her young child's consumption only.

Constraints and facilitators: Beans were considered to be generally accessible and most caregivers reported that they were already eating this food as a family two to four times per week. However, the high cost of purchasing and preparing enough beans to simultaneously meet the requirements of this FBR and feed the rest of the family was the main constraint to feeding beans to young children at the recommended three to four times per week. Lower frequencies were considered more acceptable and feasible.

Preparation of mashed or pureed beans for children 6–11 months was not a familiar practice for most caregivers and conflicted with widely held beliefs about the appropriate age to introduce the food to young children. Caregivers had limited exposure to previous guidance to try feeding beans to young children and in many cases required at least two encouraging home visits to try the FBR.

B. Acceptability

Some of the participants said that this would be an easy FBR to put into practice due to the fact that this was a normal food and reasonably accessible locally and easy to attain. However, beans were virtually absent from the diets of children 6–11 months, unless given as bean broth. Many caregivers expressed reservations about feeding mashed or pureed beans to a child 6–11 months (as opposed to bean broth), as it could cause an upset stomach or diarrhea in the young child.

> *Moderator: Do you give her beans?*
>
> *Woman (mother of a child 8 months), Quiche: No, because it's not good, because she's so small.*
>
> *Moderator: And no one has told you that it's good to give her beans?*
>
> *Mother: No.*

Regarding the optimal age to introduce beans, some from the Huehuetenango FGD commented that 6 months seemed too young, with 9 months and over being preferable, while individual mothers mentioned 12 months.

> *Moderator: When is it okay to start giving children beans?*
>
> *Woman: When they are 10 or 11 months old.*

The portion of two tablespoons of beans was acceptable to some mothers (particularly for children almost 12 months). However, other mothers reported that their child was not able to eat the entire portion and that one spoonful would be enough.

Enabling environment: Aside from the perceived high cost of purchasing and preparing beans, family members were generally supportive of this FBR. Two women said that their mothers-in-law had already told them that they should be feeding beans to their babies to make them strong. In addition, a few women had also heard this recommendation at the health center.

A few mothers of children 12–23 months in Quiché and Huehuetenango were reluctant to put this FBR into practice regularly as they believed that serving *grano* or whole beans (as per the photo on the promotional card used) was not good for their children. In these cases, researchers discussed alternative methods for serving beans to small children, such as mashing, which was considered more acceptable. Upon subsequent household visits, some of these women had started giving their children mashed beans and one changed her mind and said that she now saw that *grano* was good for her child.

Prior to the FBR trials, some caregivers of children 6–11 months mentioned hearing positive messages about feeding beans to such a young child, while others had heard negative comments or never heard of giving beans (except for bean broth) for this age. However, during the course of the three visits, most caregivers asked for guidance on the bean FBR from family members and were ultimately encouraged by their mother, mother-in-law, or husband.

> *Moderator: So at the moment he's not eating beans?*
>
> *Mother-in-law of boy 7 months: Only the bean broth.*
>
> *Moderator: Only the broth? Why not the bean?*
>
> *Mother-in-law: It would give him diarrhea.*
>
> *Moderator: So you haven't tried it?*
>
> *Mother-in-law: No.*
>
> *Moderator: Do you think that you could try little by little and see how he goes? Then try a little more?*
>
> *Mother-in-law: A little bit yes, but really well mashed. Whole beans, no.*

Perceived difficulties, constraints, and facilitators: A few of the mothers interviewed were worried that the frequency suggested by the FBR was too much for their children and that they would become bored with beans or stop eating them. It was suggested that one to three servings per week would be more appropriate. The portion of two tablespoons of beans was acceptable to some mothers (particularly for children over 11 months of age), while others reported that their child was not able to eat the entire portion and that one spoonful would be enough. The desire for variety in meals throughout the week was raised by women in both departments.

> *Moderator: Twice per week then? If you could produce more (beans), if there was perfect rainfall and no pests, would you eat them more often or would you sell them? Like maize or would you get bored?*
>
> *FGD Participant, Quiché: Maize no, we wouldn't be bored. Beans yes! (Laughter)*
>
> *FGD Participant, Huehuetenango: You have to give different foods, the more variety the better for children.*

Commonly mothers mentioned concerns that beans should be introduced to children after at least 9 months as feeding beans earlier could cause an upset stomach. The concern was particularly related with the outside of the bean (*la cascara*) and mothers stressed that it was essential to mash or blend the beans into a fine paste for children in the 6–11 month age group. For several families a blender was mentioned as the preferred option to make a smooth puree, and in some cases the entire family then ate the beans this way.

C. Feasibility

Access to resources: Black beans were considered to be an expensive food by most caregivers interviewed and in some cases cost was noted as a barrier to putting the FBR into practice at the recommended frequency. However, some families commented that the price of beans was stable throughout the year, always around Q5 ($.66) per pound and that implementing the FBR would not imply much additional cost as the family was already preparing beans a few times per week. Others reported seasonal price variation between Q3–Q5 ($.40-$.66) per pound. Some caregivers from Quiché said that cost would not be an issue in putting this FBR into practice because they were able to grow beans. All FGD participants in Quiché reported growing beans at home, but said that they could not eat them when they were drying and would need to buy beans during this time instead.

In Huehuetenango there was a perception among some that the price of beans had risen of late and it was necessary to travel further to purchase beans at a more affordable price. Another said her family tried to get around the higher cost of beans by buying a lot at once and storing them in the home, but that this was dependent on having the spare money available to purchase such a large quantity. Other informants said they were limited to small, regular purchases when they had money to spend. Beans purchased (often in lesser quantities) at small local shops were reportedly more expensive than those from larger markets.

Cost in time and effort: Most caregivers said that it did not take much extra time or effort to mash or blend whole cooked beans into a puree, if the beans were already prepared for the rest of the family. However, some caregivers mentioned the time needed to purchase and prepare extra beans to put this FBR into practice as significant, especially in cases where beans needed to be purchased at local markets. While the preparation of beans was a usual practice, a few women said that the amount of time, water, and firewood needed to prepare this food prevented them from doing so more than one to two times per week.

Many caregivers interviewed said that they would try putting this FBR into practice only "if" or "when" they had the money to do so. One informant from Quiché said that her family would not be able to give the recommended amount of beans to her child as she would also need money to buy fuel (wood) in order to cook the beans. Another informant said that she would not spend more on beans as she would prefer to spend this money on buying eggs for her child. In contrast, one caregiver from Huehuetenango who was receiving remittance payments from her father who was working in the United States said that the FBR would be easy to put into place and that she would not have to spend any extra money.

Availability: Beans were reportedly grown by most of the participating families in Quiché but household production was not mentioned as a source of black beans by any of the participants from Huehuetenango. These families purchased their beans at small local stores or at larger markets if not available in the community. Beans were deemed to be available year-round, but the price often fluctuated with the season. A few families reportedly bought and ate less beans when the prices were high. FGD participants from one community in Quiché were worried that they would not be able to put this FBR into practice as they were experiencing drought conditions, which was causing their bean crops to die.

> *Woman, Quiché: Mine died, we all planted beans but they are dying, since there is not enough water.*
>
> *Woman, Quiché: At this time of the year there aren't any beans, you have to buy them in the town, but these come from other parts of the country, not here.*

Social/family support: Almost all of the caregivers interviewed said that it would be their decision to purchase more beans to put this FBR into practice, even though they would be using money from their husbands/fathers/fathers-in-law to make the purchase. Only one caregiver in the sample said that it was the decision of her mother (household head) as to whether more beans would be purchased and given to the child.

Perceived difficulties, constraints, and facilitators: Caregivers with home production of beans expressed fewer concerns about accessing beans to meet the FBR for their children, particularly if the rest of the family was already consuming beans about three times per week. If it was not feasible for the rest of the family to eat beans three times per week and beans were only prepared for the young child, it would create additional needs for resources, fuel, and cooking time.

FBR 5: Green Leafy Vegetables

Table 19. Details of the green leafy vegetable FBR validated during the household trials

Target group	Quantity (g)	Frequency (servings/week)	Recommendation used	Serving size
Children 12–23 months	30	4	Give your child green leafy vegetables 4 times a week	2 raw large Swiss chard leaves or 1/2 a cup of cooked green macuy leaves

A. Successful Implementation of the Green Leafy Vegetable FBR

This FBR recommended that children 12–23 months be given four servings of green leafy vegetables per week. A summary of the compliance of putting this FBR into practice across the trial is given in Tables 11–14. All of the children 12–23 months in the sample had previously been fed green leafy vegetables at some stage and almost all caregivers were reportedly giving their children this food at baseline. Across the course of the trial, all informants gave their children green leafy vegetables at least once, but only 9 of 17 were able to do so at the recommended frequency and quantity.

Caregivers mentioned feeding their children green leafy vegetables such as lettuce, chard, cabbage, spinach, nightshade, squash leaves, chayote leaves, flowers, and other native greens. The main method of preparation mentioned at baseline was green leafy vegetables in broth, generally prepared for the whole family and given in small quantities to young children. A few children were usually only fed the liquid part of this broth. At the second and third household visits, green leafy vegetables were still reported as being cooked in broth; however, when serving this food to their children most informants mentioned

preparing portions that had more vegetables (in small pieces or mashed) and less liquid. A few informants continued giving only broth throughout the trial.

The recommended portion size of green leafy vegetables was 30 g, which was communicated as two raw Swiss chard leaves or half a cup of cooked nightshade. Most caregivers gave children between two to three tablespoons of cooked green leafy vegetables (with broth) at the second and third household visits, which met or came close to meeting the recommended quantity.

Intra-household distribution/sharing: At baseline, all caregivers said that they would take green leafy vegetables in broth from the family pot to give to their 12–23 month child and never prepare it as a separate meal for the child only. Participants reported that eating green leafy vegetables was a "family practice" and that "everyone ate them." Some caregivers said that they usually prepared green leafy vegetables for the family every other day. Throughout the trial, the purchase and preparation of green leafy vegetables for the child's consumption only was not mentioned. Many caregivers pointed out that they would have to acquire enough green leafy vegetables to prepare for the entire family if they were going to put this FBR into practice and that this could have cost implications.

Constraints and facilitators: The ease of access to green leafy vegetables due to home production/foraging and similarity of this recommendation with existing family practices were the main facilitators to putting this FBR into practice. Green leafy vegetables were considered to be an easy food to prepare as they required minimal cooking time and could be added to broths being prepared for the entire family. One informant from Huehuetenango explained that the green leafy vegetables were not difficult to give to her child often because they could easily be added to many different foods such as eggs, soup, and porridge.

Few constraints to putting this FBR into practice were raised by informants during the trials. A few informants said that they would not be able to follow the recommendation if they did not have time to forage for green leafy vegetables or if there was a low supply in the area due to seasonal changes. However, the majority of caregivers considered this an accessible food.

B. Acceptability

All but two caregivers thought that their children liked to eat green leafy vegetables or did not mention any issues with feeding green leafy vegetables to their child. Many of these women also shared that they themselves liked to eat green leafy vegetables. One woman said that she had difficulty feeding green leafy vegetables to her child and that he refused to finish the portion. Another mother said that her child tired of eating green leafy vegetables every day, which made the FBR difficult to put into practice. Some women participating in the FGD in Huehuetenango were worried because leafy greens would sometimes appear undigested in their child's feces, but recognized that this would not be the case if the food was more thoroughly chopped or mashed.

> *Woman: The greens come out whole in his stools, but it's because he eats them whole.*

Social/family support: Many of the informants said that this FBR was likely to receive a lot of support within the household as it was a food that the family already ate and was relatively easy to access. Further, some caregivers had discussed the FBR with other women in their community (female family members and neighbors) who had agreed that it was a good food for young children. In particular, women thought that green leafy vegetables were good for their children's health because they were natural and contained vitamins, which helped children to grow. It was believed that green leafy vegetables contained more vitamins than other vegetables (such as potatoes or broccoli).

A few caregivers shared beliefs that could hinder the adoption of this FBR. One woman from Quiché believed that it was more important to give her child the broth that the green leafy vegetables had been cooked in stating that this contained more vitamins than the leaves themselves. One woman from Huehuetenango said that she didn't want to give her child too many green leafy vegetables as she thought that they would stick to his stomach (and potentially cause gastric issues). Another woman from Huehuetenango thought that green leafy vegetables would be hard to eat for children who were not able to chew well.

> *Mother, Huehuetenango: Greens stick to children's stomachs, this is why you shouldn't give them every day.*

C. Feasibility

Access: The cost of purchasing green leafy vegetables was not commonly raised by caregivers due to the fact that household production or foraging was the most common way of accessing this food. A few participants also mentioned purchasing green leafy vegetables at the local market or store and said that it was not an expensive product. One woman said that if she could not find any green leafy vegetables among her maize crop she would purchase it at the market. Only one informant raised access to money to buy green leafy vegetables as a potential barrier to putting this FBR into practice and said that this would mean she could not comply with the recommended frequency. In contrast, five participants explicitly stated that they would not need extra money to put this FBR into practice.

Availability: Caregivers considered green leafy vegetables to be "easy" to access because it was available "everywhere." Informants in Huehuetenango thought that access to this FBR was constant, even during the dry season. However, those from Quiché shared that some varieties were not available year round, especially during the drier months, and that they would have to purchase them if this was the case.

> *Woman, Quiché: Here there's not enough water. Over there in the other community they have irrigation, they have enough for all of the fields, large fields of onion so they plant them…greens, cilantro, nightshade, all the herbs, but here, as I said, there's no water so it's difficult. Only during the rainy season, then we can plant some.*

Many varieties of green leafy vegetables mentioned were said to grow easily (often wild) between maize stems and not require special attention. In addition, caregivers sometimes foraged for native herbs or other green leafy vegetables around the community and three participants from Quiché said that they could also access green leafy vegetables from their neighbors. The production of green leafy vegetables for sale was not mentioned by any of the families who participated in the trial. In contrast, the green leafy vegetables most commonly discussed (nightshade, shoots, and leaves) were often the result of "informal" production or acquisition.

Enabling environment: All participants reported receiving support from their family to practice this FBR. All but one caregiver said that they made the decision alone to feed green leafy vegetables and that their husbands and/or mother-in-law approved. One woman said that she would need her husband's permission to buy green leafy vegetables for their child if it was not available from household production/foraging.

7. Exploration of Alternative FBRs and Micronutrient Products to Achieve an Adequate Diet

The process of generating FBRs using Optifood showed that FBRs incorporating both nutrient-dense local foods and fortified foods or micronutrient supplements are necessary for meeting the nutritional requirements of important problem nutrients. Without fortified foods or micronutrient supplements, even if families make optimal use of local foods, women and children are unable to meet nutrient requirements during the critical 1,000-day window of opportunity. Following the analysis of qualitative data for this study, further Optifood testing was carried out to examine the impact of adjusting the FBRs for each target group to make their adoption more feasible, as well as combining the FBRs with different scenarios of micronutrient supplementation, MNPs, and FBF. The new set of FBRs omitted the potato recommendation for children and PLW, omitted oranges for PLW, and limited the vegetable servings for PLW from 28 to 14 per week. The analysis showed that when micronutrient supplements or MNPs are consumed along with a feasible set of FBRs that includes FBF, these combinations are capable of supplying most problem nutrients for PLW and children 6–23 months, provided the micronutrient supplements or MNPs are consistently available and consumed with the recommended frequency.

Testing the new FBRs versus the original FBRs: The original set of FBRs that were used in the household trials were compared to the revised set of FBRs that were considered to be more feasible for families to implement (see Annex 2 for nutrient and cost comparison). As expected, these tests found that reducing the variety of foods and the number of servings per week of different foods negatively impact nutrient adequacy, but not dramatically. Table 20 shows that a high level of nutrient adequacy was still achievable with the new FBRs in combination with micronutrient supplements and FBF, with only a few missing nutrients. Key findings include the following:

- Supplementation using micronutrient powder and/or iron and folic acid is essential to meet adequacy for some modeled nutrients, especially iron and zinc for children 6–11 months and iron for pregnant women and children 12–23 months.
- While potato was not considered a priority FBR due to relatively low nutrient density and difficulty of access in Quiché, removing it from the FBRs meant that B6 requirements for children 6–11 months would be difficult to meet without modifying B6 content in micronutrient supplements or fortified products. Also, calcium for children 9–11 months would be needed.
- Oranges or other vitamin C-rich fruit were necessary to meet the vitamin C requirements of PLW. Tailoring an MNP for women to increase vitamin C content could be considered if access to vitamin C-rich foods is difficult.
- Despite folic acid supplementation, pregnant and lactating women's needs are not met. Reformulation of fortified products or a review of micronutrient supplementation would be needed to meet nutrient adequacy for folate among pregnant and lactating women.
- Overall, the new FBRs are a good option to improve feasibility, provided that the missing micronutrients can be addressed through a tailored MNP.

Table 20. Nutrient adequacy achievable using the new set of FBRs with micronutrient supplements and FBF*

Shaded areas indicate nutrient needs that are met, while unshaded areas indicate unmet nutrients.

Nutrient	Target Group				
	Children 6–8 months	Children 9–11 months	Children 12–23 months	Pregnant women	Lactating women
Calcium	✓		✓	✓	✓
Vitamin C	✓	✓	✓		
Thiamin	✓	✓	✓	✓	✓
Riboflavin	✓	✓	✓	✓	✓
Niacin	✓	✓	✓	✓	✓
Vitamin B6			✓	✓	✓
Folate**	✓	✓	✓		
Vitamin B12	✓	✓	✓	✓	✓
Vitamin A	✓	✓	✓	✓	✓
Iron	✓	✓	✓	✓	✓
Zinc	✓	✓	✓	✓	✓

* Nutrient adequacy defined as ≥ 65% of recommended nutrient intake met in minimized diet in Optifood module 3 (represents lower tail of nutrient intake). Supplementation included 3 sachets per week of Chispitas for children 6–23 months and IFA supplements for PLW as per MSPAS guidelines.
** Despite folic acid supplementation, PLW's needs are not met. However, reformulation of fortified products or review of supplementation could be used to meet nutrient adequacy for folate among PLW.

Testing the contribution of FBF to nutrient adequacy: Use of an FBF requires the government to incur costs for purchase and distribution, or families to purchase an FBF such as Incaparina.[12] Annex 3 presents the cost estimates for each fortified product by target group, including FBFs. Looking at the dietary profile of women and children in Guatemala, given that caloric and protein intake are generally acceptable, and that body mass index is high among women, there may be an opportunity to focus on appropriately targeted micronutrient supplementation rather than fortified food products. This issue warrants further investigation and discussion as Guatemala seeks to achieve nutrient adequacy for women and children at the lowest cost for both the government and families. Therefore, an additional Optifood analysis was carried out to understand whether FBF in combination with the new FBRs and micronutrient supplements is critical to achieving nutrient adequacy for the different target groups, or if it could be replaced by less expensive micronutrient supplementation.

Annex 4 provides the comparison of the new FBRs and micronutrient supplements, both with and without FBF, in terms of nutrient adequacy and cost. Table 21 indicates nutrient needs that are met under the

[12] Although donors have purchased and distributed FBF within a specific catchment area, national provision of FBF, if mandated, is understood to be a government expense.

scenario of the new FBRs plus micronutrient supplementation, but without FBF. Key points from this analysis include:

- While programmatic and acceptability considerations should be further explored, Annex 4 shows that it is notably less expensive for the government to provide an MNP or other micronutrient supplements to women and children, along with promotion of the FBRs, than to distribute FBF as well.
- For PLW, zinc was inadequate without the FBF (as well as folate and vitamin C, which were inadequate even consuming FBF).
- For children 6–11 months, not having FBF results in 4–5 nutrients being inadequate. Additional fortification of the MNP may be considered if feasible.
- For children 12–23 months, calcium and iron were inadequate and would need to be addressed.
- For children 6–23 months, if MNP is used without the FBF, it should be sprinkled on a nutritionally dense maize porridge to provide the needed caloric density and micronutrients.
- When an FBF is not provided to families free of cost, the analysis in Annex 4 shows that families need to spend more on their base diet to replace the calories provided by the FBF.

In summary, to remove the FBF from the set of FBRs, it is crucial to further adapt micronutrient supplements to replace the missing nutrients for children and PLW (shown as unshaded areas in Table 21). Another option is to maintain the FBF for children, who have more missing nutrients without it, but remove it from the FBRs for women.

Table 21. Nutrient adequacy achievable using the new set of FBRs and micronutrient supplements without FBF*

Shaded areas indicate nutrient needs that are met, while unshaded areas indicate unmet nutrients.

Nutrient	Target Group				
	Children 6–8 months	Children 9–11 months	Children 12–23 months	Pregnant women	Lactating women
Calcium				✓	✓
Vitamin C	✓	✓	✓		
Thiamin			✓	✓	✓
Riboflavin	✓	✓	✓	✓	✓
Niacin			✓	✓	✓
Vitamin B6		✓	✓	✓	✓
Folate	✓	✓	✓		
Vitamin B12	✓	✓	✓	✓	✓
Vitamin A	✓	✓	✓	✓	✓
Iron	✓	✓		✓	✓
Zinc			✓		

* Nutrient adequacy defined as ≥ 65% of recommended nutrient intake met in minimized diet in Optifood module 3 (represents lower tail of nutrient intake). Supplementation included 3 sachets per week of Chispitas for children 6–23 months and IFA supplements for PLW as per government guidelines.

Comparing MNP and IFA supplements for PLW: Given that several problem nutrients for PLW persisted under different scenarios, despite IFA supplementation and FBF, an additional analysis was conducted to examine whether an MNP rather than an IFA supplement would better address nutrient adequacy, and possibly at a lower cost. Annex 5 provides an analysis of nutrient adequacy and cost to families and the government for the new FBRs and FBF, plus either an IFA supplement or MNP. Key findings from this analysis indicate:

- Either IFA supplements or an MNP reach similar levels of nutrient adequacy when used with the new FBRs and FBF, but folate and vitamin C were inadequate under both scenarios.
- Either supplement could be adjusted to increase folic acid, but the MNP could more easily include additional vitamin C.
- Overall, an MNP is a potential option to replace IFA supplements. It can provide at least the existing level of nutrient adequacy in combination with FBRs. However, an MNP is slightly more expensive than the IFA supplement and would require women to adopt a new behavior, as taking IFA supplements is already well-established and actively promoted by the health sector.

These additional analyses demonstrate that the new FBRs are a viable choice for promotion, given that they are more feasible according to the household trials. Additionally, the analysis shows the important potential of micronutrient powder to complement food-based approaches to supplement local diets and suggest that reformulation could help to further fill nutrient gaps, even when an FBF is not available.

8. New FBRs for Promotion

Based on the household trials of the original FBRs and the Optifood analysis of alternative sets, the new set of FBRs is presented below as the updated version for promotion. Each FBR is listed with specific considerations that may be useful for local adaptation or to address seasonality. Given that many families will face challenges achieving the recommended frequency and quantity, it is important to note that the FBRs reflect the ideal quantities and frequency of consumption for the recommended foods.

New FBRs for Children 6–23 Months

FBR 1: Breastfeeding on Demand

Target Group	Recommendation
Children 6–11 months	Breastfeed your child on demand
Children 12–23 months	

FBR 2: Fortified Porridge

Target Group	Quantity (g)	Frequency (servings/week)	Recommendation	Serving size
Children 6–11 months	20	5	Give your child fortified porridge five times per week, or as often as possible	1 tablespoon of dry FBF mixed with 1/3 cup of boiled or treated water
Children 12–23 months	30	4	Give your child fortified porridge four times per week, or as often as possible	2 tablespoons of dry FBF mixed with 1/3 cup of boiled or treated water

Note: It is recommended that only FBF and water (with oil and sugar if desired) be used to make the porridge until the practice is well established, after which additional foods can be optionally included in the porridge.

FBR 3: Eggs

Target Group	Quantity (g)	Frequency (servings/week)	Recommendation	Serving size
Children 6–11 months	25	3	Give your child half an egg at least three times per week, or as often as possible	1/2 of a well-cooked, medium-sized egg (yolk and white)
Children 12–23 months	50	4	Give your child a whole egg at least four times per week, or as often as possible	1 well-cooked, medium-sized whole egg (yolk and white)

Note: Both egg white and egg yolk should be promoted (per WHO/PAHO guidelines; PAHO 2003). Whether eggs are boiled or cooked another way, they should be fully cooked until firm.

FBR 4: Black Beans

Target Group	Quantity (g)	Frequency (servings/week)	Recommendation	Serving size
Children 6–11 months	25	3	Give your child beans three times per week, or as often as possible	2 tablespoons of cooked beans (mashed, pureed, or refried)
Children 12–23 months	25	4	Give your child beans four times per week, or as often as possible	2 tablespoons of cooked beans (whole, mashed, pureed, or refried)

FBR 5: Green Leafy Vegetables

Target Group	Quantity (g)	Frequency (servings/week)	Recommendation	Serving size
Children 12–23 months	30	4	Give your child green leafy vegetables four times per week, or as often as possible	1/2 a cup of cooked green leafy vegetables, for example, Swiss chard, spinach, or macuy leaves

Note: Green leafy vegetables (*hierbas*) are not available year round, and therefore may require purchase.

New FBRs for Pregnant and Lactating Women

FBR 1: Thick Fortified Atole

Quantity (g)	Frequency (servings/week)	Recommendation	Serving size
30	7	Consume thick atole made from FBF or fortified oats every day	Two heaping tablespoons of dry FBF or fortified oats with a cup of boiled or treated water

FBR 2: Liver

Quantity (g)	Frequency (servings/week)	Recommendation	Serving size
90 (3 oz)	1	Consume beef liver or chicken liver once per week	90 g (3 ounces) of liver (chicken livers or beef liver)

FBR 3: Vegetables

Quantity (g)	Frequency (servings/week)	Recommendation	Serving size
85	14	Consume two portions of vegetables each day of the week	1 medium-sized tomato, half a large carrot, or 1 cup of chopped vegetables

9. Discussion and Recommendations

Improving and optimizing the diets of PLW and children 6–23 months is essential to reduce the prevalence of stunting in Guatemala. Despite the small sample size, these methods worked well to test the feasibility and acceptability of the FBRs and the results provide important insights on the extent to which study participants would be able and willing to try improved practices. Generally, the findings indicate that the FBRs that were promoted were largely acceptable to the study participants as they were based on locally available foods as evidenced by the phase one Optifood dietary survey. Beliefs and preferences were not significant barriers to implementing the FBRs, indicating that behavior change is possible, but that some of the improvement must come from strengthening the enabling environment by ensuring access to and affordability of nutrient-dense foods, as well as family support. Economic access to the recommended foods presented significant constraints, as well as challenges with household availability and market access.

FBRs for PLW: The findings show that for PLW, consuming thick fortified atole and liver were both feasible and acceptable, indicating that these FBRs could be promoted by government and nongovernmental implementing partners in a programmatic setting. In contrast, many PLW felt that implementing the vegetable FBR was difficult because they did not have daily access to the markets to buy fresh vegetables and, as they were highly perishable, it was difficult to buy them in bulk and store at home. Adaptation of this FBR to reduce the vegetable servings from 28 to 14 servings per week should make it more feasible.

FBRs for children: Some FBRs were easier than others, and in the case of children 6–23 months, feeding a fortified porridge was the most difficult FBR. This was mostly due to lack of access to government-provided Vitacereal, and the perceived high cost of alternative FBFs, such as Incaparina. Feeding potatoes, eggs, and beans was more feasible than preparing the fortified porridge for young children in the study. In comparing the two departments, no significant differences were observed in the ability to put the FBRs into practice or acceptability of the FBR foods, with the notable exception of potatoes, which were not grown in Quiché.

Some mothers of children 6−11 months had concerns about the quantity and texture of foods to be offered. Some mothers thought that a child should show signs of being ready to eat a food in order for it to be offered. Mothers were not aware of needing to offer new foods multiple times in order for their child to develop not only a taste for it but also the motor skill to eat different textures. It was also common to offer broth to young children rather than the food itself, a practice that precipitates malnutrition because of the low nutrient and caloric density. Regarding convenience and feeding young children frequently, bean flour would overcome some of the challenges mentioned in the FBR trials, making it possible to prepare small portions quickly, with minimal time and fuel and without concerns about choking on whole beans.

Nutrition practices: Among children 6–11 months particularly, there is a need to further explore feeding challenges as this is a key period in the 1,000 days when children are at risk of becoming malnourished. The practices that need to happen to achieve adequate feeding during this time period are complex and should occur simultaneously. Adequate infant feeding depends on frequency of feeding; responsive feeding; food hygiene and handwashing practices; and quantity, quality, and variety of the overall diet of each meal. Because this study focused on testing whether the FBRs could be implemented, rather than probing all feeding practices, the findings for children 6–11 months provide only a snapshot of the challenges faced in feeding these young children. A greater focus on this age range is needed to

understand the challenges to implementing the optimal set of practices, beyond just the adoption of FBRs, to protect children's nutritional well-being from a young age.

Another consideration is the quality of exclusive and continued breastfeeding. National data show that the duration of exclusive breastfeeding is variable and generally suboptimal, and it is likely that many children who transition to starting complementary foods may already be frequently ill, underweight, and stunted (MSPAS 2010). While good complementary feeding is important, exclusive breastfeeding for the first 6 months of life and continued optimal breastfeeding beyond 6 months carries equal weight; both breastfeeding and complementary feeding practices are essential components in the continuum of infant and young child feeding.

Family culture around sharing food and resources: One key observation from across the data is the belief that food must be shared equally among family members. In the case of potatoes, for example, putting this FBR into practice for a child meant preparing a large quantity of this food for the entire family. However, there were exceptions, as some families showed willingness to buy eggs and FBF only for their young children. Additionally, many women reported the influence of husbands and mothers-in-law on how resources are spent and how foods are shared within the household. Since the nutrition of PLW and children is not given priority over others in the household in the current socio-cultural context, the findings suggest a need to make family decision-makers aware of the special needs of women and children during the 1,000 days.

Household availability: Although families grew some of the FBR foods or raised chickens, home production of FBR foods was not a guarantee of adequate access. Challenges cited were scarcity of land for production, insufficient year round access to water, and low crop production, as well as animal deaths. Seasonal production of vegetables was high during the FBR trials, while at other times of the year, such as during the dry season, fewer vegetables would be produced. Concerns about spoilage of perishable high-nutrient foods were commonly mentioned. The Ministry of Agriculture, Livestock, and Food's family agriculture program (*Programa de Agricultura Familiar)* has reactivated a network of rural extensionists after 25 years of inactivity. This approach presents opportunities to support home production and storage of FBR foods, but more support is needed to maximize the impact of the program across the Western Highlands.

Economic and market access: Expanding economic and market access is critical as the majority of families purchase more than half of the food they consume and seasonal price variation was also cited as a constraint for purchase when prices rise. Infrequent market access was a factor in some cases, as well as the high cost of transportation to visit markets. A key approach to enabling families to have better diet quality will be increasing incomes and possibly subsidizing the cost of certain foods, or using vouchers as a strategy to support production as well as consumption of FBR foods. For example, increasing access to eggs or fresh vegetables could achieve a dual goal of diversifying diets with nutritious foods as well as investing in and ultimately increasing local egg production.

Programming to promote the FBRs: As the FBR foods were generally acceptable, if these foods were included in a social and behavior change strategy, it is likely that families could adopt the FBRs given adequate time, along with support to access the foods. Sequencing the FBRs in a social and behavior change strategy could be extremely beneficial, helping families to master one practice at a time (see Figure 11 for a graphic example demonstrating the age sequencing of infant and young child feeding practices, FBRs, and essential food hygiene practices). It would also be important to prioritize the practices that warrant adoption first. The new set of FBRs provided in section 8 are presented in relative order of importance, so that promotion activities, as well as families themselves, can prioritize their efforts and resources toward the FBRs likely to make the greatest contribution to nutrient adequacy.

Figure 11. Age sequencing of infant and young child feeding practices, FBRs, and food hygiene practices

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	6–8 MONTHS	9–11 MONTHS	12–17 MONTHS	18–23 MONTHS
BREASTFEEDING *(exclusive breastfeeding from 0–5 months)*				
Continued breastfeeding	Breastfeed on demand →			
COMPLEMENTARY FEEDING *(starting at 6 months, in addition to breastfeeding on demand)*				
Food-based recommendations by age	Give your child: • **Fortified porridge made with 1 tablespoon of FBF and 1/3 cup of boiled or treated water** 5 times per week, or as often as possible • **Half a well-cooked, medium-sized egg (yolk and white)** at least 3 times per week, or as often as possible • **Beans** 3 times per week, or as often as possible (2 full tablespoons cooked beans—mashed, pureed, or refried)		Give your child: • **Fortified porridge made with 2 tablespoons of FBF and 1/3 cup of boiled or treated water** 4 times per week, or as often as possible • **One whole, well-cooked, medium-sized egg (yolk and white)** at least 4 times per week, or as often as possible • **Beans** 4 times per week, or as often as possible (2 full tablespoons of cooked beans—whole, mashed, pureed, or refried) • **Green leafy vegetables** 4 times per week or as often as possible (1/2 a cup of cooked green leafy vegetables, for example, Swiss chard, spinach, or macuy leaves)	
Frequency	2–3 meals a day, plus if the child has an appetite for more food, 1–2 nutritious snacks can be offered	3–4 meals per day, plus if the child has an appetite for more food, 1–2 nutritious snacks can be offered →		
Texture	Thick porridge/pap Mashed/pureed family foods	Thick porridge that stays on spoon Finely chopped family foods/finger foods/sliced foods →		
			Sliced foods Family foods →	
Quantity	Start with 2–3 tablespoons per meal, gradually increasing to 1/2 of a 250 ml cup (additional 200 kcal per day)	Offer a variety of foods—1/2 of a 250 ml cup for each meal (additional 330 kcal per day)	Offer a variety of foods—3/4 of a 250 ml cup for each meal (additional 550 kcal per day)	
Responsive feeding	• Feed the child with a small spoon • Introduce new foods 2–3 days apart • If the child rejects a new food, try feeding it a few more times to enable the child to develop a taste for it • Feed the child until he/she no longer shows interest in the meal			
	Infants up to 6 months of age have a tongue thrust reflex that protects them from choking. As the infant gets older, this reflex will reduce making it easier to feed the infant.	By 9 months, infants will: • Puts things in his/her mouth • Drink from a cup • Pick up things like beans between thumb and index finger To feed the infant: • Feed the child with a spoon, or if the child is ready to pick up small pieces of soft food, encourage the child to feed him/herself • Stay with the child during feeding		
FOOD HYGIENE	• Keep clean ◦ Set up tippy tap handwashing station near latrine and cooking area; maintain with soap and water ◦ Wash hands with soap before and during food preparation ◦ Wash hands with soap after going to the toilet, and after cleaning baby and disposing of feces ◦ Wash and sanitize all equipment and food preparation areas ◦ Protect kitchen area from animals, pests, and insects ◦ Treat water if giving to baby or mixing with food ◦ Regularly wash child's hands with soap and water, particularly before feeding time ◦ Keep the play area and where baby sleeps, sits, or eats clean of animal and human feces • Separate raw and cooked foods ◦ Keep meat, poultry, and seafood separate from other foods ◦ Use containers to store cooked and raw foods separately ◦ Use separate equipment, knives, and cooking utensils for cooked and raw foods • Cook foods thoroughly, especially eggs and other animal foods • Keep food at safe temperatures, serve food hot, and do not leave food out at room temperatures for longer than 2 hours • Use safe water and fresh foods			

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Developed by FANTA based on information from WHO 2009; WHO n.d.

It may also be beneficial to develop a tailored plan of practices based on individual family needs. For example, if a family already feeds a child beans, the focus of the counseling could be on other foods the family does not offer yet, understanding why these foods are not offered, and troubleshooting with families how to address each constraint. Teaching families how to prepare a fortified porridge using FBF, and beginning with a basic recipe, would enable them to first learn a simple recipe and then build on this, eventually adding other foods and modifying the preparation over time (i.e., adding beans or egg). It is clear that effectively promoting the fortified porridge FBR would require improving government distribution of FBF before expecting that families can adopt this practice. As such, it is essential for the social and behavior change strategy to work through multiple channels to educate and motivate, as well as improve access and availability of FBR foods.

National programs and policies: Improving national programs and engaging with the government will be essential to promote access to important products such as FBF, MNP, and IFA supplements. Results from the broader Optifood activity, as well as this study, consistently show that meeting protein and energy requirements and accessing staple foods, such as maize, is not a widespread problem for most families. However, for young children, micronutrient deficiencies are significant and indicate the need for formulation of FBFs and micronutrient powders to include adequate levels of nutrients that are difficult to provide through local foods (such as iron and zinc, and also folate and vitamin B12 for women). The implications of these findings are relevant for improving nutrition practices, household food production, economic and market access, and national programs.

Recommendations

To promote the new FBRs (see Table 22), it will be necessary to integrate the FBRs within the broader strategy focused on the 1,000 days for these regions of the Western Highlands and ensure the approach is integrated at multiple levels, including the policy, program, community, household, and individual levels. The following specific recommendations were developed regarding nutrition practices related to the FBRs, household availability of FBR foods through agriculture and livestock activities, economic and market access to FBR foods, and an enabling environment with effective policies and programs to promote improved dietary quality.

Table 22. New FBRs developed for PLW and children 6–23 months in the Western Highlands

Pregnant and Lactating Women	Children 6–11 Months	Children 12–23 Months
1. Drink a cup of thick fortified drink (*atole espeso*) made with FBF or fortified oats every day. *Serving size: 2 heaping tablespoons of dry FBF or fortified oats with a cup of boiled or treated water.* **2.** Eat 2 servings of vegetables every day of the week. *Serving size: 1 medium tomato, half a carrot, or 1 cup of chopped vegetables.* **3.** Eat beef liver or chicken liver once a week. *Serving size: 90 grams (3 ounces) of liver (chicken livers or beef liver).*	**1.** Continue to breastfeed on demand. **2.** Give your child fortified porridge 5 times per week, or as often as possible. *Serving size: 1 tablespoon of dry FBF mixed with 1/3 cup of boiled or treated water.* **3.** Give your child half an egg at least 3 times a week. *Serving size: 1/2 of a well-cooked, medium-sized egg (yolk and white).* **4.** Give your child beans 3 times a week. *Serving size: 2 tablespoons of cooked beans. Prepare mashed, pureed, or refried.*	**1.** Continue to breastfeed on demand. **2.** Give your child fortified porridge 4 times a week. *Serving size: 2 tablespoons of dry FBF mixed with 1/3 cup of boiled or treated water.* **3.** Give your child an egg at least 4 times a week. *Serving size: 1 well-cooked, medium-sized whole egg (yolk and white).* **4.** Give your child beans 4 times a week. *Serving size: 2 tablespoons of cooked beans. Prepare whole, mashed, pureed, or refried.* **5.** Give your child green leafy vegetables 4 times a week. *Serving size: 1/2 a cup of cooked green leafy vegetables, for example, Swiss chard, spinach, or macuy leaves.*

Nutrition Recommendations

- **Priority FBRs:** Prioritize the most nutrient-dense FBRs, such as eggs, beans, and fortified porridge, rather than potato. (Potato, while important for meeting B6 requirements, is less nutrient-dense and difficult to access in some areas).
- **FBRs represent the goal:** Consider the FBRs as ideal practices for families to strive for, while sequencing and staggering the promotion of each FBR so families can adopt and assimilate one practice at a time and then move onto the next.
- **Optimal infant and young child feeding:** Promote the FBRs alongside broader infant and young child feeding practices, highlighting children's developmental phases generally as well as improved food hygiene practices, responsive feeding, overall feeding frequency, dietary diversity, quantity, quality, and preparation of foods in a nutrient-dense form, as previously presented in Figure 11.
- **Targeting youngest children:** Further emphasis is needed on targeting social and behavior change efforts toward particular feeding challenges for children 6–11 months who are at the highest risk of becoming malnourished due to the complexity of feeding behaviors such as introducing new tastes and textures for the first time.
- **Basic nutrient-dense porridge:** Promote a simple preparation of fortified porridge (without additional ingredients) when an infant is being introduced to solids at 6 months of age.
- **Alternative FBR foods:** Identify and promote other local foods with similar nutrient profiles to provide alternatives if certain foods are seasonal, as in the case of oranges for pregnant and lactating women, which could be substituted with lemons, mango, or other vitamin C-rich fruit.
- **Special nutritional needs of children and PLW:** Target multiple decision makers within households, including women/mothers, their partners, and parents/in-laws through a gender-sensitive social and behavior change strategy to emphasize the heightened nutrition needs of PLW and young children.
- **Hygiene practices:** Equally important to improving feeding practices is the need to promote food hygiene and handwashing practices in general and specifically related to the FBRs (e g , well-cooked eggs).

Specific Challenges Related to Liquid versus Solid Foods

- FBF for children should be promoted as porridge rather than atole.
- Giving watery broths to children should be discouraged and giving mashed cooked foods promoted.
- Nutrition education should focus on clarifying that nutrients and energy are in the foods themselves, not in the broth.

Household Production Recommendations

- **Nutrient-dense crops:** Prioritize and support increased household production of nutrient-dense FBR foods commonly consumed by children and PLW, particularly beans and vegetables, including native plants that are well-suited to climate conditions in the Western Highlands.
- **Egg production:** Provide technical assistance for raising chickens as well as their vaccination, management, and use of eggs for family consumption.
- **Processing:** Explore options for home or commercial processing of FBR foods, such as grinding beans into flour to make them easier, faster, and more convenient to prepare and feed young children in small portions.

- **Storage:** Support improved storage of perishable foods to decrease loss of high-nutrient foods to spoilage.

Economic and Market Access Recommendations

- **Incomes and safety nets:** Explore options for the government's safety net programs to expand access to FBR foods that fill nutrient gaps in the diet, such as the introduction of cash transfer or voucher systems.
- **Prioritizing household expenditure on food:** Advocate for prioritization of household expenditures on the foods promoted in the FBRs, particularly reaching decision makers such as husbands or mothers-in-law to encourage them to direct resources to buying nutrient-dense local foods identified in the FBRs.
- **Market access:** Support access to local markets or mobile vendors to ease the transportation cost and time burden for families. Also, consider the creation of small-scale private-public partnerships to increase access to recommended foods through better access to or improved reach of community stores, markets, and mobile butchers.
- **Access to FBF:** Promote economic access or vouchers for an FBF (e.g., Incaparina), if Vitacereal is not being distributed to households for PLW and young children.

Policy and Programmatic Recommendations

- **Family agriculture support:** Strengthen the national program for family agriculture so that it can support technical assistance and resources to promote high-nutrient FBRs through agriculture and livestock.
- **Formulation of fortified products:** Ensure that micronutrient supplementation is appropriately targeted to the problem nutrients identified by Optifood, taking into account the particular needs of each target group (children 6–8 months, children 9–11 months, pregnant women, etc.).
- **Government provision of fortified products and micronutrients supplements:** Ensure that procurement and distribution of fortified products and micronutrient supplements are supplied consistently to maintain planned frequency of consumption according to government norms.
- **Improve use of fortified products and micronutrient supplements:** Support strategies to improve uptake of and compliance with supplementation programs among recipients and support review of packaging and promotional information for fortified products and micronutrient supplements to improve acceptability and use.
- **MNP option to replace FBF:** Explore opportunities to provide an improved multiple micronutrient powder for children 6–23 months and PLW, in place of an FBF, if programmatic challenges can be addressed. This could enable the government to reorient resources for the distribution of necessary micronutrients without the cost of producing, procuring, or transporting bulky foods.
- **Vouchers for local foods:** Explore food-based safety nets that prioritize and support local production, as well as expand access to FBR foods. Consider provision of vouchers or funds to access locally produced, micronutrient-dense FBR foods.

The household trials have demonstrated the promise and potential for promoting the FBRs as well as complementary strategies to improve nutrient intake in the diets of children 6–23 months and PLW. Findings also point out that approaches to address chronic malnutrition during the 1,000 days will need to be multi-sectoral and multi-stakeholder to overcome constraints ranging from existing nutrition practices and beliefs, economic constraints, and low household production, with the support of national policies and programs that are well targeted to the challenges that families in the Western Highlands

have shared in this report. Such programmatic and policy approaches, while complex to design and implement, are fundamental steps to address the intractable problem of stunting in Guatemala.

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Annex 1. Fortified Porridge Recipes for Children 6–23 Months Provided to Families during FBR Household Trials

Recipe for sweet porridge for children 6-23 months

Sweet porridge with egg
1 tablespoon of Vitacereal/Incaparina
1 egg
1/3 cup of boiled or treated water
1 tablespoon cooking oil
1 tablespoon of sugar and a pinch of salt

Preparation:

1. Beat the egg and mix with the water
2. Stir the Vitacereal/Incaparina with the water and Vita/Incap
3. Put the heat on low and boil for two minutes without stopping stirring
4. Add the oil, sugar, and salt and mix well

Recipe for savory porridge for children 6-23 months

Savory porridge with beans and potato
1 heaping tablespoon of Vitacereal/Incaparina
1 tablespoon of cooked beans
1/3 cup of boiled or treated water
1 tablespoon of cooking oil and a pinch of salt
½ small cooked potato

Preparation:

1. Firmly mash the potato and the beans
2. Mix the Vitacereal/Incaparina with the water
3. Put the Vitaceral or Incaparina on low heat to boil for two minutes without stopping stirring
4. Add the mix of potatoes and beans
5. Add the oil and pinch of salt and mix well

Receta de papilla dulce para niños y niñas de 6 meses a 2 años

Papilla dulce con huevo
1 cucharada sopera de Vitacereal/Incaparina
1 huevo
1/3 taza agua hervida/agua pura
1 cucharada aceite de cocina
1 cucharada azúcar y pizca de sal

Preparación:

1. Bata el huevo y mezcle con el agua
2. Revuelva el Vitacereal/Incaparina con la mezcla de huevo y agua
3. Ponga al fuego suave a hervir por dos minutos sin dejar de mover
4. Agregue el aceite, el azúcar y pizca de sal y mezclar bien

Receta de papilla salada para niños y niñas de 6 meses a 2 años

Papilla salada con frijoles y papas
1 cuchara sopera llena de Vitacereal/Incaparina
1 cucharada sopera de frijoles cocidos
1/3 taza agua hervida/agua pura
1 cucharada aceite de cocina y pizca sal
½ papa pequeña cocida

Preparación:

1. Machaque finamente los frijoles y la papa
2. Revuelva el Vitacereal/Incaparina con el agua
3. Ponga el Vitaceral o Incaparina al fuego suave a hervir por dos minutos sin dejar de mover
4. Agregue la mezcla de papa y frijoles
5. Agregue el aceite y pizca de sal y mezclar bien

Annex 2. Comparison of Unmet Nutrient Needs between the Original and New Set of FBRs

The following table provides a comparison of the level of nutrient adequacy and the cost to families and the government for the original, field-tested sets of FBRs along with Vitacereal and MNP, compared to the set of new FBRs that were determined more feasible. Additionally, the table includes estimated costs to families and the government for these scenarios. The analysis assumes that MNP, IFA supplements, and Vitacereal would be provided free to recipients, as such, no cost to families is added for these products. The cost of purchasing cooking fuel and time costs are not considered in this analysis, nor are the distribution costs.

FBR set tested	# of nutrients for which needs are unmet	Nutrients for which needs are unmet (% recommended nutrient intake achieved in minimum diet)	Estimated cost/day to families (Q)	Estimated cost/person/day to government (Q)
Children 6–8 months[1]				
Original FBRs with Vitacereal and MNP	0		0.90	0.30
New FBRs with Vitacereal and MNP	1	Vitamin B6 (43.7%)	0.90	0.30
Children 9–11 months[1]				
Original FBRs with Vitacereal and MNP	0		1.20	0.30
New FBRs with Vitacereal and MNP	2	Calcium (59.4%), vitamin B6 (53.5%)	1.10	0.30
Children 12–23 months[2]				
Original FBRs with Vitacereal and MNP	0		2.50	0.34
New FBRs with Vitacereal and MNP	0		2.10	0.34
Lactating women[3]				
Original FBRs with Vitacereal and IFA supplement	1	Folate (63.5%)	10.70	0.46
New FBRs with Vitacereal and IFA supplement	2	Vitamin C (33.1%), folate (55.6%)	10.30	0.46
Pregnant women[3]				
Original FBRs with Vitacereal and IFA supplement	1	Folate (57.9%)	9.40	0.46
New FBRs with Vitacereal and IFA supplement	2	Vitamin C (33%), folate (43.2%)	8.80	0.46

[1] *Original* FBRs tested for children 6–11 months included potatoes 3 times a week, eggs 3 times a week, beans 3 times a week, and fortified porridge 5 times a week. In the *New* FBRs for children 6–11 months potatoes were removed.

[2] *Original* FBRs tested for children 12–23 months included potatoes 4 times a week, eggs 4 times a week, beans 4 times a week, fortified porridge 4 times a week, and green leafy vegetables 4 times a week. In the *New* FBRs for children 12–23 months potatoes were removed.

[3] *Original* FBRs tested for PLW included potatoes 7 times a week, liver once a week, thick fortified atole 7 times a week, vegetables 28 times a week, and oranges 3 times a week. In the *New* FBRs for PLW potatoes and oranges were not included and the frequency of vegetables was reduced to 14.

Annex 3. Costs Incurred by Government and Families for Micronutrient Powders, Iron-Folic Acid Supplements, and Fortified-Blended Flour

The table estimates the costs incurred by the government or families for fortified foods or micronutrient supplements required to complement the food-based recommendations. These estimated costs assume that MNP, IFA supplements, and Vitacereal would be provided by the government at no cost to recipients, and that Incaparina would be purchased by families. It is important to note that storage and distribution of MNP, IFA supplements, and Vitacereal requires human resources for logistical management of storage, transportation, and distribution, as well as infrastructure for distribution. These costs are not taken into account and may be significant, particularly in the case of Vitacereal due to the volume of product needed.

Fortified product	Estimated cost/day to families (Q)	Estimated cost/person/day to government (Q)
MNP for children or pregnant and lactating women		0.09
IFA supplements for pregnant and lactating women		0.03
Vitacereal		
Children 6–11 months		0.21
Children 12–23 months		0.25
Pregnant and lactating women		0.43
Incaparina		
Children 6–11 months	0.30	
Children 12–23 months	0.40	
Pregnant and lactating women	0.60	

Annex 4. Comparison of Nutrient Adequacy and Cost of New FBRs and Supplements, With and Without Fortified Blended Flour

The following table provides a comparison of the level of nutrient adequacy and the cost to families and the government for the new set of FBRs and supplements, both with FBF included in the scenario and not included. The analysis assumes that MNP, IFA supplements, and Vitacereal would be provided free to recipients, as such, no cost to families is added for these products. The cost of purchasing cooking fuel and time costs are not considered in this analysis, nor are costs related to distribution of the products.

FBR set tested	# of nutrients for which needs are unmet	Nutrients for which needs are unmet (% recommended nutrient intake achieved in minimum diet)	Estimated cost/day to families (Q)	Estimated cost/person/day to government (Q)
Children 6–8 months[1]				
New FBRs with Vitacereal and MNP	1	Vitamin B6 (43.7%)	0.90	0.30
New FBRs with MNP (no Vitacereal)	5	Calcium (49.9%), thiamin (54.2%), niacin (32%), vitamin B6 (48.5%), zinc (58.3%)	1.10	0.09
Children 9–11 months[1]				
New FBRs with Vitacereal and MNP	2	Calcium (59.4%), vitamin B6 (53.5%)	1.10	0.30
New FBRs with MNP (no Vitacereal)	4	Calcium (49.4%), thiamin (60%), niacin (39.6%), zinc (59.2%)	1.40	0.09
Children 12–23 months[2]				
New FBRs with Vitacereal and MNP	0		2.10	0.34
New FBRs with MNP (no Vitacereal)	2	Calcium (55.2%), iron (52.9%)	2.30	0.09
Lactating women[3]				
New FBRs with Vitacereal and IFA supplement	2	Vitamin C (33.1%), folate (55.6%)	10.30	0.46
New FBRs with IFA supplement (no Vitacereal)	3	Vitamin C (33.1%), folate (45.4%), zinc (60.7%)	10.90	0.03
Pregnant women[3]				
New FBRs with Vitacereal and IFA supplement	2	Vitamin C (33%), folate (43.2%)	8.80	0.46
New FBRs with IFA supplement (no Vitacereal)	3	Vitamin C (33%), folate (33.4%), zinc (49.2%)	9.00	0.03

[1] *New* FBRs for children 6–11 months include eggs 3 times a week, beans 3 times a week, and fortified porridge 5 times a week.

[2] *New* FBRs for children 12–23 months include eggs 4 times a week, beans 4 times a week, fortified porridge 4 times a week, and green leafy vegetables 4 times a week.

[3] *New* FBRs for PLW include liver once a week, thick fortified atole 7 times a week, and vegetables 14 times a week.

Annex 5. Analysis of the New FBRs for Pregnant and Lactating Women Comparing Micronutrient Powder with Iron-Folic Acid Supplements

The following table provides a comparison of nutrient adequacy and the cost to families and the government for the new FBRs that were considered more feasible and Vitacereal, plus either an IFA supplement or MNP. The analysis assumes that MNP, IFA supplements, and Vitacereal would be provided free to recipients, as such, no cost to families is added for these products. The cost of purchasing cooking fuel and time costs are not considered in this analysis, nor are costs related to distribution of the products.

FBR set tested	# of nutrients for which needs are unmet	Nutrients for which needs are unmet (% recommended nutrient intake achieved in minimum diet)	Estimated cost/day to families (Q)	Estimated cost/person/day to government (Q)
Lactating women[1]				
New FBRs with Vitacereal and IFA supplement	2	Vitamin C (33.1%), folate (55.6%)	10.30	0.46
New FBRs with Vitacereal and MNP	2	Vitamin C (46%), folate (51.4%)	10.30	0.52
Pregnant women[1]				
New FBRs with Vitacereal and IFA supplement	2	Vitamin C (33%), folate (43.2%)	8.80	0.46
New FBRs with Vitacereal and MNP	2	Vitamin C (50.1%), folate (39.7%)	8.80	0.52

[1] *New* FBRs for pregnant and lactating women include liver once a week, thick fortified atole 7 times a week, and vegetables 14 times a week.