

Products are not enough:

**Putting nutrition products in their proper place in the treatment and prevention
of global acute malnutrition**

Briefing and Position Paper



Action Contre la Faim International

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1. Introduction

The management of acute malnutrition has been revolutionized in recent years, fuelled by innovations in nutrition products. Initially designed to treat severe acute malnutrition, there is now an expanding range used to prevent acute malnutrition, treat moderate acute malnutrition, and tackle stunting and micronutrient deficiencies. The growing options can present opportunities to improve nutrition programming, but also introduce potential confusion and challenges related to which product to use, cost-effectiveness, local production, sustainability, patents, ethics and the evidence-base for impact. This paper aims to help policy makers and field practitioners understand the role products can play in nutrition programming and ACF's position on key issues.

1.1 Structure and remit of paper

The paper is designed not only to provide a briefing on the different types of nutrition product available, but also to provide ACF's position on a number of key related issues. Whilst chronic under-nutrition and the prevention of micronutrient deficiencies are hugely important, this paper focuses on the use of products in the prevention and treatment of acute malnutrition. Part A focuses on the treatment of severe acute malnutrition. Part B looks at the prevention and treatment of moderate acute malnutrition and Part C considers the role of nutritional products as part of broader strategies to build resilience to, and prevent, under-nutrition. The paper focuses on children aged 6-59 months, which represent the majority of beneficiaries within ACF's global programmes. ACF interventions also focus on other sub-groups such as pregnant and lactating women, children under 6 months, adolescents and HIV-infected patients, for which separate guidance is available.

1.2 Intended audience

The paper is written to be accessible to field staff requiring guidance on whether or not to use a certain type of product, and also to provide clear guidance on ACF's position for policy makers.

1.3 Some definitions

There are many different types of nutrition product in use. The relevant nutritional product depends on the type of under-nutrition and whether the aim is treatment or prevention. It is therefore useful to briefly summarise the main types of under-nutrition and product categories to set the scene for more detailed discussions later in the paper (see Box 1 & 2 and Table 1).

Box 1: Nutrition Definitions

Chronic Undernutrition: This is where insufficient dietary intake occurs over a long period of time. If not corrected within the first two years of a child's life (including the antenatal period) this can lead to 'stunting' (low height for age), resulting in decreased physical and cognitive development, lower work capacity, and an increased risk of a range of chronic health problems. The same symptoms can be seen with repeated episodes of acute malnutrition or infections.

Acute Malnutrition: This occurs over a short period of time. The symptoms are either a dramatic loss of weight ('wasting') or bilateral pitting oedema of the body ('kwashiorkor'). Wasting results in extreme thinness, and severe forms of kwashiorkor result in swelling, tight, shiny skin, lesions and discoloured hair. Acute malnutrition is determined using anthropometric (body measurement) indicators: weight, height, mid-upper arm circumference and oedema check.

Severe Acute Malnutrition (SAM): This is the stage where the body is so undernourished that the immune system becomes compromised, increasing risk of infection and prolonging existing infections, and the main internal control systems gradually shut down. Risk of mortality is highest in this phase, and recovery requires urgent use of medical treatment and special therapeutic foods. There are three main types of SAM: marasmus (severe wasting), kwashiorkor, or a combination of the two (marasmic kwashiorkor). The latter is the most difficult to treat.

Moderate Acute Malnutrition (MAM): This stage is where the body is becoming seriously undernourished and starting to show signs through the loss of weight and increasing risk of infection. MAM needs treatment using foods high in energy and nutrients to help the body recover to normal and to stop the condition falling into the severe acute category.

Global Acute Malnutrition (GAM): This category includes all children who have MAM or SAM. The prevalence of GAM is often used as indicator to decide which nutrition intervention is required. The World Health Organization (WHO) classify a nutritional emergency when GAM rates exceed 15%, or 10% with aggravating factors.

Mid-Upper Arm Circumference: Measured on the left arm at the mid-point between the tip of the elbow and shoulder blade, typically for children aged 6-59 months as a measure of mortality risk. It is used as a rapid screening tool for nutrition programs to identify the most malnourished children.

Box 2: Product categories

Therapeutic milk: These are manufactured milk powders used to treat children with severe acute malnutrition who require inpatient care due to medical complications. F-75 milk is used in the initial stabilization stage, and F-100 milk is used in the next stages as the child begins to recover, after which the child is normally discharged and treated through outpatient facilities with Ready-to-Use Therapeutic Food (RUTF). For the rehabilitation of severely acutely malnourished children under 6 months of age, diluted F100 is used, through a 'supplementary suckling technique', until breastfeeding can be fully re-established and the child is gaining weight.

Ready-to-Use Food (RUF) encompasses any food that is designed to be eaten straight from the packet, without the need for cooking or other preparation. RUF is therefore an umbrella term to include the RUTF, RUSF and RUCF categories defined below.

Ready-to-use therapeutic food (RUTF): RUTF contains all the energy and nutrients necessary to allow for rapid catch-up growth and is used particularly in the treatment of children over 6 months of age with severe acute malnutrition without medical complications. The majority are lipid-based products based on a paste of peanuts, sugar, milk powder and micronutrient mix, with low risk of contamination and a long shelf-life (e.g. Plumpy'nut[®], Eezeepaste-NUT). RUTF can also be found in the form of biscuits (e.g. BP-100) where ingredients are compressed into a bar.

Ready-to-use supplementary foods (RUSF) are similar in design to RUTF but are only designed to provide part of the daily energy and nutrient requirements. These are commonly in the form of pastes (e.g. Plumpy'sup[®]) and provide about 500 kcal per day in doses of 92g. RUSF is used in the treatment of MAM.

Ready-to-use Complementary foods (RUCF): These again use an ingredient mix similar to RUTF and RUSF. Products given in doses of around 50g per day (e.g. Plumpy'doz[®]) are more likely to be used for blanket targeting of young children (6-23 months) to avoid deterioration of nutritional status and therefore prevention of acute malnutrition. Products given in doses of around 20g a day tend to be used for the prevention of micronutrient deficiencies (e.g. Nutributter[®]).

Fortified blended foods (FBF): These are often used in the treatment and prevention of moderate acute malnutrition, and used as a supplementary food for pregnant and lactating mothers and certain other patients (e.g. those with HIV/AIDS and TB). The common base for these foods is a blend of milled cereals and soya, to which a micronutrient mix, milk powder, oil or sugar may be added e.g. Corn Sov Blend (CSB) CSB+, CSB++, wheat sov blend.

Micronutrient powders (MNP): These are sprinkled onto food at the household level and are designed to provide the recommended nutrient intake for at least 15 minerals and vitamins (e.g. MixMe™, Sprinkles™). Some products also contain essential amino acids and macro-minerals e.g. MixMe Plus™, Topnutri™ range.

Lipid-based Nutrient Supplements (LNS) encompasses products where the majority of energy supplied is derived from fats. These products typically contain varying amounts of vegetable fat, milk powder, ground nuts or soya, sugar and micronutrient mixes. LNS therefore comprise some RUTF, RUSF and RUCF products. They are becoming increasingly popular due to their long shelf life and low risk of contamination.

High-energy biscuits: these can be used during the first phase of an emergency, particularly when people are displaced with no access to a general ration or local food. They can be eaten directly, and some products can also be crumbled into porridge. Sometimes these biscuits are added to other rations in the management of moderate malnutrition. Examples include BP-5, NGR-5 and high protein biscuits.

Ready-to-use infant formula (RUIF): this is used as a breast milk substitute for infants who cannot be breast-fed. Infant formula is not used for treatment of acute malnutrition, and is only used in well-nourished children if it is appropriate and safe to do so.

A note on terminology:

Because malnutrition can refer to both over-nutrition and under-nutrition, the term 'under-nutrition' has been used where possible in this paper. Where widely used technical terms use 'malnutrition', such as severe acute malnutrition (SAM), the original terms have been kept.

Table 1: Overview of products used in the treatment and prevention of undernutrition.

Source: MAM Task Force October 2011 Version

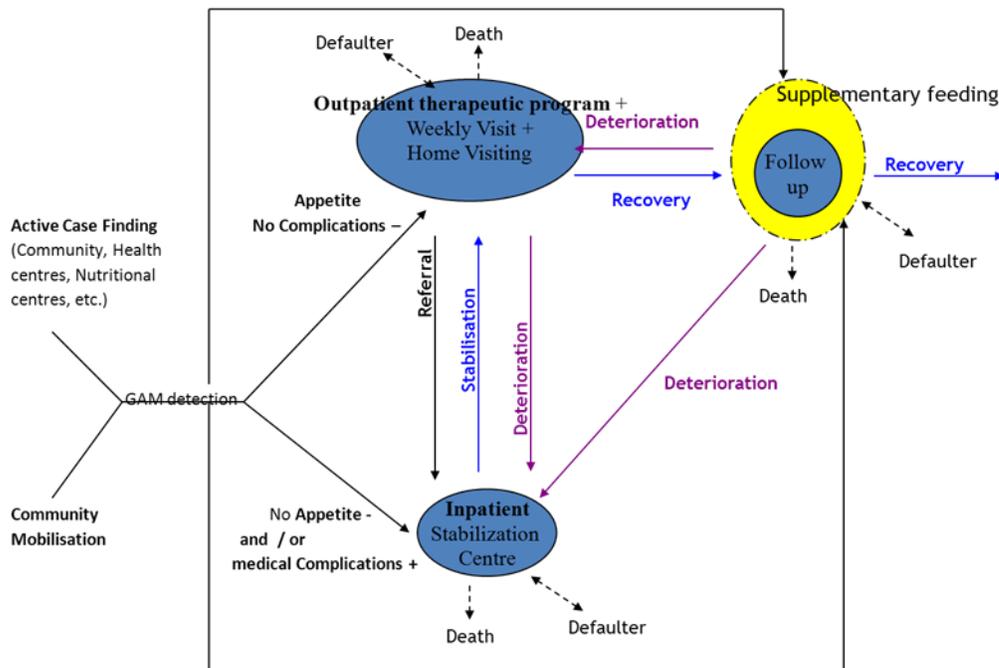
Objective	Treatment of Severe Acute Malnutrition	Treatment of Moderate Acute Malnutrition		Prevention of under-nutrition				Other
Generic Term	Ready-to-Use Therapeutic Foods (RUTF)	Lipid-based Nutrient Supplements (LNS) <i>High quantity</i>	Fortified Blended Foods	Lipid-based Nutrient Supplements (LNS) <i>Medium Quantity</i>	Fortified Blended Food	Lipid-based Nutrient Supplements (LNS) <i>Low quantity</i>	Vitamin & Mineral Powder	High Energy Biscuit (HEB)
Brands	 <p>Plumpy'nut® is part of a range of products patented by IRD/Nutriset</p>	 <p>supplementary plumpy</p> <p>Patent IRD / NUTRISET</p>	 <p>SuperCereal/ oil/ sugar</p> <p>Supercereal Plus</p>	 <p>plumpy'noz</p> <p>Patent IRD/Nutriset</p> <p>Wawa Mum</p>	 <p>SuperCereal/oil/ sugar</p> <p>Supercereal Plus</p>	 <p>Nutributter®</p> <p>Patent IRD/Nutriset</p>	 <p>BP-5</p> <p>NRG-5</p> <p>UNICEF High Protein Biscuits 40g</p>	
Purpose	Treatment of uncomplicated severe acute malnutrition with continued breastfeeding	Supplement to treat moderate acute malnutrition with continued breastfeeding	Supplement to treat moderate acute malnutrition with continued breastfeeding	Supplement to the local diet for prevention of acute malnutrition with continued breastfeeding and prevent micronutrient deficiency and stunting	Supplement to the local diet for prevention of acute malnutrition with continued breastfeeding and prevent micronutrient deficiency and stunting	Supplement to the local diet with continued breastfeeding to prevent micronutrient deficiency and stunting	Fortification of home prepared foods, just before consumption, with continued breastfeeding to prevent micronutrient deficiencies	Temporary meal replacement; prevention for acute malnutrition and micronutrient deficiencies for vulnerable groups
Target Group	6-59 months <i>Older children and adults including HIV+</i>	6-59 months <i>Others pregnant and lactating women including HIV+ adults</i>	6-59 months: <i>SuperCereal Plus</i> <i>Others including PLW, HIV+ adults: SuperCereal</i>	6-23 months	6-23 months: <i>SuperCereal Plus</i> 6- 59 months in acute onset emergencies <i>PLW: SuperCereal</i>	6-23 months Potentially for PLW (under research)	6-59 months	General population, vulnerable groups

Nutritional Composition	Peanut paste, veg oil, sugar, whey, maltodextrin, dry skim milk, cocoa; micronutrient formulation	Peanut paste, veg oil, sugar, whey, maltodextrin, soy protein isolates, cocoa; micronutrient formulation	Maize, de-hulled soy, skim milk powder (8%), sugar, soya oil, micronutrient formulation	Peanut paste, veg oil, sugar, whey, Malto-dextrin dried skim milk, micronutrient formulation	Maize, de-hulled soy, skim milk powder (8%), sugar, soya oil, micronutrient formulation	Peanut paste, veg oil, sugar, whey, Malto-dextrin dried skim milk, micronutrient formulation	A, C, D, E, B1, B2, niacin, B6, B12, folic acid, iron, zinc, copper, iodine, selenium- 15 component	Baked wheat, vegetable fat, sugar, vegetable protein, malt, micronutrient formulation.
Energy /nutrient per 100g	500 kcal 12.5g protein 32.9g fat	500 kcal 12.5g protein 32.9g fat	840kcal 32gprotein 18g fat	247kcal 5.9gprotein 16g fat	840kcal 32gprotein 18g fat	108kcal 2.5gprotein 7g fat	<u>Daily supplement:</u> <u>RDI:</u> A- 400ug, C- 30ug, D- 5ug, E- 5ug, B1- 0.5, B2- 0.5 ug, niacin- 6ug, B6- 0.5ug, B12- 0.9ug, folic acid-150ug, Iron- 10ug, zinc- 4.1, copper- 0.56, iodine-90ug, selenium-17ug	1,800 kcal/400g (biscuits) 2,300kcal/500g (BP-5, NRG-5)
Packaging	Sachet = 92g	Sachet = 92g	SuperCereal: 25 kg bag SuperCereal Plus: 1.5kg bag	325 gm pots	SuperCereal: 25 kg bag SuperCereal Plus: 1.5kg bag	Sachet = 20g	Sachet = 1g	400g packs (HEB) 500g packs (NRG-5, BP-5)
Shelf life	24 months	24 months	12 months	24 months	12 months	18 months	24 months	5years
Ration/dose	According to weight: 6-59m: 200kcal/kg/day	One sachet/day 92g/day (75kcal/kg/day)	200g/day	47-50g/day	200g/day	20g/day	One sachet/day 1g/day or 5g/day	Adults: 400g/day (HEB),500g/day (NRG-5, BP-5)
Approx. duration of treatment	6-8 weeks	3 months	3-6 months	3-6 months	3-6 months	6 months	6-12 months	1 week as full diet 1 month for children
Cost/dose/day (USD)	\$50-\$70 0.36/sachet	0.29/day	Super Cereal: 0.15 / day Super Cereal Plus 0.26/day	0.18/day	Super Cereal: 0.15 / day Super Cereal Plus 0.26/day		0.028/day	2.84/day
Manufacturer	Nutriset (Fr), Vitaset (DR), JB (Mad), Nutrivita (Ind), Edesia (US), Diva (SA), Com-pact (N, Ind), Tabatchnick (US), Challenge (US), Insta(Ke), local production	Nutriset (Fr), Edesia (US), Compact, India & Norway Nutrivita, India (local distribution) Four local producers in Pakistan	Michiels fabrieken (Bel); CerFar (It); ProRata, Somill, J&C (SA) ; Export Trading, Rab (Mal) ;	Nutriset (Fr), Edesia (US) Compact (India, Norway) Nutrivita (India)	Michiels fabrieken (Bel); CerFar (It); ProRata, Somill, J&C (SA) ; Export Trading, Rab (Mal) ;	Nutriset (Fr), Edesia (US)	Global Health Initiative, DSM, Fortitech, Heinz, Hexagon, Piramal (India), Renata (Bangladesh)	NRG-5/BP-5: MSI (D), Compact (N), Biscuits: Nuova Biscotti (I), Michiels (B), Insta (Ke)

PART A: Products & Severe Acute Malnutrition

Between the years 1950 and 2000, children with SAM were treated as inpatients in clinic facilities. Such facilities were often overcrowded, achieved low coverage, kept the caregiver away from home for weeks at a time, and suffered high mortality rates (often well over 30%). The first innovation in nutritional products came in the mid-1990s when therapeutic milks were designed, combined with improved medical and management protocols. This enabled mortality rates to be significantly reduced, although program coverage remained low. From 2000 the approach to treating SAM evolved to a community-based approach where children with SAM without medical complications could be treated as outpatients. This was made possible by the second innovation: the development of RUTF and the approach, termed the ‘community-based management of acute malnutrition’ (CMAM) significantly reduced mortality rates and increased the coverage of nutrition interventions (Briend and Collins, 2010). The latest development is to establish the CMAM approach in non-emergency settings through integration with existing health structures. The major components of the CMAM approach are shown in fig. 1 below.

Fig. 1: The principle components of CMAM



The treatment of SAM relies on specially formulated products combined with medical care. For inpatient care therapeutic milks are used. F75 was formulated in 1994 and provides 75kcal per 100ml; it is used in the first phase of stabilization. The next phases, which help the child to catch-up weight, use F-100. This was designed in 1993 and provides 100kcal per 100ml. Inpatient care for children with SAM with medical complications is generally less than 20% of the total SAM cases, varying according to location and context. In some ACF missions it has been observed it can be lower than 5%. For these children the therapeutic milks should be used according to WHO protocols, which include detailed medical protocols. The first RUTF was developed in 1996 and in 2007 a joint statement was released by WHO, WFP, UNICEF and the UN Standing Committee on Nutrition endorsing the use of RUTF as part of programmes using the CMAM approach.

The majority of cases SAM cases can be treated in outpatient care using RUTF coupled to a medical protocol. Here patients receive a weekly or bi-weekly supply of RUTF to be eaten at home and eaten daily, together with close follow-up and specific drugs. ACF is of the opinion that the monitoring and medical management of SAM patients is just as important as the product used, if not more important.

The key joint UN statement

WHO, WFP, SCN, UNICEF. (2007) *Community-based management of severe acute malnutrition: A joint statement by the World Health Organization, the World Food Programme, the United Nations System.*

Available at

http://www.who.int/nutrition/topics/Statement_community_based_man_sev_acute_mal_eng.pdf

More information on the history of SAM treatment:

Briend A and Collins S. 'Therapeutic nutrition for children with severe acute malnutrition: Summary of African Experience'. *Indian Pediatrics* 2010; 47: 655-659.

<http://www.indianpediatrics.net/aug2010/aug-655-659.htm>

Golden M. 'Evolution of nutritional management of acute malnutrition'. *Indian Pediatrics* 2010; 47: 667-678.

<http://www.indianpediatrics.net/aug2010/aug-667-678.htm>

ACF Position: The role of management within protocols

ACF recognizes that there are multiple factors that contribute towards recovery of patients from severe acute malnutrition. Whilst therapeutic products, including RUTF, have been a proven key element of success, it is important to note at the outset that the supply of a product is accompanied by other program components. A medical protocol is used to tackle underlying infections and to respond to new or worsening symptoms appropriately. Within outpatient care weekly follow-up is essential, with criteria of how to respond to patients who are not recovering properly. In inpatient care it is essential to have continuous observations by qualified medical personnel. Continual emphasis is placed on the role of appropriate infant and young child feeding within sustainable recovery. A number of ACF missions have found it helpful to introduce focus groups, individual counselling and home follow-up of non-responders and defaulters as a way of improving recovery rates and reducing the proportion of defaulters. In ACF experience, even if the supply chain of RUTF is disrupted temporarily and the amount of RUTF prescribed to the patient is reduced, the continuation of good management procedures that emphasize these other programme elements can help ensure successful outcomes.

A.1 RUTF: a brief overview

RUTF has a composition based on F100 therapeutic milk, but with added iron. RUTF is designed so that it can be used as a complete replacement for food in the early stages of recovery, and then is generally supplemented with usual home feeding, along with infant and young child feeding (IYCF) counselling where necessary, as recovery progresses. Breastfeeding is encouraged throughout. The amount of RUTF a child needs is dependent on body weight, with dosages aiming to provide 200kcal/kg/day. Most RUTF is packaged in 92g sachets, each providing 500kcal. The contents of RUTF have to meet international standards for nutritional composition and maximum toxin levels as set out in the 2007 joint UN statement. RUTF does not replace breastfeeding, and is not used in children under age 6 months. For this age category, diluted F100 therapeutic milk is given through the supplementary suckling technique, until breastfeeding is successfully re-established.

Table 2: RUTF nutritional composition according to the Joint UN (2007) Statement (p.6).

Moisture content	2.5% maximum	Vitamin D	15–20 µg/100 g
Energy	520–550 Kcal/100 g	Vitamin E	20 mg/100 g minimum
Proteins	10%–12% total energy	Vitamin K	15–30 µg/100 g
Lipids	45%–60% total energy	Vitamin B1	0.5 mg/100 g minimum
Sodium	290 mg/100 g maximum	Vitamin B2	1.6 mg/100 g minimum
Potassium	1,110–1,400 mg/100 g	Vitamin C	50 mg/100 g minimum
Calcium	300–600 mg/100 g	Vitamin B6	0.6 mg/100 g minimum
Phosphorus (excluding phytate)	300–600 mg/100 g	Vitamin B12	1.6 µg/100 g minimum
Magnesium	80–140 mg/100 g	Folic acid	200 µg/100 g minimum
Iron	10–14 mg/100 g	Niacin	5 mg/100 g minimum
Zinc	11–14 mg/100 g	Pantothenic acid	3 mg/100 g minimum
Copper	1.4–1.8 mg/100 g	Biotin	60 µg/100 g minimum
Selenium	20–40 µg	n-6 fatty acids	3%–10% of total energy
Iodine	70–140 µg/100 g	n-3 fatty acids	0.3%–2.5% of total energy
Vitamin A	0.8–1.1 mg/100 g	Vitamin D	15–20 µg/100 g

Plumpy'nut® was the first RUTF developed in 1996 by Nutriset and L'Institut de recherche pour le développement (IRD). The idea originated from trying to replicate F100 in a solid bar form. Getting a product with such a high fat content that would remain solid at high temperatures with a good taste proved highly problematic. It was during this experimental stage that the idea of a

spread came up, which had fewer constraints than trying to produce a solid product. To obtain the right melting point a lot of the skimmed milk powder found in F100 was replaced by peanut paste. Initial concerns about how acceptable a spread would be for children were dispelled after the first field trial by ACF in Chad showed that children enjoyed the taste. A second Chad trial in 1998 (Briend *et al*, Lancet, 1999) confirmed that not only was acceptability for RUTF high, but that compared to F100 the energy intake from RUTF was higher. A further trial in 2003 in Dakar showed that mean weight gain from RUTF was over 5g/kg/day higher than with F100 (Diop *et al* 2003). The increased effectiveness of RUTF compared to F100 was particularly pronounced for the most severely wasted children.¹ Further field tests were conducted by Concern Worldwide and Valid International. Now RUTF is commonly used for all children who have uncomplicated cases of SAM. F100 remains important for children who are too young for solid food, or who have a medical condition requiring liquid food intake for the first part of their treatment.

The main advantages of RUTF include:

- The ability to be eaten straight from the packet without need for dilution, preparation or cooking;
- Low risk of contamination due to minimal water content. Drinking water has to be provided with the RUTF, and therefore it is essential to integrate efforts to provide clean water supplies with under-nutrition programs;
- The ability to be used at home by patients without medical complications. This enables treatment of severe acute malnutrition to be achieved at greater scale, and reduces the time taken caregivers have to spend separated from the rest of their family in hospitals, and hence adherence to treatment;
- Fewer staff needed and lower risk of cross-infection when compared to inpatient care;
- Proven effectiveness when used according to international protocols (see Box 3).

¹ Information summarised from <http://www.fantaproject.org/ctc/plumpynut2PPT2.pdf>

Box 3. Key papers that explore RUTF effectiveness in the treatment of severe acute malnutrition.

The evidence for RUTF effectiveness is not only verified in published studies, but also in the everyday experiences of agencies targeting acute malnutrition. The following are some of the key texts.

Collins S. *Community-based therapeutic care: A new paradigm for selective feeding in nutritional crises*. Humanitarian Practice Network Paper 48, London: Overseas Development Institute, 2004. Available at http://reliefweb.int/sites/reliefweb.int/files/reliefweb_pdf/node-22314.pdf

Sadler K. *Community-based therapeutic care: Treating severe acute malnutrition in sub-Saharan Africa*. PhD Thesis. Institute of Child Health, University College London: London, 2009. Available at <http://eprints.ucl.ac.uk/16480/>

Ashworth A. Efficacy and effectiveness of community-based treatment of severe malnutrition. *Food and Nutrition Bulletin*, 2006; **27**(3): S24-S48. Available at <http://helid.digicollection.org/en/d/Js13429e/2.2.html#Js13429e.2.2>

Gera T. Efficacy and safety of therapeutic nutrition products for home based therapeutic nutrition for severe acute malnutrition: A systematic review. *Indian Pediatrics* 2010; **47**: 709-718 Available at <http://www.indiannpediatrics.net/aug2010/aug-709-718.htm>

A.2 Main RUTF products and producers

There are an increasing number of companies producing RUTF for both local and international sale. Table 3 below is not exhaustive, but highlights the main producers at the time of writing.

Table 3: Main RUTF producers

Brand Name	Company	Production location
BP100	Compact	Norway
Chiponde	Peanut Butter Project	Malawi. Part of Plumpy'field [®] , although the Peanut Butter Project is likely to be independent from Nutriset in the coming months.
Diva RUTF	Diva Nutritional Products	South Africa
Eezeepaste-Nut	Compact	Norway and nationally in Kenya and India
Medika Mamba	Meds & Food for Kids	Haiti. Part of Plumpy'field [®] .
Nourimanba	Partners in Health	Haiti
Nutty Butta	Tabatchnick Fine Foods	USA
Plumpy'nut [®]	Nutriset	France and through national partners as part of the 'Plumpy'field [®] network'. There are currently 9 local partners producing Plumpy' nut [®] as a franchise: Amwili (DR Congo), Edesia (USA), Hilina (Ethiopia), Joint Aid Management (Mozambique), JB (Madagascar), NutriVita Foods (India), Power Foods (Tanzania), Société de Transformation Alimentaire (Niger), Vitaset (Dominican Republic).
Re:vive	Mama Cares	USA
VN Peanut Formula	Valid Nutrition	Malawi (own factory) and Kenya (through Insta Products EPZ, also an international RUTF supplier).

A.3 Local production

The above list indicates that there are currently RUTF factories in several developing countries. Although these are widely termed 'local producers' there is no actual definition for what constitutes a local producer. It would be more accurate at this point to define these factories as 'national-level producers' since they rely on large-scale machinery and skilled staff to produce RUTF which meets international standards as set out by the joint UN 2007 paper.

Local level production, with its potential benefits for local farmers and producers, was originally a vision which accompanied the 'birth' of CMAM. However, this has been very difficult to achieve in reality, due to the following challenges:

Production at the truly local level (i.e. village level) faces the following challenges:

- The most expensive ingredient is milk powder, which is not always locally available.
- A mechanical mixer is needed to achieve small enough particle size to avoid separation.
- In order to increase shelf life of RUTF airtight packaging should be used. Without this the lipids and vitamin A and C in the RUTF can quickly oxidise and reduce the shelf life to 3-4 months. If nitrogen-flush packaging is used, the shelf is increased to two years. However, such machinery is expensive for the local producer.
- Quality control: aflatoxin levels need to be carefully checked. Peanuts can be affected by a type of fungus which can cause hepatic oxidative stress or certain cancers when eaten.
- Hygiene: production sites need to be clean and free from rodents.
- Regular testing of the product (in particular for the levels of lipids, proteins and micronutrients) is needed, which requires either owning expensive machinery or otherwise using an external laboratory.
- Local production may be more expensive than production in developed countries due to lack of subsidies for key ingredients (e.g. milk powder), although transport costs may be reduced.

Other challenges include whether the local culture is accepting of RUTF, its ingredient mix and its political implications (see section A.7 for a further discussion on this). Further developments related to local production of RUTF are described in section A.5.

For more information on local production of RUTF:

Local production and provision of ready-to-use therapeutic food (RUTF) spread for the treatment of severe childhood malnutrition. Mark Manary.

Available at: http://www.fantaproject.org/downloads/pdfs/FNB_27_3_2006_e.pdf

Production and Distribution of a Therapeutic Nutritional Product for Severe Acute Malnutrition in India: Opportunities and Challenges. KN Beesabathuni and UCM Natchu. Available at <http://www.indianpediatrics.net/aug2010/702.pdf>

Local Production of RUTF (Special Supplement 2)

<http://fex.enonline.net/102/4-3-1.aspx> and an active discussion on local production available at <http://www.en-net.org.uk/question/225.aspx>

A.4 Validation process

Some of the main buyers and distributors of RUTF have determined a specific validation process before engaging in a contract with a supplier. UNICEF and MSF are examples of such buyers. Main components of the validation process include:

- Certificates of Analysis (CoAs) for all the raw materials used in the RUTF;
- Specification and test results of the mineral and vitamin premix and oil used;
- Complete batch analysis of the finished product submitted annually;
- Test results of certain mineral and vitamin levels in the finished product;
- Product safety tests including levels of aflatoxins, micro organisms, coli, clostridium perfringens, yeast, moulds, pathogenic staphylococci, salmonella, listeria and chronobacter sakazakii.
- Pesticide and radioactivity checks;
- Certificates confirming no ingredients were genetically modified (some countries only);
- Shelf-life tests;
- Clinical trials for any product not using the ingredient list set out in the 2007 UN Joint Statement.
- Acceptability studies;
- Labelling standards met;
- Packaging in 92g sachets and cartons of 150 sachets;
- Manufacturing license.

More details on UNICEF's validation process can be found here:

http://www.unicef.org/supply/files/Technical_Requirements_for_RUTF_Products.pdf

In 2010 UNICEF had 14 validated suppliers, 7 of which were based in developing countries.

More details on UNICEF's RUTF procurement data can be found here:

http://www.unicef.org/supply/files/Overview_of_UNICEF_RUTF_Procurement_in_2010.pdf

ACF Position: Local production and validation

ACF procures RUTF directly from a variety of suppliers. However, many projects receive in-kind contributions from UNICEF which may be sourced from further suppliers. ACF is in the process of validating several international and local suppliers and is designing its own approval protocol for product efficacy, safety and quality. ACF would support the establishment of an independent approval board so that it is not only the main RUTF customers who are the quality regulators.

We see the potential advantages of (and are therefore fully supportive of) procuring RUTF from local suppliers based in developing countries, using local food products wherever possible. Our long term vision will be pursuing our validation process with local suppliers where product efficacy, safety and quality has been demonstrated.

In 2009 UNICEF commissioned an evaluation of its global RUTF supply chain (Duke University *et al.* 2009). Overall recommendations included the use of pre-positioned stocks of RUTF and diversifying the supplier base. We acknowledge that such recommendations are also relevant for our own operations.

A.5 Future developments for RUTF

The RUTF field is constantly expanding and evolving. The following points highlight just some of the latest developments.

i. Product research and development

- There are opportunities for RUTF to be produced at a more local level using existing equipment found in some bakeries and dairy factories. Valid Nutrition are developing an alternative to the standard peanut paste, substituting milk powder and peanut paste for

other cheaper, locally available raw materials (such as chick peas, sesame seeds, maize, soya and sorghum). The alternative formula is currently undergoing efficacy trials and the final version will not have a patent. Once these trials have been completed this could substantially reduce the cost of local production.

- For a summary of potential alternative recipes see here:

<http://fex.ennonline.net/102/4-3-2.aspx>

ii. *Production*

- A factory in Ethiopia is now developed by Valsek to produce a Valid Nutrition product, awaiting UNICEF certification.*
- Potential expansion in Mali by the Peanut Butter Project.*
- Potential expansion of Haiti plants by Meds & Foods for Kids.*
- Factories in the validation process for UNICEF: Project Peanut Butter in Sierra Leone, Valsek in Ethiopia (for Valid Nutrition), Mana Nutritive Aids in Rwanda.
- Nutriset has identified potential partners willing to be part of Plumpy'nut® network in Uganda, Sudan and Burkina Faso.*
- Codex Standards are under development for RUTF. This will fall under the Codex Committee on Nutrition and Foods for Special Dietary Uses. To date a document is being drafted as an annex to the existing standard for processed cereal-based foods for infants and young children.²

A.6 **Patents and Plumpy'nut®**

Nutriset, the producer of Plumpy'nut®, has patented its products. This means that any producer wanting to manufacture RUTF in paste form similar to Plumpy'nut® has to obtain permission from Nutriset in countries where the patent is registered. The patent for Plumpy'nut® was registered in 1997 and now exists in 28 countries to date.³ Manufacturers are free to produce similar products where a patent does not exist (e.g. Haiti). The patent has recently been made much more accessible (see below for details).

² Komrska (2010) and communication as of 23 May 2011

³ Confirmed by Nutriset legal office as of 19th May 2011.

* Communication with producers, May 2011.

The patenting of Plumpy'nut[®] has provoked widespread debate. The following points summarise some of the arguments against the patent raised by some companies and agencies (see Box 4 for sources):⁴

- 'The Plumpy'nut[®] formula is not innovative enough to warrant a patent.'
- 'The patent bars some producers (based in developed economies) from manufacturing the product at a lower cost.'
- 'Monopoly on products keeps cost high, competition could lower costs.'
- 'A patent for a humanitarian product in so much demand, when one producer cannot meet all the needs, is unethical.'
- 'A patent shows that Nutriset are trying to profit from poverty.'

On the other side of the argument:

- 'Patents can protect local producers from producers based in developed economies using subsidised ingredients to produce RUTF far cheaper than could be produced locally.'

Box 4: Plumpy'nut and patents in the news:

'The Sticky Situation Surrounding Plumpy'nut', February 2010.

<http://www.irinnews.org/report.aspx?ReportId=86979>

'The Peanut Solution.' *New York Times* September 2010.

http://www.nytimes.com/2010/09/05/magazine/05Plumpy-t.html?_r=1

'Legal fight over Plumpy'nut, the hunger wonder-product.' BBC News, April 2010.

<http://news.bbc.co.uk/1/hi/world/europe/8610427.stm>

MSF open letter to Nutriset, November 2009.

http://www.msfacecess.org/fileadmin/user_upload/diseases/malnutrition/MSF%20letter%20to%20Nutriset%20Nov_13_2009.pdf

Update from Nutriset on Patent Agreements, 2011:

<http://www.ilins.org/Ins-research-network/information-sharing>

⁴ Note that the statements have been simplified and stereotyped for simplicity and do not necessarily all have evidence to back them up.

- ‘A patent helps to protect against producers selling counterfeit RUTF products which do not meet the adequate nutritional specification.’

As of October 2010 Nutriset opened up access to the Plumpy’nut® patent through an online service (‘Patent Usage Agreement’). This enables eligible companies to create their own formulations and branding of RUTF, and market it independently of Nutriset. In order to qualify for this usage agreement the company has to be based in a developing country covered by the patent (with a majority of the company’s shareholders also based in that developing country). There is no financial obligation to Nutriset for the patent usage agreement, although a 1% contribution of sales is suggested as a donation towards ongoing research.

ACF Position: RUTF and Patents

ACF acknowledges that the global demand for RUTF will continue to increase, particularly as RUTF usage becomes integrated into existing health systems. As such no single producer can be relied on due to constraints on production capacity and the global supply chain. ACF therefore welcomes the steps Nutriset have taken recently to make access to the patent agreement more accessible to local producers. ACF does not consider patents as inherently wrong, recognising the role they can play in protecting RUTF quality and local producer viability, so long as measures continue to be put in place to ensure a sustainable global supply chain of RUTF.

A.7 Acceptance issues

i. Culture and politics

RUTF has been widely used and proven effective in Africa. However, it has not been universally taken up by other countries in the world, seen by some as an ‘African’ solution. There is need of further evidence to prove its efficacy in the Asian context; as such some countries have been reluctant to accept externally produced therapeutic products.

On one side of the argument there are those advocating for the immediate use of externally produced therapeutic food products for the treatment of SAM to minimize the number of children's lives that are put at risk without it. On the other side, there are those advocating for the use of local food products (as have been used in the past) and locally-produced RUTF (removing the need to rely on external suppliers). Some companies have opened factories producing RUTF in Asian countries. However, the production of RUTF in some such countries is for export purposes only and use is sometimes restricted to specific research projects (see Singh *et al.* 2010).

For more information see:

'India blocks UNICEF from using Plumpy'nut[®] to treat malnutrition' *The Times*, August 2009.

<http://www.timesonline.co.uk/tol/news/world/asia/article6739362.ece>.

A consensus statement on the management of SAM in India:

<http://www.indianpediatrics.net/aug2010/aug-661-665.htm>

ii. Peanuts

Peanuts are a barrier to acceptance of some types of RUTF for the following reasons:⁵

- Peanuts have a low lysin content, which means their amino acid profile is not as complete as other foods.
- Peanuts have a very high phytate content and a resulting high phytate: zinc ratio, which decreases the absorption of several minerals in the body.
- Aflatoxins are a risk with peanuts contaminated with a certain type of fungus.
- Some people are allergic to peanuts.
- Not all cultures are used to eating peanuts.

⁵ Summarised from <http://nutrisave.org/nutrisaveblog/?cat=9>

However, used in combination with the other RUTF ingredients they represent a good source of energy and are often locally available for RUTF production. Indeed, if used according to the WHO (2007) RUTF ingredient mixture, the other ingredients in RUTF mean that the amino acid profile and phytate content problems of peanuts are overcome. Peanut allergies in developing countries have been very rarely documented, and the causes of allergies are not well understood (Burks, 2008).

ACF position: RUTF acceptance

ACF has seen the effectiveness of RUTF work first-hand in several contexts and supports widespread uptake of the CMAM approach by health facilities and communities through government management, and the local production of RUTF to meet the demand. The scale-up of CMAM should be alongside (and not replace) initiatives which look at all forms of malnutrition.

Regarding the use of peanuts, ACF has not come across allergic reactions to peanut-based RUTF consumption in developing countries. This could be because peanuts form a part of children's diets from an early age in our areas of operation (including exposure whilst in the womb and through breastfeeding). It may also be due to allergies being on the rise in developed countries due to over-sanitized conditions. At this stage we feel that the proven effectiveness of RUTF outweighs the risk of peanut allergies in the countries we work in. However, we support continued research into alternative recipes that could further reduce the risk of allergic reactions and provide more culturally appropriate ingredient mixtures. We recognise that peanuts are only effective in SAM treatment when combined with the correct ratio of other ingredients as set out by the joint UN statement in 2007.

A.8 Cost

In 2010 ACF was paying \$0.25 per packet of RUTF (Plumpy'nut®). Using an average child weight of 10kg and a length of treatment of 6 weeks, the average cost of treatment is \$45 for the product alone. Transport, storage, staff and drug costs also need to be considered, which will depend on the local context. A 2009 World Bank report estimated that the cost of funding CMAM fully at a global level would be \$2.6 billion a year, which was based on an estimated full cost of treatment of \$200 per child (Horton *et al.* 2009), but the cost of strengthening the health system (a precondition to scale up CMAM) is not included. However, this may well be an underestimate if we consider there are 19 million children with SAM (Black *et al.* 2008), and that some of these children will require more than one cycle of treatment.⁶

Whilst the price of CMAM using RUTF is high, its cost must be interpreted within the context of recognising the considerable returns such an approach delivers. It is more costly not to invest in such interventions. For example, the Scaling Up Nutrition (SUN) Framework (2010) describes how key nutrition interventions (of which therapeutic feeding is one component) will impact significantly on all of the Millennium Development Goals (MDGs), promising 'exceptional pay-off in terms of mortality, morbidity, physical and mental growth, contributions to MDGs, lifetime earnings and overall development' (p.8).

Further information on calculating the cost of SAM treatment:

MSF report on how much is being spent on malnutrition (2009):

<http://www.doctorswithoutborders.org/publications/reports/2009/MSF-Malnutrition-How-Much-is-Being-Spent.pdf>

World Bank report on 'Scaling Up Nutrition: what will it cost' (2009)

<http://siteresources.worldbank.org/HEALTHNUTRITIONANDPOPULATION/Resources/Peer-Reviewed-Publications/ScalingUpNutrition.pdf>

World Bank report on Scaling Up Nutrition: A framework for action (2010)

http://www.unscn.org/files/Announcements/Scaling_Up_Nutrition-A_Framework_for_Action.pdf

CMAM Costing Tool (2011) http://www.fantaproject.org/publications/CMAM_costing_tool.shtml

CONCERN study of cost-effectiveness of CMAM in Malawi:

<http://heapol.oxfordjournals.org/content/early/2011/03/04/heapol.czr017.abstract>

⁶ \$200 per treatment x 19 million children = \$3.8 billion.

ACF Position: Cost of RUTF

ACF recognises that the cost of treating a child with RUTF is not comparable to other products such as micronutrient supplements. Since the cost of many RUTF products is highly linked to fluctuating milk powder prices, ACF welcomes continued research into lower cost alternatives using locally available products. We also recognise that locally-made RUTF products may not be as inexpensive as expected due to lack of subsidies for key ingredients found in some developed countries. However, ACF feels the added benefit to the local economy brought about by local factories should be factored into any cost-benefit analysis when choosing products, and suggests that quantitative research into such local benefits is continued and published. ACF believes that for now RUTF is the most effective treatment for SAM when used with proper management and medical protocols, and should be continued despite the higher product costs in comparison to other nutrition interventions. We advocate for the scale-up of the treatment of SAM, and currently the CMAM approach is the only tested methodology through which we can achieve this (see section A.9). We recognise that in theory the increased demand for RUTF combined with the existing proliferation of good quality RUTF products on the market will increase competition and bring prices down. This must go alongside preventative nutrition strategies that will help reduce the caseload of SAM patients in the first place.

A.9 Coverage and funding

There are an estimated 19 million children with SAM worldwide (Black *et al.* 2008). The World Bank estimates that roughly 1 million children are reached by current nutrition programs,⁷ giving an approximate coverage of only 5.3%. Alternative calculations place the coverage to be within a range that can be as low as 3% to a maximum of 9% (e.g. ACF, 2010). Whilst accurate

⁷ Source: Scaling Up Nutrition: World Bank, 2009

figures are impossible to obtain it is clear that coverage of CMAM needs to be dramatically scaled up. However, as demonstrated above, the cost of treatment using RUTF is beyond the ability of most beneficiaries.

ACF position: Coverage and funding

ACF fully supports the scaling up of CMAM activities for the treatment of SAM. RUTF production and the CMAM approach need to be dramatically increased if all children with SAM are to be reached. We believe that the only way to achieve substantial coverage is through supporting governments to integrate the CMAM approach into existing health facilities where possible. To date there is compelling evidence from Malawi, Ethiopia and Zambia to show that scaling up CMAM through integration into national health systems is feasible and achievable. However, the scale-up of CMAM is also dependent on adequate health staff and facilities, and RUTF and medicines being available at all times to all health facilities treating children with SAM.

Direct operations may well be needed in emergency situations and where existing facilities do not exist, yet a capacity building approach should be employed where possible. ACF strongly urges donors and governments to prioritise funding of CMAM activities in order to achieve the coverage urgently needed. Free access to treatment for children under five is essential if users are to be able to access the necessary services.

A.10 Sustainability

RUTF use is often criticized for being a short-term fix without addressing root causes of under-nutrition. Furthermore, the high cost of the products means that governments or other agencies need to find a lot of funding to serve those in need. ACF believes that a CMAM approach is much more than the provision of a nutrition product. Without close follow-up, a proper

accompanying medical protocol and nutrition education sessions, impact and sustainability can be compromised. True sustainability will only be achieved when CMAM is integrated into existing and functioning health structures. Furthermore, a multi-sector approach involving food security, water and sanitation, integration of HIV management and addressing care practices is needed to make a lasting impact and prevent the development of acute malnutrition in the first place. This topic is the focus of Part C, which will expand on the content highlighted here.

A.11 Impact on breastfeeding

A recent edition of *World Nutrition*⁸ expressed concern that the promotion of RUTF would undermine breastfeeding (both exclusive breastfeeding for children under 6 months and sustained breastfeeding for children aged 6-24+ months).

ACF position: RUTF and impact on breastfeeding

ACF fully supports and agrees that exclusive breastfeeding for children less than 6 months of age is essential for optimum child health. ACF actively promotes this best practice, as well as advocating for sustained breastfeeding for children aged 6-24+ months. There is an important distinction to be made between using RUTF as a treatment for SAM, and using RUTF as a preventative measure. Use of RUTF in the prevention of acute malnutrition will be discussed in Part B. As a treatment for SAM, ACF does not consider that the use of RUTF undermines breastfeeding, but acknowledges that careful follow-up should monitor this risk. If international protocols are followed, then no RUTF should be given to children below 6 months, and for children aged 6-24 months breastfeeding is encouraged before the child is offered RUTF. The message that RUTF is a therapeutic food and not for general consumption is stressed and continued education is provided on the importance of breastfeeding and the use of appropriate foods for complementary feeding.

⁸ See Latham MC, Jonsson U, Sterken E, Kent G. RUTF stuff: Can the children be saved with fortified peanut paste? *World Nutrition*. February 2011, 2, 2, 62-85. Available at www.wphna.org

A.12 Potential negative consequences of rapid re-feeding

David Barker has led a team of researchers exploring the association between low birth weight babies and later development of chronic diseases. His early research demonstrated that the lower the birth weight of the child the higher the risk of coronary heart disease in later life (Barker, 1995). Later research also highlighted potential associations with other chronic diseases as well, such as type 2 diabetes, stroke and high blood pressure. The association was found for children who were low birth weight due to slower growth rather than premature birth. The significance of early nutrition acting on later chronic disease has been labeled the 'Barker Hypothesis' or the "fetal origins hypothesis'. These findings underscore the importance of prevention of under-nutrition, particularly in the first 1000 days of life. A further association, however, has been discovered between later chronic disease and children who are thin in early childhood and then rapidly gain weight through putting on fat (Eriksson *et al*, 2003; Barker, 2005). This has more concerning implications for the rapid re-feeding of children with severe acute malnutrition. Unpublished data has also indicated that fat metabolism may be altered for those recovering from marasmus and kwashiorkor, with unknown implications for later chronic disease.

ACF position: Potential negative impacts of rapid weight gain

There have been no studies to date studying the specific example of children recovering from SAM and later chronic disease. In the research indicating the association between rapid childhood weight gain of thin children and later chronic disease, the weight gain has been over a number of years (between age 2 and 11). It is not clear whether the short period of weight gain seen in SAM children would have any negative consequences later in life, particularly if the child returned to a normal weight after recovery. Rapid early weight gain and then continued obesity for childhood would seem to be a greater cause for concern, although more research is needed to verify this. The research emphasizes that it is weight gain due to adipose tissue that carries the association with chronic disease. RUTF has been designed with the goal of restoration of lean tissue. Future research should aim to collect more data on whether RUTF causes preferential deposition of adipose or lean tissue in beneficiary populations, and whether this in turn carries different risks for chronic disease in later life. ACF will continue to provide RUTF to SAM children due to the elevated risk of immediate mortality, but acknowledges the clear need for further research.

Part B: Products for the prevention and treatment of Moderate Acute Malnutrition

(MAM)

In the case of MAM the patient does not yet display the same degree of physiological complications as a patient with SAM, although the causes are the same. However, patients with MAM are also in a highly vulnerable state and need to be treated before their condition progresses to SAM.

The use of products for the management of MAM is much less clear-cut than for the management of SAM. Indeed, the management of MAM is still an area under much discussion. In February 2010 WHO, UNICEF, UNHCR, WFP and other partners held a consultation on the dietary management of moderately malnourished children. The background research and recommendations for this consultation have been published in Food and Nutrition Bulletin, Volume 30, Number 3, September 2009. WHO are currently working to develop guidelines for the management of MAM and to coordinate a joint UN statement on specifications for foods for treating MAM.

The prevention and treatment of acute malnutrition are not necessarily two mutually exclusive activities. For example, the treatment of MAM acts as prevention for SAM; wider strategies designed to prevent acute malnutrition can also help children with MAM recover; and approaches targeting treatment of MAM can also play a role in prevention if coverage is increased to include those at risk of MAM. Whilst treatment and prevention can be tackled together, often a nutrition program will lean towards one particular element according to budget and time-scale. For example, a limited budget and short time-scale may force an agency to prioritise the immediate treatment of MAM cases over a longer-term preventative approach.

In the following section the treatment and prevention of MAM are outlined separately due to the fact that companies have designed different products (with a corresponding research base) for treatment and prevention. It is therefore important to keep in mind that strategies for prevention and treatment of MAM may overlap in the field.

B.1 Products designed to treat MAM cases

The main products designed to treat MAM are presented below. As with the treatment of SAM, it is important to remember that the treatment of MAM also includes a specific medical protocol

alongside the provision of food, including vitamin A supplementation and measles vaccination where necessary, and systematic deworming.

- **Fortified blended foods:** These products have been used traditionally for the treatment of MAM. The basic mixture contains a combination of blended flour and vegetable protein (e.g. *corn-soy blend* or *wheat-soy blend*), oil and a vitamin and mineral mixture. Sometimes extra ingredients such as sugar and milk powder are added. Before consumption the ingredients are combined into a 'pre-mix', which can be made into porridge. If the program is dealing with 'wet rations' the porridge will be made on-site at a feeding centre and patients will come each day for feeding. A more common program type is using 'dry rations' where the porridge premix is given in one- or two-weekly rations to the care-giver for home cooking through heating and the addition of water.

The wet ration porridge is designed to provide around 500-750 kcal per day per person, with fat contributing approximately 35% of the energy and protein at least 12%. For a dry ration, the caregiver is given typically twice the amount needed, to account for sharing at the household level. Therefore dry rations tend to be calculated on the basis of providing 1000-1500 kcal per patient per day.

Advantages of fortified blended food include its low cost, its good provision of amino acids and an available pipeline for the blended flour. However, the disadvantages include difficulties of pre-mixing, its bulkiness (i.e. a relatively high weight for the number of calories provided compared to other products), its poor nutritional quality and the necessity of adding oil, which is often absent from aid pipelines. Use of fortified blended food in targeted supplementary feeding programmes has also been associated with high levels of defaulting.

There has recently been a move away from using the traditional corn-soy blend formulation due to its high levels of nutrient inhibitors from phytates and high levels of defaulting associated with programs using it. Traditional CSB does not provide the high nutrient-density required by children aged under-two, especially when made into a thin porridge. Instead there have been modifications aimed at reducing levels of antinutrients and increasing the bioavailability of nutrients. The two newest blended foods used by WFP are CSB+ and CSB++, and these now replace CSB.

CSB+: This is a modified form of CSB which contains an improved profile of vitamins and minerals, and contains them in a form which is more bioavailable for the body to absorb. Levels of phytates and fibre (which act as nutrient inhibitors) are reduced through dehulling the soybeans. It is mostly used for children aged one year or older, and for supplementing pregnant and lactating mothers. There is still the need to premix CSB+ with oil and sugar before distributing. This means that the problem with the oil pipeline remains the same as before, and without oil this product is of insufficient nutritional value.

CSB++: This product contains soybean oil, sugar and milk powder in addition to the vitamin and mineral premix and corn-soy blend. There are also stricter regulations on allowable amounts of contaminants. There is no need to premix this product since it already contains all the necessary ingredients, but the main disadvantage at present is its high cost of production. The product is particularly suited to children aged 6-24 months.

- **RUSF:**

Lipid-based RUSF for the treatment of MAM has become popular recently due to the problems associated with CSB highlighted above. Products examples include **plumpy'sup[®]**, **eezeeeRUSF[™]** and locally produced **peanut/soy spreads** in Malawi. They are similar in design to RUTF such as plumpy'nut[®], but are slightly less nutrient-dense. For example, plumpy'sup[®] comes in packets of 92g providing 500 kcal, and being a lipid-based product, it has the same advantages as RUTF, as described in section A.1. The milk powder in RUTF has been replaced by whey protein and soy protein isolates. This reduces the cost compared to RUTF. RUSF is not intended to replace the normal diet; the patient is expected to eat the family meals in addition to the product. The recommended dosage is much lower than with RUTF, at 75 kcal per kg per day. However, some agencies give one packet of plumpy'sup[®] per day to all under 5s with MAM, regardless of body weight.

WFP has developed an RUSF in India and Pakistan, which is similar to plumpy'sup[®] but uses local ingredients such as chickpea and rice flour (de Pee *et al* 2010). The name in Pakistan is 'Wawa Mum' and more information can be found at this link:

<http://www.wfp.org/videos/wawa-mum-factory-field>

- **RUTF:** Products such as plumpy'nut® have also been used in the treatment of MAM, even though its main purpose is for treatment of SAM. In the treatment of MAM one sachet per day (92g, 500kcal) has been given to children aged 6 months to 5 years. ACF strictly does not support this practice and more on our position on this topic is found on page 30.

B.2 Evidence base for treating MAM through products

The evidence base for the use of products to treat MAM is still developing and is far from yielding a concrete conclusion. However, there have been some trends developing, and the following section summarises some of the key research in the field.

i. Research on traditional CSB products

The effectiveness of using fortified blended foods as a supplementary food has been questioned several times over the past 25 years (Briend & Prinzo, 2009). A review by Navarro-Colorado *et al.* (2007) performed a retrospective analysis of 82 supplementary feeding programs between 2002 and 2005. The majority of programs used a CSB mix. Only 39.3% of the programs met the Sphere standard recovery rate of 75% once non-response rates were considered. The review particularly attributed low overall recovery rates to high defaulting rates, and highlighted the low coverage of many programs. It is clear that the traditional supplementary feeding program needs substantial improvements. Reviewing the product used is only one element and this paper emphasised several management and coordination issues also needing to be addressed to improve performance. Recent (unconfirmed) anecdotal field evidence suggests that RUFs used for treatment of MAM may not be shared as much at home and may have less defaulting compared to using fortified blended foods

Webb *et al's* (2011) review of USAID food aid products and programs highlights changes that can be made to the current CSB that USAID uses. Many changes are reflected in the notes on CSB+ and CSB++ above (products used by WFP). The review mentions the potential use of other staple crop mixes such as sorghum-soy, rice-soy, potato-soy or rice-lentil. It recommends the addition of whey protein concentrate to CSB to help with the growth of lean tissue and which is richer in lactoferrin and growth-promoting substances than the dried milk used in CSB++. Another benefit of whey protein concentrate is its minimal fat content, which increases shelf life.

The review not only focuses on ways to improve traditional CSB's macro and micronutrient profile, but also considers ways to improve programming and process quality of USAID interventions.

Further analysis is still required on why levels of defaulting are so high with programs using fortified blended foods. Any programs not using fortified blended foods (apart from CSB++) will also depend on an undisrupted oil supply to make the product effective. Problems with the oil pipeline are major causes of disruption to such programs.

ii. Research on RUSF

Several studies have shown that RUSF is superior to using dry ration when looking at weight gain outcomes. For example:

Lin *et al* 2008: This prospective randomised clinical effectiveness trial took place in rural Malawi with children aged 6-18 months and compared a locally produced RUSF (made from a fortified peanut and soy-based spread) with a maize porridge fortified with fish powder. The RUSF was 3.5 more energy-dense than the porridge. Overall results showed that children receiving RUSF gained 110g more than children receiving the porridge, for children aged 6-12 months. There was no significant difference between the children aged 12-18 months. Note that the study did not target children with MAM, but showed the potential usefulness of RUSF.

Matilsky *et al* 2009: Another randomized clinical effectiveness trial in Malawi, but this time looking specifically at children aged 6-60 months with MAM. The trial compared a milk/peanut RUSF, a soy/peanut RUSF and CSB. The two RUSF products resulted in a similar recovery rate, and the RUSF groups achieved recovery rate that was 8% more than the CSB group. Weight gain rate was also higher in the RUSF groups.

Lagrone *et al* 2010: This research was not comparing different products, but looked at the effectiveness of RUSF in treating MAM outside a clinical research setting. Children with MAM in Southern Malawi received a soy/peanut RUSF (65 kcal/kg/day) and recovery was 80%, defaulting 4% and mortality 0.4%.

The conclusions were that RUSF was an effective product for MAM treatment in an operational setting.

However, there are several different types of RUSF and the evidence showing that RUSF is superior to fortified blends is not universally found. For example, a recent ACF study in Myanmar showed that plumpysup[®] and standard dry ration (fortified blended food) were equally effective in the treatment of moderate malnutrition (Rossi *et al* 2010).

iii. Research on RUTF in MAM interventions

Defourney *et al* (2006) document how MSF used RUTF to treat children with MAM in Niger in 2006. The same amount of RUTF was given to children with MAM as those with SAM. The cure rate for the children with MAM was 95.5% combined with an uncharacteristically low defaulter rate. This field experience suggests that RUTF is effective as a treatment for MAM, but highlights the high cost of such a program.

ACF position on products designed for the treatment of MAM

The management of MAM is not as clear-cut as that for SAM. The following statements only refer to situations when products are being used for MAM treatment. There are several other approaches that can be used for the management of MAM, which are outlined in following sections.

- ACF acknowledges that programs involving traditional CSB have not been highly effective, and that the general trend coming out of recent research shows RUSF may be a viable and potentially more effective alternative.
- Much of the research involving RUSF has come out of Malawi and Niger, and ACF welcomes further research in different settings to help validate RUSF for international use. ACF will also continue with its own research on the topic.
- CSB++ is a promising product that has been re-designed to take account of many of the nutritional limitations of traditional CSB. Lack of field-based evidence surrounding CSB++ makes it difficult to take a position on it at this stage, but ACF welcomes further research on it.

- Fortified blended foods with the addition of oil can be effective if efforts are made to minimise defaulting. ACF recommends continuing use of such products due to their lower cost and often local availability. If CSB++ is not available, and fortified oil is not available to accompany other fortified blended products then effectiveness will be compromised. In this scenario ACF recommends the use of an RUSF like Plumpy'sup®.
- ACF notes the potential effectiveness of RUTF in treating MAM but does not support this practice. If given a choice between RUTF and RUSF for the treatment of MAM we recommend using RUSF due to its lower cost and the importance of keeping a sustainable pipeline of RUTF for those who most need it. It is important to avoid any potential confusion in the community regarding the use of RUTF as a therapeutic food which should not be shared or sold.
- Good management of programs, including close follow-up of children and counselling in relation to caring and feeding practices is just as important as the choice of product. Further research is needed on this topic.
- ACF stresses the need to remember that products given for the treatment of MAM should be given in conjunction with the international medical protocol and close follow-up.

As with RUTF, the manufacture of products for the treatment of MAM raises questions surrounding patents, local production, cost and sustainability. The positions highlighted in Part A regarding these topics are also relevant for this section.

ACF is part of the international MAM task force, which is seeking to provide international guidance on the best practices for the treatment of moderate acute malnutrition.

B.3 Products designed for the prevention of acute malnutrition

The use of products for the prevention of acute malnutrition is a rapidly evolving field. Many of the products are also used for the prevention of chronic under-nutrition (an area not covered by this paper). The following products are some of the main ones available:

- **RUTF:** detailed above
- **Fortified blended foods:** detailed above
- **RUCF: Plumpy'doz[®]** is another lipid-based product made of vegetable fat, peanut paste, sugar, skimmed milk powder, whey, maltodextrine and a mineral and vitamin mix. Its use is intended for preventing under-nutrition (both acute and chronic malnutrition). The ingredients are similar to F100 and RUTF, but the level of vitamin and mineral fortification is higher and energy content is lower. Plumpy'doz[®] is therefore given in smaller doses than RUTF or RUSF and is designed to be eaten with the family meal. Three tablespoons (47g) are given to children per day, amounting to approximately 247 kcal. The target age range for Plumpy'doz[®] is 6-36 months.

Other RUCF products are given in smaller doses, such as Nutributter[®]. These products are more geared towards prevention of chronic under-nutrition. However, given the overlap of chronic and acute malnutrition in the field, products tackling one form of under-nutrition may well impact on other forms of under-nutrition at the same time. RUCFs designed to tackle stunting or micronutrient deficiencies are outside the remit of this paper. However, further research should be followed to see to what extent products designed for chronic under-nutrition also prevent acute malnutrition and vice versa.

- **Plumpy'Soy[®]:** Designed particularly for adults at risk of under-nutrition, but can be used for children aged 2 years and up. Similar to Plumpy'nut, made from vegetable fat, sugar, maltodextrin, soy, whey, cocoa and a vitamin and mineral mix. The recommended dose is two packets a day, providing 1000kcal and 26g protein in total.
- **Compressed biscuits:** such as BP-5 and NGR-5. These contain wheat flour, soybean oil, sugar, soya protein concentrate, amino acids and a vitamin and mineral mix. They are designed particularly for displaced populations who require an emergency ration until alternative food sources become available. They can be eaten directly or crushed into a porridge. They have been used in some circumstances when CSB is not available.

- **Grandi Bien[®]**: This is a pilot project implemented by Nutriset and Société de Transformation Alimentaire in Niger. It covers a range of preventative nutrition supplements which can be bought over the counter in an attempt to increase the coverage of nutritional supplements. It represents a new direction of private-market distribution and the results of the pilot are being assessed to see whether scale-up is an option. More information can be found here: <http://fex.ennonline.net/35/social.aspx>

This pilot project is an example of a wider approach termed 'social marketing' for nutrition. This is the application of commercial marketing strategies to try and influence voluntary behaviour change related to nutrition practices. Social marketing tends to be tailored to specific sub-groups of the population, rather than targeting the general public. Emphasis on relevant advertising, correct pricing of products and ensuring accessibility of products aim to help consumers change their behaviour. This is in contrast to approaches which rely solely on awareness creation alone, without reducing further barriers to behaviour change.

Social marketing for nutrition has been used for several decades, but most examples come from the developed world with the marketing of dietary supplements and other products to help reduce obesity. Aid agencies are starting to apply some of the best practices to their work in developing countries, but this is a relatively new field for most. There is potential for improving public-private linkages to increase availability and awareness of best nutrition practices (of which the selling of products is just one component). Whilst it is too early for ACF to have a firm position on social marketing, it is an avenue worth further research and exploration. One of the issues aid agencies will have to address is whether partnering with businesses will bring accusations of making money from poverty, or whether it will transpire that social marketing will foster local entrepreneurship and improved nutrition status if carefully managed.

For a basic overview of the principles of social marketing see:

<http://www.cdc.gov/nccdphp/dnpa/socialmarketing/training/pdf/course/Basics.pdf>

For an overview of some of the different ways social marketing has been applied to nutrition in developing countries see:

<http://www.fao.org/docrep/t2860t/t2860t02.htm>

B.4 Evidence base for prevention of acute malnutrition using products

There is a very limited evidence base documenting the impact of products used for acute malnutrition prevention.

Use of RUSF: One of the best known studies was implemented by MSF in Niger in 2007 and is documented in Defourny *et al* (2009). Here MSF distributed Plumpy'doz® every month for four months, using the standard dosage of 3 tablespoons a day. All children aged 6-36 months in a certain district were targeted. There was a very high rate of adherence between distribution rounds. The overall results showed that compared to previous years the prevalence of children falling into the SAM category (as measured by MUAC) fell by half. Indeed, the new cases of SAM expected in the annual hunger gap did not materialise and the trend even reversed. Overall the seasonal fluctuation in SAM admissions was flattened out.

Despite these encouraging results, more research is needed on whether the Plumpy'doz® displaced the usual diet at all, or was taken in addition to normal home feeding. Also it was not clear to what extent the product was shared at the household level, or sold on the market.

Use of RUTF: Isanka *et al* (2009) detail a cluster randomized trial of 12 villages in Niger. Half the villages received a 3-month distribution of RUTF and half received no intervention. The intervention areas experienced a 36% and 58% reduction in the incidence of wasting and severe wasting respectively over an 8-month follow-up.

There is no consensus yet as to whether RUTF or RUSF products are more effective for prevention: Isanka (2010) found no difference in effectiveness between the two types in areas of Niger where previous interventions had not been implemented.

Box 5: Useful resources for more information on product-related research:

Despite there being relatively few published studies to date, there is a wealth of research currently being undertaken in the field and new information is constantly being gathered. The best places to look for up-to-date research on products and their use by practitioners are:

- **iLiNS Project:** A research collaboration developing and testing new lipid-based nutrient supplements, with field sites in Malawi, Ghana and Burkina Faso. Updated research can be found on the website: <http://ilins.org/>
- **The Emergency Nutrition Network:** This documents field experience in emergency nutrition, and contains active forums where current issues are debated. <http://www.enonline.net/>
- Some of the main **producers** update their websites with latest product-related research. See for example:
 - o Nutriset: <http://www.nutriset.fr/en/news-media/bibliography.html>
 - o Valid Nutrition: <http://www.validnutrition.org/>
 - o Peanut Butter Project: <http://www.projectpeanutbutter.org/PPB/Resources.html>

B.5 Alternative nutrition-oriented approaches for treatment and prevention of MAM

As has already been mentioned, the prevention and treatment of acute malnutrition can overlap in the field. Furthermore, to gain improvements in nutrition status interventions need not be directly related to food and nutrition inputs. Depending on the causes of under-nutrition it is possible a water, livelihoods, psychosocial or health project may be more appropriate and effective. This is particularly relevant when considering the prevention of under-nutrition, and such approaches are looked at in more detail in Part C.

The following section focuses on food and nutrition interventions which may either complement or replace the use of products. Whilst all play a significant role in prevention of under-nutrition in general, they are also highly relevant in the management of MAM.

- **Infant and Young Child Feeding (IYCF)**

International guidelines on IYCF emphasise the importance of promoting and protecting exclusive breastfeeding for the first six months, the sustained use of breastfeeding whilst weaning from age 6-24 months, the timely and appropriate introduction of complementary foods and the strict adherence to policies surrounding breast milk substitutes and related items. Following the IYCF best practices is likely to be **one of the most effective ways of preventing under-nutrition** amongst infants and children. ACF uses baby tents and breastfeeding corners in addition to focus group discussions and awareness sessions in its projects to help promote proper infant and young child feeding. This approach should be integrated in all programmes implemented by ACF.

Link to IYCF guidelines: <http://www.enonline.net/resources/tag.aspx?tagid=131>

- **Nutrition promotion**

Although often seen purely as an activity accompanying the provision of food, nutrition education has been shown in some contexts to improve food intake in and of its own right. Ashworth and Ferguson (2009) summarise the evidence linking dietary counselling to weight gain, emphasizing the potential role it plays but stressing the need for messages to be made more context-specific. Nutrition counselling is a broad term that encompasses education sessions and practical demonstrations (e.g. cooking and breastfeeding). The approach this counselling takes is paramount to its overall impact. ACF uses nutrition counselling as part of its nutrition interventions, and recognises that in many contexts this information has to be coupled with an approach focusing on psychosocial support in order to be effective.

There are many approaches to nutrition counselling, many of which focus on **behaviour change models**. The positive deviance approach is just one example of how nutrition counselling can be delivered in a way that is well received with lasting impacts. Positive Deviance is an approach that seeks out the children who are well nourished and healthy in a community affected by under-nutrition. These are examples of success in a context where other children are becoming malnourished, and they are drawn from the same socio-economic background. Looking at these successful examples enables an analysis of what is working well, and the identification of best practices that can be adopted by others in the community. The premise here is that many communities already have local solutions to under-nutrition and that

what is needed is simply to help identify those practices and spread the knowledge accordingly. There is a particular focus on the identification of locally-available nutritious foods. Usually the mother or other primary caregiver of a healthy child is chosen to be a facilitator in the community and to help share experiences of the best practices. The chosen facilitator is therefore seen as a role model sharing the same cultural context as the other community members, helping to ensure awareness sessions and demonstrations are as relevant as possible. The approach is particularly useful for addressing behavioural change at the household level.⁹

The approach has been used to reduce the prevalence of acute malnutrition in many countries worldwide. For example, ACF has used the positive deviance approach to develop Community Workshops which aim to help children with MAM recover, as well as targeting children at risk of under-nutrition. A guide containing information drawn from ACF's experiences in Guinea, Mali and Malawi can be viewed here:

<http://www.actionagainsthunger.org/sites/default/files/resources/publications/ACF-Community-Nutrition-Guide.pdf>.

- **Food-based approach**

This approach seeks to maximize the nutritional uptake from existing sources of natural food, and therefore does not aim to supplement or replace the usual family meals. The food multimix concept is an example of research into how local food resources can be used for nutritional rehabilitation without the need for fortification. Here specific recipes are designed based on analysis of the available food resources to provide more than 40% of the daily nutritional requirements of vulnerable groups (Zotor & Amuna, 2008).

For a focus on the prevention of under-nutrition several food security approaches can be considered, such as dietary diversification, home-processing to increase nutrient bioavailability (such as germination, dehulling, fermenting or soaking) as well as tackling food production and access issues (e.g. see Tontisirin *et al.* 2002 for a summary of such approaches). Longer-term approaches include the options of using biofortified crops.¹⁰ For the treatment of moderate undernutrition focus is made on the promotion of foods that are nutrient-dense, high energy,

⁹ For more information on positive deviance, see Positive Deviance / Hearth Essential Elements. A resource guide for sustainably rehabilitating malnourished children. August 2005. <http://www.positivedeviance.org/pdf/manuals/addendum.pdf>

¹⁰ Biofortified crops can be developed through natural cross breeding techniques or genetically modified techniques. ACF does not support initiatives using genetically modified crops (ACF Position Paper on Genetically Modified Organisms, 2003).

containing adequate protein and having a low content of antinutrients (such as animal products, nuts, sesame paste and others).

The advantages of using local food where possible include reduced cost, increased acceptability and sustainability. However, potential disadvantages may include reduced effectiveness and poorer nutritional quality (see Part C) compared to some products, and limited viability in areas of inadequate food production. Save the Children have conducted research into the cost of a diet that provides all the nutrient requirements. In areas of their research most communities have been unable to afford such a diet, meaning that livelihood interventions become increasingly relevant if a food-based approach is to be sustainable (Save the Children, 2007).

- **Home fortification**

There are a number of products available that are designed to be added to the family food to provide a range of vitamins and minerals (micronutrient mixes), and in some cases essential fatty acids and amino acids (often termed 'complementary food supplements'). The latter tend to be targeted more to the under-2s, whereas micronutrient mixes are used by all the population. The products include, but are not limited to, QBMix[®], Nutributter[®], MixMe[™], Sprinkles[™] and Top Nutri[™]. Much of the research for these types of products are related to the correction of micronutrient deficiencies or stunting, which are outside the scope of this paper. However, more research is needed as to whether these products, in conjunction with a food-based approach, could effectively prevent acute malnutrition. Indeed, there is a strong argument to consider these types of interventions even when addressing acute malnutrition. If a program is going to last a year or more in the field it could help address stunting in the first two years of life, when the effects of chronic malnutrition are thought to be reversible. **Acute and chronic malnutrition overlap and should not necessarily be seen as separate programs.**

ACF position on products designed for the prevention of acute under-nutrition

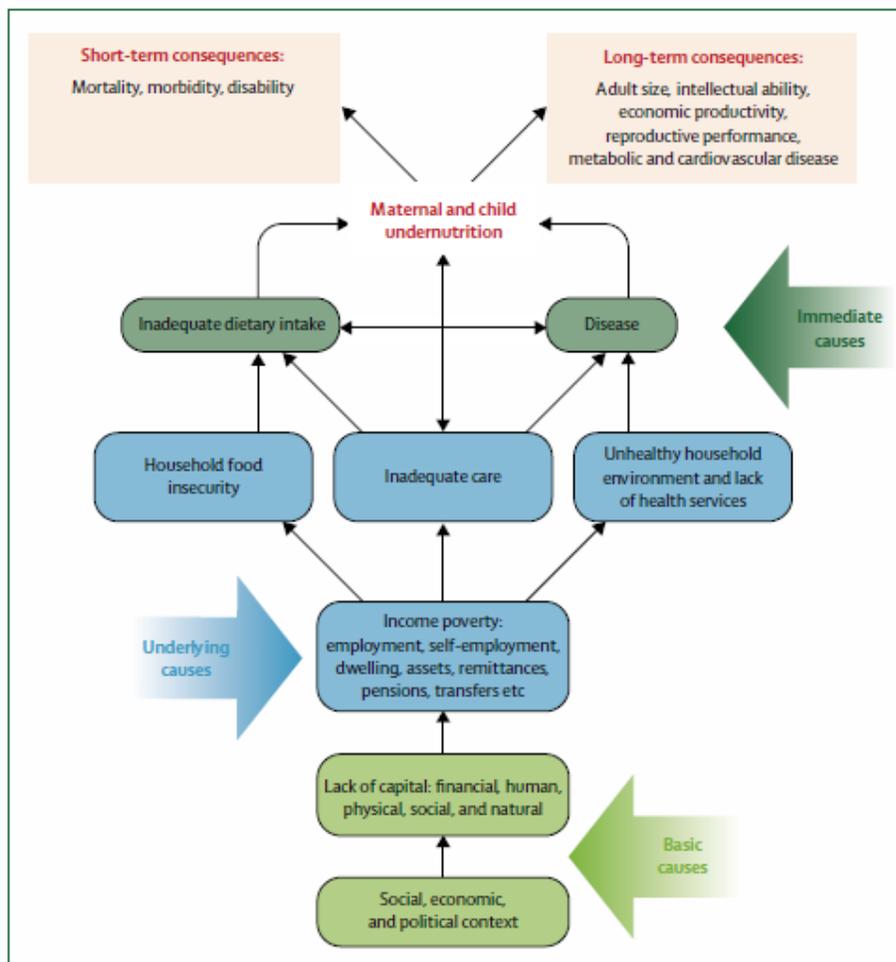
- ACF regards infant and young child feeding best practices as crucial in the effort to prevent under-nutrition. Every effort should be made to ensure that the introduction of products does not undermine breastfeeding, and any focus on a product intervention should always be accompanied by adequate IYCF work. This should include the promotion of, and support to, appropriate caring practices and understanding what the barriers are to good IYCF and caring practices.
- There are many approaches to preventing acute malnutrition, of which the provision of products is just one option. Preventing under-nutrition requires a multi-sectoral approach and therefore even if products are used they should only form one part of the response. This aspect is considered more fully in Part C.
- It is good practice to conduct a causal analysis to identify the causes of under-nutrition prior to any intervention in order to define the best response strategy.
- Where it has been determined that a direct nutritional intervention is required, a food-based approach should be used where possible to prevent acute under-nutrition because of its lower cost, better sustainability and cultural appropriateness. However, in contexts of displacement or natural disasters which have cut off food supplies, products may be the only viable option to prevent a high caseload of patients with acute under-nutrition. In this scenario RUCFs e.g. Plumpy'doz[®] or others could be used (i.e. not RUTF or RUSF due to their overlap with treatment of SAM and MAM).
- ACF acknowledges that there is not enough evidence in the use of products for prevention of under-nutrition and is continuing to conduct its own research to add to current knowledge.

Part C: Products are not enough

C.1 An integrated approach to tackling under-nutrition

Under-nutrition can have a multitude of causes operating at the national, local and household level. To help disentangle some of the different factors involved ACF uses the causal framework for under-nutrition (fig. 2).

Fig. 2: Under-nutrition Causal Framework. Source: Black *et al.* 2008 (p.6).



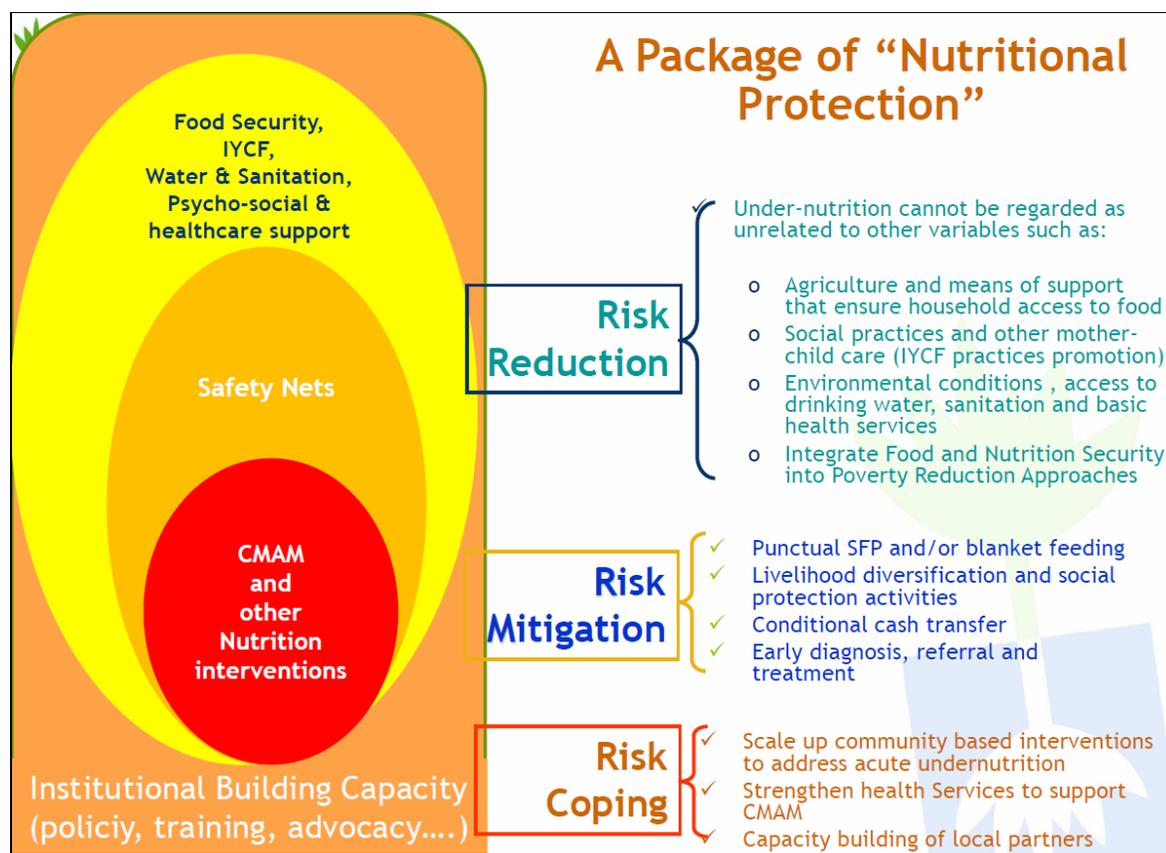
The causal framework for under-nutrition highlights why managing acute malnutrition must go beyond the provision of nutrition products alone. Instead a multi-sectoral approach should be considered and then adapted according to the local context. Depending on the specific causes of under-nutrition a response focusing water and sanitation, mental health, care practices, food

security, livelihoods, healthcare and wider advocacy initiatives may be more effective than a direct nutrition intervention. In many circumstances a combination of approaches will be required. A detailed discussion on causes of under-nutrition is outside the scope of this paper, but readers are referred to upcoming ACF publications on nutrition causal analysis and preventative strategies in nutrition for more details. Save the Children also have publication on causal analysis, and a case study on Kenya can be accessed here:

http://www.savethechildren.org.uk/en/docs/Kenya_Cost_of_the_Diet.pdf

ACF has developed a ‘nutrition protection package’ (fig. 3) to emphasize the multi-sectoral (also called ‘integrated’) approach needed when addressing under-nutrition. By acknowledging the need for using complementary interventions operating at different scales it helps highlight why any stand-alone, single activity is likely to be ineffective. This does not necessarily mean a products-led approach is inappropriate, but it does mean it would be need to be implemented as part of a wider package of support.

Fig. 3: ACF’s Nutritional Protection Package



C.2 How do we decide what approach to use?

A nutritional causal analysis (NCA) will help identify the programmatic areas to be addressed, and nutrition surveys can help give an indication of the severity of a under-nutrition problem. If it is decided that a direct nutrition intervention is relevant, the Integrated Food Security Phase Classification (IPC) can be helpful in choosing the program design (see Annex 1). The SUN (2010) document also provides a summary of evidence-based direct interventions which should be considered when a program is aimed at preventing or treating under-nutrition (including breastfeeding, complementary feeding, improved hygiene practices, increasing uptake of vitamins and minerals, food fortification and therapeutic feeding). The SUN Framework approach of tackling under-nutrition integrates nutrition indicators into other sector's monitoring tools to help promote a multi-sectoral, nutrition-sensitive approach.

When an intervention requires a direct supplementation of food it will need to be decided whether a products-led or a food-based approach is more appropriate (although the two are not necessarily mutually exclusive). The following points highlight some of the factors to consider when making the decision.

- **Nutritional requirements**

A proper analysis of the nutritional requirements of the beneficiary population should be part of any programming response. Whilst anthropometric surveys are becoming a standard tool for both planning and monitoring purposes they cannot capture all information relevant to assessing a population's nutritional intake. Tools such as dietary recalls, food frequency questionnaires and other qualitative research should also be utilized to ensure the proposed programme is adequately meeting the nutritional needs. The underlying nutritional status of a population together with its health and sanitation environment will determine whether micronutrient deficiencies, wasting, stunting or a combination of the three need to be addressed, and whether at a level of treatment or prevention or both. All of this information can help decide whether local food can meet the required gap, or whether it is necessary to consider nutritional products. This analysis is also essential to ensure certain nutrients are not given in toxic doses.

To avoid the application of a 'one-size-fits-all' approach there is therefore the need to be more analytical at the programme planning stage, and to make more use of tools such as linear

programming (see de Pee & Bloem, 2009 for examples), alongside the most recent research on nutritional requirements for undernourished populations

Until the WHO have released the official findings on the consultation on management of moderate malnutrition, Golden (2009) can be used as a resource for checking products or foods chosen meet recommended nutrient densities for moderately malnourished children.

- **Nutritional quality**

Assessment of the nutritional requirements can help determine which natural foods or products are appropriate, but this must be complemented with considering the nutritional quality of the proposed inputs. There are many components which influence the overall nutritional quality of a food item, and some of the major ones are summarized in Annex 2.

- **Acceptability**

Even if the chosen food approach is, in theory, effective and of high nutritional quality, whether the intervention is accepted or not is clearly central to its appropriateness. Local food preferences due to taste and other cultural values highly influence acceptability. Because of the highly context-specific nature of food preferences it is unwise to make broad statements on which approaches are more acceptable. Indeed, in some contexts there may be equal acceptance for different approaches. For example, in Malawi an acceptability trial showed that mothers had similarly positive attitudes towards corn-soy blend and a lipid-based nutrient supplement product (Flax *et al* 2009).

In general terms, however, a food-based approach has the highest likelihood of being accepted if proposed food combinations match local preferences and boost local markets. Products may be accepted at the household level if the taste is deemed good, but the introduction of such products may be less acceptable at the political level in certain contexts (see A.7).

Preparation time and ease is another factor contributing towards acceptability. If food-based approaches encourage the use of too many ingredients or too long a cooking time, acceptability may be reduced. In some emergency situations fuel for cooking may not be obtainable and therefore become the limiting factor. Some forms of RUF that can be eaten without being added to family food have been readily accepted due to the lack of preparation time needed.

- **Sustainability**

ACF endeavour to get the balance right between meeting nutritional needs in emergencies and considering the impact on the longer-term sustainability for the community. If communities are unlikely to be able to implement the chosen approach after the NGO presence is gone the impact will clearly be short-lived and there may be risks of reducing local empowerment and increasing dependency. A products-led approach runs the most risk of being unsustainable due to the higher expense of such items and the need to import the goods long distances in many countries. This does not mean products are always unsuitable, but it does mean that if a product-led approach is decided on it must be accompanied by efforts to increase sustainability in the long-term, for example through advocacy for cheaper products, local production of such products, and the integration of the approach into local health structures.

- **Programme context**

The above factors mention the local context in terms of certain cultural and political dynamics. However, there are also important factors related to the operation of the intervention which can influence decisions. For example, the **level of funding** available is very often the most influential factor in determining which approaches are realistic at a practical level. The time-frame available for recovery may also determine the decision. For example, if only a short time-frame for the programme is available a products-led approach may deliver faster recovery rates. However, if the programme can be implemented over a longer period where growth rates may be slower but still produce high recovery rates in the long-term, the use of fortified foods or natural family foods could be considered.

The **security situation** also has implications for program design. For example, the mass provision of RUFs may increase the risk of attacks in areas where soldiers need a supply of rations.

If the area is endemic for **malaria** then products will have to be chosen carefully according to their iron level. The current ACF position is that iron fortification levels in malarial areas should be less than 12.5mg/100g.

C.3 Towards a decision-making framework

Whilst the idea of a single framework to inform the programme design is attractive, it is not realistic, nor necessarily desirable. The context-specific nature of each programme means that different factors may prove to be limiting in different circumstances. A reliance on a framework also risks avoiding the real need to actively engage in complex decisions on a case-by-case basis. With the above caveats in mind, Annex 3 provides a very broad overview of ACF's general recommendations for program design to date where a nutritional intervention has been decided (remembering that use of the nutritional causal analysis may indicate other program sectors are more relevant). Annex 4 provides WFP's current decision-making tools regarding product choice and program design for comparison. Annex 5 provides the MAM task force list of further resources.

Summary: ACF position on nutrition products

- The solution to the management of acute malnutrition does not lie with products alone. Nutrition causal analysis should be used to determine which integrated approach should be used. Products can play a boosting role, but need to be considered as part of a wider package of support.
- Treatment of severe acute malnutrition requires the use of therapeutic milks and RUTF in accordance with the CMAM approach.
- The management of moderate acute malnutrition is less clear-cut. There is often an artificial divide between treatment and prevention, and approaches designed for one can have an impact on the other.
- If a direct nutrition intervention involving supplementation of diets is required, the choice between products and a food-based approach depends on the context; considering nutrition requirements, nutritional quality, time frame, sustainability, program setting, available funding and cultural acceptability.
- The field of nutrition products is rapidly evolving. ACF will continue to conduct relevant research to help inform program policy. A continual review of ACF positions will be needed as more products become available and as more research findings are shared.

Annex 1: IPC Classification Table

Phase Classification		Key Reference Outcomes <i>Current or imminent outcomes on lives and livelihoods. Based on convergence of direct and indirect evidence rather than absolute thresholds. Not all indicators must be present for classification..</i>	Strategic Response Framework <i>Objectives: (1) mitigate immediate outcomes, (2) support livelihoods, and (3) address underlying causes</i>
1A	Generally Food Secure	Crude Mortality Rate < 0.5 / 10,000 / day Acute Malnutrition < 3 % (w/h <-2 z-scores) Stunting < 20% (h/age <-2 z-scores) Food Access / Availability usually adequate (> 2,100 kcal ppp day), stable Dietary Diversity consistent quality and quantity of diversity Water Access / Avail. usually adequate (> 15 litres ppp day), stable Hazards moderate to low probability and vulnerability Civil Security prevailing and structural peace Livelihood Assets generally sustainable utilization (of 6 capitals)	Strategic assistance to pockets of food insecure groups Investment in food and economic production systems Enable development of livelihood systems based on principles of sustainability, justice, and equity Prevent emergence of structural hindrances to food security Advocacy
1B	Generally Food Secur	Crude Mortality Rate < 0.5 / 10,000 / day; U5MR < 1 / 10,000 / day Acute Malnutrition > 3% but < 10 % (w/h <-2 z-score), usual range, stable Stunting > 20% (h/age <-2 z-scores) Food Access / Availability borderline adequate (2,100 kcal ppp day); unstable Dietary Diversity chronic dietary diversity deficit Water Access / Avail. borderline adequate (15 litres ppp day); unstable Hazards recurrent, with high livelihood vulnerability Civil Security Unstable; disruptive tension Coping "insurance strategies" Livelihood Assets stressed and unsustainable utilization (of 6 capitals) Structural Pronounced underlying hindrances to food security	Design & implement strategies to increase stability, resistance and resilience of livelihood systems, thus reducing risk Provision of "safety nets" to high risk groups Interventions for optimal and sustainable use of livelihood assets Create contingency plan Redress structural hindrances to food security Close monitoring of relevant outcome and process indicators Advocacy
2	Moderately / Borderline Food Insecure	Crude Mortality Rate 0.5-1 / 10,000 / day, U5MR 1-2 / 10,000 / dy Acute Malnutrition 10-15 % (w/h <-2 z-score), > than usual, increasing Disease epidemic; increasing Food Access / Availability lack of entitlement; 2,100 kcal ppp day via asset stripping Dietary Diversity acute dietary diversity deficit Water Access / Avail. 7.5-15 litres ppp day, accessed via asset stripping Destitution / Displacement emerging; diffuse Civil Security limited spread, low intensity conflict Coping "crisis strategies"; CSI > than reference; increasing Livelihood Assets accelerated and critical depletion or loss of access	Support livelihoods and protect vulnerable groups Strategic and complimentary interventions to immediately food access / availability AND support livelihoods Selected provision of complimentary sectoral support (e.g., water, shelter, sanitation, health, etc.) Strategic interventions at community to national levels to create, stabilize, rehabilitate, or protect priority livelihood assets Create or implement contingency plan Close monitoring of relevant outcome and process indicators Use "crisis as opportunity" to redress underlying structural causes Advocacy
3	Acute Food and Livelihood Crisis	Crude Mortality Rate 1-2 / 10,000 / day, > 2x reference rate, increasing; U5MR > 2 / 10,000 / day Acute Malnutrition > 15 % (w/h <-2 z-score), > than usual, increasing Disease Pandemic Food Access / Availability severe entitlement gap; unable to meet 2,100 kcal ppp day Dietary Diversity Regularly 3 or fewer main food groups consumed Water Access / Avail. < 7.5 litres ppp day (human usage only) Destitution / Displacement concentrated; increasing Civil Security widespread, high intensity conflict Coping "distress strategies"; CSI significantly > than reference Livelihood Assets near complete & irreversible depletion or loss of access	Urgent protection of vulnerable groups Urgently food access through complimentary interventions Selected provision of complimentary sectoral support (e.g., water, shelter, sanitation, health, etc.) Protection against complete livelihood asset loss and / or advocacy for access Close monitoring of relevant outcome and process indicators Use "crisis as opportunity" to redress underlying structural causes Advocacy
4	Humanitarian Emergency	Crude Mortality Rate > 2 / 10,000 / day (example: 6,000 / 1,000,000 / 30 days) Acute Malnutrition > 30 % (w/h <-2 z-score) Disease Pandemic Food Access / Availability extreme entitlement gap; much below 2,100 kcal ppp day Water Access / Avail. < 4 litres ppp day (human usage only) Destitution / Displacement large scale, concentrated Civil Security widespread, high intensity conflict Livelihood Assets effectively complete loss; collapse	Critically urgent protection of human lives and vulnerable groups Comprehensive assistance with basic needs (e.g. food, water, shelter, sanitation, health, etc.) Immediate policy / legal revisions where necessary Negotiations with varied political-economic interests Use "crisis as opportunity" to redress underlying structural causes Advocacy
5	Famine / Humanitarian Catastrophe	Crude Mortality Rate > 2 / 10,000 / day (example: 6,000 / 1,000,000 / 30 days) Acute Malnutrition > 30 % (w/h <-2 z-score) Disease Pandemic Food Access / Availability extreme entitlement gap; much below 2,100 kcal ppp day Water Access / Avail. < 4 litres ppp day (human usage only) Destitution / Displacement large scale, concentrated Civil Security widespread, high intensity conflict Livelihood Assets effectively complete loss; collapse	Critically urgent protection of human lives and vulnerable groups Comprehensive assistance with basic needs (e.g. food, water, shelter, sanitation, health, etc.) Immediate policy / legal revisions where necessary Negotiations with varied political-economic interests Use "crisis as opportunity" to redress underlying structural causes Advocacy

Annex 2: Nutritional Quality Considerations

- *Macronutrient ratio:* The recommended ratio of macronutrients depends on the life stage of the beneficiary and under-nutrition context of the intervention. For example, percentage of energy coming from fat varies between 50% for breastfed infants, 30-45% for infants who are weaning, and 30-40% for emergency rations (Michaelsen *et al* 2009). This is relevant as some fortified blended food or family food combinations may not naturally contain the appropriate macronutrient content and therefore require modification before consumption.
- *Protein quality:* Total level of protein provided is not an adequate measure of overall protein quality. If possible the protein digestibility-corrected amino acid score (PDCAAS) should be obtained for the food item to ensure any limiting amino acids are met and that overall protein digestibility is high. This becomes particularly relevant if animal-source food items are not readily available locally, as over-reliance on obtaining protein from certain cereals, pulses or vegetables may result in poor PDCAAS levels.
- *Fat profile:* Similarly the fat profile should also be looked at in greater detail to ensure that the essential fatty acids are given, and provided in the right ratio.
- *Energy and nutrient density:* adequate catch-up growth is dependent on the consumption of an appropriate ratio of energy to nutrients. Food items that meet nutritional requirements for healthy individuals may be inadequate without modification for malnourished individuals with poorer appetite and increased requirements due to infections. The correct nutrient density is not only essential for overall growth rates, but also for the type of body tissue laid down. The emphasis must be on nutrient densities that promote the deposition of lean tissue rather than adipose tissue.
- *Bioavailability:* the consumption of a nutrient does not guarantee it will be utilized in the body, and the bioavailability of nutrients can vary according to the specific form of the nutrient and which other nutrients are consumed at the same time. For example, iron coming from animal sources (haem iron) has a higher bioavailability than iron coming

from plant sources (non-haem iron), and consuming vitamin C at the same time as non-haem iron can dramatically improve its absorption.

- *Antinutrient content:* certain compounds can inhibit the absorption of nutrients, and include phytates (found in some cereals and legumes) and polyphenols (e.g. tannins found in substances such as tea).
- *Fibre content:* too high a content of insoluble fibre can reduce the time the food is in the intestine and therefore reduce absorption of nutrients. Therefore whilst dietary fibre is recommended for populations at higher risk of obesity and chronic disease, in the case of malnourished children the fibre content must be minimized for more effective recovery (Michaelsen *et al.* 2009). Whilst therapeutic products are generally low in dietary fibre, home foods using cereals and legumes have much higher contents.
- *Nutrient-nutrient interactions:* The presence of one nutrient may inhibit the absorption of another. For example, iron, magnesium, calcium and zinc are all divalent cations and may compete with one another for absorption. Any product or food-based approach must therefore consider this when analyzing whether the micronutrient levels being provided are sufficient.
- *Contaminant levels:* Because the immune system of malnourished children is compromised it is especially important to ensure sufficient attention to food safety. Lipid-based products such as some forms of RUTF and RUSF have low risk of contamination due to the low water content. Some fortified blended foods and family foods may carry a higher risk of contamination through aflatoxins (e.g. through improper cereal storage) or through the requirement for adding water. To consider the provision of RUTFs or RUSFs as 'safe' purely due to their low microbial content would be over-simplistic, however, as there remains a requirement for drinking water regardless of the type of food consumed. This is why the provision of clean water is an essential part of any under-nutrition response.

Annex 3: ACF suggested framework for product use in direct nutrition interventions

Scenario	Treatment of SAM	Treatment of MAM	Prevention of GAM	Notes
Emergency setting. Short-term presence (under 1 year), displacement, poor food security,	Use of F75 and F100 for inpatient care. Use of RUTF for outpatient care. Medical protocols	1 st Choice: RUSF e.g. Plumpy'sup 2 nd choice: CSB++ Medical protocol	1 st choice: Full general ration distribution with additional CSB++ for children 6-24 months. 2 nd choice: RUCF distribution of Plumpy'doz to children 6-36 months.. 3 rd choice: Distribution of CSB+ or BP5.	Needs security assessment before widespread distribution of products. Ongoing IYCF and nutrition counselling work
Rehabilitation setting. Medium-term presence (1-3 years).	Use of F75 and F100 for inpatient care. Use of RUTF for outpatient care. Medical protocols	1 st Choice: RUSF e.g. Plumpy'sup 2 nd choice: CSB++ Medical protocol	1 st choice: Home-based fortification with small dose LNS or micronutrient mixes 2 nd choice: CSB+ with added food security measures to increase food basket	Ongoing IYCF and nutrition counselling work
Development setting. Longer-term ACF presence (3-5 years), good access.	Use of F75 and F100 for inpatient care. Use of RUTF for outpatient care. Medical protocols	1 st Choice: RUSF e.g. Plumpy'sup 2 nd choice: CSB++ Medical protocol	1 st choice: Food-based approach using combination of livelihoods and food security projects to ensure families can afford and access a nutritious diet. Use behaviour change methodologies. 2 nd choice: Home-based fortification with small dose LNS or micronutrient mixes	Ongoing IYCF and nutrition counselling work

Annex 4: WFP decision-making tables

Source: Sight and Life No. 3 (2008) Supplement p.11-10-12.

Intervention	Purpose and target groups	Commodities and considerations
<p>Blanket supplementary feeding (this is complementary to the family diet and/or the general food ration)</p>	<ul style="list-style-type: none"> To reduce high or increasing wasting prevalence ($\geq 15\%$) in highly food-insecure and difficult to reach populations To treat the most vulnerable of the population at high risk of developing undernutrition, such as young children (under-twos or under-threes), pregnant and lactating women, and the chronically ill (people suffering from TB and HIV/AIDS) 	<ul style="list-style-type: none"> Blanket supplementary feeding of all under-twos/threes is likely to be more effective to treat the population than targeted supplementary feeding of individual already-underweight under-fives In certain situations, identifying and reaching individual moderately-malnourished children may not be possible. Provide an RUF of 250 kcal/d, such as Plumpy'Doz™. RUFs that supply more energy, such as Supplementary Plumpy™ (500 kcal/d), should only be used for blanket feeding where targeting of individual malnourished children is impossible, and prevalence of moderate acute malnutrition very high Alternatively, provide improved FBFs that also include additional dairy protein, oil, and sugar for under-twos (if necessary, the oil and sugar may be given separately) Use standard FBF with sugar and oil (least preferred) Add allowance for sharing (500–1000 kcal/d/family); when FBFs are provided, the take-home ration of FBF of 1000–1200 kcal/d allows for some sharing; when another, more expensive, specially-formulated food is provided, the family should preferably receive different foods (flour/pulses/oil) to address food insecurity and sharing
<p>Targeted supplementary feeding</p>	<ul style="list-style-type: none"> Children under five years of age with moderate acute malnutrition or underweight Vulnerable groups, such as people in HIV/AIDS or TB treatment programs 	<ul style="list-style-type: none"> A ready-to-use paste, compressed biscuit or bar, that provides 251–500 kcal/d, such as Supplementary Plumpy (500 kcal/d) Improved FBF with dairy protein, oil and sugar Standard FBF mixed with sugar and oil (least preferred) Use of a new commodity should be combined with carefully conducted monitoring and evaluation, and concurrent testing of impact (may be in another location) Add allowance for sharing (500–1000 kcal/d/family) (see above)
<p>Dietary improvement – using complementary food supplements (CFSs) or specific high-quality foods for specific target groups</p>	<ul style="list-style-type: none"> Young children (<5 yrs) Pregnant and lactating women Chronically ill <p>All these groups would not meet their needs with general food fortification because their micronutrient needs are too high compared to the amounts of micronutrients that they can get from the consumption of foods that are fortified for the general population, such as wheat flour, cooking oil etc.</p>	<ul style="list-style-type: none"> These relatively new commodities for home-fortification of an individual's meal can be used where it is primarily dietary quality that is compromised, and should be used in combination with nutrition counseling The appropriate age group for a 20 g (110 kcal/d) spread such as Nutributter™ is < 2 yrs because it contains nutrients that are particularly needed by this age group for their growth and development; powdered CFS (10–20 g/d) may be provided to a slightly wider target group, unless it specifically contains the nutrients most critical for under-twos; and MNP can be used by anyone with inadequate MN intake
<p>Therapeutic feeding (note that this is not normally implemented by WFP)</p>	<p>Children with severe acute malnutrition (SAM)</p>	<ul style="list-style-type: none"> Provision of RUTFs to cases of SAM without complications (requires community-based management of SAM) F100, F75, where RUTF is not available or in case of clinical complications BP100
<p>Food distribution for the general population, including adequately fortified foods</p>	<p>Entire family, for example, as in refugee or acute emergency situation as well as Food For Asset and Social Safety Net programmes</p>	<p>Suited to situations of extreme vulnerability where populations cannot provide for their own food needs. In order to meet the needs of specific target groups, commodities mentioned under 'dietary improvement' may be added</p>

Food Commodities	Examples	For Whom? Children aged 6–23 mo – 24–59 mo	Problem to be addressed	What will the commodity do?	Proven solution or under development
Complementary Food Supplement (CFS)	<ul style="list-style-type: none"> Lipid-based nutrient supplement (LNS), such as Nutributter™ 	✓	<ul style="list-style-type: none"> High risk of growth faltering and micronutrient deficiencies, especially when lacking animal-source or fortified foods Moderately stunted children 	<p>Growth, development, immunity and preventing micronutrient deficiencies</p> <p>Increase linear growth and immunity, and address micronutrient deficiencies</p>	<ul style="list-style-type: none"> Being developed and tested High-quality cost-effective CFS is needed ~20 g/d is typically given in addition to (local) diet LNS contains micronutrients, essential fatty acids (important for mental and motor development) macro-minerals (calcium, phosphorus, potassium, magnesium), and dairy protein (latter two are important for linear growth, i.e. height)
	<p>Powdered Complementary Food Supplement, 10–20 g/d (MNs, macro-minerals, protein/amino acids, enzymes) such as MixMe Plus™ and TopNutri™</p> <ul style="list-style-type: none"> Plumpy Doz™ Indian RUF 	✓	<ul style="list-style-type: none"> High risk of/existing growth faltering and micronutrient deficiencies, especially when lacking animal-source or fortified foods 	<p>Enhance growth, immunity and prevent micronutrient deficiencies</p>	<ul style="list-style-type: none"> Powdered supplement can have same composition as lipid-based supplement (LNS), except for relative amount of essential fatty acids, and powdered supplements that currently exist also do not include dairy protein
Micronutrient-Powder (MNP), supplements, and dispersible tablets	<ul style="list-style-type: none"> MixMe™ Sprinkles™ 	✓	<ul style="list-style-type: none"> High risk of developing micronutrient deficiencies (i.e. anemia prevalence in under-fives > 30%) 	<p>Treatment and prevention of micronutrient deficiencies</p>	<ul style="list-style-type: none"> Approx 50 g/d (250 kcal) is typically given in addition to (local) diet Composition comparable to LNS but in larger amounts
		✓	<ul style="list-style-type: none"> High risk of developing micronutrient deficiencies, in case of (relative) food security, where prevalence of stunting among under-fives is limited (< 20%) 	<p>Prevention of micronutrient deficiencies</p>	<ul style="list-style-type: none"> Available formulations are used and effective Specific formulation has been developed by WFP and DSM for malaria-endemic areas (first use will be in Kakuma, Kenya) Where prevalence of stunting is higher (> 20%), a lipid-based CFS, such as Nutributter™, or a powdered CFS that provides a wider spectrum of essential nutrients (see above) will be better

Annex 5: MAM task force list of further resources. October 2011 version.

RUTF	http://www.imunut.com/index.php?page=product http://www.nutriset.fr/en/product-range/produit-par-produit/plumpynut-ready-to-use-therapeutic-food-rutf.html http://www.compactforlife.com/eezeepaste-rutf/
RUSF	http://www.nutriset.fr/en/product-range/produit-par-produit/plumpy-sup.html
PLUMPY DOZ	http://www.nutriset.fr/en/product-range/produit-par-produit/plumpydoz.html
SUPER CERAL	http://foodquality.wfp.org http://foodquality.wfp.org/FoodSpecifications/BlendedFoodsFortified/tabid/105/Default.aspx
SUPER CERAL PLUS	http://foodquality.wfp.org http://foodquality.wfp.org/FoodSpecifications/BlendedFoodsFortified/tabid/105/Default.aspx
NUTRI BUTTER	http://www.nutriset.fr/en/product-range/produit-par-produit/nutributter.html
MNP	
BP5	http://www.compactforlife.com/bp-5-emergency-rations/

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