MODULE 1: MATERNAL CHILD HEALTH AND NUTRITION

I. INTRODUCTION

An overarching objective of USAID's mandate is to improve food security of vulnerable populations in the developing world. Food security exists when all people at all times have physical and economic access to sufficient food to meet their dietary needs for a productive and healthy life. Programming of food aid through Maternal Child Health and Nutrition (MCHN) activities can help achieve the goal of improving household food security. Specifically, MCHN programs are intended to improve the nutritional status of young children and women. These programs can also address the intergenerational effects of malnutrition. For example, providing food supplements to pregnant and lactating women can improve birth outcomes and reduce low birthweight, and improve nutritional status of young children.

MCHN interventions differ from other food aid programming in two ways. First, the primary objective of MCHN programs is the reduction of malnutrition in the target population. Second, the target population consists of the most nutritionally vulnerable groups, namely young children (two years and under) and pregnant and lactating women.

Food aid to young children helps to bolster energy, protein, fat, and micronutrient intake needed for growth and development, especially for food insecure children with poor nutritional status. Providing food aid to pregnant and lactating women helps to ensure the health of the mothers who are not otherwise able to consume sufficient energy, protein, and micronutrients in their diets. Further, good maternal health during nutritionally vulnerable periods contributes to improved birth outcomes and overall health of children. Assuring food security and a healthy nutritional status of young children and women, therefore, becomes paramount in MCHN programs.

Food aid is considered only one component of an MCHN program. Food assistance within MCHN programs generally focuses on meeting the nutritional gap of young children and pregnant and lactating mothers through a cooked (wet) ration, consumed at a monitored location (on-site feeding) or through a dry ration of food commodities that are taken home (take-home rations). These meals provide extra energy, protein, and crucial micronutrients.

While food can help meet the nutritional gap for vulnerable children and women, it alone cannot improve the nutrition and health status of women and children. Food aid should be combined with components that improve the quality of health and nutrition services as well as behavior change components that improve maternal child health, feeding and care practices.

II. GUIDELINES FOR COMMODITY SELECTION FOR MCHN PROGRAMMING

The introductory chapter for Part Two entitled *Guidelines for Selecting Food Aid Commodities: An Overview* provides information on how to develop the most appropriate and cost-effective ration packages to accomplish program objectives. These guidelines are organized into five general steps. This module summarizes the five steps and includes key points of consideration for MCHN programming under each step. This guidance is meant to be flexible enough to permit the selection of the most appropriate food ration in each situation. Box 1 below lists the five steps for commodity selection:

Box 1: Five Steps for Selecting Commodity Rations:

Step 1. Program Design
Step 2. Suitability of Food Commodities
Step 3. Ration Specifications
Step 4. Ration Calculation
Step 5. Ration Ranking and Selection

STEP 1: PROGRAM DESIGN

The five key program design components are usually: (1) carrying out a needs assessment; (2) determining the appropriate use of food aid; (3) identifying characteristics of the target population, including dietary and other preferences; (4) developing program activity objectives; and (5) determining the distribution mode and frequency. Together with a monitoring and evaluation plan and an exit or graduation strategy, these components are key elements for the development of Title II food aid proposals. For detailed guidelines on proposal development see the most recent FFP's *Title II Guidelines for Development Programs* www.usaid.gov/hum_response/ffp/dappaa.htm. Also refer to Food Aid Management's website for guidelines and useful links www.foodaid.org. An explanation of each design component follows:

1. Carrying out a Needs Assessment

As the food aid component of a program is designed, it is important to articulate why food aid is needed and how it will be used to meet program goals. A needs assessment should determine the nature, extent, severity, and distribution of the food needs. If relevant to the program's objectives, the needs assessment should include identification of the degree of malnutrition in the target population. The results of the assessment should describe the criteria for selecting the beneficiaries and the geographic areas to be targeted. Factors that could impede effective use of food aid, and the possibility of using local foods to supplement the food aid ration package should also be investigated. Also include an assessment of current maternal child feeding and care practices and the quality of health services including delivery of immunizations, micronutrients and human resource capacity.

Primary Data Collection: Primary data may be collected in a variety of ways, including food consumption surveys, nutritional status surveys, or qualitative assessment. Useful qualitative techniques include in-depth interviews, focus group discussions, participatory rural appraisal, and observation. Some methods for collecting primary sources of data are described in USAID/CDIE's

Performance Monitoring and Evaluation Tips www.dec.org/usaid_eval. See also the Resource List at the end of this module.

Secondary Data Collection: Secondary data collected and reported by other organizations, including the host government can also be useful. These data should be verified with local key informant interviews. Secondary sources of information include USAID documents; Demographic Health Surveys (DHS); documents from local institutions, donor agencies, other PVOs; and UN agencies, especially UNICEF, WHO, and the World Bank.

More detailed guidance on how to conduct needs assessments and develop MCHN proposals may be found at www.usaid.gov/hum_response/ffp/dappaa.htm as well as www.fantaproject.org.

2. Determining the Appropriate Use of Food Aid

MCHN food aid can achieve several different humanitarian response objectives, such as (a) prevention of malnutrition in vulnerable target groups; (b) rehabilitation of malnourished individuals; or (c) improved participation in health and nutrition activities. To these ends, food aid serves either as a nutritional supplement or an income transfer. Naturally, different programs will require different targeting, rations, and graduation criteria.

3. Identifying Characteristics of the Target Population

MCHN programs focus on the women and children who use MCHN services, i.e., young children and pregnant and lactating women. The results of the needs assessment and the desired end results will drive further targeting within this group and should identify the specific feeding and care practices that need to be focused on for improving nutritional status. For example, if the objective is nutritional recuperation, the target group will be children who are malnourished. If the objective is to increase women's use of prenatal services and trained birth attendants, then the target group would be pregnant women. If the objective is to promote optimal growth, the recommended target group would be children aged 6-24 months. A key added characteristic could be the estimated HIV/AIDS prevalence.

4. Developing Program Activity Objectives

The most common objectives of food aid components of MCHN programs are to provide nutrients to improve or maintain the nutritional status in the target group or to provide incentive to use health or nutrition services or to participate in health and nutrition education programs.

It is critical that the design of the program does not compromise the adoption of appropriate and recommended feeding and dietary practices including exclusive breast feeding for infants under six months of age. The eligibility criteria for recipients, quantities, commodity mix, and recommendations for use of the rations should be consistent with official government policies and with standard practices used by USAID and the United Nations. Detailed recommendations for appropriate feeding practices are available from USAID's LINKAGES Project series, *Facts for Feeding* www.linkagesproject.org/pubs.html.

Although each cooperating sponsor (CS) will approach the achievement of its program objectives in a different way, following USAID's Managing for Results terminology (see Annex I of Part Three) when stating objectives, will facilitate reporting to USAID. Objectives for USAID-funded programs

should be should be result statements, that is, they should clearly describe the desired end result of the intervention. For example, "*Improved nutritional status of children under two*" is a results-oriented objective. A useful reference in this regard is the Food and Nutrition Technical Assistance (FANTA) project's guide on the use of food rations in MCHN programs www.fantaproject.org.

USAID recommends that there should be at least one performance indicator to track progress toward each objective or result. Performance indicators are variables with a particular characteristic or dimension that can measure progress toward the stated result. An example of an indicator for the result statement mentioned above (Improved nutritional status of children under two) could be "average weight-for-age z-score of children under two". When possible, impact and output indicators should also be developed and monitored. The benefits of having both types of indicators are self-evident. For example, it is not only important to know the percent of the population reached with food aid (output), but to also determine whether nutritional status of the target population improved as a result of the food aid (impact). USAID/CDIE's *Performance Monitoring and Evaluation Tips, (*www.dec.org/usaid_eval*)* provides guidance on how to develop results statements and performance indicators. Other resources for developing nutrition and food security related indicators can be found in Annex II of Part Three.

CSs should also include a description of the baseline data or spell out a plan to collect it. It would be ideal to include as part of the needs assessment baseline studies that identify values for the selected indicators. However, if this is not possible then the indicators can be submitted for FFP review after the program proposal is approved. Naturally, each CSs resources to monitor and evaluate programs are different. This will be taken into consideration during USAID's food aid proposal review and approval process.

5. Distribution Mode and Frequency

There are two primary ways to distribute MCHN food aid rations: on-site feeding and take-home rations. Below is a description of these two distribution methods. Box 2 summarizes the advantages and disadvantages of each mode.

- **On-site (wet) feeding** is where the food aid recipient is fed prepared wet rations at a designated site outside the home. MCHN on-site feeding is usually targeted to mild to moderately malnourished children at MCHN or community feeding centers, and the food provided is intended to supplement, not replace, what the children eat at home. During periods of severe food insecurity all children in a selected age range might be eligible for on-site feeding at community centers. To obtain maximum nutritional improvement, feeding would be daily, 365 days per year. Depending on program objectives and local conditions, some feeding programs operate only 5 or 6 days per week, and many operate only during "lean" seasons of the year. The advantage of on-site feeding is that food rations are eaten under supervision, which helps to ensure that the food supplement is actually consumed by the target population. However, on-site feeding is labor intensive for a community to organize and prepare. A potential disadvantage of on-site feeding is that food may be withheld at home because the recipient is fed at the feeding center.

- **Take-home rations** are dry, uncooked food rations that are prepared and eaten at home. Take-home packages can provide the entire day's requirements of energy and protein, or only a part of these requirements, filling a gap between the recipients' typical diet and what they need. The

advantage of take-home rations is that they are easier to administer, more cost effective, less time consuming for recipients, and can reach larger numbers of recipients. However, dry rations may be shared with other family members (leakage or dilution) or sold/exchanged in the market, thereby reducing nutritional impact on the intended beneficiary.

As take-home ration feeding activities are being designed, it would be helpful to determine to what extent the take-home food rations will be shared by other family members. Several ways to address intra-household sharing of food rations include education, increasing the amount of the ration package, and selecting rations that promote self-selection. For example, self-targeting "baby food" (or weaning food), such as blended cereals may be less acceptable to other family members, thus more likely to be consumed only by target children.

The mode and frequency of distribution should be based on project objectives, the costs, local conditions, including human resource capacity to help with distribution, the nutritional deficiency profile of the target group, and the type and quantity of rations. It is important, also, to consider the demands on caregivers to pick up the food or attend the feeding center. A program should also consider whether it will be clinic (or center based) or community-based. The advantages and disadvantages of on-site or take-home feeding distribution modes should be weighed to optimize the nutritional impact on women and children. Box 2 below summarizes the key points of both distribution modes:

Box 2- Advantages and Disadvantages of Feeding Modes	
On-site feeding	**Take-home rations**
Advantages: ➢ Rations eaten under supervision. ➢ Help can be given to ill or anorexic children. ➢ Feeding problems can be identified and dealt with. ➢ Ensures that food ration is consumed by target population. ➢ Opportunity to inform caregiver.	Advantages: ➢ Large numbers of recipients can be reached. ➢ Fewer resources required to administer the program. ➢ Fewer costs for preparation and distribution. ➢ Caregiver spends less time and effort attending feeding site. ➢ Families take responsibility for feeding recipient.
Disadvantages: ➢ Recipients may be given less food at home (substitution). ➢ Requires that caregivers travel to feeding center on a daily basis. ➢ Resource intensive requiring equipment, fuel, a feeding facility, and well-trained staff.	Disadvantages: ➢ No guarantee that recipient consumes the food ration as it may be shared with other family members (dilution or sold and traded, leakage). ➢ Less time for behavior change and communication.

STEP 2: SUITABILITY OF FOOD COMMODITIES

The suitability of a ration should be assessed with regard to the needs and preferences of the targeted individuals, households, and community. A ration is suitable if it can be used effectively to achieve intended objectives. Aspects of food commodities that should be considered include women's and

children's nutritional needs and physiological capacities, food consumption preferences and patterns, locally available foods, household and community food processing and storage capacities, and local market value.

Appropriateness to good feeding practices: The use of specific donated foods should be consistent with good scientific feeding guidelines, including exclusive breast feeding for infants under 6 months of age and continued, frequent on-demand breast feeding to 24 months and beyond. For children 6 to 24 months, it is important to gradually introduce thicker and more various foods that can complement but not replace breast milk. The following recommendations come from LINKAGES *Facts for Feeding: Guidelines for Appropriate Complementary Feeding of Breastfed Children 6-24 months of age*:

- Provide 6 to 8 month old infants *approximately* 280 kcal per day from complementary foods.
- Provide 9 to 11 month old infants *approximately* 450 kcal per day from complementary foods.
- Provide 12 to 24 month old children *approximately* 750 kcal per day from complementary foods.

Feeding frequency is another important consideration. By combining meals and snacks, children should be fed complementary foods with the following frequency:

- Feed complementary foods for 6 to 8 month old infants 2-3 times per day.
- Feed complementary foods for 9 to 11 month old infants 3-4 times per day.
- Feed complementary foods for 12 to 24 month old children 4-5 times per day.

Complementary foods can include the food aid commodity and should be programmed to ensure the young child has a diversified and nutritious diet. During illness, the child should continue to receive breast milk and receive frequent and active feeding. Any feeding activity should be designed so that the young child is fed directly, slowly and patiently. Children should not be forced to eat.

More detailed information can be found in the LINKAGES Project series titled *Facts for Feeding* www.linkagesproject.org/pubs.html

Below are key suitability factors to consider as food aid rations for MCHN programs are being developed. Field tests and monitoring to confirm that MCHN rations are well accepted and used appropriately are recommended.

Cultural suitability: It is important to consider women's and children's traditional diets, taste preferences, food taboos, and feeding practices. Unfamiliar food may be made more acceptable through nutrition education, food processing, packaging, and/or by combining it with familiar foods in recipes.

Nutritional content: This refers to the energy, fat, protein, and micronutrient content of the rations. There are certain nutritional considerations for women and children that should be examined when designing food rations. Young children, especially those up to 24 months of age, suffer linear growth faltering (stunting) and delayed development that leaves permanent damage when they are not adequately nourished. Underweight children are also at much higher risk of death due to illness than are their well-nourished counterparts. Although energy (kilocalories) is the main predictor of height and growth, adequate micronutrients and protein for this age group are also important, particularly

vitamin A.[1]

Pregnant and lactating women need extra energy, protein, and micronutrients to support the growth of their fetus or infant and maintain their own health. Pregnant women need the extra nutrients for the growing fetus and to ensure a healthy and safe birth outcome without depleting her own reserves and putting herself and her child at greater risk. While frequent, on-demand breastfeeding helps maintain the quantity of breast milk, lactating mothers need extra energy and nutrients to produce optimal quality breast milk, to protect their own health, and to assure that their nutritional stores are preserved or restored to support subsequent pregnancies.

Physiological appropriateness: Because of small stomachs, infants from 6-24 months of age are unable to meet their energy needs through high-bulk foods, such as cereals and legumes. (See Box 3 below for gastric capacity of this age group.) For example, infants between 9-11 months have a stomach capacity of 285 grams. To meet their daily energy needs (850 kcal) they would need to consume 226 grams of CSB a day, which when cooked, yields about 1,883 grams of gruel (assuming the gruel is 12% CSB).[2] If an infant were fed six times a day it would need to consume 314 grams of gruel during each meal to meet its energy needs with only CSB. Clearly, infants in this age range do not have the stomach capacity to consume this amount of food. Therefore, nutrient-dense, low bulk sources of energy such as edible vegetable oil should be added when these cereals are the primary source of nourishment.

Children who are undernourished have an even smaller stomach capacity. For this reason, nutrient rich blended food commodities and fortified vegetable oil are important commodities to provide for these children.

Box 3- Stomach Capacity of Children 6 to 23 months

Well nourished:	
6-8 months	249 g
9-11months	285 g
12-23 months	345 g
Growth retarded	
6-8 months	192 g
9-11 months	228 g
12-23 months	273 g

Source: WHO, Complementary Feeding of Young Children in Developing Countries: a review of current scientific knowledge, p. 61.

The viscosity of prepared foods for young children should also be considered. Cereal gruels can vary considerably in viscosity, and as they cool or are repeatedly reheated, they can become thicker and more difficult to eat. If when reheating, mothers dilute the cereals to make them more edible for their young children, they significantly reduce the energy, protein, and micronutrient densities and may

[1] WHO, Complementary Feeding of Young Children in Developing Country: a review of current scientific knowledge,1998
[2] Refer to the Commodity Fact Sheets, CRG, Section I at

introduce harmful microorganisms. For this reason, quick-cooking, nutrient and energy dense - blended cereals, that can be prepared easily, several times daily, are good choices for rations for small children and their mothers.

Availability of processing and/or storage facilities: Consider factors that affect food preparation, such as access to mills and processing facilities and fuel, and women's or institution's preparation and cooking time. Household's or institution's capacity to store food aid commodities is another consideration.

Characteristics of locally/commercially available food: The timing of harvests, seasonal shortages, and the affordability of staple foods should be examined to determine if they can complement and eventually replace the donated Title II food commodities.

Cost: Ideally, the most cost-effective food ration is the one that achieves the desired results with the least cost. Step 5 below provides guidance on how to calculate the cost -effectiveness of a ration package.

STEP 3: RATION SPECIFICATIONS

The size of the ration should be based on the purpose of the food and its use in the MCHN program: the recipients' nutritional needs and/or the ration's income value. However, there are other factors that influence ration size. These include existing ration standards, e.g., government standards, those that other implementing agencies are using, or past program ration specifications. To determine the ration specifications, first articulate the minimum nutritional or income value a ration must have to achieve the project objectives. Below is an explanation of how to calculate nutritional and income transfer values and key considerations for MCHN programs.

1. Determining Nutritional Values

Determining the nutritional value of a ration package is important for selecting the commodities that will assure meeting program objectives. Targets for minimum nutritional values of rations should be based on estimates of deficits in existing diets of the target group, in terms of energy (calories), fat, protein and micronutrients. Generally, more food is added to rations to address substitution effects (when home diets are reduced because of on-site feeding) or to account for take-home rations shared with other family members (leakage). For pregnant and lactating women, a ration should supply, at a minimum, the extra energy and protein they need during these reproductive periods. Therapeutic feeding programs (TFP) are medical interventions that require food commodities not available through Title II. The specification of rations for this type of program is, therefore, beyond the scope of this guide.

When providing food aid supplements for children or women in circumstances where a household food shortage is the underlying cause of the malnutrition, it is recommended that rations fill as much as possible of the nutrient gap between available food and requirements. (For specific suggestions on the use of food rations, refer to the "*Use of Food Rations in Maternal and Child Health and Nutrition Title II Programs*" at www.fantaproject.org/publications/index.html.

Ideally, program managers would use the precise method in Box 4 below to determine the nutritional deficit of a ration package. However, the precise value of substitution and leakage are difficult to

estimate and the measurement of energy consumption is also difficult and costly to determine exactly. In such cases, program managers may wish to employ an estimation method. Therefore, both methods are presented.

Box 4 – Precise Method for Determining Nutritional Energy Deficit

Recommended energy allowance (REA)	+	Substitution/leakage factors	-	Estimated energy intake	=	Total energy deficit (kcals)

a) <u>Precise Method for Determining Energy Deficit</u>

Based on the formula in Box 4 above, detailed instructions on how to determine nutritional energy values of ration packages are as follows:

Recommended energy allowance (REA) – This is the amount of kilocalories (energy) recommended for children and adults to maintain health and a good level of mental and physical performance[3]. For the purposes of demonstrating how to calculate the energy deficit, the National Research Council's (NRC) *Recommended Dietary Allowances*, 10th Edition (1989) is used as the reference for recommended energy allowance requirements. NRC's values for REA are a sum of resting energy expenditure (REE) from WHO equations and energy required for light to moderate levels of activity. Steps for calculating the REA for a target group follow:

Determine the REA per person per day for different target groups using Table 1 in Annex III. REA values are expressed in kilocalories (kcal) and are based on median weights for the U.S. population. For median weights of target groups from specific countries, refer to FANTA's publication "*Measuring Household Food Consumption: a Technical Guide*" (February, 2000) www.fantaproject.org/publications/index.html.

1) REA for children differentiates the energy allowances between sexes to take into account the onset of puberty and activity.

2) For children less than two years of age who are breastfed, use Table 2 in Annex III to calculate the energy allowances needed from complementary foods to meet daily energy requirements.
3) For adults with heavy activity level, REA will need to be adjusted. Use Table 3 in Annex III to obtain resting energy expenditure (REE) per age category and multiply this number times 1.82 for women and 2.10 for men.[4] If needed, a list of heavy activities can be found in FANTA's publication, *Measuring Household Food Consumption: a Technical Guide*" (February, 2000) www.fantaproject.org/publications/index.html.

4) For pregnant and lactating women, factor in additional energy requirements needed during this period. If a woman is pregnant, add 350 kilocalories to her recommended energy allowance. If

[3] National Research Council, Recommended Dietary Allowances , National Academy Press, 1989
[4] Multiplier value from WHO, 1985, Energy and protein Requirements: Report of a Joint FAO/WHO/UNU Expert Consultation, p. 78

a mother is lactating, add 500 kilocalories.

Substitution/leakage factors: If they can be reliably estimated, the ration should include additional food to address substitution (cutting back intake at home because a food supplement is provided) or leakage (sharing the food ration with other family members), especially if household-level food deficits are large. Self-targeting foods (foods assumed to be eaten by the target beneficiary only and not shared) may be less prone to family-wide sharing, but their use will probably not be sufficient to eliminate leakage. Additional ways to reduce substitution or leakage problems include education, on-site feeding, or provision of a family package consisting of other commodities. There is no empirical data on how to calculate how much extra energy to add. Past experience with food aid programs or trial and error may be the best way to determine the quantity of energy to add to account for substitution and leakage.

Estimated energy Intake – This is often the most difficult and costly to assess. Methods of collecting these data include the following:

- **Aggregate household level surveys** - Data gleaned from household surveys generally include information on food expenditures, production and stocks, and food acquired as in-kind income. These surveys help determine whether there is a general food deficit and the severity of the deficit at the household level. Information from food gap assessments may be used for interim guidance if no other sources of information are available.

- **Individual food intakes** - This is a way to assess food deficits for specific age groups, such as women and children. Data collection approaches include dietary recall surveys, reviews of food records, and observation studies. These approaches can be built into sample household surveys. For children under 2 years of age, an estimate of the extent to which breastfeeding is contributing to the diet is useful. It is often difficult and costly to gather individual intake. Therefore, availability or expenditure surveys may provide substitute data that will enable Program Managers to estimate individual intake.

- **Availability or expenditure surveys** - These surveys are ways to gather information on the availability of food in a household and estimates of energy expenditures of individuals. Data from these surveys can help to estimate intake of certain groups.

- **24-hour recall surveys**- This is a method for collecting information on the food consumption of individual household members over the previous 24 hour period. A respondent is asked to recall all the foods consumed, sometimes including the exact amounts of each food. A respondent is asked to recall all foods consumed and breast feeding patterns, sometimes including the exact amount of each food or quantity of breastmilk.

Publications describing different methods for measuring consumption can be found in the Resource List. While it is ideal to know the exact actual intake of the target group, estimates or data from secondary sources may be more practical.

Total energy deficit per ration : This is the difference between the REA + substitution/leakage factors and the estimated energy intake. The resulting value represents the caloric deficit in a person's

diet. A ration package is usually designed to fill the caloric and protein deficit of the target group's diet.

Once the nutritional energy of rations are defined, the ration package can be adjusted to meet the fat, protein, and micronutrient needs. Detail on how to calculate the protein and fat composition of the package is presented in step 4 of this module.

b) Estimation Method for Determining Ration Size

In the absence of sufficient data to accurately quantify requrirements and food shortages, recommendations for optimally closing major nutrient gaps are:[5]

- **Energy:**

Women: Rations should supply about one third of the energy needs of pregnant and lactating women (750-850 kcals/day). At the very least, the rations for these women should provide the extra energy and protein demands of pregnancy or lactation, i.e., 350 kcals, including 10-13 g protein, for pregnant women, and 500 kcals, including 14-19 g protein, for lactating women.

Children: Rations should supply about one half of the energy needs of young children (about 150-350 kcals/d for breast fed children aged 6-24 mos, and 400-600 kcals/d for those that are not).

- **Fat:** For breastfed children 6-24 months, older children and women, the fat content should be about 20% of the total energy. For children under two who are not breastfed, the fat content of the ration should be higher, 30-40% of the total.

- **Protein:** As long as the fat in the ration is held to the above guidelines, the fulfillment of the remaining energy with a combination of pulse and cereal or a blended food (which contains both), will inevitably provide women or children enough protein to meet their needs.

Box 5 below shows an example of how to calculate the ration size for children 1-3 years of age who are moderately malnourished, based on the precise and estimated methods.

Box 5: Example of Calculating Energy Deficit of Moderately Malnourished Children 1-3 years of age

Precise Method

REA for children 1-3 years of age is 1,300 kcal per day (from Table 1 Annex III).

For this example, calculate 20% of the REA for the leakage factor: 1,300 x 0.20 = 260 kcal.

Add the kcal from the REA and leakage factor: 1,300 kcal + 260 kcal = 1,560 kcal.

Subtract Estimated energy intake, which for this example is 1,000 kcal: 1,560 kcal –1,000

[5] Derived from WFP, *Supplementary Feeding for Mothers and Children: Operational Guidelines* and WHO, *Complementary Feeding of Young Children in Developing Countries.*

kcal = 560 kcal.

Thus, the caloric deficit for this target group would be 560 kcal per person per day

Estimation Method

Assuming the target child is from 6-24 months of age and is **not** breastfeeding, the ration size would be in the range of 400-600 kcal/day, or 500 kcal/day on average would supply roughly half of the child's daily nutritional energy requirement.

c) HIV/AIDS Affected Individuals: People with HIV/AIDS suffer from appetite loss (anorexia), eat less food and have difficulty eating and therefore fail to meet their dietary requirements. HIV/AIDS also affects how the body uses the foods that are consumed and this results in nutrient malabsorption. Fevers and the infections that accompany an HIV infection also lead to greater nutrient requirements and poor use of the nutrients by the body. There are several illnesses that are common with people living with HIV/AIDS and that cause malnutrition. These include poor appetite or anorexia, losing weight, fever, diarrhea, frequent vomiting, oral thrush and other infections. Good nutrition for HIV affected people requires the consumption of an adequate amount of macronutrients such as proteins, carbohydrates and fats, and micronutrients, which include vitamins and minerals. A deficiency in macronutrients, also known as protein energy malnutrition manifests itself in the weight loss and wasting that is typical of AIDS patients. This weight loss and wasting occurs as a result of reduced food intake, nutrient malabsorption and changes in metabolism. Vitamin A for HIV affected people is important for growth, immune function and maintenance of the lining of the respiratory, gastrointestinal, and gastro-urinal tracts. Consuming micronutrients especially vitamin A, B6, B12, iron, and zinc are important for building a strong immune system and fighting infections. Consuming fortified foods like the cereal blends and vegetable oil fortified with vitamin A as well as taking micronutrient supplements at early stages of HIV infection can slow weight loss and disease progression. In the case of vitamin A there is the likelihood of reduced transmission between mother and child and slowing the progression of the disease in infected people. Refer to the FANTA publication on "*Nutritional Care and Support for Persons Living with HIV/AIDS and other Affected Household Members*" at www.fantaproject.org.

d) Micronutrients.

Young children's and pregnant and lactating women's micronutrient requirements are high; therefore, micronutrient fortified commodities should be included in the rations.

All oil provided through Title II is fortified with vitamin A nutrient essential for the protection of the health of any population, but particularly young children. Forty grams (40g) of refined vegetable oil potentially satisfies children's full daily requirements and about 70% of adult requirements.

Whereas whole grain cereal, such as wheat and corn are not fortified, all processed food cereals under Title II programs, with the exception of rice, are fortified with B vitamins (thiamin, riboflavin, folic acid, and niacin), vitamin A, calcium, and iron. Blended cereals (corn-soy blend and wheat-soy blend)

are further fortified with zinc, B12, pantothenic acid, iodine, magnesium, vitamin C, vitamin D, and vitamin E.

The micronutrient content of blended cereals (see the Commodity Fact Sheets found in Section I of the CRG) are estimates.[6] Because some of these vitamins are lost during storage and cooking, they do not accurately reflect the quantities available to the body after consumption. For example, up to 40 percent of vitamin A is lost from fortified cereals that is exposed for several months to heat, light and air. Minerals are not subject to deterioration by environmental factors, however, their bioavailability in cereal can be greatly reduced by absorption inhibitors present in food aid commodities and other foods commonly consumed, such as tea, and coffee.

Since micronutrient deficiencies, particularly vitamin A and iron are common in most food insecure areas, food aid programs, to the extent possible, should try to provide vitamin A and iron supplements to young children and pregnant and lactating women. Cooperating Sponsors should try to link with government services or donors such as UNICEF to obtain a regular supply of supplements.

2. Income Transfer Value

Rations are sometimes used as an incentive for mothers to attend health facilities, and it is the income transfer value of the ration package that is important. Income transfer value is the monetary value of the ration to the household. The estimated income transfer of Title II rations is the market price of equivalent quantities of the local commodities that are most similar to the food aid commodities in the ration. If an MCHN program uses food aid for its income transfer (monetary) value, the ration package's minimum level of acceptable income transfer value will need to be determined. The minimum level of income transfer value should include the recipients' participation costs, such as lost wages and transportation.

When used as an incentive, past program experience, conversations with local authorities and community leaders, and discussions with agencies implementing MCHN programs may be useful sources of data and information before agreeing upon a minimum level. To determine the income transfer value needed for incentive-type programs, the following factors should be considered:

- What is the cost to the target population for participation in the program, i.e., transportation, daily lost wages, daily wage rate?
- What other incentives are offered, i.e., health services?
- What is the value of the commodities to the participants?

Foods in the current diet should be determined, such as:

- imported foods
- high cost items, i.e., oil, milk and other commercial processed foods
- seasonally unavailable staples
- important foods that cannot be obtained in adequate quantities because of income constraints

Commodities that replace highly valued and expensive food items, such as oil, may have a substantial

[6] However, U.S. manufacturers of dry food aid commodities are now required to produce fortified food with average lot values of not less than 80 percent of the vitamin values and 100 percent of mineral values as specified in Part One of the CRG. In refined vegetable oil, the vitamin A levels are mandated to be between 60 and 75 IU/gram.

income mediating effect, freeing up income typically used for purchasing expensive items to buy less expensive local foods or goods that can enhance and diversify the diet. See Module 2: FFW Programs for more information on income transfer value considerations. HYPERLINK.

STEP 4: RATION CALCULATION

After calculating the nutritional or income value of a proposed ration package, the following actions may be taken: (1) calculate the ration package; (2) calculate the total amount of commodities needed for the program; and (3) determine commodity cost-effectiveness. The large number of commodities on the Title II eligibility list makes it possible to design a variety of ration packages.

It is useful to develop several alternative ration packages so that they can be compared for cost and other trade-offs. Alternative rations should be considered in the initial planning stages in the event that a commodity is not available, may be delayed in transport or when changes in commodity availability, prices, and packaging significantly alter the relative cost effectiveness of a ration package. If a micronutrient deficiency is a problem, consideration of key micronutrient values of a food aid commodity should be factored into the selection process.

1. Calculating the ration package

For logistical and management reasons, a ration package that meets nutritional values **should use no more than three commodities per ration** unless strong reasons exist. Because vegetable oil is a dense source of energy for food deficient populations, it should almost always be included in a ration package. While there is an element of trial and error, the following checklist helps provide a systematic approach for designing food aid ration packages and selecting commodities and their quantities to meet nutritional values:

- Consider the energy and protein nutritional values of the proposed food ration, which have been calculated using Step 3.

- Calculate the oil ration. Around 20% of the food ration's energy should come from oil.[7] Multiply the total energy value of the ration package by 20%. Then divide this amount by 9 (number of kcal per one gram of vegetable oil).

- Subtract the energy contribution of oil from the total energy value of the proposed food package to obtain the balance of kilocalories needed.

- Select a cereal or cereal blend from the list of commodities in Section I of the CRG. Projects targeting a protein or micronutrient deficit target group should first consider blended cereals, such as corn-soy blend (CSB) or wheat-soy blend (WSB). While blended, fortified, or value added foods should be considered first, other factors such as cost, energy and protein content, acceptability, ease of storage, and processing requirements should also be considered.

[7] The total contribution of fat to the calories in the ration will be higher than 20 percent, especially if oil is combined with either CSB or WSB, which contain about 7 percent fat. About 16 percent of the nutritional energy of these foods is in the form of fat because oil is a part of the blend, while other processed cereals contain much less fat content. Also, the overall contribution of fat by the local food in the diet should be considered. With the exception of breast milk, in most poor households the amount of fat consumed by a child is likely to be low.

- Calculate the number of kilocalories per one gram of cereal/cereal blend by dividing the number of kilocalories per 100 grams of commodity by 100 (from Commodity Fact Sheets in Section II). These fact sheets are available at www.usaid.gov/hum_response/crg.

- Divide the balance of kilocalories needed by the number of kilocalories per one gram of cereal/cereal blend to obtain the total grams of cereal/cereal blend.

- Calculate the number of grams of protein per one gram of cereal/cereal blend by dividing the grams of protein per 100 grams of commodity by 100.

- Multiply the amount of protein per one gram of cereal/cereal blend times the total grams of cereal/cereal blend in the ration package to obtain the protein contribution of the cereal/cereal blend.

- Subtract the protein contribution of the cereal/cereal blend from total protein value target for the proposed ration package. If more protein is needed, either increase the amount of cereal/cereal blend, replace the cereal with a cereal blend, or use a third commodity.

- If a third commodity will be used, dry beans, peas, lentils, or soy should be used to increase the protein value of the package.

- Determine the number of grams of protein per one gram of the third commodity by dividing the grams of protein per 100 g of commodity by 100. Then, divide the balance of protein needed by the grams of protein per one gram of the third commodity. This will determine the amount of commodity needed to provide the remaining protein allowance.

- A ration calculated this way would contain up to 30 percent of its energy from fat (lipid) if a cereal blend is used along with the oil, because of the contribution of fat from the cereal commodity. If another cereal is used, the fat contribution will be closer to 20 percent. The fat contribution can be adjusted by lowering or raising the percentage of oil the first step of the calculation.

- Do not forget to take into account the energy value of the third commodity and, if necessary, reduce the cereal ration accordingly.

Box 6 below provides a detailed example of how to calculate a ration package for 1-3 year old children.

Box 6: Calculating a Ration Package For 1-3 Year Old Children

(This example uses the nutritional energy value from Box 5, "precise method".)

OIL

1) Multiply the total number of kcal times .20 (20%) to determine kcal from oil ration.
   560 kcal (from Box 5) x 0.20 = 112 kcal

2) Divide the number of kcal of oil by 9 (1 g oil = 9 kcal).
   112 kcal ÷ 9 kcal/gram = **12.44 g** or **12 g of fortified, vegetable oil per child per day**

3) Subtract the caloric contribution of oil from the total caloric value of the ration package.
   560 kcal – 112 kcal oil = 448 kcal

CORN SOY BLEND

4) CSB is selected to meet needs of young children. Calculate the number of kilocalories per gram of CSB by dividing the number of kilocalories per 100 grams of CSB by 100.
   375 kcal ÷ 100 g = 3.75 kcal per one g of corn-soy blend (CSB)

5) Divide the balance of kilocalories by the number of kilocalories per one gram of CSB.
   448 kcal ÷ 3.75 kcal/gram = **119.47 g** or **119 g of CSB per child per day**

6) Calculate the number of grams of protein per one gram of CSB by dividing the grams of protein in a 100 g amount by 100.
   17.2 g ÷ 100 g = 0.17 g

7) Then multiply the protein amount per one gram of CSB times the total grams of CSB.
   119 g x 0.17 g= **20.23 g or 20 g of protein per child per day**

Thus, a ration package of 12 g of fortified, vegetable oil and 119 g of CSB provides 560 kcal and 20 g protein. (Fat contributes 30 percent of the calories in this ration.)

The micronutrient content of the ration package should also be considered when designing ration packages for MCHN programs. The ration package containing 105 grams of CSB in Box 7 provides between 50% to over 100% of this target group's (children 1-3 years of age) recommended dietary allowances (RDAs) for vitamin A, vitamin C, the B vitamins, folate, calcium, magnesium, iron, zinc, and iodine. The micronutrients content of blended cereals (see Commodity Fact Sheets in Section II) are estimates. Because some of these vitamins are lost during storage and cooking, they do not accurately reflect the quantities available to the body at consumption. For example, up to 40 percent of vitamin A is lost from fortified cereals that is exposed for several months to heat, light, and air.[8] Minerals are not subject to deterioration by environmental factors, however, their bioavailability can be greatly reduced by absorption inhibitors, such as phytates, tea, and coffee.

[8] SUSTAIN. *Final Report of the Micronutrient Assessment Project*. Washington, D.C., 1999.

2. Calculating the Total Amount of Food Commodities Needed

Once the ration package is determined, the amount of commodities needed to feed the total number of persons/household for the program period (usually in metric tons) can be calculated. To determine the number of metric tons (MT) needed for each commodity use the following steps:

- Multiply the number of grams of the commodity per person per day times the total number of persons to receive the commodity.
- Multiply the total number of grams of the commodity needed to feed the target group times the number of days the program will provide the ration package.
- Determine the number of metric tons of commodity needed by dividing the total number of grams per program period by 1,000,000 (number of grams in a metric ton).
- Complete the same calculation for each commodity (vegetable oil, cereal, cereal blend, or legume) that comprises the ration.

Box 7 below provides an example of how to calculate the total amount of commodities.

Box 7: Calculating Amount of Commodities Needed For 2,500 Children 1-3 Years of Age for One Year

1) Multiply grams of vegetable oil per child per day times 2,500 times 365 days.
   12 g oil (from Box 7) x 2,500 persons = 30,000 g x 365 days = 10,950,000 g
2) Divide the total number of grams of oil per year by 1,000,000
   10,950,500 ÷ 1,000,000 = **10.9 MT of fortified vegetable oil per year**
3) Multiply grams of CSB per child per day times 2,500 persons times 365 days.
   119 g CSB (from Box 7) x 2500 persons = 295,500 g x 365 days = 108,587,500 grams
4) Divide the total number of grams of CSB by 1,000,000
   108,587,500 g ÷ 1,000,000 = **108.6 MT of CSB per year**

3. Determining the Cost Effectiveness of Ration Packages

For information on determining cost-effectiveness of the ration package and ranking commodities, refer to the beginning of Part Two of the CRG, *Guidelines for Development of Food Aid Programs: An Overview*.

STEP 5: RANKING AND SELECTION

Naturally, cost plays a key role in the size and effectiveness of programs and cost calculations involve decisions about what cost elements to consider. At a minimum, the illustrative list of commodity

prices in Annex V and current in-country transportation and storage costs can be used. Other factors to consider are:

- **Market disruptions**: The Bellmon determination must ensure that the local market is not disrupted. Market considerations in local areas where programs are targeted might also come into play. For example, it may be less disruptive to provide certain foods in the lean season rather than the harvest season. Guidance on conducting the Bellmon analysis may be found online at www.usaid.gov/hum_response/ffp/bellmon.htm.

- **Logistics and management**: Some commodities may impose undue management or cost burdens due to unusual local conditions (e.g. transportation, storage, handling, pilferage) or unsuitable packaging, for the limited shelf life of the commodity.

The usual sources of data for considering potential market disruptions and logistical problems include past evaluations of similar programs, interviews with host governments and local and international PVO, as well as discussions with international organizations (such as the World Bank and the United Nations), USAID, USDA Agricultural Attaches and Economic/Commercial Officers at U.S. Embassies.

Proposed and alternative, ration packages can now be ranked by nutritional value, income transfer value, total cost, and other factors, such as potential market disruptions and logistical problems. They might also be ranked by cost. Decisions to change ration packages can be made less arbitrarily when alternative rations and their main attributes have been examined in advance.

RESORUCE LIST

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   - *Agricultural Productivity Indicators Measurement Guide.* Patrick Diskin
   - *Anthropometry Indicators Measurement Guide (Draft*). Bruce Cogill
   - *Food For Education Indicator Guide (Draft).* Joy Miller del Rosso and Gilles Bergeron
   - *Food Security Indicators and Framework for Use in the Monitoring and Evaluation of Food Aid Programs.* Frank Riely, Nancy Mock, Bruce Cogill, Laura Bailey, and Eric Kenefick
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   - *Measuring Household Food Consumption: A Technical Guide.* Anne Swindale and Punam Ohri-Vachaspati
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2. Food Aid Management (FAM), 1625 K Street, NW, 5th Floor Washington, DC 20006. Tel: (202) 223-4860, Fax: (202) 223-4862; Web site www.foodaid.org. FAM provides USAID documents (FY 1990-ongoing).

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