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DELIVERING IMPROVED NUTRITION

RECOMMENDATIONS FOR CHANGES TO U.S. FOOD AID PRODUCTS AND PROGRAMS



April 2011

Food Aid Quality Review Report to the United States Agency for International Development.
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ON THE COVER (color photo) A child in Tajikistan holds a tin of fortified vegetable oil donated by USAID. The photo was taken in Khuroson District of Tajikistan near the border with Afghanistan at a Save the Children program.

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EXECUTIVE SUMMARY

Food aid provided by the United States has saved the lives of vulnerable people in dire need of assistance for almost two centuries. The volume of such aid, and the scope of the interventions it supports, dramatically increased in the 1950s with the enactment of Public Law 480. Billions of dollars have been invested since then in protecting life during conflicts and natural disasters and in enhancing the diets of chronically undernourished people in development settings. This review is part of a long-standing USAID effort to improve the quality of food aid products and programs as priorities and needs evolve.

Today, however, food aid is at a crossroads. Severe resource constraints, reduced volumes of food aid shipped globally, and questions posed about whether products used are “fit for purpose” all represent challenges to current food assistance practices. A spotlight has been turned on the U.S. food aid agenda.

Recognizing the need for a thorough review of product formulations and specifications, USAID commissioned a two-year assessment of quality issues relating to Title II food aid products. This report presents the findings and recommendations of that review.

Although the work was initially focused on cereal-based blended products enriched and/or fortified with micronutrients, it became clear that the bigger picture had to be taken into account (including attention to non-cereal products), and that a focus on food products alone would not suffice. Thus, the report addresses not just the nutritional quality (composition) of food aid, but also the nature of programming and the processes that support programming, from procurement through to delivery.

A number of broad conclusions emerge. First of all, USAID and its partners on the ground already achieve remarkable impacts under the most challenging of circumstances imaginable. Most food aid now responds to humanitarian crises, and specification of products has to be framed in that context, without ignoring the valuable food-assisted work conducted outside of emergencies.

But there is much scope for improvement. Smarter programming, more careful targeting, greater attention to cost-effectiveness (in relation to planned human outcomes, not just numbers of people “fed”), enhanced coordination and streamlining of U.S. Government interagency processes, enhanced policy harmonization among international players, and application of best practice in product formulation and production can markedly increase the impact of U.S. food aid resources.

Second, the needs of food aid beneficiaries are not homogeneous—there is no one food product that can meet every kind of programming goal, and no one programming approach that fits all needs. The right tools have to be available for specific jobs on the ground, and new products that demonstrably meet defined needs in a cost-effective manner are to be welcomed. But combinations of foods are always more appropriate to the needs of beneficiaries than are combinations of nutrients in a single food.

Third, improving food aid quality is more than just fine-tuning the composition of products; it is as much about ensuring appropriate programming of all products.

Specific recommendations include the following:

1. Improve the formulation of existing Fortified Blended Food (FBF) products used in Title II programming. This includes the addition of a dairy source of protein to products consumed by children 6 to 24 months of age, pregnant and lactating women, wasted children, and wasted individuals undergoing HIV/AIDS treatment; the development of new forms of such products (including alternative grains and vegetable protein sources); and exploring ways to reduce phytates, which inhibit iron and zinc absorption, via processing. New packaging is needed to support more effective targeting and shelf life.

2. Upgrade the vitamin and mineral mixes used and diversify approaches to addressing micronutrient needs. Enhance the composition of premixes used to fortify blended foods as well as milled grains and vegetable oil; facilitate shipping of fortificant premix with bulk cereals for in-country fortification; and develop micronutrient powders (sachets) and other point-of-use fortification options.

3. Develop or adopt non-cereal-based (e.g., lipid-based) products for the management of nutritional deficiencies. A wider range of products should be available offering varying quantities and types of nutrients for different programmatic contexts. This is an argument for more choice among appropriate tools, not for discarding products that have already shown their value over many years. It also does not reduce the need to maintain a focus on supplying high volumes of quality grains as the main staple in food aid baskets.

4. Provide clearer programming guidance. Improved decision tools are needed to enable implementers to match products to specific consumption and nutrition goals (product-for-purpose). New guidance is needed on nutrition support for HIV/AIDS programming, home preparation of FBF products (enhanced as proposed) with vegetable oil for nutritionally vulnerable beneficiaries, and planning for delivery of nutrients across a basket of commodities rather than via single products. Additional investments are also essential to support behavior change communication and programming that

support global infant and young child feeding principles.

5. Establish an interagency committee to oversee all government interests in the food aid agenda. Such a U.S. cross-agency committee would be co-chaired by USAID and USDA, and would oversee ongoing review of products (improvement in existing, and introduction of new, products as needed) and programs (including careful testing of changes recommended here), progressive harmonization of products and policies among global food aid agencies, and effective integration of food aid in food security initiatives.

6. Enhance processes along the product value chain. Effective interaction with the private sector is needed to bring industry best practice to bear on food aid supply, food safety and quality assurance, and public-private partnerships to promote product innovations.

7. Strengthen the evidence base for innovations in products, programming approaches, and institutional processes. Successful programming has to be evidence-based, not driven by simple data on tonnages and “hungry people fed,” but by an understanding of the unit cost of impact. Empirical rigor is essential to determine the role of alternative programming approaches, the cost-effectiveness of different products, and the relative efficiencies of using food versus other resources to achieve defined goals. The evidence base for people living with HIV (PLHIV) is particularly limited and warrants further investigation. Any significant program changes, including those recommended here, should be tested and monitored.

Putting nutrition at the heart of the food aid agenda will enhance the impact and credibility of Title II programming. Innovations must be carefully tested and processes defined to support ongoing improvements across the food aid system. The ultimate goal of high-quality food aid programming should still be an end to the need for food assistance. USAID should champion smart programming, prioritize evidence-based cost-effective strategies, and advocate for a global convergence toward quality—not just in terms of products, but in terms of the way in which business is conducted.

I. INTRODUCTION

USAID's food aid programming, through FFP under Title II of Public Law 480, has been, and remains, an important instrument in tackling the multifaceted problems of food insecurity around the globe. Demands on food aid continue to grow, with increased frequency of natural disasters, increased numbers of people affected by such shocks, and upward pressures on food prices since 2007 leading to more people unable to meet minimum food requirements—all contributing to what has been called “the growing problem of hunger” (USAID 2010).

That said, the total volume of food aid delivered by the United States has been falling since the later 1990s, mirroring patterns globally (Figure 1). During that time, the relative importance of emergency food aid grew relative to development project and program (balance of payment) support activities.

A range of foods is used in both emergency and nonemergency settings. Based on United States Department of Agriculture (USDA) annual reports from fiscal year 2004 to 2008, 15 commodities accounted for 96 percent of the volume and 94 percent of the cost of all Title II food aid (USDA 2008). Prices ranged from \$137 to \$298/metric ton (MT) for basic grains, from \$275 to \$314/MT for milled flours, from \$368 to \$473/MT for fortified blended milled products, and from \$486/MT for pulses to more than \$1000/MT for value-added products, such as fortified vegetable oil. Nutritionally enhanced products, such as Corn–Soy Blend (CSB),

m micronutrient- and/or soy-fortified milled cereals, and fortified vegetable oil, represented 25 percent of the volume but 44 percent of the cost of Title II commodities purchased.

In the design and distribution of food rations, Title II programs implement activities in a similar range of technical sectors in both emergency and nonemergency settings: Maternal and Child Health and Nutrition (MCHN), agriculture and natural resource management, education, and water and sanitation. A key difference, however, is that emergency programs provide food rations that are often designed to meet a significant proportion, if not all, of a household's nutritional needs.

In nonemergency programs, Title II commodities are also used as an incentive or as pay or compensation for participation in activities such as training or labor (land clearing or preparation, construction of roads or other physical assets, construction of irrigation or potable water systems, construction of latrines, etc.) and not necessarily, or primarily, for health or nutritional improvement.

In contrast, Title II food is used *primarily* to prevent or treat malnutrition in the context of MCHN activities (including the Prevention of Malnutrition in Children under Two Approach [PM2A]), in programs supporting HIV/AIDS and tuberculosis treatments (often used to promote care-seeking behavior and retention in care), and in programs managing wasting (low weight-for-height) or promoting healthy birth outcomes. Foods used in this way—such as CSB, Wheat–Soy Blend (WSB), or lipid-based nutrient-dense products—should be designed with the physiological demands of the target group in mind. Rations intended to provide a basic food basket to food-insecure households should be nutritionally adequate, but often do not need to include specialized, nutrient-dense food unless a nutritionally vulnerable individual is explicitly targeted. Food intended for monetization (sale on the open market) need not be formulated to meet specific nutrient needs of target groups; highly fortified foods are unlikely to command a premium on the market that would match the cost of producing them, and, if sold, their nutritional value is effectively “lost” to the intended consumer groups.

Recently, there has been a renewed focus in Title II programming on the prevention of chronic malnutrition (stunting, or low height-for-age), the treatment of moderate wasting, and the supplementation of pregnant and lactating women. For example, the PM2A is being promoted by FFP as a strategy of choice for preventing child malnutrition in food-insecure environments. The approach is based on the concept of preventive “blanket feeding,” that is, providing rations to all members of the target group (defined by age and physiologic status) in a given geographic area, irrespective of their *current* nutritional status. The approach is a conditional food transfer program that requires a strong behavior change communication component to improve infant and young child feeding and nutrition practices along with the blanket feeding.

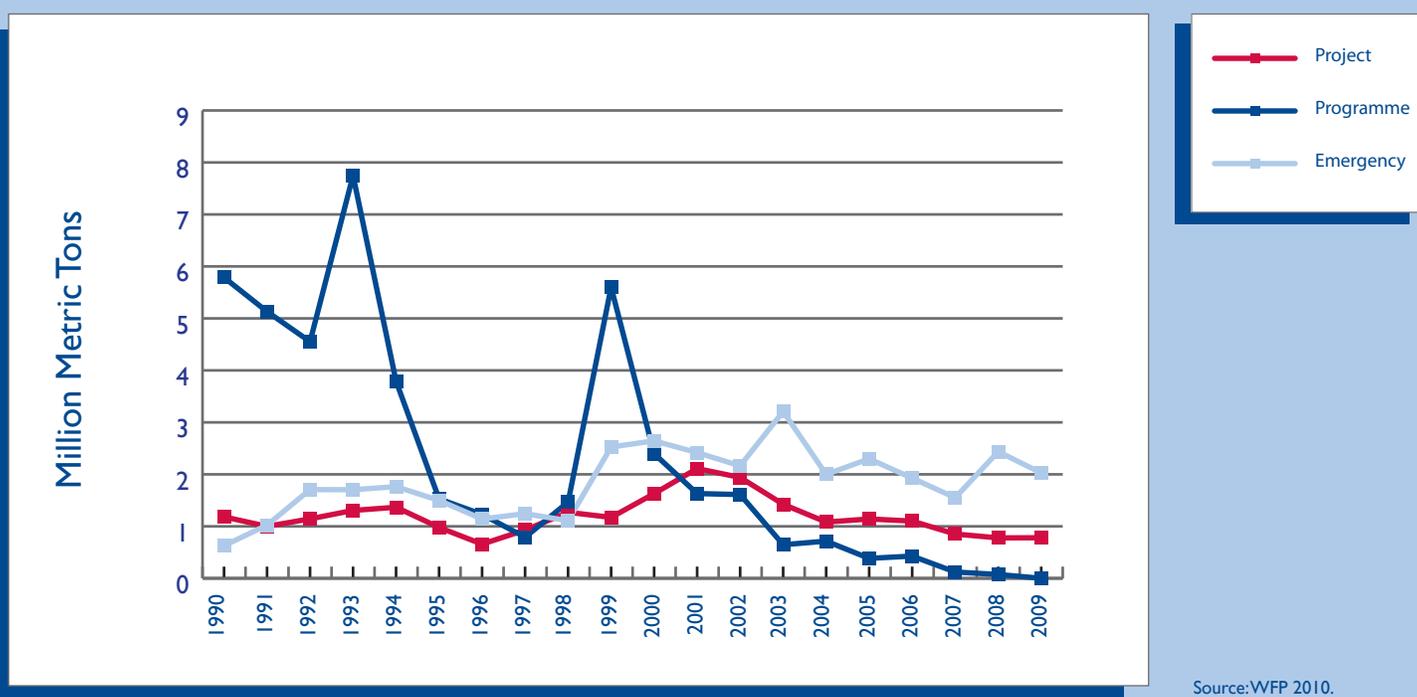
Title II commodities currently used in such activities include precooked FBFs such as CSB and WSB, pulses or legumes, enriched cereal blends (e.g., soy-fortified bulgur [SFB]), and fortified vegetable oil, coupled with staple grains (whole or milled), all of which also are fortified with some combination of micronutrients.

Title II foods that were fortified accounted for just over 300,000 MT of Title II deliveries in 2009 (Figure 2).

In fiscal year 2011, novel forms of nutrient delivery were introduced or pilot tested in some U.S. food assistance programs, such as Nutributter®—a 20-g foil sachet containing a micronutrient-fortified lipid paste used for at-home fortification of meals for young children. Similarly, USDA is pilot testing novel products to deliver micronutrients in its McGovern-Dole International Food for Education and Child Nutrition program (FFE).

Although this range of nutritionally enhanced food products is used in diverse settings, USAID’s Office of Food For Peace commissioned this review to address the mounting evidence that a) the formulation of some Title II products is not up to date with current science; b) some Title II programs do not apply best practice in matching products to defined purposes; and c) the product value chain is not protected using industry best practice. As a result, the two-year review of the nutritional

FIGURE I.
U.S. FOOD AID DELIVERIES, 1990–2009



Source: WFP 2010.

quality of Title II food aid addressed three core issues relevant to the quality of title II food aid:

1. Product quality—that is, the characteristics of foods used in terms of nutrient composition, product acceptability (ease of usage, sensory properties), etc. The core question addressed was, Are current commodity specifications for enriched, FBFs appropriate in light of evolving nutritional science and food fortification technology, or do they need to be updated?

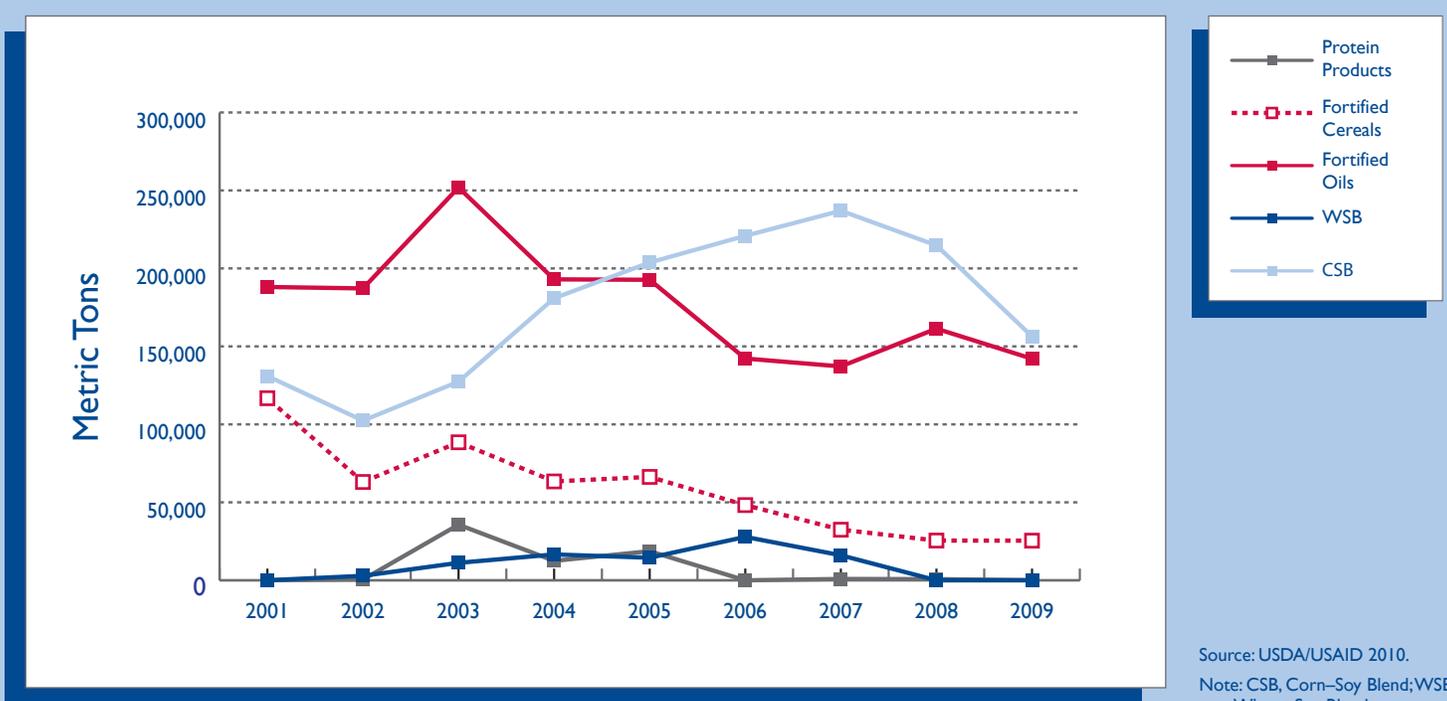
2. Programming quality—how are food products currently used? Are interventions appropriately designed and implemented to achieve nutrition objectives consistent with the products used? The core question addressed was, Could nutrition targets be met more cost-effectively if different products were available and if nutritionally enhanced foods were programmed differently?

3. Process quality—do the systems that govern and oversee processes for the approval of product introduction and modification, for procurement and transportation, for quality control and assurance, and for interagency coordination

optimally support a whole-of-government, multi-agency food aid agenda? Can USAID respond better and more cost-effectively to the nutrition needs of its beneficiaries through changes in product formulation, the range of products provided, and/or modes of product approval, processing, procurement, and distribution?

A reformulation of products cannot be based on nutritional considerations alone. The technological feasibility of modified fortification specifications, the cost of new packaging, the review of new products or reformulations, the stability of nutrient levels during shipping and storage, and the assumptions made by implementing agencies about food sharing among beneficiaries are critical. Ultimately, the more tailored and targeted a product, the smaller the quantity of each one that will be needed, but the higher the cost. What are the implications for FFP’s budget and its ability to reach its strategic goals? As USAID administrator Rajiv Shah recently put it, the overall aim is to transform the U.S. food assistance program “to make it more effective” (Shah 2010).

FIGURE 2.
U.S.-PURCHASED MICRONUTRIENT-FORTIFIED FOOD AID, 2001–2009



Source: USDA/USAID 2010.
Note: CSB, Corn–Soy Blend; WSB, Wheat–Soy Blend.

I.1 CONTEXT AND APPROACH

The FAQR was not a stand-alone activity. USAID and USDA have long supported activities aimed at enhancing product choice under Title II, improving quality control (of both processes and products), and updating technical guidance on programming approaches. The current report builds on work supported by FFP since the mid-1990s, focused on micronutrient quality and contents of food aid, revising and rationalizing specifications for Title II processed products (including updates of the Commodities Reference Guide [CRG] and USDA food aid commodity product and procurement specifications), and issues relating to U.S. Government processes involved with the identification and review of new or modified commodities and with food safety and quality control (SUSTAIN 2008).

Several new products have recently been approved for the Title II commodities list, and more are likely to be proposed in the coming years. Partners in the field are aware of the proliferation of new products (such as the new class of lipid-based products referred to as Ready-to-Use Foods [RUFs]). In addition, there is continued debate surrounding the appropriateness of foods that do not contain animal-source proteins to support infant growth and recovery from severe malnutrition. Finally, there have been some questions about food safety, in light of a small number of “problem batches” of commodities delivered to the field. All such issues pointed to a need for a more comprehensive approach to reviewing product suitability, encouraging appropriate operational practices, and overseeing the many processes in the U.S. Government food aid supply chain.

The findings presented here derive from analysis of empirical data, where available, and on expert opinion where the evidence is limited. Empirical data were derived from a number of sources, including a survey of implementing partners, qualitative interviews with operational agency heads and program and logistic experts, and review of existing literature and reports. Expert views were gathered from numerous consultations with scientists, U.S. Government employees and contractors, academics, donor agency staff from many countries around

the world, United Nations personnel, and field-level food aid programming technical staff. For example, a survey of USAID implementing partners was conducted among 64 responding offices in 40 countries. The survey targeted program and logistics officers from every implementing partner distributing Title II food during the period from January to September 2010. The response rate was 81 percent. This survey gathered data on the use and effectiveness of enriched, fortified, or blended Title II commodities in programs, the use of new commodities, and procurement or logistics aspects.

Simultaneously, a formal process of consultation was put in place to engage scientists, industry, implementing partners, civil society, and donor organizations, which was integral to the preparation of this final report. A dozen well-attended meetings were organized around the world with groups of stakeholders, and well over 100 meetings were held with individuals and small groups. More than 400 individuals registered and accessed the dedicated website set up to promote knowledge about, and discussion of, the review’s focal tasks. A panel of experts from the fields of food technology and science, policy, law, industry, medicine, development and humanitarian work, and the maritime industry was consulted throughout the review process, in both individual consultations and collective gatherings. The expert panel, divided into technical and programming subgroups, reviewed and critiqued findings and recommendations, offering professional peer review from numerous relevant perspectives. In addition, an interagency panel composed of key staff from USDA and USAID agencies was set up and consulted individually, and through formal meetings of the group, to provide input throughout the process and feedback on recommendations.

The draft findings and recommendations were widely shared and posted on the review website for public comment during early 2011. Twenty organizations and individuals shared comments on the draft in addition to the views of the expert panels. These comments were incorporated into the drafting of the final report, of which this document represents a summary. (For the full report, see USAID FFP website.)

2. THE NUTRITIONAL ENHANCEMENT OF FOOD AID — OPTIMIZING PRODUCTS

While numerous adjustments have been made over time in both product composition and usage, the current review sought to assess what further changes are necessary, and how to pursue such changes in ways that are evidence driven and can be carried out more swiftly and transparently than in the past. The initial focus, as mandated by contract, was on cereal-based FBFs—defined here as a category of cereal/vegetable protein/oil admixture that is fortified with a range of vitamins and minerals (micronutrients), with the possible addition of an animal-based source of protein such as dairy. Grains and legumes are partially precooked to enhance their digestibility, denature antinutritional factors, and reduce the cooking time required. According to the United Nations, such foods should be a) energy-dense and “rich in micronutrients,” b) easily digestible and palatable, and c) able to be prepared relatively quickly, i.e., with minimal cooking (IASC 2009).

The workhorses of the FBF category, CSB and WSB, have undergone a series of modifications and upgrades over time such that the U.S. versions in 2011 are referred to as CSB13 (that is, version 13) and WSB15 (version 15). Are these kinds of FBFs and other nutritionally enhanced products “fit for purpose”? One can only answer that question in relation to a) what a product was designed to achieve, b) how it is programmed and for whom, and c) what has changed in our understanding of nutrient needs and product formulation since the last revision of specifications.

An appropriate balance of nutrients matters in ration design. The delivery of essential macronutrients (i.e., kilocalorie-generating carbohydrates, protein, and fats) and micronutrients is key to the management of undernutrition, whether in the treatment of wasted individuals in hospitals or in the specialized therapeutic feeding centers that are increasingly a feature of humanitarian action, in supplementary feeding, or in more general ration feeding, where delivery of micronutrients matters as much as delivery of kilocalories to prevent outbreaks of deficiency disease.

The original formulations of FBFs—Corn–Soy Milk and Wheat–Soy Milk (CSM and WSM)—were high in protein (17.8 g/100 g dry weight, compared with 5.9 g/100 g in CSB13) and relatively low in fat (6.3 g/100 g, compared with 8.7 g/100 g in CSB13). They were fortified with 11 vitamins and minerals and contained dried skimmed milk. CSM and WSM cost roughly \$0.40 per 1000 kilocalories in 1971, compared with \$0.08 per 1000 kcal for CSB13 (using 2010 prices and gross domestic product [GDP] deflator to derive constant 2010 dollars). The

lower cost of energy delivered in today's products is due to lower real food prices compared with the late 1960s, even allowing for the recent world food price hikes. In the 1980s, FBFs were reformulated to omit the dried skimmed milk for reasons of cost and availability.

The original formula was prepared on the assumption that a single daily ration would meet roughly 25 percent of energy needs, with a view to “overcoming malnutrition in the pre-school-age child” (Combs 1967). The dairy protein was considered to be appropriate to support the recuperation of children in, for example, the Biafra crisis (during the late 1960s). That humanitarian context convinced the United Nations Children's Fund (UNICEF) that specific products were needed to support the treatment of wasting. However, a criticism leveled at CSB recently has been that its composition no longer includes animal-source protein (typically meaning a dairy source) to meet the needs of wasted children or (a new focus) to prevent stunting among infants. Indeed, the focus of use shifted over time from the needs of “small children” to older children, and then to adults (in emergencies or with HIV/AIDS). This shift has led to the “one size fits all” criticism often leveled against the programming of FBFs during the second half of the 2000s (SUSTAIN 2007; Fleige et al. 2010a).

However, meeting the macro- and micronutrient needs of all beneficiaries is a challenge if a single product is to be the delivery mechanism. The appropriate formulation of any food product depends on its use—by whom, for what purpose, and for how long? It is these questions that led Beaton (1998) to argue that blended food products cannot meet all the needs of all beneficiaries (he used the term “mismatch”) and that much more attention needed to be paid to the potential for differing nutrient composition profiles “for different planned uses.”

Thus, in specifying the composition of upgraded FBFs and other nutritionally enhanced products, all depends on the assumptions made regarding the quantity of product to be consumed daily by target beneficiaries, the contribution of nutrients consumed from that product to the overall diet, the bioavailability of nutrients (depending in

part on the presence of antinutrients in the rest of the diet), the health status of the target consumer, intrahousehold sharing of the product, and more. The resulting formulations cannot be a perfect match for each beneficiary in every circumstance. Hence, the importance of a) tailoring product choice and combination (i.e., the ration mix) to programming intention (the role products can be expected to play in attaining specific outcomes), and b) understanding that nutrient needs should be met across the diet, not in single products; that is, most beneficiaries do not consume only a single food aid item, nor do most rely only on food aid (for example, the diet of children 0 to 24 months of age typically includes breast milk and/or complementary foods).

2.1 DEFINING NUTRITIONAL TARGETS

The landscape of targets, needs, and approaches for prioritization of food aid continues to change. Along with recognition of evolving priorities (not least the shift toward emergency response), there has been a growing consensus during the 2000s on a) the imperative for targeting wasted children, b) the need for increased attention to micronutrient deficiencies, and c) the importance of promoting linear growth in children, which requires attention to children from conception up to two years of age (often referred to as ‘the first 1,000 days’).

New understanding of nutritional requirements during pregnancy and lactation to nourish fetal development and growth and to prevent low birth weight, and of the increased needs for growth and prevention of stunting comes from a series of expert meetings—including those underpinning the Food and Agriculture Organization (FAO)/World Health Organization (WHO) report on Energy Requirements (2004), a WHO/FAO/United Nations University (UNU) report on Protein Requirements (2007), the FAO/WHO report on Human Vitamin and Mineral Requirements (2001), and the Dietary Reference Intake (DRI) reports by the United States and Canada of requirements for macronutrients, vitamins, and minerals (IOM 2002; IOM 2004).

The major underlying principles supporting the current review's recommendations can be summarized as follows:

First, energy-dense foods with good protein content and an appropriate inclusion of essential micronutrients are necessary (albeit not always sufficient) to achieve defined nutrition goals among vulnerable populations. Staple foods must be available in sufficient quantity to ensure that nutritionally enhanced (value-added, usually processed) food products are adding to rather than replacing other sources of energy in the local food supply.

Second, there is increasing recognition that vulnerable children in countries where there is a high prevalence of undernutrition usually have a high exposure to infectious diseases and poor quality of hygiene and sanitation. The nutrient requirements for *preventing* malnutrition (as well as treating it) under such conditions are higher than those in a healthy environment with low rates of undernutrition.

Third, for the prevention of stunting (promotion of linear growth), a growing consensus gives priority to children under two years of age, along with the needs of pregnant and lactating women (Horton et al. 2009; Scaling-Up Nutrition Roadmap Task Team 2010). This poses a challenge in dealing with infants around six months old who may still be breastfed, but for whom the contribution of milk in the diet is unknown, and who should consume complementary foods that not only are of sufficient quality (to meet the high demands for key nutrients) and quantity but that also meet high food safety standards.

Fourth, with regard to wasting, the prevention and treatment of moderate acute malnutrition (MAM) should be a special focus of food aid, given the high prevalence rates of MAM in regions and target areas where Title II delivers most food, especially in emergency settings, with its accompanying high risk of mortality and permanent developmental deficits and physical delay. Treatment of severe acute malnutrition (SAM) with Ready-to-Use Therapeutic Food (RUTF) (i.e., nutrient-dense, lipid-based food products formulated for treatment of SAM) has been a success story, leading to the wider use of such foods, sometimes in programs for which they were not intended—a reflection of demand for effective *products* in interventions around the world.

Fifth, HIV/AIDS is a special case in which the burden of HIV infection is often compounded by the presence of additional (opportunistic) infections that further increase metabolic demands. Although it is generally accepted that individuals with HIV have increased energy demands, the precise amount of additional demand is not clearly defined by currently available data. In addition, specific requirements for individual macro- and micronutrients have not been studied sufficiently, particularly with regard to the response to antiretroviral therapy (ART). The appropriate criteria for initiation of (and graduation from) food aid need to be defined, as the altered nutritional demands do not abate in this population. Much more needs to be known on the nutritional requirements for different groups of PLHIV.

Despite these limitations, we used the best current evidence and sought insight from leaders in the field to define nutrient target levels for vulnerable target groups, in particular for infants 6 to 11 months, children 12 to 36 months, and pregnant and lactating women. The target micronutrient contents and macronutrient densities built on the in-depth work by Lutter and Dewey (2003), Golden (2009, 2010), Chaparro and Dewey (2010), and Fleige et al. (2010a, 2010b), in addition to consensus recommendations from a wide range of experts. The targets presented here (Table 1) derive from the widely accepted vitamin and mineral requirements promulgated as Recommended Nutrient Intakes (RNIs) by FAO/WHO (2001), supplemented by more recent recommendations for some nutrients in the Dietary Reference Intakes of the U.S. Institute of Medicine (IOM) report of 2004 (IOM 2004). Nutrient target levels are set at about 115 percent of the recommended amount to cover extra needs of the target population, which suffers systematically from poor absorption induced by intermittent infection and food and water contamination (Golden 2009).

Safe Upper Levels (ULs) were taken into account, especially where nutrients added as fortificants could theoretically reach levels with adverse effects when ingested regularly over long periods. Where no ULs have been established by the IOM, the No Observed Adverse Effect

TABLE I.**DAILY NUTRIENT NEEDS BY SELECTED AGE AND DEMOGRAPHIC GROUPS FOR MODERATELY MALNOURISHED POPULATIONS (~115% OF RNI OR DRI)**

| NUTRIENT | INFANTS 6-11 MONTHS | CHILDREN 12-36 MONTHS | PREGNANT WOMEN* | LACTATING WOMEN |
|--|--------------------------------|----------------------------------|----------------------------|----------------------------|
| Energy (kcal) | 675 | 1000 | 2385 | 2600 |
| Protein (g) | 16 | 23 | 71 | 71 |
| Fat (g) | 31 | 30 | 20-35 | 20-35 |
| Minerals (mg) | | | | |
| Calcium** | 299 | 700 | 1150 | 1150 |
| Chromium | 0.0115 | 0.01265 | 0.035 | 0.052 |
| Copper† | 0.253 | 0.391 | 1.15 | 1.495 |
| Iodine‡ | 0.104 | 0.104 | 0.230 | 0.230 |
| Iron‡ | 10 | 10.35 | 31 | 23 |
| Magnesium‡ | 62.1 | 69 | 253 | 310.5 |
| Manganese | 0.69 | 1.38 | 2.3 | 2.99 |
| Molybdenum† | 0.00345 | 0.0196 | 0.0575 | 0.0575 |
| Phosphorus† | 316.25 | 529 | 805 | 805 |
| Potassium | 805 | 3450 | 5405 | 5865 |
| Selenium† | 0.012 | 0.020 | 0.035 | 0.048 |
| Sodium | 425.5 | 1150 | 1725 | 1725 |
| Zinc‡ | 5.75 | 7.13 | 8.05 | 9.2 |
| Vitamins (mg) | | | | |
| Vitamin A (re)‡ | 0.460 | 0.460 | 0.920 | 0.978 |
| Vitamin B ₁ (thiamin)‡ | 0.345 | 0.575 | 1.61 | 1.725 |
| Vitamin B ₂ (riboflavin)‡ | 0.46 | 0.575 | 1.61 | 1.84 |
| Vitamin B ₃ (niacin)‡ | 4.6 | 6.9 | 20.7 | 19.6 |
| Vitamin B ₅ (pantothenic acid)‡ | 2.07 | 2.3 | 6.9 | 8.05 |
| Vitamin B ₆ ‡ | 0.345 | 0.575 | 2.19 | 2.30 |
| Vitamin B ₇ (biotin)‡ | 0.0069 | 0.0092 | 0.0345 | 0.0403 |
| Vitamin B ₉ (folic acid)‡ | 0.054 | 0.101 | 0.406 | 0.338 |
| Vitamin B ₁₂ ‡ | 0.000805 | 0.00104 | 0.00299 | 0.00322 |
| Vitamin C‡ | 34.5 | 34.5 | 63.25 | 80.5 |
| Vitamin D ₃ ** | 0.0115 | 0.0173 | 0.0173 | 0.0173 |
| Vitamin E‡ | 5.75 | 5.75 | 11.5 | 8.63 |
| Vitamin K | 0.0115 | 0.0173 | 0.0633 | 0.0748 |

All nutrients without a footnote are the Adequate Intake (AI), as established by IOM.

* Throughout the report, we will only compare products with the pregnant women's recommendations.

** There are RNIs established for these nutrients, but we chose to follow the new IOM guidelines released in 2010.

† These nutrient amounts are the Recommended Dietary Allowances (RDAs) for children 12 to 36 months of age and pregnant and lactating women.

‡ These nutrient amounts are based on Recommended Nutrient Intakes (RNIs).

Level (NOAEL) or the Lowest Observed Adverse Effect Level (LOAEL) has been used. These are defined as part of the process of determining ULs and have been established for a few nutrients that currently do not have ULs. For ease in labeling tables, we refer to all of these levels as "ULs."

It should be understood that the ULs in the IOM report were focused, by definition, on diets and supplements of *healthy* individuals in North America in order to prevent excessive intakes of vitamins or minerals, especially in the form

of fortified foods or as dietary supplements. In some tables, ULs refer to the total amounts of nutrients *added* to a fortification premix, not to the total amounts *in* the food, which include intrinsic levels and those from the premix.

As such, the ULs do not pertain to the operational settings in which USAID's implementing partners typically work. In these contexts, high levels of undernutrition and multiple micronutrient deficiencies are present, in contrast to a "generally healthy population." As Golden (2009) puts it, "The [UL] levels explicitly do not

apply to deficient individuals or to therapeutic treatment of nutritional diseases and could argue therefore that such limits do not apply to FBFs and other supplementary foods for the malnourished child.” We are therefore in strong agreement with both Golden (2009) and Dewey and Huffman (2009) on the importance of giving higher priority to essential nutritional needs for growth than to theoretical concerns about population-wide excess.

2.2 RECOMMENDATIONS FOR PRODUCT CHANGES

Four changes are recommended here in terms of reformulations of existing products:

1. Upgrade the macronutrient contents of the precooked, fortified cereal blends (CSB, WSB, and similar FBF products)
2. Upgrade the micronutrient composition of those same FBFs
3. Upgrade the micronutrient composition of soy-fortified enriched blended cereals (SFB, soy-fortified grits [SFG], and similar products) and of fortified milled grains
4. Upgrade the micronutrient profile of currently used vitamin A–fortified vegetable oil

UPGRADE THE MACRONUTRIENT COMPOSITION OF CSB AND WSB

The reformulation of FBFs recommended here is intended to meet the needs of multiple nutritionally vulnerable beneficiaries, including, but not limited to, breastfed children (as a complementary food). That said, FBF is not intended to serve as a generic vehicle for “nutritional quality” (delivering micronutrients) to *all* household members or for use in any undifferentiated setting.

The promotion of breastfeeding (and optimal complementary feeding) is underscored here; recommendations include estimates of the contribution of breastfeeding to a small child’s diet. A formulation based on intake of 50 g per day (when served as recommended with 15 g of fortified vegetable oil) would meet most nutrient needs of a breastfeeding infant aged roughly 6 to 12 months. Additional quantity increments

of the same product will similarly meet most nutrient needs of other target consumers, be they wasted children up to 5 years of age, underweight pregnant or lactating women, or wasted adults with HIV/AIDS.

| PRIMARY BENEFICIARY GROUPS (MODEL FOR FBF REFORMULATION) |
|---|
| Prevention of stunting (linear growth promotion) among children 6–24 months |
| Management of moderate wasting among children 6–59 months |
| Meeting the elevated protein and micronutrient needs of nutritionally-vulnerable pregnant and lactating women |
| Management or prevention of moderate wasting among people (including adults) living with HIV or AIDS |

* The amounts should be adjusted according to local context needs.

Described below is the recommended content of a modified FBF (focusing for this report on CSB as an example, which we call CSB14 since the current formulation is CSB13). It includes levels of micronutrients and high-quality protein (i.e., delivering adequate essential amino acid levels), so that a 50-g ration of reformulated CSB, WSB, or other FBF (potentially based on a different staple grain, such as a sorghum–soy, rice–soy, potato–soy, or rice–lentil blend), would satisfy the needs of a 6- to 12-month-old infant. For example, 50 g of CSB14 prepared with 15 g of fortified vegetable oil would allow infants aged 6 to 12 months who are still breastfed to meet roughly 100 percent of their protein, energy, and micronutrient daily needs.

Of course, many assumptions have to be made about the contribution of food aid products to the overall diet of target consumers. As noted long ago, “in assessing nutritional benefits to be derived from the modification or the formulation of foods, the composition of the overall diet must be considered.” (AMA/CFN 1968) Unfortunately, detailed knowledge of local diets and dietary practices in locations where FFP supports programming is often extremely weak. This was noted in the mid-1990s, when Dexter (1995) pointed out although calculations indicate that FBFs make an important contribution to nutrient needs, “information on actual food intakes is limited.” And it remains true today, as revealed in the FAQR Implementing Partner Survey and consultations with implementing partners and

WFP. Thus, assumptions about the share of the diet to be delivered via FBFs have varied widely.

The original CSM was designed so that a daily 50-g ration would meet 10 percent of the Recommended Dietary Allowance (RDA) for energy and 25 percent of RDAs for micronutrients of infants (Wood et al. 2008), but Dexter (1995) noted that later versions of CSB met 25 percent of the energy needs of “young children *and pregnant and lactating women.*” [emphasis added] Fleige et al. (2010b) more specifically suggested that FBFs be fortified “at a level that would supply 75 percent of the Recommended Nutrient Intake (RNI) or Adequate Intake (AI) for most micronutrients if consumed to supply 25 percent of daily energy.”

The FBFs formulated by WFP and UNICEF align themselves with the 1991 Codex Alimentarius *Guidelines for Formulated Supplementary Foods*, which indicate that 100 g should provide at least two thirds of the RNI for essential nutrients. Section 6.2.4 of the Codex’s Guidelines also recommends a daily ration of 100 g per day, although Zlotkin et al. (2010) point out that “new evidence suggests that breastfed children do not need such large amounts of energy ... [and that 100 g] would exceed the requirements for breastfed infants 6 to 11 months of age” and hence could inhibit breastfeeding.

To better support defined nutritional goals while promoting optimal breastfeeding and infant feeding practices, the macronutrient profile of CSB and WSB and similar products should be adjusted in three main ways:

Recommendation 1: The quantity of protein should be increased, and whey protein concentrate (WPC) should be added. The inclusion of 3 g WPC80 per 100 g dry product of CSB or WSB will increase the protein available in these products and provide essential growth factors derived from an animal source, thereby improving their effectiveness in the management of moderate wasting, as well as in meeting the enhanced nutritional needs of children 6 to 24 months of age, thereby promoting linear growth. The addition of an animal-source protein acknowledges new evidence that animal-source proteins matter in the accrual of lean

tissue during recovery from wasting and in linear growth of children (Murphy and Allen 2003).

Animal-source proteins, in particular those from milk sources, contain (as yet incompletely defined) growth factors such as IGF-1 and anti-infective agents such as lactoferrin (Hoppe et al. 2006; Michaelson et al. 2009).

The current preferred measure of protein quality is the Protein Digestibility Corrected Amino Acid Score (PDCAAS), which takes account of digestibility as well as protein quality. If they are provided together with adequate calories from fat or oil for full utilization of the high-quality protein, CSB and WSB have a high PDCAAS due to amino acid complementarity, as defined by WHO/FAO/UNICEF (2007). Foods with a PDCAAS above 0.80 are considered good sources of protein. The addition of 3 percent WPC80 brings the PDCAAS up to 0.88 (Table 2).

TABLE 2.
PROTEIN QUALITY OF SELECTED FBFs

| MEASUREMENT | CSB14 | CSB13 | CSB+++ | WSB16 | WSB15 |
|-------------------|-------|-------|--------|-------|-------|
| PDCAAS score | 0.88 | 0.85 | 0.89 | 0.72 | 0.63 |
| Total P/E ratio** | 18% | 18% | 15% | 30% | 35% |

* The new version of CSB following World Food Programme specifications.

** Without oil added at time of consumption.

While existing FBFs composed with soy protein already have a good protein profile, empirical evidence suggests that an animal-source protein will contribute further to appropriate utilization and lean mass accretion (Grillenberger et al. 2003). For both cost and supply reasons, whey protein concentrate with 80 percent protein content (WPC80) was chosen over dried milk solids, since its protein quality as measured by PDCAAS score is equivalent to that of dried milk. Indeed, WPC80 is slightly richer in growth-promoting substances and lactoferrin than dried milk. WPC80 is recommended over WPC34 (34 percent protein content) for quality and cost reasons. WPC is essentially free of any fat, so concerns about shelf life are minimal.

The addition of WPC80 makes the protein quality of CSB13 comparable to that of WFP’s CSB Plus Plus (CSB+++), which has added dried

skimmed milk. The total protein-to-total energy ratios of CSB14 and CSB++ (18% and 15%, respectively), without adding oil, are about the same as that of CSB13 (18%). WSB15, which is the current version listed among the products approved for use in Title II, and WSB16 (with additional WPC80 at 3 percent) have lower PDCAAs than CSB, even with the addition of animal-source protein, because the amino acid profile of wheat is poorer than that of corn. As other FBFs are developed, the formulations and nutrient levels should be assessed to best establish the level of WPC or other dairy source of protein to maximize nutritional benefits.

Field trials are ongoing aimed at understanding the optimum levels of protein enhancer to be included in such blended products (i.e., how little of the product can provide adequate nutritional content, thereby keeping costs to a minimum). Although the unit price of WPC80 is relatively high, the addition of just 3 percent (bringing with it important nutritional value) would represent 15 percent of the total ingredient cost of CSB14. Tests should be conducted to assess if 3 percent is the optimal level for CSB or WSB to achieve desired nutritional goals at the lowest price (sensitivity analysis around the current recommendation). FFP should also be open to alternative sources of animal-source protein that meet at least equivalent performance specifications.

The amount of WPC to be added to CSB and WSB recommended here (3 g per 100 g) meets the target levels for high-quality protein at a ration size adjusted by target group, but the possibility of keeping quantities as low as possible would also have to be tested against desired operationally relevant nutrition outcomes, given the possibilities for sharing and other leakage. Although dried skimmed milk is a potential source of such protein (as in the original CSM and in WFP's new form of CSB), we recommend WPC for three reasons: a) it delivers significant nutrient value in small quantity (avoiding "bulking up" the final product at the expense of other nutrients); b) its price in the United States has been more stable (variable within a narrower band) than skimmed milk during the past decade, which offers the advantage of

more predictable pricing; and c) it contains no fat, thereby not impairing the shelf life of the finished product. WPC80 is already on the approved commodities list.

Recommendation 2: Increase the fat content.

Some fat derives from the cereal blend, but it is our recommendation that such products be prepared and served with an appropriate quantity of fortified vegetable oil. Much of the nutritional value added offered by lipid products derives from the higher fat and energy content per daily dose or ration. The recommended CSB or WSB should be prepared and consumed with fortified vegetable oil at defined volumes (15 g oil per 50 g dry matter, and in increments of that ratio), resulting in higher fat and energy delivered; both are important for management of wasting and for supporting child growth.

This recommendation is not without historical precedent and scientific support. Dewey et al. (2004) discuss feeding of non-breastfed children 6 to 24 months old and recommend a maximum amount of 35 g oil per day for this group if animal-source proteins are not consumed. The International Federation of Red Cross and Red Crescent Societies' (IFRC's) *Nutrition Manual for Humanitarian Action* (Mourey 2008) recommends preparing the following ration for supplementary feeding where CSB is not available: 60 g flour, 40 g dried skimmed milk, 30 g oil, 10 g sugar, and ~400 ml water. This is in line with this report's recommendation to prepare 100 g CSB with 30 g oil and 400 ml water. Similarly, the United Nations High Commissioner for Refugees' (UNHCR's) 1982 *Handbook for Emergencies, Save the Children's 1987 Drought Relief in Ethiopia: Planning and Management of Feeding Programmes*, and WFP's 2000 *Food and Nutrition Handbook* all recommend similar recipes for supplementary feeding that include a mixture of some type of flour, a protein (typically dried skimmed milk), and oil at roughly the same ratios (Appleton J et al., UNHCR 1982; WFP 2000). The improved fat profile from combining products (CSB or WSB with oil) at the point of consumption will allow the attainment of nutritional goals similar to those attained with the use of alternative lipid-based products. This will require

greater programmatic guidance and investments in enhanced social marketing and behavior change communication to promote adherence. This change will benefit PLHIV, as dyslipidemia in this group, fostered in part by inadequate dietary intake, is frequent.

When combined with breast-feeding, CSB14 will provide two thirds of fat requirements, nearly 80 percent of energy requirements, and 100 percent of gross protein requirements for 6- to 12-month-olds. The addition of calories as oil will provide essential fatty acids, irrespective of the vegetable oil provided, whether linoleic (omega 6) or linolenic (omega 3).

Brown, Dewey, and others have emphasized the importance of energy density of complementary feedings for children who are at risk for malnutrition or malnourished from 6 months on to meet energy needs and prevent stunting, given the limited gastric capacity of infants. Their studies demonstrate the importance of divided and multiple feedings to achieve enhanced energy intake (Brown et al. 1995; Islam et al. 2006; Bennett et al. 1999; Dewey et al. 2004). Our recommendation that CSB be ingested by infants at a ratio of 50 g CSB to 15 g oil with about 200 ml boiled water in three or four feedings per day would enhance the calorie value of feedings (by the use of oil) by roughly 50 percent. This additional calorie contribution would permit the intake of enough energy (with associated nutrients) to meet the needs for growth or growth recovery, which could not be achieved by CSB alone. The gastric capacity of the 6-month-old infant is estimated as 40 g per kilogram of weight (adapted from Brown et al. 1995); for a 6-month-old girl weighing 7.3 kg (WHO 2006), the gastric capacity would be nearly 290 ml, well within the capacity to ingest the 86 ml of CSB porridge with oil in four divided feedings of the 50:15:200 ratio recommended for the 6- to 12-month-old infant. In addition, the oil can be expected to improve the palatability and texture of the porridge.

Recommendation 3: Increase the energy content. The proposed reformulation is such that a significant share of the nutrient needs of children and adults could be met by increasing the quantity in increments according to age.

TABLE 3.
ESSENTIAL FATTY ACIDS

| Fatty acid | CORN OIL | | SOY OIL | | RDI OR AI (G/DAY) | |
|---------------|----------|--------|---------|--------|-------------------|--------|
| | g/15 g | g/30 g | g/15 g | g/30 g | 7–12 mo | 1–3 yr |
| Omega 3 (ALA) | 0.87 | 1.74 | 0.98 | 1.96 | 0.5 | 0.7 |
| Omega 6 (LA) | 3.44 | 6.88 | 7.50 | 15.0 | 4.6 | 7.0 |

Source: IOM 2005; USDA/ARS 2010.

Note:ALA, alpha-linolenic acid; LA, linoleic acid.

Infants 6 to 11 months of age would meet 50 percent of their energy requirements and most of their micronutrient requirements if they consume 50 g of FBF with 15 g (~1 table-spoon) of vegetable oil (during one day, not at a single sitting); children 12 to 24 months of age would meet around two thirds of their energy requirements and most of their micronutrient requirements if they consumed 100 g of FBF with 30 g (~2 tablespoons) of oil. If 100 g of CSB or WSB, for example, is appropriately prepared with 30 g of oil, the energy content increases by roughly two thirds over that of the currently used CSB13 (which is often not prepared with oil at time of consumption). In combination with energy from breast milk (at younger ages) or other foods (at older ages), the energy provided would meet most needs of nutritionally vulnerable and/or compromised children.

Recommendation 4: Add a flavor enhancer to formulations of FBFs. The addition of a sweetening additive would enhance taste and acceptability, which is particularly important when seeking to increase consumption among sick, undernourished children. UNICEF's version of CSB (UNIMIX) includes sugar, which is not recommended here. It has been suggested by industry that toasting the corn germ would provide a flavor that suggests sweetness. We urge exploration of innovations in processing by the private sector that would increase palatability (particularly for undernourished children) without significantly increasing cost.

UPGRADE THE MICRONUTRIENT COMPOSITION OF CSB AND WSB

Overall, micronutrient levels should be set higher than in the past, with a target of 115 percent of RNI across the diet to account for disease-intense (low-hygiene) environments and assumptions regarding prior nutritional deficits and likely current dietary deficiencies. Target levels are adjusted taking into account intrinsic levels of food ingredients, updated knowledge of fortificant stability (losses due to length of storage, sunlight, and cooking), assumed breast milk consumption of infants, and other factors.

Recommendation 5: Increase the levels of vitamins B₁ (thiamin), B₂ (riboflavin), B₃ (niacin), B₅ (pantothenic acid), B₁₂, D₃, and E. Scientific consensus is moving toward an understanding that each of these vitamins is important in its own right. Increased levels will render the FBFs more effective, will not pose undue technical difficulties for producers, and should not have adverse organoleptic impacts on the final product. Levels of vitamins D and E are increased in line with recent recommendations by the IOM and other expert consultations.

Recommendation 6: Maintain vitamin C at the current level. Vitamin C is kept in the formulation to serve as an “enabler” to improve absorption of other nutrients and possibly as a future marker to replace vitamin A. Losses of vitamin C are known to be high, but its cost is no longer a major component of the premix price. It is therefore recommended that target levels remain at the status quo until future testing confirms that a) its removal from the premix would not impair iron absorption, or b) it could not be delivered in alternative forms that would be more stable and thus deliver vitamin C more reliably, for example, in home fortificants. If more stable forms of premix-bound vitamin A and field-friendly spot tests for vitamin A levels in premixes become viable and cost-effective in coming years, the rationale for retaining vitamin C (as a marker in the premix) would be further weakened.

Recommendation 7: Reduce levels of vitamin A. With vitamin A in vegetable oil, the amount in FBFs should be reduced not only to save cost,

but, more importantly, to avoid any potential for exceeding ULs among nutritionally vulnerable consumers (particularly pregnant women). The recommended combination of 50 g of upgraded CSB or WSB with 15 g of fortified vegetable oil *and* breast milk meets 90 percent of the RNI of vitamin A for an infant 6 to 11 months of age. Similarly, 200g of upgraded CSB/WSB with 40g of fortified vegetable oil meets 76 percent of the recommended daily intake of Vitamin A for pregnant women and only 23% of the upper limit.

Recommendation 8: Add vitamin K to the premix on a provisional basis. Acknowledging recommendations by several nutrition scientists, and following WFP’s lead, we propose adding vitamin K. Although widespread deficiency of this vitamin is rare it can occur when the body is unable to absorb nutrients via the intestinal tract. Deficiency is therefore possible in unsanitary environments and where dietary sources of vitamin K (leafy green vegetables and fruits) are few, as in refugee camps or where markets are disrupted in emergencies. Adding vitamin K to the premix represents two percent of the cost. The stability of this new nutrient should be confirmed through testing, and its value should be assessed in field settings. If it is decided to continue including vitamin K, the potential cost savings from its addition to the oil versus its addition to the premix should also be examined.

The addition of other “new” vitamins (not currently included in the premix) should be based on evidence of deficiency among target populations or risks associated with potential deficiency. The potential inclusion of certain nutrients, such as biotin, selenium, molybdenum, manganese, and chromium, was considered, but their inclusion was not recommended until convincing data emerge on their functionality in relation to beneficiary needs and programming goals. There is a lack of strong empirical evidence that they should be included, beyond the assumption that since they are “required nutrients” they should be added. Actual evidence of a significant risk associated with an absence from the premix should determine whether or not these and other nutrients should be included, rather than an argument based on “negligible” cost.

Recommendation 9: Combine two forms of iron, NaFeEDTA and ferrous fumarate, in the premix to enhance iron absorption. Reduce the level of ferrous fumarate and add sodium iron ethylenediaminetetraacetate (NaFeEDTA) to levels currently permitted for children by the Codex Alimentarius (pending revisions to the guidelines). Ferrous fumarate has limitations in terms of its bioavailability. A combination of ferrous fumarate and NaFeEDTA will enhance the impact of CSB and WSB by making more iron available to the beneficiary. The amount of NaFeEDTA to be included is restricted by current WHO limits (1.9 mg per kilogram of body weight for children). Increased effectiveness of the product justifies the increased cost of the micronutrient premix. Iron levels overall are set lower than in the past because of concerns over potential toxicity effects in seriously undernourished children.

Recommendation 10: Increase levels of zinc and add potassium. These two minerals play important roles in child growth, as well as supporting recovery from wasting. Zinc is separately important for enhancing iron absorption and combating diarrheal disease. We recommend that zinc oxide be included in all product specifications henceforth. Current FBF specifications are confusing, since both $ZnSO_4 \cdot H_2O$ and $ZnSO_4 \cdot 7H_2O$ are quoted in guidance as the zinc compound to be used. The level of zinc recommended is not as high as would be required to meet the 115 percent target set for other nutrients, mainly due to uncertainty about its organoleptic properties. It is recommended that levels be increased from current targets to half of what has been suggested by some analysts (and roughly the same as for WFP's CSB++). Testing should be carried out to ascertain if higher levels of zinc in FBFs would be feasible without affecting product acceptability.

Recommendation 11: Decrease levels of magnesium, calcium, iodine, and sodium. The levels of these minerals in current premixes are considered excessive. The sodium level was high in earlier CSBs because iodized salt was the source of iodine, which can now be added independently. High sodium can be a factor in renal overload and edema. Calcium levels are

reduced in line with the new IOM recommendations, dropping from 400 to 260 mg per day.

The estimated cost of a reformulated CSB14 would be around \$833/MT from the mill (although as with all FBF the price will change over time depending on variability in ingredient and other costs). This reflects an increase in unit price of around 18 percent over CSB13. The drivers of the increase include a higher macro ingredient cost due to addition of WPC80 and an estimated rise of 11 percent in “up-charge” from producers due to the increased complexity of mixing (since the processors would need to procure and store more ingredients and might need to make special arrangements for handling WPC80). Overall, CSB14, with its reformulated micronutrient premix profile, is moderately *less* expensive than CSB13 (\$73.57/MT versus \$76.20/MT).

However, further cost factors need to be considered. In terms of food technology, it is recommended that when premixes are prepared, iron and zinc should be combined with the vitamins and calcium and phosphorus added separately. The bulkiness of calcium and phosphorus can cause problems in mixing (clumping and nonhomogeneity). The possibility should be explored of moving from one premix for vitamins and another for minerals, to one premix for vitamins *plus* the iron and zinc (which are now stable and less likely to interact with the vitamins) and a separate premix for the bulky minerals. An additional food technology issue is that the potential should be explored of processing that can reduce the antinutrient content of such foods, including extrusion and the use of phytase once it has been granted Generally Recognized as Safe (GRAS) status. There are many more options to be considered, in collaboration with industry, to enhance the nutrient and energy density of FBFs, reduce phytates and fiber, improve product quality, and enhance shelf life. For example, WFP has carried out extrusion trials using high moisture and co-extrusion, which have demonstrated improvement in the shelf life of CSB products.

A further cost issue relates to changes in packaging size and composition. It is argued here that improved packaging materials and smaller-sized

TABLE 4.
TARGET LEVELS OF NUTRIENTS FOR UPGRADED CSB PLUS OIL

| | FORTIFIED VEGETABLE OIL | FORTIFICATION (PREMIX) | CSB14 PRODUCT TOTAL* | CSB14 AND OIL | FORTIFICANT FORM |
|---|--------------------------------|-------------------------------|-----------------------------|----------------------|--|
| Quantity | 30 g | per 100 g | 100 g | 100 g/30 g | |
| Kilocalories | 265 | | 387 | 652 | |
| Protein | - | | 18 | 18 | |
| Fat | 30 | | 9 | 39 | |
| Minerals (mg) | | | | | |
| Calcium | | 279.08 | 352.89 | 352.9 | 2% Tri-calcium phosphate |
| Copper | | - | 0.39 | 0.39 | N/A |
| Iodine | | 0.23 | 0.23 | 0.228 | Potassium iodide |
| Iron | | 13 | 15.5 | 15.5 | EDTA and ferrous fumarate |
| Magnesium | | 9.47 | 94.06 | 94.1 | Magnesium oxide |
| Manganese | | - | 0.79 | 0.787 | N/A |
| Phosphorus | | 290.97 | 513.31 | 513.3 | 2% Tri-calcium phosphate |
| Potassium | | 163.19 | 707.07 | 707.1 | Potassium monophosphate (mono-calcium phosphate) |
| Selenium | | - | 0.02 | 0.02 | N/A |
| Sodium | | 225.67 | 239.19 | 239.2 | Sodium chloride |
| Zinc | | 5.5 | 6.85 | 6.85 | Zinc sulfate monohydrate |
| Vitamins (mg) | | | | | |
| Vitamin A | 0.378 | 0.110 | 0.154 | 0.532 | Vitamin A palmitate |
| Vitamin B ₁ (thiamin) | | 0.652 | 0.746 | 0.746 | Thiamin mononitrate |
| Vitamin B ₂ (riboflavin) | | 0.933 | 0.967 | 0.967 | Riboflavin |
| Vitamin B ₃ (niacin) | | 9.07 | 9.74 | 9.74 | Niacinamide |
| Vitamin B ₅ (pantothenic acid) | | 3.34 | 3.53 | 3.53 | Calcium D-pantothenate |
| Vitamin B ₆ | | 0.619 | 0.752 | 0.752 | Pyridoxine hydrochloride |
| Vitamin B ₉ (folic acid) | | 0.087 | 0.095 | 0.095 | Folic acid |
| Vitamin B ₁₂ | | 0.0015 | 0.0015 | 0.0015 | Vitamin B ₁₂ 0.1% (water soluble) |
| Vitamin C | | 40 | 40 | 40 | Coated ascorbic acid. Type EC |
| Vitamin D ₃ | 0.0042 | 0.025 | 0.025 | 0.030 | Vitamin D ₃ 100,000 IU/g |
| Vitamin E | 2.454 | 10.77 | 10.88 | 13.34 | Vitamin E 50% CWS |
| Vitamin K | | 0.033 | 0.033 | 0.033 | Dry vitamin K ₁ 5% (spray dried) |

* Including intrinsic values in CSB. These numbers will be slightly different depending on what FBF is being fortified, as the premix is the same for all FBFs.

units should both be urgently explored. Given the costs involved in improving FBFs outlined above, it is believed that improved packaging of the enhanced product would support behavior change communication at the field level to reduce sharing within the household (by focusing products on the actual intended consumer) and would potentially also improve storability. Many agencies and experts have suggested that providing recipients with a closed package reduces the potential for contamination and is also a more dignified method of distribution. Smaller packaging is recommended, down from current delivery in 25-kg sacks to monthly ration sizes, perhaps in the 6-kg to 10-kg range (based on 100 g/day for 60 days for a total of 6 kg). However, the actual size, form, and mode of sealing all remain to be appropriately determined, as well as the cost relative to enhanced targeting effectiveness.

Metal (foil) package specifications for vegetable oil should be reassessed in the light of potential alternatives and frequent reports of breakage. A “best if used by” date or an expiry date should be included on all Title II packaging, particularly for new formulations of CSB and WSB, after testing for shelf life. Greater flexibility in packaging size should be allowed, given differences between U.S. and international metrics. Current requirements stipulate 50-lb bags, and since those specifications would have to be changed to allow for smaller bags, it would allow vendors more flexibility if metric-based alternatives were possible (i.e., kilograms as alternatives to pounds). The feasibility of “front-of-packet” messaging must be fully explored in relation to costs and the viability of improving intrahousehold targeting and correct use. The impact of smaller, more targeted packaging on consumption by target consumers (reduced sharing) as well as shelf life and storability will have to be tested under field conditions.

The new CSB provides roughly 400 kcal in a 100-g ration (dry weight), conforming to Codex Alimentarius Guidelines. When it is served with the prescribed amount of oil, the total energy provided rises to more than 650 kcal. The importance of providing sufficient supplemental energy in itself should not be discounted. Meeting the

need for calories through a mix of sources (so that fats, oils, and other lipids provide 30 to 45 percent of calorie intake) is central to the goals of restitution of linear or catch-up growth or weight and utilization of protein and amino acids for lean mass accretion (Golden 2009, 2010).

The recommendation that Title II stay with a single improved CSB to meet explicitly-defined nutritional goals (rather than multiple variants, some with animal protein added and others without) rests on two principles: first, that nutrient-dense, value-added foods should not be used as a generic vehicle for the delivery of “nutrient quality” in an untargeted fashion when nutrient value can be delivered in other, less expensive and more appropriate ways; and second, that the ability to promote the enhanced FBF as a food designed to support specific nutrition outcomes among clearly identified target demographics would be compromised. Voices for and against this position were listened to during the review process, with as many people arguing for a single version (“to avoid confusion in the field,” “to keep programming logistics as simple as possible,” “to focus more attention on the prescribed uses of CSB”) as against (“there should be harmonization with the practice of UN agencies,” “implementing partners working with both USAID and WFP will be confused”).

Nutrients should be delivered across the food basket, and wherever possible a range of foods should be programmed. The goal of ensuring adequate micronutrient content of a family ration can be met in a cost-effective manner more by improving the cereal component than through the use of CSB or WSB. Sharing is common, but unless targeted to specific individuals, the CSB or WSB will not achieve intended goals. Although most implementing partners recognize the potential value of having different versions of CSB for different nutritional purposes (mainly supporting a CSB without animal protein for use in school feeding activities), the majority also stated that they would not want to program two different versions because of the logistical and programming challenges involved. Although it is not based on these survey responses, the recommendation here for a single enhanced FBF does address such concerns, in addition to accounting

TABLE 5.
CSB14 AND OIL WITH ~115% RNI/DRIS FOR THREE GROUPS OF TARGET BENEFICIARIES

| Nutrient | INFANTS 6-11 MONTHS | | CHILDREN 12-36 MONTHS | | PREGNANT WOMEN | |
|---|-----------------------|---|------------------------|--|------------------------|---------|
| | 50 g CSB14 + 15 g oil | 50 g CSB14 + 15 g oil + 444 g breast milk | 100 g CSB14 + 30 g oil | 100 g CSB14 + 30 g oil + 362 g breast milk | 200 g CSB14 + 40 g oil | |
| | % of 115% RNI/DRIs | | | | | % of UL |
| Kilocalories | 48 | 91 | 65 | 89 | 47 | |
| Protein | 55 | 84 | 77 | 93 | 50 | |
| Fat | 63 | 118 | 129 | 176 | 192 | |
| Mineral | | | | | | |
| Calcium | 58 | 100 | 50 | 64 | 61 | 28 |
| Copper | 76 | 120 | 99 | 122 | 67 | 1 |
| Iodine | 53 | 100 | 106 | 144 | 95 | 20 |
| Iron | 99 | 101 | 319 | 321 | 99 | 68 |
| Magnesium | 75 | 100 | 135 | 153 | 74 | |
| Manganese | 56 | 57 | 56 | 57 | 68 | 14 |
| Phosphorus | 80 | 100 | 96 | 106 | 126 | 29 |
| Potassium | 43 | 72 | 20 | 26 | 26 | |
| Selenium | 87 | 165 | 103 | 139 | 116 | 10 |
| Sodium | 28 | 43 | 21 | 25 | 27 | 21 |
| Zinc | 59 | 59 | 95 | 95 | 168 | 34 |
| Vitamin | | | | | | |
| Vitamin A | 52 | 100 | 103 | 143 | 76 | 23 |
| Vitamin B ₁ (thiamin) | 73 | 100 | 88 | 101 | 63 | |
| Vitamin B ₂ (riboflavin) | 66 | 100 | 106 | 128 | 76 | |
| Vitamin B ₃ (niacin) | 86 | 100 | 114 | 122 | 76 | 45 |
| Vitamin B ₅ (pantothenic acid) | 61 | 100 | 111 | 139 | 74 | |
| Vitamin B ₆ | 88 | 100 | 106 | 111 | 56 | 1 |
| Vitamin B ₉ (folic acid) | 58 | 100 | 62 | 81 | 31 | 13 |
| Vitamin B ₁₂ | 46 | 100 | 72 | 106 | 50 | |
| Vitamin C | 17 | 68 | 34 | 76 | 37 | 1 |
| Vitamin D ₃ | 98 | 100 | 130 | 131 | 245 | 84 |
| Vitamin E | 102 | 120 | 204 | 219 | 190 | 2 |
| Vitamin K | 92 | 100 | 122 | 127 | 67 | |

for cost, cost-effectiveness, and programming priorities in Title II programs.

Table 5 illustrates the nutrient targets that would be achieved for three key beneficiary groups were they to consume the recommended amounts of the proposed new formulation of CSB plus the recommended amounts of vegetable oil. It underlines the fact that since the nutrient requirements of individuals are constantly changing through the life cycle, a single product cannot be expected to achieve

the same goals for every consumer or for every nutrient. However, the formulation proposed does allow Title II to achieve at least minimum goals for most nutrients for key nutritionally vulnerable beneficiaries.

Table 6 compares macro ingredient costs for CSB14, with CSB13 and WFP's CSB++. This comparison underscores that despite considerable enhancements in the nutritional profile of CSB14, the cost increase over CSB13 (and WSB equivalents) is not expected to be substantial,

and the increase will be less than that for WFP's specified CSB++ when compared with CSB 13.

Table 7 compares components of CSB13, CSB14, and WFP's CSB++ per 100 g, the amount suggested for children 12 to 36 months of age, and considers the nutrient sufficiency of the formulations in comparison with our aforementioned nutrient targets. There are some differences in the formulations, such as for calcium. The IOM has released new recommendations for calcium, resulting in our decreased level. Note that the current reformulation is not the final word on FBF product composition; we recommend the creation of a mechanism for ongoing review of appropriate evidence that would allow for periodic updating of formulation as required.

TABLE 6.
COMPARISON OF MACRONUTRIENT INGREDIENT COSTS FOR CSB 13, CSB 14, AND WFP CSB++

| Ingredient | Cost (\$/MT) | CSB 13 | | CSB 14 | | CSB ++ | |
|---------------------------------|--------------|--------|--------------|--------|--------------|--------|--------------|
| | | g/kg | Cost (\$/MT) | g/kg | Cost (\$/MT) | g/kg | Cost (\$/MT) |
| Corn meal | 403 | 69.55 | 280 | 67.27 | 272 | 62 | 249.86 |
| Soy flour | 488 | 21.85 | 107 | 21.13 | 103 | 14.9 | 60.05 |
| Vegetable oil | 877 | 5.5 | 48 | 5.50 | 48 | 3 | 14.64 |
| Whey concentrate 80% | 5405 | | | 3.00 | 162 | | |
| Dried skimmed milk | 2976 | | | | | 8 | 238.08 |
| Sugar | 1120 | | | | | 9 | 100.80 |
| Ingredients cost (\$/MT) | | | 435 | | 585 | | 663.43 |

Source: Data from USDA and milling companies ("Ingredient Market Reports," Milling & Baking News, April 27, 2010).
Note: Ingredient costs do not include freight.

TABLE 7.
MACRO AND MICRONUTRIENT CONTENT OF CSB 13, CSB 14, AND CSB++ IN SERVING SIZE RECOMMENDED FOR CHILDREN 12-36 MONTHS (100 GRAMS)

| Nutrient | CSB13 | CSB14 & OIL | CSB++ |
|-------------------------------------|--------|-------------|--------|
| | 100g | 100g/30g | 100g |
| Kcals | 386.1 | 652.2 | 397 |
| Protein | 15.9 | 17.7 | 15.3 |
| Fat | 8.7 | 38.8 | 9.59 |
| Mineral (mg) | | | |
| Calcium | 650 | 352.9 | 755 |
| Copper | 0.403 | 0.39 | 0.497 |
| Iodine | 56.8 | 0.228 | 40 |
| Iron | 10.6 | 15.5 | 12.54 |
| Magnesium | 168.0 | 94.1 | 138 |
| Manganese | 0.815 | 0.787 | 0.756 |
| Phosphorus | 522 | 513.3 | 334 |
| Potassium | 563 | 707.1 | 1045 |
| Selenium | 0.021 | 0.02 | 0.015 |
| Sodium | 326 | 239.2 | 65 |
| Zinc | 5.94 | 6.85 | 7.58 |
| Vitamin (mg) | | | |
| Vit A | 0.819 | 0.532 | 0.825 |
| Vit B ₁ Thiamin | 0.61 | 0.746 | 0.557 |
| Vit B ₂ Riboflavin | 0.481 | 0.967 | 0.856 |
| Vit B ₃ Niacin | 6.29 | 9.74 | 7.42 |
| Vit B ₅ Pantothenic Acid | 3.285 | 3.53 | 7.39 |
| Vit B ₆ | 0.532 | 0.752 | 2.18 |
| Vit B ₉ Folic Acid | 0.247 | 0.095 | 0.110 |
| Vit B ₁₂ | 0.0013 | 0.0015 | 0.0023 |
| Vit C | 40.2 | 40 | 101.6 |
| Vit D ₃ | 0.0050 | 0.03 | 0.005 |
| Vit E | 0.98 | 13.34 | 8.7 |
| Vit K | 0.0009 | 0.033 | 0.114 |

UPGRADE THE PREMIX FOR CEREAL BLENDS AND FOR MILLED CEREALS

Currently Title II has five different fortification standards applying to corn meal, wheat flour, and soy-fortified products, including bulgur, sorghum grits, and corn masa flours. A single upgraded premix is recommended. Having a single version will reduce confusion and allow cost savings to the miller. In this case, however, the intention is not to meet 115 percent of micronutrient requirements; instead, goals are set at between 55 and 100 percent of RNI for adult women (depending on the nutrient), with a view to balancing nutrients delivered via other food sources.

Recommendation 12: Cut levels of vitamin A, vitamin B₁, vitamin B₃, and iron, but increase vitamins D₃ and B₆. The recommended level of vitamin A in the new premix is much lower than the previous recommendation. Given the levels proposed for vegetable oil and FBFs, it is recommended that the vitamin A level in cereal flours be reduced from 6.6 ppm (required for wheat flour) to 1.1 ppm. This lower level will provide 100 percent of the RNI for women, assuming consumption of 400 g, and children 2 to 5 years of age, assuming consumption of 300 g—with added CSB and fortified oil providing a margin of safety in both cases. For children 1 to 3 years of age, 100 g of fortified cereal flours provides about one third of the RNI, with CSB and oil (and supplementation with high-dose capsules) providing the remainder. Additionally, the stability of vitamin A compounds used in cereal fortification needs to be improved. Vendors of vitamin A should be challenged to address improve the stability of vitamin A in premixes. To be able to determine improved stability, it will be important to secure approval (or other official status) for a vitamin A stability test (i.e., from AOAC International or the American Association for Clinical Chemistry [AACC]).

Recommendation 13: Change the form of iron in the premix to NaFeEDTA (as in the CSB or WSB reformulation) to enhance bioavailability, which allows for slightly lower levels to be added, thereby containing costs.

Recommendation 14: Add zinc and vitamin B₁₂ at levels recommended by WHO (WHO 2009).

Recommendation 15: Remove calcium from the premix. This nutrient is both bulky and costly, causing problems at the point of mixing, and it would require a threefold increase in calcium in the premix to reach target levels of 115 percent of RNI—at which point its cost would become prohibitive. At current levels, calcium already represents 16 percent of the premix cost. Taking food technology and price factors into consideration, weighed against the role of calcium in a generic premix (for household use as opposed to being targeted to specific consumers), its removal from this particular premix is the efficient option.

Table 8 compares levels of fortification proposed for milled cereals with current Title II specifications, as well as the nutrient form. The lower amounts of thiamin and niacin in the recommendations are not considered to be nutritionally significant. Higher vitamin D fortification takes account of newer recommendations in the face of increasing evidence of vitamin D deficiency as a global problem in nutrition. Similarly, the higher amounts of vitamin B6 represent a reaction to evidence of the importance of this nutrient to protein metabolism, growth, and disease resistance.

The cost of the recommended fortification profile is approximately \$6.68/MT (based on the 2010/11 micronutrient cost of \$8.89/kg, an addition rate of 600 g/MT, and a 20 percent increase in the cost of premix). This compares favorably with the current cost of \$10.12/MT. NaFeEDTA accounts for about one third of the cost and is considered essential because of its superior bioavailability. The new fortification profile may be significantly less expensive than the current one, possibly one third less. This is largely the result of significantly lower vitamin A levels as well as the elimination of calcium in the proposed fortification profile. Although the cost of iron is significantly higher in the proposed profile due to the addition of NaFeEDTA, cost savings are still achieved by lowering vitamin A and eliminating calcium from the premix.

TABLE 8.
FORTIFICATION OF MILLED AND BLENDED CEREALS (PREMIX COMPOSITION)

| NUTRIENT | CURRENT TITLE II FORTIFICATION LEVEL | RECOMMENDED LEVEL | FORTIFICANT FORM |
|-------------------------------------|--------------------------------------|-------------------|--|
| | mg/100 g | mg/100 g | |
| Vitamin A | 0.66 | 0.11 | Vitamin A palmitate 250 (spray dried) |
| Vitamin B ₁ (thiamin) | 0.638 | 0.4 | Thiamin mononitrate |
| Vitamin B ₂ (riboflavin) | 0.396 | 0.4 | Riboflavin |
| Vitamin B ₃ (niacin) | 5.28 | 4 | Niacinamide |
| Vitamin B ₆ | | 0.4 | Pyridoxine hydrochloride |
| Vitamin B ₉ (folic acid) | 0.154 | 0.154 | Folic acid |
| Vitamin B ₁₂ | | 0.011 | Vitamin B ₁₂ 0.1% (water soluble) |
| Vitamin D ₃ | | 0.002 | Vitamin D ₃ 100,000 IU/g |
| Iron (EDTA) | 4.4 | 4 | NaFeEDTA |
| Zinc | | 2.4 | Zinc oxide |

UPGRADE THE MICRONUTRIENT COMPOSITION OF FORTIFIED VEGETABLE OIL

With an average distribution of 170,000 MT per year, oils make significant contributions to fat and calories in the food basket, and they represent the least expensive vehicle for vitamin A. At the current vitamin A fortification level of 20 ppm, vegetable oil in the quantities provided is generally sufficient to provide substantial levels of vitamin A protection for most people.

Recommendation 16: Maintain level of vitamin A in oil and add vitamin D. Reaching desired (target) levels of oil-soluble micronutrients for child beneficiaries is considerably less expensive when those nutrients are included in the food specifically targeted to children. On the grounds of cost-effectiveness, therefore, the recommendation that CSB and WSB (and future analogues) be prepared or served with vegetable oil at the point of consumption suggests that there should be an appropriate level of vitamin A in the FBF as well as in the oil (which is shared across the entire household). For household consumption targets, vitamin A is recommended

for inclusion in the premix intended to fortify milled cereals.

In addition to vitamin A, oils can be effective fortification vehicles for oil-based vitamins such as vitamins D, E, and K. The full food basket includes vitamins E and K from oil and legumes. However, there are no sources of vitamin D. Therefore, we recommend vitamin D fortification at 0.425 ppm to provide 100 percent of the RNI for adult women in a 40-g ration (Table 9). With vitamin A at 18 ppm and vitamin D at 0.425 ppm, the legumes and oil provide virtually full protection for vitamins A, D, and K and about one third the RNI of vitamin E. The oil used in the manufacture of FBFs should be nonhydrogenated, rather than hydrogenated, which will be more in line with current industry practice and thereby keep costs down.

The cost of the vitamin A fortificant at 20 ppm is estimated at \$3.96/MT of oil. The additional cost to fortify vegetable oil with the recommended level of vitamin D is estimated at \$2.13/MT. Currently, vegetable oil is fortified only with vitamin A. With an average annual purchase of 170,000 MT of oil, an increased cost of about

TABLE 9.
COST OF PROPOSED VEGETABLE OIL FORTIFICATION SPECIFICATIONS

| VITAMIN | PPM | COMPOUND | % ACTIVITY | COST (\$/KG) | COST (\$/MT) |
|--|------|---------------------------------------|------------|--------------|--------------|
| Vitamin A | 20 | Vitamin A palmitate 1,000,000 IU/g | 51 | 101 | 3.96 |
| Vitamin D | 0.42 | Vitamin D ₃ 1,000,000 IU/g | 2.50 | 127 | 2.13 |
| Total fortificant costs (\$/MT) | | | | | 6.09 |

\$2.13/MT, or a total of \$360,000 annually, would be required to add vitamin D.

2.3 INTRODUCTION OF NEW PRODUCTS

Three recommendations for “new products” are also made:

1. Include in the commodity list a range of lipid-based fortified products
2. Explore the development and introduction of new forms of cereal-based blends (particularly focusing on cereals that are nutritionally and culturally appropriate for use in Africa, and/or using alternative sources of plant-based protein, such as legumes or vegetables)
3. Consider new vehicles for micronutrient delivery, including shipping premix for bulk grains and point-of-consumption (i.e., at home) fortificant powders

INTRODUCE A RANGE OF LIPID-BASED READY-TO-USE FOODS

Arguably the most significant change in food aid during the 21st century has been the arrival of a new family of products in the form of lipid-based spreads. In terms of composition, these were originally solid-form analogues of the therapeutic milks already used for in-patient treatment of severe wasting. These RUTFs are “high-energy, high-protein milk feeds” designed explicitly to meet WHO recommendations for treatment during rehabilitation after severe wasting. They can be consumed without cooking or other preparation, and their lower water activity means a lower risk of bacterial contamination.

There is an increasing interest in variants of such RUTFs for use beyond the treatment of SAM. What are now widely called lipid-based nutrient supplements (LNSs) are already being used in the management of *moderate* acute malnutrition, in the prevention of stunting, and as a form of home fortificant used to deliver micronutrients and small amounts of fat, energy, and protein. At the time of publication of this report, numerous studies were ongoing in the rapidly changing LNS supplement area, and over the coming years much is to be learned. That said, there is already sufficient practical evidence that such products

can, appropriately programmed, be a useful complement to other food products in operations seeking to have nutritional impact, with the knowledge that their nutrient and ingredient profiles may need to be modified in the coming years on the basis of emerging data.

Recommendation 17: Lipid-based products should be available for use by Title II implementing partners. Such products should be assessed for their value to Title II operations and applied in relevant settings. It is likely that certain LNS products will be cost-effective when specific nutrition goals are explicitly defined. However, it is also recommended that FBFs continue to play an important role as part of a suite of products available to Title II implementing partners. Rather than argue for dispensing with FBFs, which have served relatively well for decades, we argue to including enhanced FBFs and LNS products in the set of food aid options available. Lipid-based products and cereal blends offer price-, taste-, and acceptability-differentiated options that can be taken into consideration when designing a ration based on local programming needs.

For comparative purposes, Table 10 presents the nutrient composition of the proposed CSB14 (100 g plus 30 g of vegetable oil as recommended), with 46 g of Plumpy’doz®, 92 g of Supplementary Plumpy®, and 20 g of Nutributter®. They are compared in this fashion, with varying quantities, because these are the recommended daily serving sizes. The FFP should continue to identify appropriate lipid-based products for inclusion in its approved commodity list and field operations. Cost-effectiveness studies in the field will be critical to determining which products offer impacts at best value.

INTRODUCE NEW FORMS OF CEREAL-BASED BLENDED FOODS AND OTHER PRODUCTS

Recommendation 18: Encourage the development of new cereal-based FBFs beyond wheat and corn as the cereals and soy as the current legume sources, including bars and other products. Several cereals offer potential as variants of CSB or WSB. One example, sorghum, could be well suited, given its acceptability in Africa, its

TABLE 10.
COMPOSITION OF CSB14 AND OIL COMPARED WITH LNS UNITS

| NUTRIENT | CSB14 +OIL | PLUMPY'DOZ® | SUPPLEMENTARY' PLUMPY® | NUTRIBUTTER® |
|---|------------|-------------|------------------------|--------------|
| | 100 g/30 g | 46.3 g | 92 g | 20 g |
| Energy | 652.6 | 247 | 506 | 108 |
| Protein | 17.7 | 5.9 | 13.8 | 2.6 |
| Fat | 38.8 | 16 | 34.96 | 7.1 |
| Minerals (mg) | | | | |
| Calcium | 352.89 | 387 | 303.6 | 100 |
| Copper | 0.39 | 0.3 | 1.84 | 0.2 |
| Iodine | 0.23 | 0.09 | 0.1012 | 0.09 |
| Iron | 9 | 9 | 11.592 | 9 |
| Magnesium | 94.1 | 60 | 92.92 | 16 |
| Manganese | 0.787 | 0.17 | 0 | 0.08 |
| Phosphorus | 513.3 | 275 | 303.6 | 82.1 |
| Potassium | 707.1 | 310 | 1124.24 | 152 |
| Selenium | 0.02 | 0.017 | 0.03036 | 0.01 |
| Sodium | 239.2 | 0 | 266.8 | |
| Zinc | 11.6 | 9 | 13.8 | 4 |
| Vitamins (mg) | | | | |
| Vitamin A | 0.532 | 0.4 | 0.92 | 0.0004 |
| Vitamin B ₁ (thiamin) | 0.7 | 0.5 | 1.104 | 0.3 |
| Vitamin B ₂ (riboflavin) | 0.967 | 0.5 | 1.84 | 0.4 |
| Vitamin B ₃ (niacin) | 9.7 | 6 | 5.336 | 4 |
| Vitamin B ₅ (pantothenic acid) | 3.53 | 2 | 3.128 | 1.8 |
| Vitamin B ₆ | 0.8 | 0.5 | 0.644 | 0.3 |
| Vitamin B ₉ (folic acid) | 0.2 | 0.16 | 231.84 | 80 |
| Vitamin B ₁₂ | 0.0015 | 0.0009 | 1840 | 0.5 |
| Vitamin C | 40 | 30 | 121.44 | 30 |
| Vitamin D | 0.03 | 0 | 20.608 | |
| Vitamin E | 13.4 | 6 | 23 | |
| Vitamin K | 0.033 | 0 | 23 | |

relatively low price, and its acceptability among host governments. A sorghum–soy (or indeed sorghum–pea or other pulse) blend could be envisaged, as could millet–soy, rice–soy, or other cereal or even potato–soy (or other pulse) blends, offering new choices for programming, potentially including new forms of fortified biscuits used in schools or for emergency response. The establishment of performance-based specifications should free up vendor initiative to explore the most cost-effective approaches to meeting better-defined nutritional product characteristics. Enhanced formulations of so-called High-Energy Biscuits (HEBs), typically used in early phases of emergencies or as snacks in schools,

should also be explored, tested, and costed. HEBs have not been reviewed or reformulated for many years.

Recommendation 19: Establish public–private partnerships to accelerate development, testing, and implementation of new products. Innovation in product development should be encouraged and supported. There are many food technology issues and challenges still needing to be addressed. These include processing, allergen concerns, packaging requirements, potential micronutrient interactions in both the premixes and the fortified foods, and organoleptic properties of FBFs. The food manufacturing

industry has the know-how and experience to identify and solve many of them. There is a need for transparent mechanisms for a) USAID and USDA to consult with industry and solicit industry input and expertise in a timely manner regarding e.g., new and modified products, technology, and safety, and b) industry to consult with USDA and USAID as needed to bring up and resolve issues related to manufacturing, product safety etc. U.S. agencies, in collaboration with the United Nations, should join forces with the private sector to fast-track the improvement of nutritionally enhanced products of all kinds. Input from industry is critical to ensuring the feasibility and cost-effectiveness of improved products; the appropriate approach would involve a public-private partnership. USAID should provide funding to launch an initiative to develop practical specifications for novel products and test them for program applicability and cost-effectiveness.

Recommendation 20: Establish a Micronutrient Fortification Program for pursuing innovations in micronutrient delivery. To ensure that USAID stays at the cutting edge in delivery of micronutrients through food aid, it should take the mandate for leadership in micronutrient programming offered by the 2008 Food for Peace Act and play a strong role in global efforts to set standards (including safety and quality assurance), establish premix norms, consider alternative measures of fortification

effectiveness, and assess the cost-effectiveness of alternative ways to deliver micronutrients.

Recommendation 21: Ship micronutrient premix and home fortificant powders as Title II products. If milled or fortified cereals cannot be shipped or procured locally, FFP should establish the practice of allowing bulk premix packages to be shipped along with bulk grains for addition to cereals milled close to the operation (within the recipient developing country). A budget will be required to support the added local costs of milling, break-bulk bill of lading¹, and rebagging. However, costs will be saved from the reduced volume of FBFs delivered when aimed at meeting micronutrient needs at the household level (that is, untargeted as opposed to focused on meeting the needs of defined beneficiary groups). Support for in-country milling and fortification capacity (training, contracting, technology development, quality assurance, etc.) in the vicinity of emergency operations will overlap with other USAID development goals, as elaborated in the Feed the Future Initiative. Joint ventures and industry-to-industry exchanges (along the lines of farmer-to-farmer programs) could allow U.S.-based millers and manufacturers to partner with FFP in enhancing the capacity of developing countries for local fortification and processing, thereby promoting modernization of their staple grain value chains.

1. Break-bulk bill of lading is the carriage (transportation) at sea of conventional goods with the exclusion of containers, in other words in the liner shipping as it existed before containerization (http://www.maritimeknowhow.com/English/Know-How/Bill_of_Lading/types_of_bill_of_lading/introduction.html)

3. PRODUCT SELECTION AND USAGE— OPTIMIZING PROGRAMMING

Improved programming is as important as improved products, as FFP seeks to achieve greater impacts in nutrition through food-based interventions, and these changes are essential to accelerate efforts to reduce malnutrition and food insecurity in the long term. Enhanced programming has several dimensions: a) better choice of products and program design (following enhanced guidance); b) changes in the way products are used (addition of oil at the point of food preparation); c) changes in packaging of products, designed to reduce sharing and improve correct use; d) improved approaches to delivery; e) more effective behavior change communication; and f) consideration of ancillary services to improve health on the one hand and food security on the

other, all supported by more specific technical guidance and an enhanced evidence base for decision making. This section makes recommendations on the matching of products to purpose, enhanced operational guidance to implementing partners, and the evidence needed for programming, and explores the special case of nutritional support to HIV/AIDS treatment.

3.1 CURRENT PROGRAMMING APPROACHES

A review was conducted of all the development and emergency programs that were operational in fiscal year 2009 and all the end-line evaluation reports available for programs ending in fiscal year 2009. In addition, a telephone survey was conducted with senior programming and logistics or procurement managers in all the implementing partner agencies carrying out programs using Title II foods during fiscal year 2009.² The survey showed that the use of FBFs varies between emergency and development programs: 50 percent of emergency programs

2. Implementing Partner Survey, FAQR (2010): The results are based on responses from 64 agencies in 40 countries, of 82 agencies initially contacted (79 of which were appropriate for interviewing, i.e., implemented at least one program making use of Title II foods). Programs that use food only for monetization were excluded. Agencies were interviewed about a total of 133 programs, where a program was defined as an activity in a particular technical sector, so that one agency in a country could represent several programs. The response rate was 81 percent, and the respondents were willing to be contacted by phone or email for follow up.

and 40 percent of development programs (where a program means an activity in one technical sector) reported using CSB or WSB. Sixty-nine percent of health programs and roughly half of education and emergency preparedness programs used FBFs in emergencies, compared with 61 percent of health programs, 63 percent of vulnerable group or social safety net programs, and 25 percent of education programs.

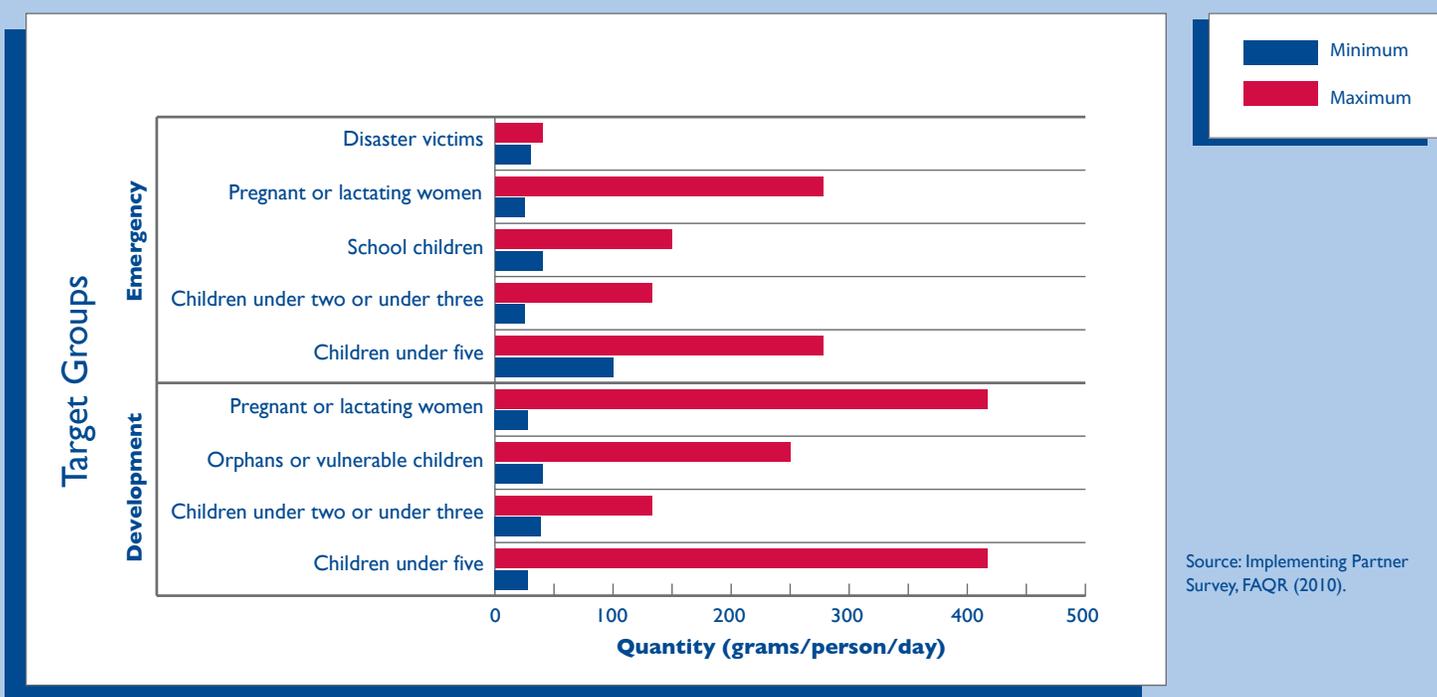
When CSB or WSB is *not* included in the ration, the commonest reasons are that a) beneficiaries are not familiar with the product or it is not culturally accepted, b) there are national restrictions on use of the food (in particular relating to genetically modified content), c) the programs do not deal explicitly with nutrition, and d) the cost is high compared with that of bulk commodities.

This review’s analysis of rations used in Title II Programs found that 12 of 30 development programs and 28 of 54 emergency programs planned to provide CSB or WSB. In both cases, all but one of these also planned to include oil in the ration. Among programs included in the Implementing Partner Survey, 30 of 76 nonemergency programs provided CSB or WSB

and 67 provided oil as part of the ration. Of 56 emergency programs surveyed, 28 provided a precooked FBF and 51 included oil in the ration. In fact, both the survey of implementing partners and our review of rations found that vegetable oil is the most widely used commodity across the span of Title II programs because of its versatility and acceptability. Virtually all the rations that include CSB or WSB also provide vegetable oil, which indicates the feasibility of ensuring that enhanced FBFs be distributed with oil. This supports our recommendation that CSB and WSB be prepared with oil. Of programs currently using FBFs, 76 percent instruct the beneficiaries to prepare the product with another food; of these 38 programs, 11 instruct the beneficiaries to prepare the product with oil and 7 to prepare it with sugar (FAQR 2010).

Among these programs, the majority of maternal and child programs (92 percent) use FBFs for explicit nutritional goals; 88 percent cite maintenance of adequate growth, and several cite treatment of moderate malnutrition; only 4 percent mention treating but 8 percent mention preventing micronutrient deficiencies. Half of the programs using FBFs for emergency

FIGURE 3.
CSB RATION RANGES BY EMERGENCY VS. DEVELOPMENT



Source: Implementing Partner Survey, FAQR (2010).

preparedness and vulnerable group feeding or social safety nets also cite specific nutritional goals, such as maintaining adequate growth. In the case of education, use of the ration as an incentive was cited 27 percent of the time, and in vulnerable group feeding or social safety nets, “ensuring the adequacy of a general ration” was also cited as a reason for using FBFs. Overall, 20 percent of programs reported using FBFs as a wage or incentive, but of these, 80 percent said that the goal was explicitly related to nutritional improvement.

One of the most striking results to emerge from the present review of rations was the wide variability in the amount of FBFs included in the rations for various target groups. These results were confirmed in the survey. Figures 3 and 4 show the range in the amount of FBFs included in the rations from lowest to highest for each target group, aggregated as well as broken down by the kinds of programs in which the product is delivered.

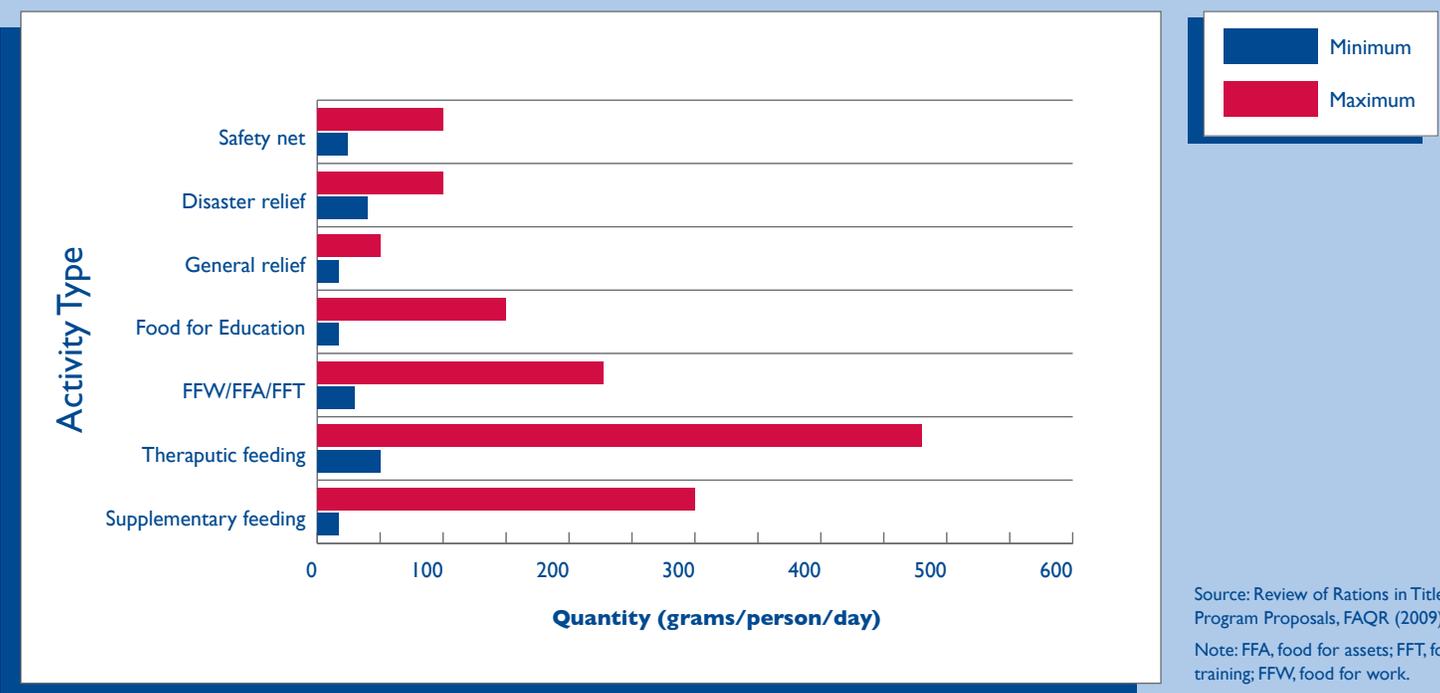
The widespread practice of intrahousehold sharing and the wide range of rations programmed suggest that the fine tuning of micro- and macronutrient content to meet the nutritional

needs of specific target groups needs to be balanced against the need to allow for fairly wide tolerances in the composition of these foods. Careful programming, improved communication, and changed packaging *may* reduce leakage, but these are unlikely to eliminate sharing completely, given the cultural and maternal inclination to provide for the whole family.

Any new product, FBF or LNS, needs to be designed with the expectation that the quantities consumed cannot be completely managed and controlled by the implementing agency. Further study of the factors that influence intrahousehold distribution and consumption is sorely needed. However, there is also a need for better sharing of information currently available on food aid programming realities (based on evidence from the field); this could allow for potential replication of innovations.

Recommendation 22: The capacity for rigorous evaluation of program innovations should be strengthened. When new products or new program elements are introduced, evaluation of these elements should be required in at least two different country contexts before the innovation is accepted as a permanent part of the

FIGURE 4.
CSB RATION RANGES BY TYPE OF ACTIVITY



Source: Review of Rations in Title II Program Proposals, FAQR (2009).

Note: FFA, food for assets; FFT, food for training; FFW, food for work.

Title II program. Evaluation of any new product (including those we recommend in this report) must take into account the complementary program elements discussed above and must assess effectiveness by comparing “like with like,” that is, using the different products in comparable program contexts. Investment in the provision of technical assistance and resources to conduct studies will be returned in their contribution to more effective and cost-effective programs. Not every implementing partner will have the capacity to design and implement such studies, and technical assistance and, in many cases, external support will be needed to implement the kinds of evaluations that genuinely contribute to an understanding of what works, and why.

3.2 THE CASE OF HIV/AIDS PROGRAMMING

Not identified separately in Figure 4 are programs that offer foods in support of HIV/AIDS programming. Programs delivering ART continue to expand and reach increasing numbers of infected individuals. However, although there have been advances in HIV treatment, equivalent advances in the programming of nutritional support to ART activities remain limited. The scientific literature suggests that weight loss, which is extremely common in HIV infection, is independently associated with increased risks of disease progression, opportunistic infection, and death. Studies in which macronutrients were given in a variety of formulations were consistently able to demonstrate an increase in weight or body mass index (BMI) (Clark et al. 2000; de Luis et al. 2003; Ndekha et al. 2005; Schwenk et al. 1999; Swaminathan et al. 2010). The inclusion of food rations in ART programs suggests that the availability of rations increases adherence to ART and also results in an increase in BMI that does not persist, however, after discontinuation of the ration. Although dietary interventions are often able to improve BMI, they do not return it to a normal or pre-morbid level. Taken together, these data strongly suggest that both food access issues and altered metabolism play a role in weight loss and nutritional compromise in HIV-infected individuals. RUTFs appeared to be linked to more rapid gain in weight. None of these studies were able to

demonstrate any impact on CD4 count (cluster of differentiation 4) or viral load, although these were not included as endpoints in most studies.

A telephone survey was conducted with all country coordinators for the President’s Emergency Plan for AIDS Relief (PEPFAR), as well as a review of both the grey and published literature for descriptions and evaluations of programs that have delivered food specifically for people infected or affected by HIV. This survey will be referenced throughout the following section.

Title II has used food in HIV programming since 1999, focusing on meeting the needs of HIV-affected food-insecure households. PEPFAR-funded programs have only used food since 2006, and the priorities of these programs have focused on meeting the nutritional needs of HIV-positive pregnant and lactating women, orphans and vulnerable children born to HIV-positive parents, and HIV-positive adults in care and treatment programs. This support is delivered largely through nutrition assessment, counseling, and support (NACS) programs that include, as one component, provision of food supplementation, otherwise known as Food by Prescription (FBP). These programs emphasize the nutritional rehabilitation and/or support of the HIV-positive individual to improve well-being and treatment outcomes. However, there is limited guidance on priority beneficiary targets for nutrition support through such programming.

Recommendation 23: USAID and the office of HIV/AIDS should develop guidance on priority demographics for nutrition support and food assistance.

Recommendations from PEPFAR suggest that orphans and vulnerable children and HIV-positive pregnant and lactating women are most vulnerable and that they should be prioritized for food assistance. However, in practice the most commonly targeted groups are HIV-positive non-pregnant women and other adults (along with adolescents). To achieve a switch or broadening of target emphasis would require that programs develop a stronger link with ongoing antenatal, Prevention of Mother-to-Child Transmission (PMTCT), and Maternal and Child Health (MCH) services and with programs that treat wasting among

children. Those individuals with HIV in any group (pre- or post-ART, and of any age) who are moderately to severely malnourished should be prioritized for nutrition intervention.

Articulating the objectives of the use of food in HIV programming is important; as with all other food programming, we need to ask the question “for what?” Weight loss, which is extremely common in HIV infection, is independently associated with increased risks of disease progression, opportunistic infection, and death. Studies in which macronutrients were given in a variety of formulations were consistently able to demonstrate an increase in weight or BMI. The inclusion of protein led, in one study, to an increase in lean body mass (Swaminathan et al. 2010; Ndekha et al. 2005; Schwenk et al. 1999; Clark et al. 2000; de Luis et al. 2003). The inclusion of food rations in ART programs suggests that the availability of rations increases adherence to ART and also results in an increase in BMI that does not persist after discontinuation of the ration. However, although dietary interventions are often able to improve BMI, they do not return it to a normal or pre-morbid level. Taken together, these data strongly suggest that both food access issues and altered metabolism play a role in weight loss and nutritional compromise in HIV-infected individuals.

Recommendation 24: Better indicators of nutritional need and cutoffs are needed to determine eligibility for food assistance in HIV programming. Because HIV programming largely deals with adults, questions about nutritional assessment and appropriate indicators and cutoffs for eligibility are particularly pertinent. Moderately malnourished individuals and those being monitored pre-ART should be included where possible. There is emerging evidence to suggest that the earlier malnutrition is detected and treated, the more likely it is that food will slow progression of the HIV disease. However, food supplementation should be time limited, with specific graduation or exit criteria for program participants. This is usually achieved with an anthropometric criterion, such as BMI greater than 18.5, or with some kind of socioeconomic criterion.

Most program descriptions reviewed, and all PEPFAR country programs surveyed, articulated objectives that could be classified according to the three broad goals: i) treatment, ii) care and support, and iii) prevention and mitigation. PEPFAR uses food mainly for nutritional rehabilitation, whereas Title II supports broader nutrition, food security, care, and support. Considerations of the type of food most appropriate to meet these different objectives are very different. Therefore, for this review it is useful to group program objectives into “nutritional” and “non-nutritional” (i.e., those that aim to use food to support participation in services, to affect health outcomes such as the progression of HIV itself, or to improve food security).

Of the 48 programs reviewed, 94 percent delivered food for some kind of nutritional objective, 45 percent aimed to achieve both nutritional and non-nutritional objectives, and only 8 percent aimed to achieve only non-nutritional objectives. FBFs were used by all programs that specified nutritional objectives, i.e., that aimed to prevent deterioration or to treat undernutrition. Most of those programs (75 percent) also used other basic commodities, such as cereals and grains, oil, and pulses. Of the 25 programs that specifically aimed to treat adults or children suffering from moderate or severe wasting, 72 percent used a ration that included FBF with other basic commodities, including oil. Of this group, 50 percent also added an LNS to the ration.

Recommendation 25: A strong signal is needed from PEPFAR supporting allocation of funds for food in HIV programs. PEPFAR country coordinators report that requests for approval of the use of funds for food are still commonly met with caution. This contributes to low coverage of food assistance within programs. Coordinated work between PEPFAR, Title II, and Feed the Future should create a clear agenda and strategy for enhancing the use of nutrition assessment counseling and support (NACS) in HIV programming. A continued effort is required to expand Title II targeting mechanisms to use clinics, PMTCT, and other HIV service delivery sites. In addition, programs that implement stronger “wrap-around” mechanisms, such as economic strengthening and social assistance,

express higher levels of confidence in their ability to graduate clients. Support for ongoing initiatives such as the Livelihood & Food Security Technical Assistance Project (LIFT) project, which aims to enable U.S. Government-funded programs to support the improvement of food security of HIV-affected families through livelihood assistance and economic strengthening activities will be beneficial. For PEPFAR/FBP programs, the need for such support also reinforces a need to link with Title II and other food security support programs through “hybrid” agreements and proposals. Documentation of successes in this area remains scarce and is needed.

The PEPFAR survey highlighted demand for increased access to a wider variety of products, such as LNS. The reasons varied from recognizing the need for products that provide protein and micronutrient density for people with increased nutritional requirements, to “ease of programming” compared with bulky flours. Many acknowledged that funding would be a limiting factor. As a result, increasing numbers of programs are combining the use of an FBF with an LNS, particularly for severely wasted HIV-positive adults and moderately wasted HIV-positive adults and children. The thinking behind this combined ration is that it supports higher nutrient intake and improved effectiveness of programs that aim to rehabilitate wasted individuals while keeping costs down and diet diversity more acceptable. There is increasing anecdotal evidence that adults do not like eating only the sweet LNS pastes.

Enhanced versions of CSB and WSB that, with the addition of oil, could meet the generally increased requirements of PLHIV to maintain or improve the nutritional status of non-wasted individuals or to address moderate acute wasting in this group without the need for combining products would be useful. A Ready-to Use Supplementary Food (RUSF) would also be appropriate for addressing the latter. There is a need to conduct both effectiveness and cost-effectiveness studies to examine the advantages of using each commodity for these objectives. In many countries, very large numbers of HIV-positive adults with mild-to-moderate malnutrition

are being identified, and the cost of providing nutritional support to these adults (particularly with an imported LNS) is a commonly voiced concern. An improved, locally produced FBF has the potential to be more cost-effective.

Second, fortified cereals (flour and meal) or fortified cereal blends (such as FBFs) also fulfill an important role in combined rations where they improve acceptability (particularly for adults) and protect the ration of nutrient-dense spreads for the treatment of severe acute wasting. In programs that do not have a nutrition rationale, there is no need to provide products that are designed with nutrient density in mind. Issues such as ease of use and acceptability do become more important for PLHIV, who may not have the resources, social support network, or good health to support ration collection, use, and consumption by program participants.

Where there *is* a defined nutrition rationale, improved data collection is essential in order to determine best practice in food support. Of the 48 programs reviewed, 20 detailed a list of indicators that they planned to use to monitor program progress and outcomes. Of these 20 programs, only 7 documented nutritional outcomes (quantitative and/or qualitative measures) in their own monitoring and evaluation. Where programs attempt to measure impact, neither eligibility and graduation criteria, rations provided, nor the indicators used are standardized; thus, it is impossible to compare outcomes across programs.

3.3 ENHANCING PROGRAM GUIDANCE TO IMPLEMENTING PARTNERS

A range of guidance is provided to USAID implementing partners as they prepare their proposals. A review of the available guidance demonstrates some problems. One is that there are multiple sources of guidance, some quite lengthy, all of which need to be considered in agencies’ responses. The length and complexity of guidance for Title II programs exceeds that for other U.S. food assistance programs. A more serious problem is that the guidance is at times inconsistent, providing conflicting advice in different places, and the sources of information

on ration composition (in particular the CRG) contain information about the nutritional composition of foods that is in places out of date and/or incorrect. A comprehensive review of program guidance provided to Title II implementing partners should be conducted, with a view to simplifying and harmonizing the guidance provided and assuring that it is up to date, correct, and consistent.

A recent change is that USAID now provides food security analyses through FANTA-2 for agencies applying to implement development programs. These analyses do not offer guidance on program design, but they do provide a detailed analysis of the food security situation and its determinants, based on available data. This level of analysis of national food security context is probably beyond the technical capacity of many of the individual implementing partners, so having it done by an outside agency is a positive development. However, where implementing organizations are designing programs that do have nutritional intent, their capacity to identify problems to be tackled, understand local diets needing to be changed, and document the impact of interventions needs to be considerably improved.

Recommendation 26: Support implementing partners to incorporate data on local consumption and food availability into the design of rations and programs. Few, if any, programs design their rations based on empirical data about local diets and consumption patterns. The majority of plans reviewed make reference to calorie gaps estimated from FAO food balance sheets or, in some cases, from needs assessment missions. The paucity of information has meant that food-assisted programs and the choice of both quantity and quality of the commodities in the rations have not always supported the specific needs of the most nutritionally vulnerable, nor always accounted for food resources present in the community and diet practices. We do *not* recommend that each agency undertake primary data collection on dietary consumption prior to designing its own programs. However, we recommend attempts to narrow the gaping chasm between knowledge of dietary realities and program design. Many

agencies implementing programs using Title II foods have been working in the same area for many years; agencies should be encouraged and assisted to incorporate, explicitly, their knowledge of local food availability and food consumption in the design and justification for their programs, including the design of their food rations.

Recommendation 27: USAID should improve training on needs assessment and on monitoring and evaluation methods and tools with regard to nutrition. If programs are to be designed with appropriate reference to local conditions, new approaches must be more rigorously tested, and empirical support must be provided for common assertions about the effectiveness of specific program elements and their cost-effectiveness. To enable implementing partners to do this, USAID will need to improve their capacity to undertake the necessary studies. In addition, funds and sources of technical assistance to the agencies to support these activities should be identified.

Recommendation 28: USAID should systematically incorporate cost-effectiveness into the evidence base for nutrition programming. In nutrition interventions, the cost of programming (versus the cost of product) has had too little attention. As Ashworth (2006) noted in the mid-2000s, information on the cost of the products used is important, but the product does not deliver itself; equally important is clarity on the cost of “logistics of procurement and distribution.” The lack of costing data on programming is common problem in the intervention literature. Enhanced evidence on the efficacy of food supplements, but especially on the effectiveness of food-based interventions as implemented, is urgently needed to establish policy and program options to deal with the coexistence of protein–energy malnutrition and multiple micronutrient deficiencies. A number of important program issues require empirical investigation to ensure that assumptions and assertions are justified. Similarly, program impact is commonly reported in midterm and endline evaluations using indicators such as the percentage of children under two who are malnourished (underweight [low weight-for-age Z score] or stunted [low

height-for-age Z score]). Other, more process-oriented indicators include the number of individuals or households reached, the amount of food distributed, and other process-focused accomplishments. These numbers are of limited use in choosing among programs unless the cost of achieving a particular impact is included in the analysis. Therefore, some estimate of cost and cost-effectiveness should be incorporated as a routine element of program evaluations.

There is, as noted earlier, a significant amount of programming that does not have explicit nutritional intent (although there are other, equally appropriate goals). For such operations, the selection of commodities and choice of ration sizes should not be guided by nutritional parameters, but by other priorities. FFP must provide clearer guidance to implementing agencies on the recommended compositions of food rations for different nutrition goals (matching product to purpose). Current practice allows for a wide range of quantities to be programmed and requires little empirical support (i.e., based on current dietary and consumption patterns) for the choices made. Guidance should be framed and communicated through easy-to-use flow charts and decision trees accompanied by clear “how-to” guides. In all cases, rations should be tailored for, and appropriate to, clearly defined outcomes.

Recommendation 29: Enhanced guidance should be prepared (such as decision tree tools) to enable agencies to better select commodities for programming. Annex 1 presents a set of flow charts and decision trees to guide the selection of commodities for different kinds of emergency and nonemergency programs. These graphics provide a basis for making decisions about the composition of food aid rations for different purposes. They are intended as guidance and of course must be applied flexibly in light of the specific situation in which food is being used. They represent just a first step in the development of tools for improved programming decisions.

The foods developed for use under Title II should be appropriate to their defined objectives if they are to achieve cost-effectiveness. Enhanced versions of CSB and WSB and

other FBFs should be used primarily in support of interventions that have explicit nutritional goals. Rations used as an incentive or as pay (e.g., food-for-work or food-for-training) should be based on the local value of commodities with respect to wages and on household (as opposed to individual) needs. In contexts in which targeted outreach to nutritionally vulnerable individuals is possible, the family ration should not automatically include nutritionally enhanced products. However, when it is deemed that a household ration will not meet the needs of vulnerable consumers (such as infants 6 to 12 months of age in an emergency setting where non-food-aid sources of food are limited), then enhanced products can be added to the general distribution.

3.4 WHAT WILL IT COST? IMPLICATIONS OF PRODUCT AND PROGRAMMING CHANGES

To roughly estimate the effect of recommended changes in products and programming approaches on overall intervention costs, seven of the largest (in term of tonnage) Title II emergency programs in fiscal year 2009 were compared to assess their overall costs under current program expenditures (using current prices) versus potential expenditures following the recommendations made here on upgraded products and changes to programming approaches (as captured in the decision trees laid out in Annex 1). Fiscal year 2009 development programs operational in the same countries were also included in the calculation to get a sense of development program costs as well, which increased the number of programs assessed to 10.

Table 11 suggests that when rough estimates of actual versus projected costs of programs are used, the net impact of improved products and programs on costs is not hugely higher, despite the expected gains in nutritional benefit. The calculations are based on real commodity and freight prices drawn from averages of fiscal year 2009 commodity prices received from USAID and real ration quantities taken from a number of proposal narratives for each country or implementing partner.

TABLE II.
PROGRAM (ESTIMATED) COST COMPARISONS UNDER RECOMMENDED
CHANGES TO PRODUCTS AND PROGRAMMING APPROACHES

| PROGRAM | ORIGINAL C&F (1000S) | NEW C&F WITH FAQR SCENARIO (1000S) | % CHANGE IN C&F |
|-----------------------------------|-------------------------|---------------------------------------|-----------------|
| Emergency | | | |
| DPRK Mercy Corps | 45,787.7 | 47,036.5 | 2.7 |
| Ethiopia WFP | 606,606.9 | 667,292.4 | 10.0 |
| Guatemala WFP | 25,141.0 | 25,512.3 | 1.5 |
| Haiti WFP | 71,671.1 | 88,916.4 | 24.1 |
| Kenya WFP | 87,734.4 | 87,936.1 | 0.2 |
| Niger WFP | 154,262.2 | 161,594.5 | 4.8 |
| Somalia WFP | 76,776.3 | 82,490.1 | 7.4 |
| Development | | | |
| Ethiopia Catholic Relief Services | 41,243.3 | 41,319.5 | 0.2 |
| Guatemala Mercy Corps | 19,295.7 | 20,884.1 | 8.2 |
| Haiti World Vision | 24,086.1 | 23,446.9 | -2.7 |

Note: C&F Commodity and freight; DPRK, Democratic People's Republic of Korea; WFP, World Food Programme.

Several factors cause program costs to increase in some countries under the FAQR scenario (i.e., FAQR-recommended rations and commodities per technical sector and target group). First, in programs where CSB13 (the current version) was used for nutritional purposes (i.e., in settings where beneficiaries are screened for malnutrition or where nutritional improvement is an explicit objective), the recommended versions of CSB and WSB raise the cost of product, though not necessarily of programming. Second, in programs that provide whole grains in the ration, the FAQR scenario recommends milling and fortifying those grains, incurring a cost relating to milling, fortification, and bagging. Since the quantity of whole grains provided in emergencies is high in the fiscal year 2009 scenarios considered, this element raises costs, while delivering needed micronutrients to very large numbers (millions) of beneficiaries. Third, because the review recommends serving enhanced FBFs with vegetable oil, the total amount of vegetable oil programmed is (in this calculation) increased if this is necessary to meet recommended preparation levels (15 g vegetable oil for 50 g enhanced FBF).

However, although some costs increase, a factor causing costs to decrease is the recommendation that enhanced FBFs be used only for nutritional purposes (i.e., in programs targeted to specific,

nutritionally vulnerable demographic groups). Therefore, where CSB13 was used in fiscal year 2009 for non-nutritional purposes (e.g., as an incentive or pay), it was replaced in this exercise by less expensive fortified products, such as SFG, or by fortified milled grains (depending upon the country or region and the level of nutrient need determined by FAQR-established criteria). The average increase in cost for the nine programs seeing a rise was 6.6 percent (or 5.6 percent when the program seeing a reduced cost is included).

This estimate represents just a first step in what should be a serious process of assessing actual and likely costs of changes in product price and packaging, as well as costs relating to recommended changes in programming—that is costs per outcome desired, not simply cost per ton of product delivered. Empirical assessment should be conducted of the change in program costs as these recommendations are implemented.

4. OPTIMIZING PROCESSES

4.1 ENHANCED COORDINATION ACROSS THE U.S. FOOD AID SYSTEM

A large number of agencies and stakeholders are involved in food aid today, including FFP, the Office of Foreign Disaster Assistance (OFDA), several agencies within USDA, the Department of Defense, the Food and Drug Administration (FDA), the State Department, USDA, and others, yet the lines of accountability are not always clear or transparent. Currently there is a division of roles and responsibilities between USAID and USDA for the provision and distribution of Title II foods. USDA is responsible for the development of food specifications and provides the quality assurance oversight for the production and shipment of foods. However, the foods are distributed under the oversight of USAID in the field. As nutrition science develops, there will be an increasing need for closer collaboration on a technical level between these two agencies and between other agencies to facilitate the development and review of new products, assess quality, and resolve concerns. This increased collaboration will benefit food aid administered by USDA, which increasingly is exploring the use of new products (e.g., for its McGovern-Dole International Food for Education and Child Nutrition Program).

Recommendation 30: Establish an Interagency Food Aid Committee. An Interagency Food Aid Committee (IFAC), co-chaired by USAID and USDA, is needed to facilitate all-of-government oversight of the increasingly complex food aid agenda. Made up of technical experts from

USAID and USDA (as well as WFP and UNICEF), it would facilitate systematic reviews of products and quality assurance systems and would investigate and resolve complaints in a timely manner. Fragmentation of oversight responsibilities across the U.S. Government leads to confusion. It also weakens the potential for enhanced coherence with the U.S. Government's various global initiatives, to which FFP and its partners have a lot to contribute. What is needed is a "one-stop shop" for matters dealing with U.S. Government food aid. The FAQR has already begun to hold a series of interagency meetings to foster information exchange and lay the foundation for enhanced communication and collaboration among various agency stakeholders.

Committee representation should be broad, but participants would have expert technical knowledge. The committee would seek regular and substantive involvement of key technical departments in both USDA and USAID, while also seeking formal representation of FDA, IOM, and the Food and Nutrition Board of the National Academy of Sciences. In addition, the committee would invite as observers key international food aid bodies, including WFP, UNICEF, UNHCR, and IFRC. The goal would be to promote policy alignment, share resources where appropriate (such as in promoting joint public-private partnership initiatives around new product development and testing), and establish a common product review and approval process.

The committee would oversee issues relating to food aid products *and* programming, with a mandate allowing it to a) convene expert panels to address critical questions as they arise; b) commission relevant reviews of the effectiveness of new products in the field (suppliers to demonstrate efficacy and acceptability, while users [implementing partners] should have a voice or a vote on proposals to formally adopt new products); c) support improved communications among industry or suppliers, stakeholders in the field, and other donors; d) play a role in coordinating responses to requests for information from Congress (including coordination of data used in the Foreign Assistance Coordination and

Tracking System and playing a more proactive role in informing members of Congress about food aid issues); and e) contribute to the U.S. Government's determination of "eligible" or "priority" countries (based on food aid needs and consideration of wasting and micronutrient deficiencies, not just the current focus on stunting as the single metric of malnutrition).

4.2 NEW PRODUCT INTRODUCTION AND MODIFICATION

The system for introduction and review of new Title II products involves many steps and several offices within USAID and USDA. Although new product introductions can be internally generated as needs arise, there continues to be external pressure on FFP to adopt "new" products. Most of the pressure is driven by suppliers and the food industry, with companies approaching FFP and USDA on an ad hoc basis with ideas for new products. It is not clear that these products respond to a felt need on the part of the agencies that will use them. Even when internally generated (within the community of U.S. Government food aid programs and implementing partners), the process of approval can take years. For example, it has taken 10 years (2001 to 2011) from concept to procurement of an Emergency Food Product line of paste and bars for early-stage emergencies. Many commercial products are already available or in development that could be of interest to Title II. There is, therefore, an urgent need for a more streamlined process for approval of new or modified products that is clear, straightforward, transparent, and timely. Further, there is a need to assess the nutrient compositions of approved food aid products in light of emerging scientific evidence and evolving target group needs. We recommend the establishment of a formal, systematic process for ongoing, rather than repeated, periodic ad hoc reviews of issues around product composition.

Recommendation 31: Establish a formal product review and approval process. Under the auspices of the proposed IFAC (above), a new multistakeholder working group would deal with technical and scientific review of existing and proposed new and modified products. This technical subcommittee would ensure that scientific

and technological advances, new developments in programming, and emerging nutritional and food security considerations are reviewed on a systematic, ongoing basis and applied to the design of food aid programs as appropriate. This process or system should be co-owned and co-funded with relevant UN agencies, with a view to moving toward convergence on specifications for, and guidance in the usage of, nutritionally enhanced food aid products.

The review and approval process would need to include the following elements: a) A jointly funded and "owned" external (outside the U.S. Government) Interagency Technical Advisory Group (ITAG) should be established that would serve the U.S. Government (including representation from key offices and divisions within USAID, USDA, the Centers for Disease Control and Prevention (CDC), the National Institutes of Health (NIH), and FDA, as appropriate, but also WFP and other relevant agencies) as a "one-stop global shop" mechanism for product (or ingredient) review and approval. b) The review and approval process should be of industry standard in terms of pace of response to interested parties. A transparent timeline (deadline) for decision making should be established and communicated. c) The ITAG would offer publicly accessible generic feedback (open guidance) relating to products reviewed and problems encountered. Reviews would be blind, but communication to applicants about why decisions were made, suggestions for avoiding delays in review, future challenges likely to be faced, etc. would be a valuable mechanism for public-private engagement around product development. The approval process for new products should be no more complex and cumbersome than that in the commercial sector and should be standardized with the approval processes of WFP and UNICEF, so that a single approval would be deemed sufficient by the other partners (and review of products already approved by one of the other agencies would be expedited). The process for approval of single ingredients should be distinct from the process for approval of multiple-ingredient (processed) products. A confidential, reciprocal approach to auditing of suppliers (plant and laboratory inspections) would allow

for sharing of knowledge and costs (avoiding multiple audits or demands for information from the same suppliers) and identification of capacity gaps requiring attention.

Although it is desirable to develop specifications for the nutritional composition of finished products, true performance-based specifications, with penalties for nonperformance, need to be developed based on industry standards of private sector procurement processes. Steps should be taken with input from industry to move toward such performance-based specifications and appropriate sanctions for noncompliance. Input from the field should be taken into account when new products are proposed, and a system should be established to facilitate such input, including comments on proposed products and a system for requesting the development of products or product modifications to meet the program needs of the agencies.

Recommendation 32: Establish performance-based specifications (i.e., basic nutritional profiles of final products) for nutritionally enhanced products. Lowest cost is not always compatible with best value (when food safety or other quality problems arise), let alone with nutritional quality. “No tolerance” rules should be established for suppliers such that minimum quality is maintained. More than one third of complaints about commodities and products reported by SUSTAIN (2006) related to CSB; another 20 percent focused on oil, with almost 10 percent concerning SFB and fortified corn meal. Complaints about the quality of CSB mostly concerned shelf life and organoleptic issues. Complaints about the quality of vegetable oil concerned the packaging strength of metal containers. A number of these issues have been resolved and prevented through new procurement specifications and quality control measures in recent years. Vendor specifications should include rigorous performance criteria with penalties for nonconformance, including exclusion from subsequent tender bids for a predetermined period (a “time-out” clause). The use of price discounts for substandard processed food should be discontinued.

The number of FBF manufacturers in the United States participating in the program has fallen

considerably in recent years. Consultations with industry, USAID, and USDA representatives all confirm that the main reason for this decline is the lack of predictability in orders, which does not allow vendors to plan production consistently. Current vendors who are members of the North American Millers Association (NAMA) note that having a more consistent order requirement would allow them to supply a pipeline on a regular basis, and in cases of urgent need would allow them to meet extra demand in a timely manner.

One way of increasing the vendor base would be to investigate alternative vendors to produce FBFs, such as dry food blending manufacturers. These could include bakery premix suppliers, custom dry blenders, breakfast cereal manufacturers, etc. Consideration should be given to the development of annual supply contracts for CSB and WSB that would include periodic regular delivery of foods into the pipeline and repositioning of stockpiles for emergencies. These measures would apply to other FBFs and specialized products that are needed on a relatively small tonnage basis. It should be noted that once the effectiveness of reformulated FBFs used in enhanced programming contexts deliver improved outcomes, field demand for FBFs would increase, leading to a need for increased, not just enhanced, output.

Recommendation 33: Develop a planning model that would better predict demand for FBFs and support longer vendor contracts for value-added commodities. The current procurement system is widely perceived as lacking transparency and consistency. It is also seen as too short-term in the specification of contracts. A lack of predictability in demand, together with cost inefficiencies arising from unsecured contracts over the longer term, results in waning interest among vendors and leads to concerns about the supply of quality products. Planning is not easy for existing vendors, and new vendors are put off by their perception that procurement processes are unwieldy and inconsistent. Revising the procurement system to allow for 12- to 18-month contracts based on a fixed volume rather than batch-by-batch tenders and repositioning of emergency stockpiles of

FBFs for rapid deployment would permit more predictable contracts.

4.3 QUALITY ASSURANCE

Dealing with problem products is a lengthy process, involving many supply chain steps along the value chain. Recent negative experiences with certain products, the complexity of tracing responsibility, the lack of timeliness, and the cost of problem solving have all contributed to a less than optimal process. USAID and USDA have developed a feedback loop, but it is complicated and there is no definitive feedback to the companies or the implementing partners in the field that the problem has been resolved and that the supplier and product have been cleared; as a result, to industry and implementers alike, there seems to be no closure. Timing also has proven to be a constraint. Contract requirements are very tight, with vessels booked and penalties for late shipment. Any delay costs vendors dearly, and serious quality problems cause serious problems for all involved in the supply chain from vendor to recipient. Several of the recommendations made below have been made before by SUSTAIN.

Recommendation 34: Design and implement a comprehensive food aid quality assurance strategy and plan of action. With increasing public concerns about food safety, growing international scrutiny of food aid products, and continued problems with the quality of certain batches, it is important for USAID and USDA to work more closely together to establish transparent and rigorous mechanisms for oversight of quality throughout the food aid commodity supply chain.

This should include the following elements. First, a raw materials quality assurance system has to be developed, including mycotoxin monitoring, with required testing by millers or required certificates of assurance from suppliers for susceptible products. Nutritionally enhanced foods should be manufactured in plants that use food-based quality systems such as Good Manufacturing Practices (GMP) and/or Hazard Analysis and Critical Control Points (HACCP) that are common in private sector food manufacturing. Standardized and transparent methods

for batch and laboratory testing and reporting and guidance on how to deal with suspected problems are priorities. Second, vendor specifications should include rigorous performance criteria with penalties for nonconformance, including exclusion from future tender participation until certain criteria are met. Third, a new approach is needed to quality control via site inspections, whereby plants producing value-added foods would be subject to FDA quality standards and inspections. Premix producers and analytical laboratories should also be audited. Fourth, clear sampling and testing procedures, with defined responsibilities for agencies and industries, are essential, including defined steps for the assessment of problem batches of products. Detailed sampling procedures and analytical parameters must be laid out clearly. Methods to achieve representative sampling of lots are critical, and sufficient quantities must be retained (separately, rather than mixed) to allow validation testing at accredited laboratories.

Recommendation 35: Update the Commodities Reference Guide (CRG) and establish a process for regular updating and communication. A major overhaul of the CRG is needed to correct inconsistencies and errors of fact, fill in missing data, and ensure that the guide serves the purpose for which it was intended. Responsibility for maintaining (updating and correcting) the CRG should be clearly defined. Commodity groups and industry, as well as scientific experts, should be brought into this process of overhauling current information. Inconsistencies between USDA's food reference database and alternative sources of nutrient composition should be investigated, and major differences should be clearly flagged and explained.

5. CONCLUSIONS

“The question is not whether we can end hunger, it’s whether we will.”

**SECRETARY OF STATE,
HILLARY RODHAM CLINTON**

USAID and its food aid partners carry out very effective work around the globe in harsh and difficult settings. Food delivered is saving lives and promoting development in diverse contexts. The instances of serious systems failure are remarkably few, given the tonnage of food shipped, the range of implementing partners involved, and the number of beneficiaries reached. However, this does not diminish the importance of seeking to enhance all aspects of quality assurance and control and of ensuring that such efforts become systematized, rather than pursued periodically in an ad hoc manner. Improvements in products developed, modified, and used and in the ways that FFP carries out its business will be important for future success.

It is increasingly accepted that food aid has a part to play in addressing certain categories of nutrition problems in developing countries. Its role is not simply to “feed hungry people” in a generic sense, but to address specific needs of vulnerable people in both emergency and nonemergency settings where food is the optimal resource to use. High-quality bulk grains moved quickly to feed very large numbers of people in emergency contexts are, and will remain, important; so too

are nutritionally enhanced products targeted to smaller numbers of particularly vulnerable individuals. All need nutritionally appropriate foods of the best quality. Cost-effective programming requires the optimal delivery of appropriate *combinations* of foods so that defined nutrition goals can be achieved. In this sense, the measure of success relates less to tonnage of commodities moved than to desired outcomes achieved.

Upgraded FBFs, programmed appropriately and consumed in expected amounts, would support the programmatic goals of management of moderate wasting (targeted supplementary feeding); support for MCHN, including growth promotion and the prevention of stunting (PM2A and other operations reaching mother and infant pairs); and the management of nutrition among persons with HIV/AIDS and tuberculosis. Such programming goals cut across the conventional emergency development funding envelopes. Other than lifesaving or life-supporting products intended for immediate response to humanitarian crises (such as humanitarian daily rations or emergency food bars), FBFs are not tailored for emergency or for development settings but rather for specific goals within either setting.

That said, no one product can be effective for every purpose in every setting, regardless of how much it is enhanced and fine-tuned. Although products can be optimized in terms of a tradeoff between nutrient composition and cost, no food can fulfill all nutrient requirements of all potential beneficiaries over time. This necessitates tailoring of products to purpose and greater attention to the contribution of individual products in the context of whole diets.

As a result, improving food aid quality means not only fine-tuning the composition of products; it is equally about appropriate programming of those products. Not only must

food aid be fit for purpose—nutritionally adequate for its intended purpose, safe, and culturally appropriate—but programming must also be appropriate to the products selected. Product formulation is not the only, or even always the most important, factor in achieving nutrition impact. This field has been characterized by debate over inclusion of one micronutrient over another, or levels of nutrients defined in micrograms, yet programming matters at least as much as product quality.

Finally, effective programming requires supportive institutional processes. Enhanced oversight of, and coordination across, the entire food assistance endeavor is needed not simply to enhance and protect the quality of products delivered, but to generate value added from an all-of-government approach that sees food aid as one key instrument in a more united approach to increasing food security around the world and finally conquering hunger.

ABBREVIATIONS AND ACRONYMS

| | | | |
|---------|--|----------|---|
| AACC | American Association of Clinical Chemists | MCH | Maternal and Child Health |
| ACF | Action Contre la Faim | MCHN | Maternal and Child Health and Nutrition |
| AI | Adequate Intake | MNP | Micronutrient Powder |
| ART | Antiretroviral Therapy | MRE | Meals Ready to Eat |
| BASF | BASF Micronutrient Initiatives | MSF | Médecins sans Frontières |
| BMI | Body Mass Index | MT | Metric Ton |
| C&F | Commodity and Freight | NACS | Nutrition Assessment, Counseling, and Support |
| CDC | Centers for Disease Control and Prevention | NaFeEDTA | Sodium Iron Ethylenediaminetetraacetate |
| CRG | Commodities Reference Guide | NAMA | North American Millers Association |
| CRS | Catholic Relief Services | NIH | National Institutes of Health |
| CSB | Corn–Soy Blend | NOAEL | No Observed Adverse Effect Level |
| CSB13 | Corn–Soy Blend Version 13 | OFDA | Office of U.S. Foreign Disaster Assistance |
| CSB14 | Corn–Soy Blend Version 14 | OVC | Orphans and Vulnerable Children |
| CSM | Corn–Soy Milk | PDCAAS | Protein Digestibility Corrected Amino Acid Score |
| DCHA | Bureau for Democracy, Conflict and Humanitarian Assistance | P/E | Protein/Energy |
| DPRK | Democratic People’s Republic of Korea | PEPFAR | President’s Emergency Plan for AIDS Relief |
| DRI | Dietary Reference Intake | PLHIV | People Living with HIV/AIDS |
| DSM | Dry Skimmed Milk | PLW | Pregnant and Lactating Women |
| EMOP | Emergency Operation | PM2A | Prevention of Malnutrition in Children Under Two Approach |
| FANTA-2 | Food and Nutrition Technical Assistance II Project | PMTCT | Prevention of Mother-to-Child Transmission |
| FAO | Food and Agriculture Organization (UN) | PRRO | Protracted Relief and Recovery Operation |
| FAQR | Food Aid Quality Review | RDA | Recommended Dietary Allowance |
| FBF | Fortified Blended Food | RNI | Recommended Nutrient Intake |
| FBP | Food by Prescription | RUF | Ready-to-Use Food |
| FDA | Food and Drug Administration | RUSF | Ready-to-Use Supplementary Food |
| FFA | Food for Assets | RUTF | Ready-to-Use Therapeutic Food |
| FFE | Food for Education and Child Nutrition | SAM | Severe Acute Malnutrition |
| FFP | Office of Food for Peace (USAID) | SFB | Soy-Fortified Bulgur |
| FFT | Food for Training | SFCM | Soy-Fortified Corn Meal |
| FFW | Food for Work | SFG | Soy-Fortified Grits |
| GAIN | Global Alliance for Improved Nutrition | SUSTAIN | Sharing and Utilizing Science and Technology to Aid in the Improvement of Nutrition |
| GMP | Good Manufacturing Practices | UL | Safe Upper Level |
| GRAS | Generally Recognized as Safe | UNHCR | United Nations High Commissioner for Refugees |
| HACCP | Hazard Analysis and Critical Control Points | UNICEF | United Nations Children’s Fund |
| HDR | Humanitarian Daily Ration | UNU | United Nations University |
| HEB | High-Energy Biscuit | USAID | United States Agency for International Development |
| IFAC | Interagency Food Aid Committee | USDA | United States Department of Agriculture |
| IFRC | International Federation of Red Cross/Red Crescent Societies | WFP | World Food Programme |
| IOM | Institute of Medicine | WHO | World Health Organization (UN) |
| ITAG | Interagency Technical Advisory Group | WPC | Whey Protein Concentrate |
| JBPHN | Jack Bagriansky Public Health Nutrition | WSB | Wheat–Soy Blend |
| LLC | Limited Liability Company | WSB15 | Wheat–Soy Blend version 15 |
| LNS | Lipid-Based Nutrient Supplement | WSM | Wheat–Soy Milk |
| LOAEL | Lowest Observed Adverse Effect Level | WV | World Vision |
| MAM | Moderate Acute Malnutrition | | |
| MANA | Mother Administered Nutritive Aid | | |

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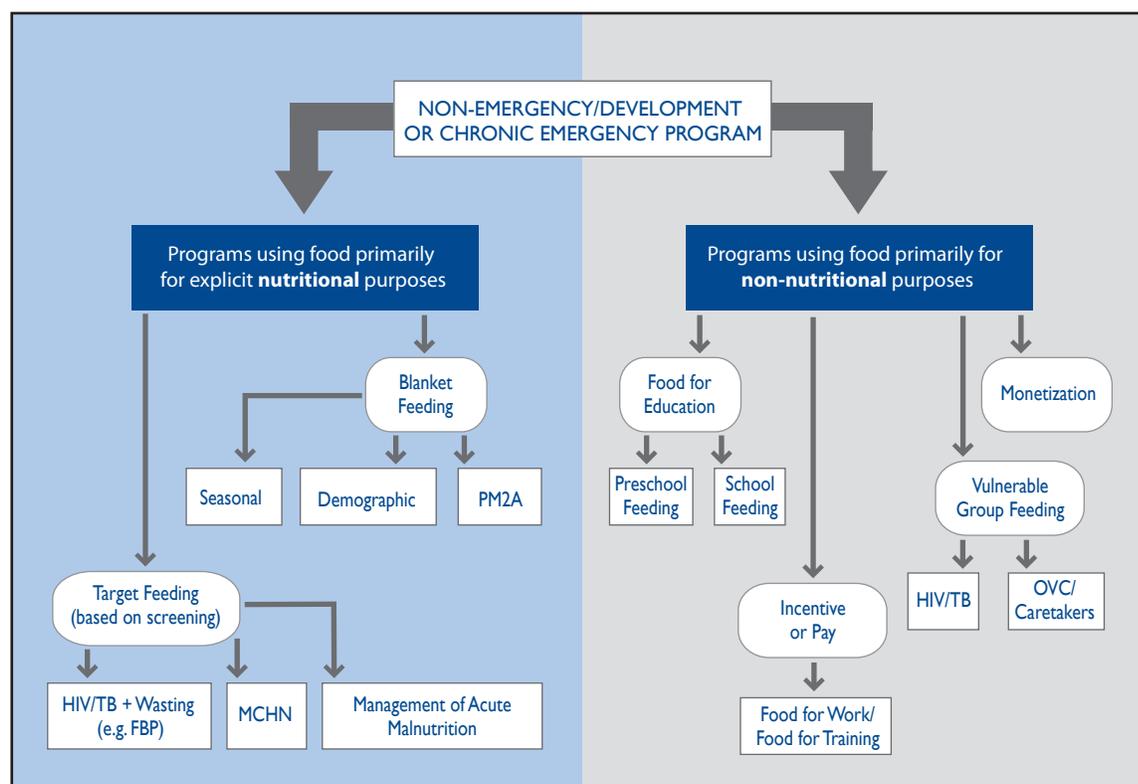
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ANNEX I: ENHANCED PROGRAM GUIDANCE: DECISION TREES AND FLOW CHARTS

FLOW CHART: NON-EMERGENCY/DEVELOPMENT OR CHRONIC EMERGENCY



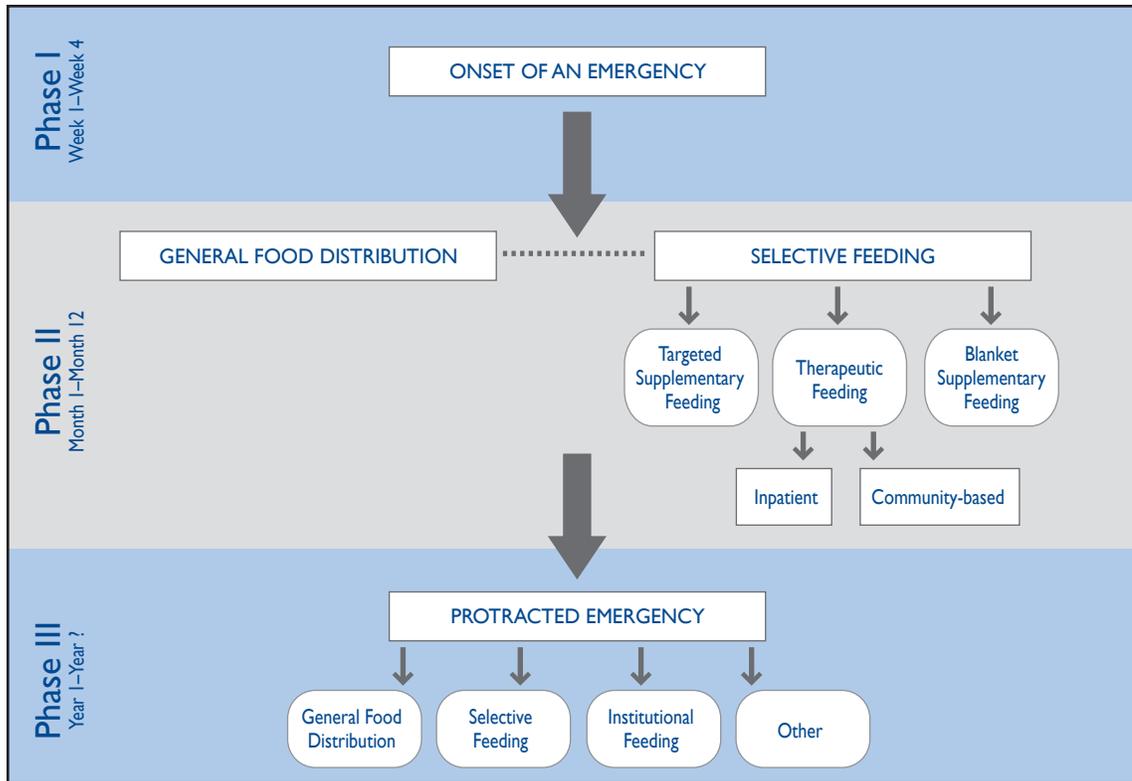
Note: FBP, Food by Prescription; MCHN, Maternal and Child Health and Nutrition; OVC, orphans and vulnerable children; PM2A, Prevention of Malnutrition in Children Under Two Approach.

This figure shows the decision-making process guiding the use of food in various types of nonemergency programs. Among these, we can distinguish between programs in which food is used primarily for nutritional purposes, that is, to prevent or address undernutrition (wasting, stunting, and, less often, the prevalence of deficiencies of micronutrients such as iron, vitamin A, and others) and those in which food is used as compensation, as incentive or pay, or to meet general household food needs in highly food-insecure households. In programs with explicit nutritional goals, blanket feeding is the approach that provides supplementary food to all individuals in the high-risk categories. In addition to blanket feeding as a preventive strategy, some

programs use nutritional screening as a basis for the provision of supplementary food, due to the cost and intensity of treatment.

On the right of the diagram, the graphic describes programs in which food is used primarily for non-nutritional purposes. These uses include food for education, food as pay in FFW and FFT programs, and vulnerable group feeding, in which food is provided to households that are at exceedingly high risk for food insecurity. In these cases, use of specialized, nutrient-dense products such as CSB14 or LNS is not appropriate, and distribution of improved basic staples is recommended where possible.

FLOW CHART: EMERGENCY



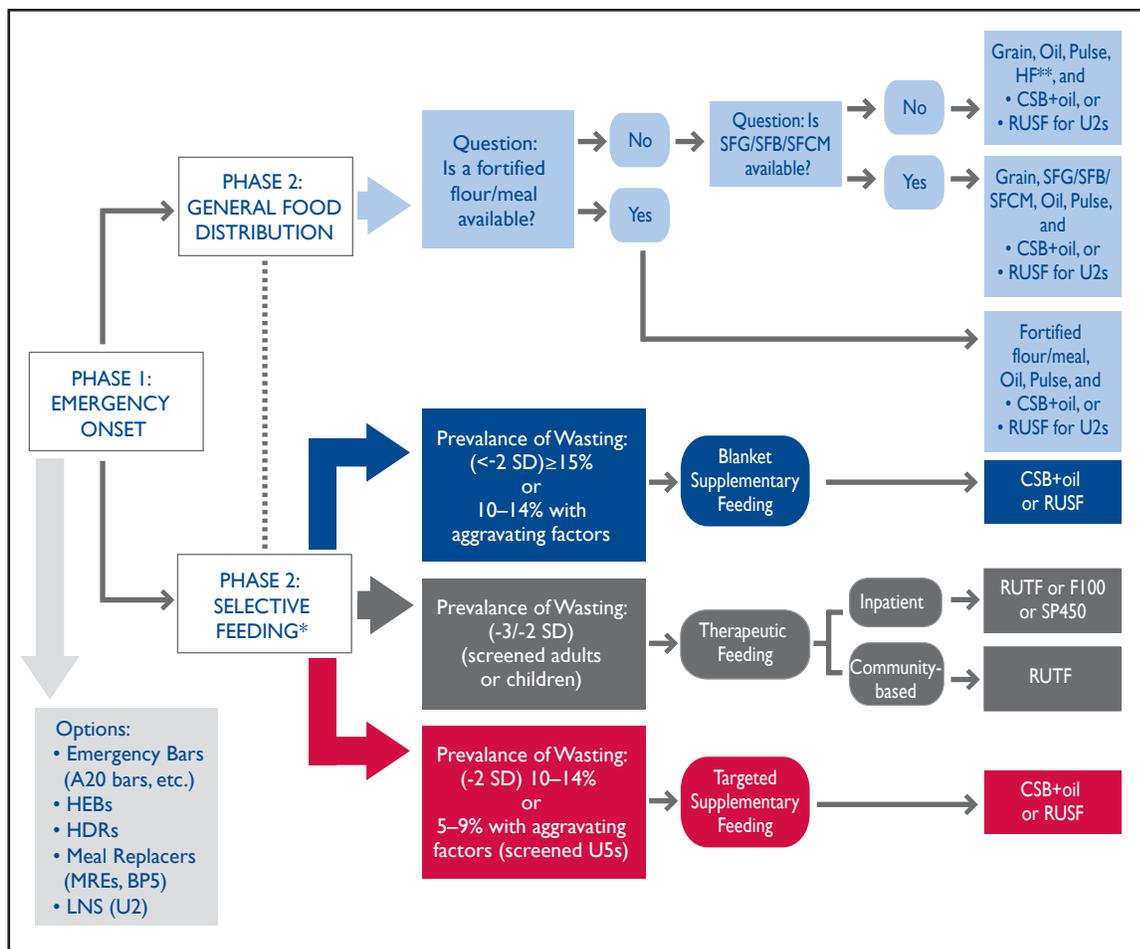
This figure emphasizes that the choices available in emergencies vary depending on the phase of the emergency. In the first few weeks of an emergency, whether due to conflict or natural disaster, the goal is to address immediate threats to survival. Provision of food is often restricted to easily transportable emergency rations. As the emergency situation stabilizes, maintenance of the threatened or displaced population becomes the priority, making use of general food distribution to households that have lost their access to food supplies and selective feeding of individuals at high risk for nutritional deficiency.

Selective feeding is feeding that is targeted on the basis of nutritional risk (defined in terms of age and physiologic or disease status) or nutritional condition. Blanket feeding is based on risk category; it is targeted on the basis of age

and physiologic or disease status, but not on the basis of anthropometric screening for wasting or stunting. Some programs make use of nutritional screening of these high-risk groups to determine who receives the specialized, nutrient-dense supplementary food, particularly in situations where resources do not permit blanket feeding based on risk category alone. Therapeutic feeding of children or older wasted individuals suffering from SAM is delivered according to a medical model of treatment, whether it is clinic or community based, and is by definition based on nutritional (anthropometric) screening.

If an emergency becomes protracted, that is, lasting for years, the range of programs provided under the rubric of emergency comes to resemble those common in nonemergency programs.

DECISION TREE: EMERGENCY



Note: BP-5 Compact Food; CSB, Corn–Soy Blend; HDR, Humanitarian Daily Rations; HEBs, High-Energy Biscuits; LNS, Lipid-Based Nutrient Supplement; MREs, Meals Ready to Eat; RUSF, Ready-to-Use Supplementary Food; RUTF, Ready-to-Use Therapeutic Food; SFB, Soy-Fortified Bulgur; SFCM, Soy-Fortified Corn Meal; SFG, Soy-Fortified Grits; U2, under 2 years of age; U5, under 5 years of age.

This figure describes the range of rations commonly used in various phases of emergency programs. In Phase 1 (emergency onset), packaged products are used to promote survival and prevent starvation. In Phase 2 of an emergency, choices are made based on the availability of food products and prevailing nutrition situations. For general food distribution, we recommend a food basket of cereal, pulse, and oil, but with an enhanced nutrient profile for cereals.

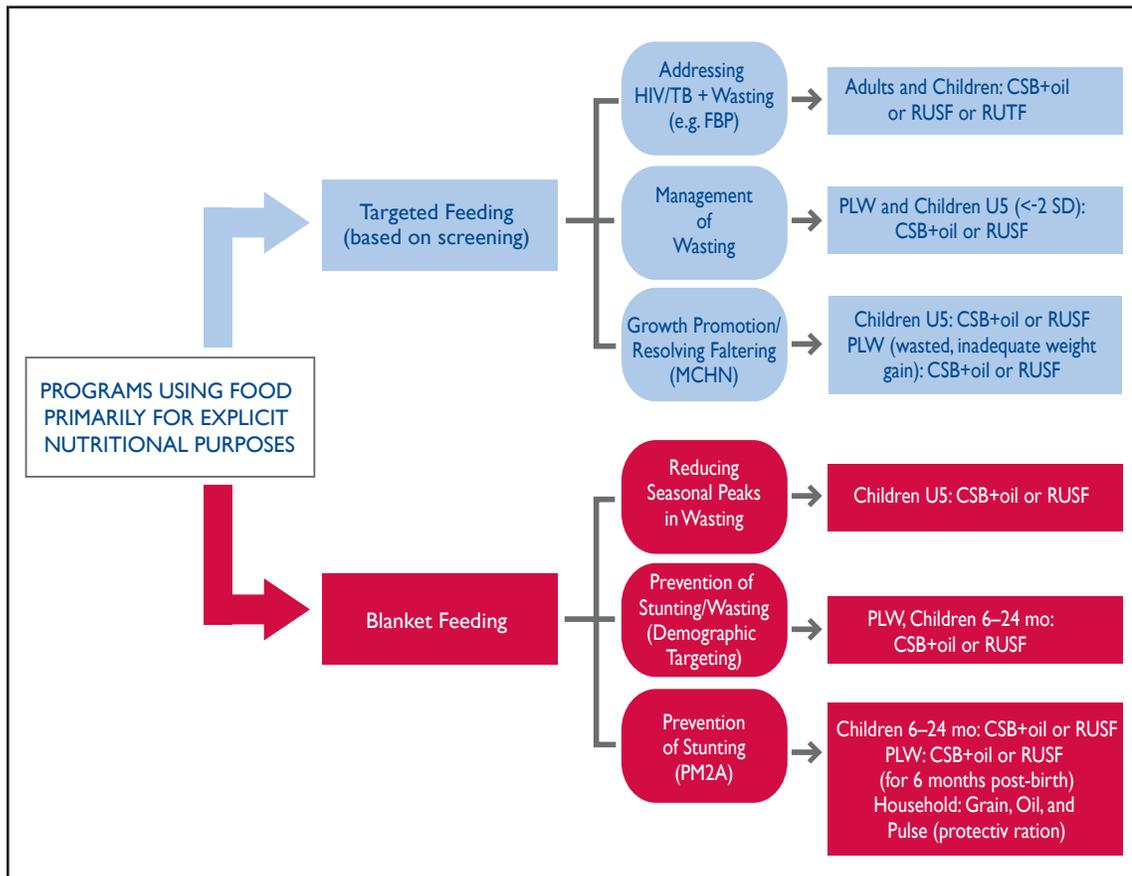
When the prevalence of wasting in children under five exceeds 15 percent (or is 10 to 15 percent with aggravating health factors), blanket feeding of high-risk groups is recommended. Virtually all children in this case are in need of nutritional improvement, even if they have not yet fallen below thresholds for stunting or

wasting. If blanket supplementary feeding is not possible, distribution of supplementary food based on screening of individuals may be needed.

Therapeutic feeding has not normally been a part of nonemergency Title II programs but is now increasingly included. Therapeutic feeding must be based on screening and is directed at children with SAM, that is, weight-for-height Z score below -3 SD. Therapeutic feeding in a clinical setting may use LNS or F-100 (with careful oversight to avoid contamination), but in community-based therapeutic feeding programs, LNSs are recommended because of the lower chance of microbiological contamination (although drinking water quality still needs to be monitored carefully).

DECISION TREE: NON-EMERGENCY/DEVELOPMENT OR CHRONIC EMERGENCY

(where the program is designed with explicit nutritional objectives)

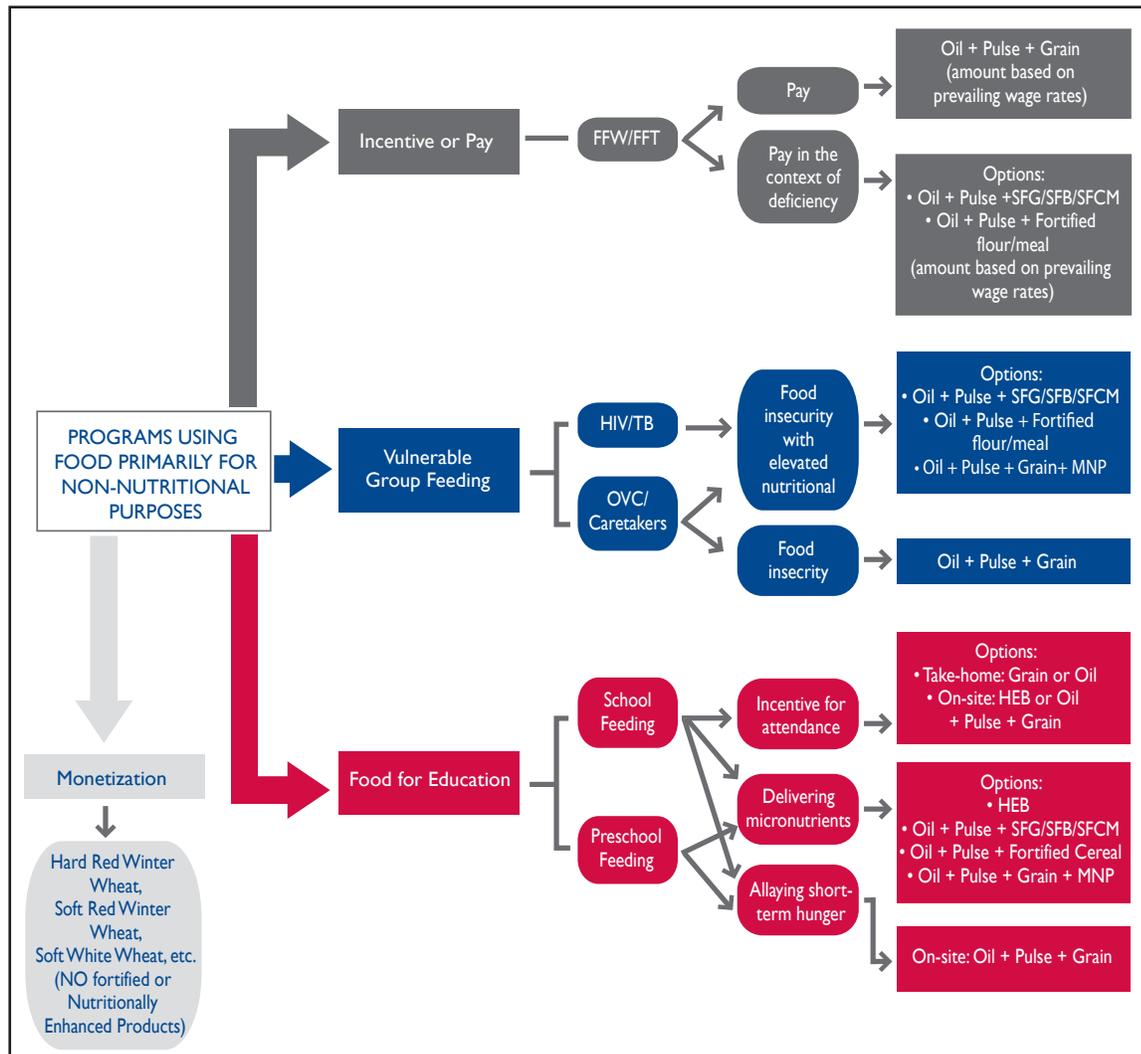


Note: CSB, Corn-Soy Blend; FBP, Food by Prescription; MCHN, Maternal and Child Health and Nutrition; PLW, pregnant and lactating women; PM2A, Prevention of Malnutrition in Children Under Two Approach; RUSF, Ready-to-Use Supplementary Food; RUTF, Ready-to-Use Therapeutic Food; U5, under five years of age.

This figure describes food choices appropriate for the Title II programs listed. In the case of blanket feeding for prevention, it is appropriate to use an enhanced FBF, such as CSB combined with oil, or, depending on the circumstances, an LNS (developed as an RUSF). All of the above recommendations must be tested, including effectiveness, acceptability, efficacy, and feasibility of programming an enhanced CSB.

In the case of the PM2A approach, family food (cereal, pulses, oil) is provided as a protective ration, so that the more costly, nutrient-dense food is more likely to reach target individuals. Modifications to this approach are currently being tested, including the provision of LNS in place of CSB and the provision of a smaller protective ration.

DECISION TREE: NON-EMERGENCY/DEVELOPMENT OR CHRONIC EMERGENCY (where the program is designed with primarily non-nutritional objectives)



Note: FFE, Food for Education and Child Nutrition; FFT, Food for Training; FFW, Food for Work; HEBs, High-Energy Biscuits; MNP, Micronutrient Powder; OVC, orphans and vulnerable children; SFB, Soy-Fortified Bulgur; SFCM, Soy-Fortified Corn Meal; SFG, Soy-Fortified Grits.

This figure shows the ration choices recommended for programs in which nutrition is not explicitly included as an objective for the use of Title II food. When food is used as incentive or pay, or as a means of addressing household food insecurity, the preferred ration options should not include CSB or LNS, but rather a combination of fortified staples, oil, and pulses—the standard household ration.

We have recommended that all cereals distributed through Title II programs (not monetized) be fortified with a wider range of micronutrients than is currently the case, in order to assure adequacy of these key micronutrients without

the need to rely on the addition of specialized, nutrient-dense foods to the household ration. The provision of FBFs or LNS is not ideal to assure the nutritional adequacy of the household ration. Where micronutrient deficiencies are prevalent at levels that may not be addressed with fortified cereal products alone, the use of home fortificants may be considered. Similarly, in school and preschool feeding programs, the grain/pulse/oil ration is most appropriate, with MNP added in cases where micronutrient deficiency is a significant issue. If on-site food preparation is not possible or there are other logistical constraints, HEBs are commonly used in place of a school meal.

ANNEX 2: FOOD AID QUALITY REVIEW AUTHORS, STAFF, AND EXPERT PANELISTS

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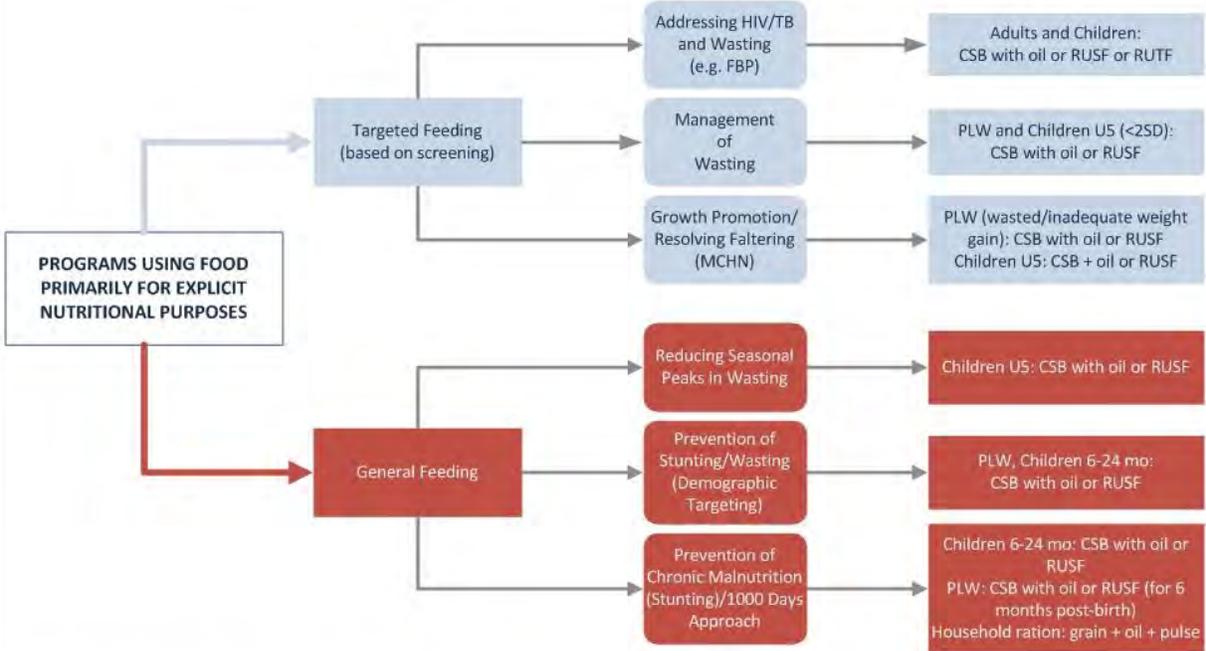
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Addendum to Delivering Improved Nutrition: Recommendations for Changes to U.S. Food Aid Products and Programs

November 2012

The decision trees on the following pages are updated versions of the decision trees in the original 50-page summary report. These were updated in November 2012.

DECISION TREE: DEVELOPMENT OR CHRONIC EMERGENCY
(where the program is designed with explicit nutritional objectives)



Notes: CSB, Corn soy blend; FBP, Food by Prescription; MCHN, Maternal and Child Health and Nutrition; PLW, pregnant and lactating women; RUSF, Ready-to-Use Supplementary Food; RUTF, Ready-to-Use Therapeutic Food; U5, Under five years of age

