

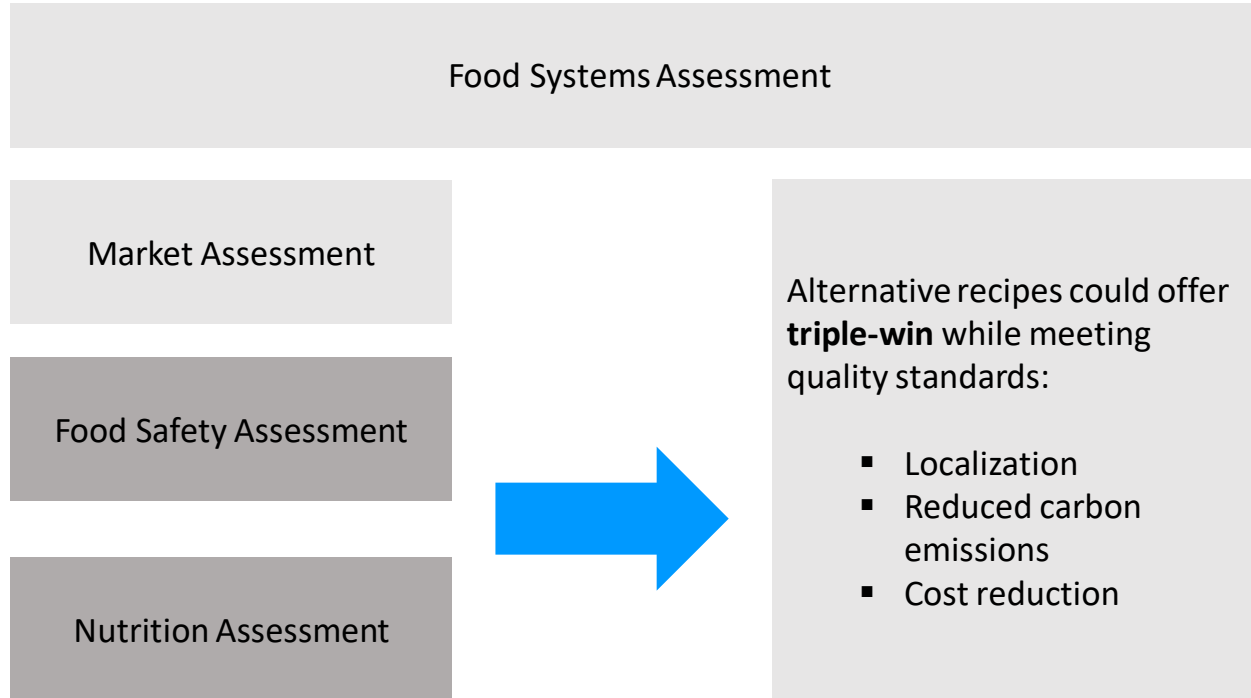
Alternative ingredient for Lipid Nutritional Supplements (LNS) and RUTF

Risks and Opportunities

unicef 
for every child

Alison Fleet
Nutrition Supplier
Forum 2023

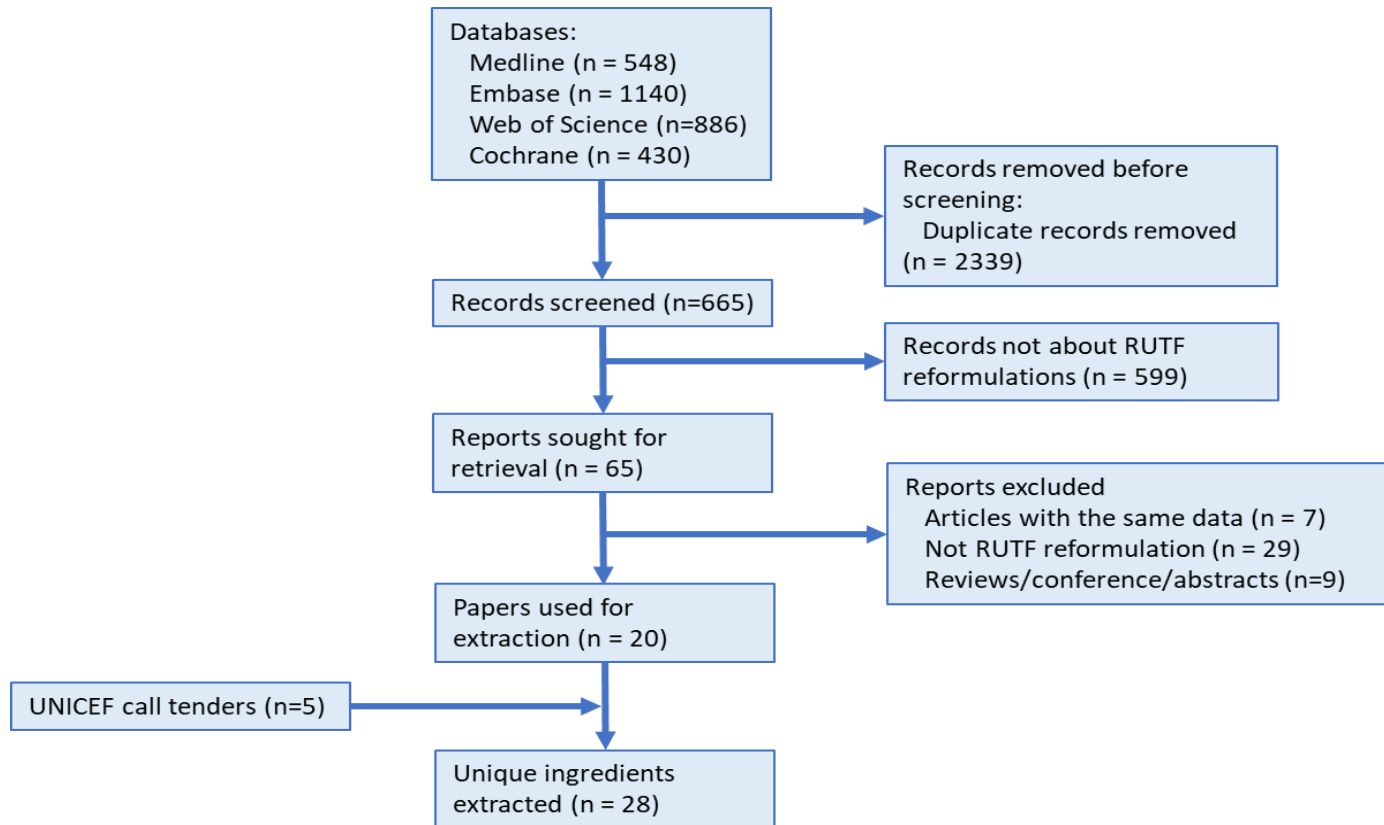
Vision for alternative recipes



Nutrition Ingredient Assessment



Nutritional assessment included of alternative Ingredients for RUTF and LNS products



Twenty-eight Ingredients were included in the Nutrition assessment



Legumes (lentils, Chickpeas, yellow peas, mung beans, **cowpeas**)



Oil seeds: Peanuts, peanut paste, soy four, protein isolate, coconut (desiccated)



Dairy/Milk products (Skimmed milk powder, whey powder)



Poultry (Chicken eggs, duck eggs)



Cereals (Wheat, semolina, maize, sorghum, millet, oats, rice)



Carbohydrates: (sugar maltodextrin)



Refined veg oil (palm, canola/rapeseed, soy, flaxseed, perilla)



Fish (dried Siamese mud carp)



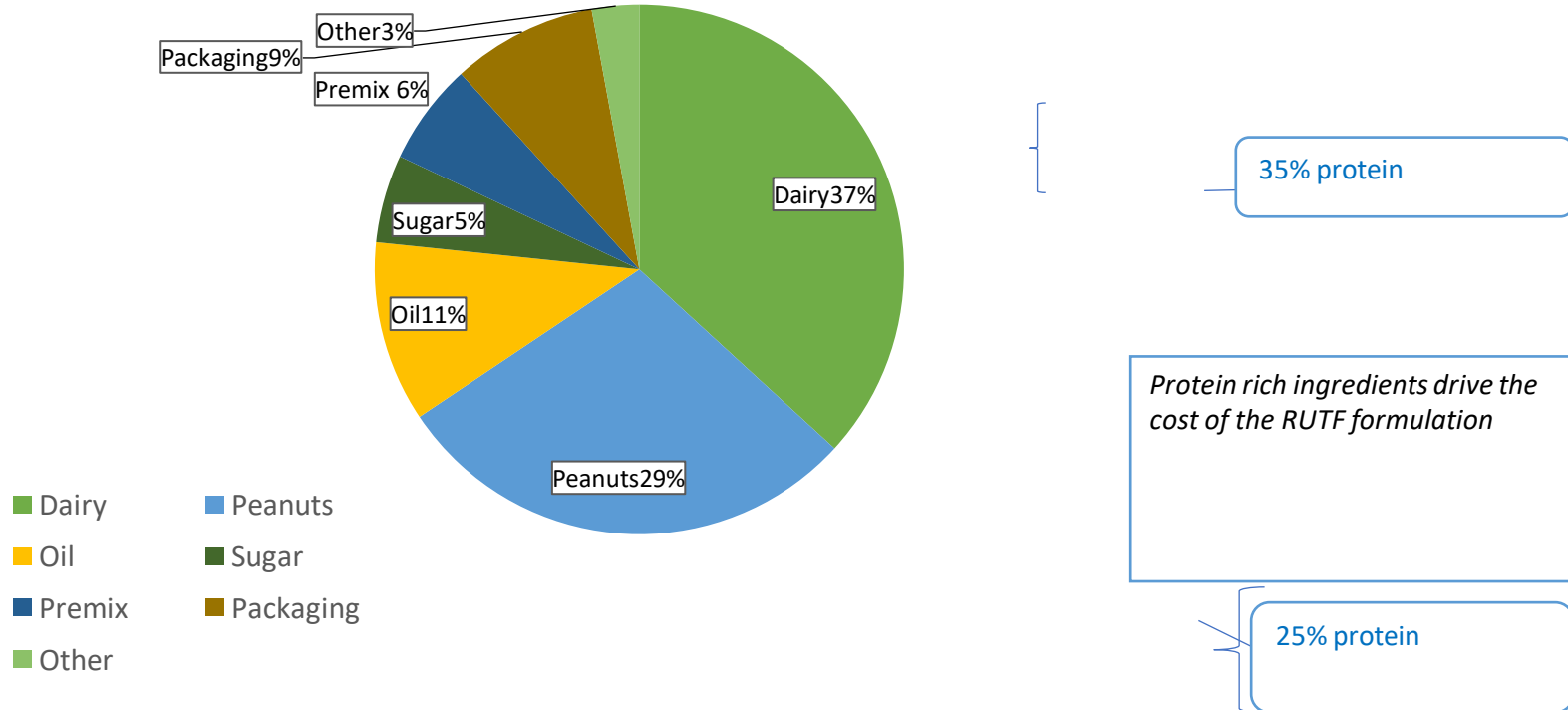
Plantain/ green banana



Additives flavours (vanilla)

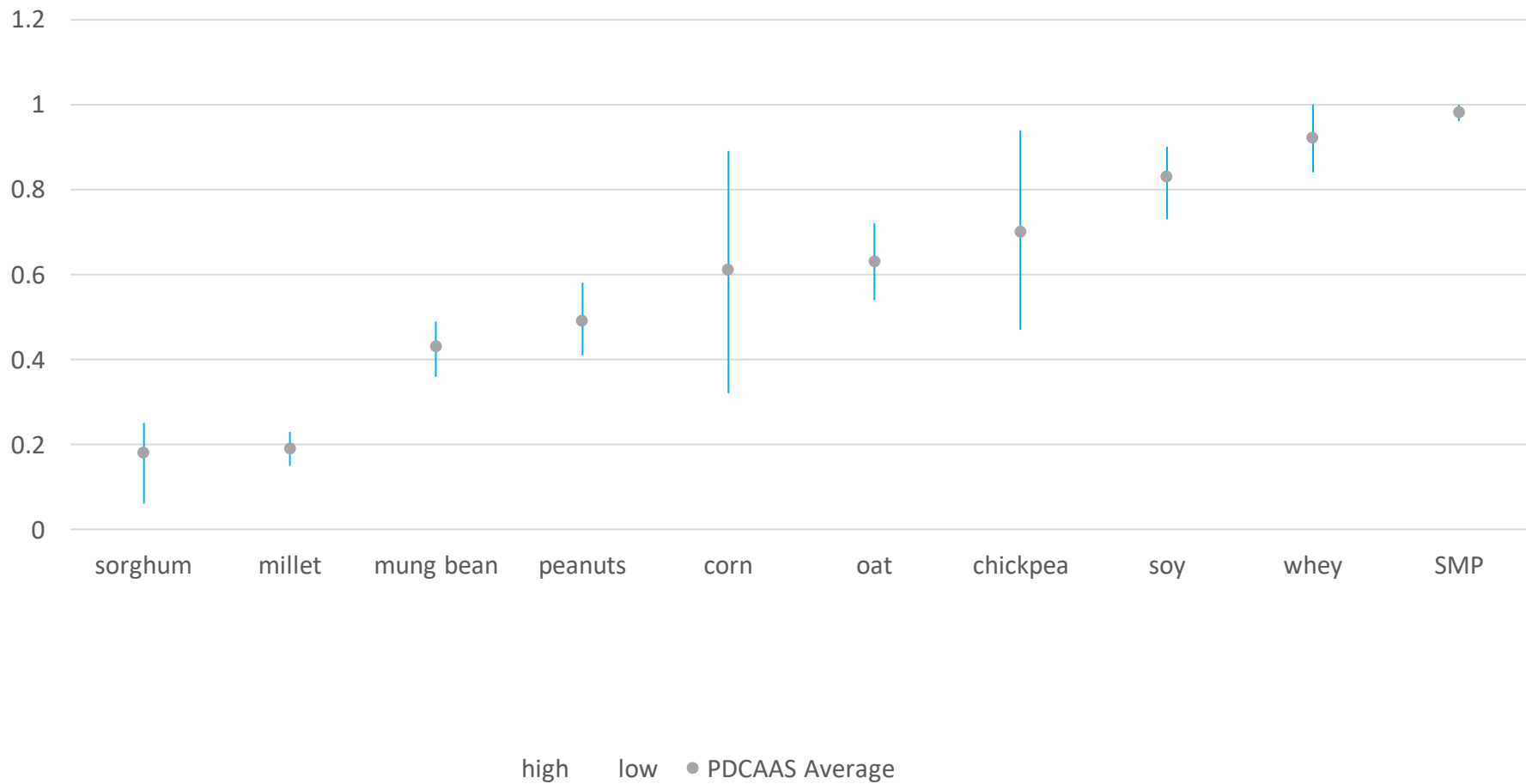
Food Ingredient cost drivers in RUTF

Breakdown of Cost of Goods Sold by RM Value in RUTF (2020)



Source: Dairy, Peanuts, Vegetable oil and sugar are based on submission from UNICEF suppliers in 2020. The costs of premix, packaging and other raw material are prorated based on survey conducted with suppliers in 2013. Disclaimer: UNICEF could not independently audit or verify the raw materials costs provided by the suppliers.

PDCAAS Score Comparisons of Alternative protein sources for RUTF



Plant sources of protein ranking high to low (by average of PDCAAS range)



Soy



Chickpea



Oat



Corn



Peanuts



Mung beans



Millet

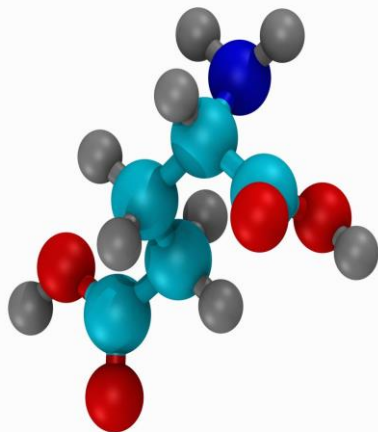


Sorghum

6 selected formulae were included in the assessment

Renovation formula – Chickpea	Renovation formula – Soy	Novel RUTF (Soy, Sorghum, Maize)	NumTrey	Innovation RUTF (Mung)	MDF-2
Skim milk powder Sugar Chickpea Canola Oil Non hydrogenated Palm oil/soy oil Vitamins and minerals premix Emulsifier	Skim milk powder Sugar Defatted soy flower (toasted) Non hydrogenated Soy or canola Oil Non hydrogenated Palm oil/soy oil Vitamins and minerals premix Emulsifier	Whole soybean/ Defatted soybeans Maize flower Sorghum Palm oil Canola oil Palm stearin Sugar Vitamin/Mineral/Amino acid premix Amino acids Lysine hydrochloride Glutamine L-methionine L-proline parts	Small indigenous fish (8%) (Siamese mud carp) Mung beans Rice Soybeans Icing sugar Maltodextrin Canola oil (g) Palm vegetable shortening Desiccated coconut Vitamin and mineral mix Rice flour, Duck eggs Refined sugar, Coconut Vanilla, Oil for cooking	Vegetable oil Mungbean powder Sugar Dairy product Emulsifier Vitamin and mineral premix	Chickpea flour Peanut flour Soybean flour Green banana Rice Lentil Sugar Soybean oil Vitamins and minerals premix Emulsifier (?)

Limiting amino acids in alternative ingredients assessed for RUTF



Lysine

- Legumes, cereals, oil seeds, coconut and plantain

Sulphur amino acids and tryptophan

- Legumes, chickpeas

Histidine

- All animal products

Comparison of nutritional profile of different formulae

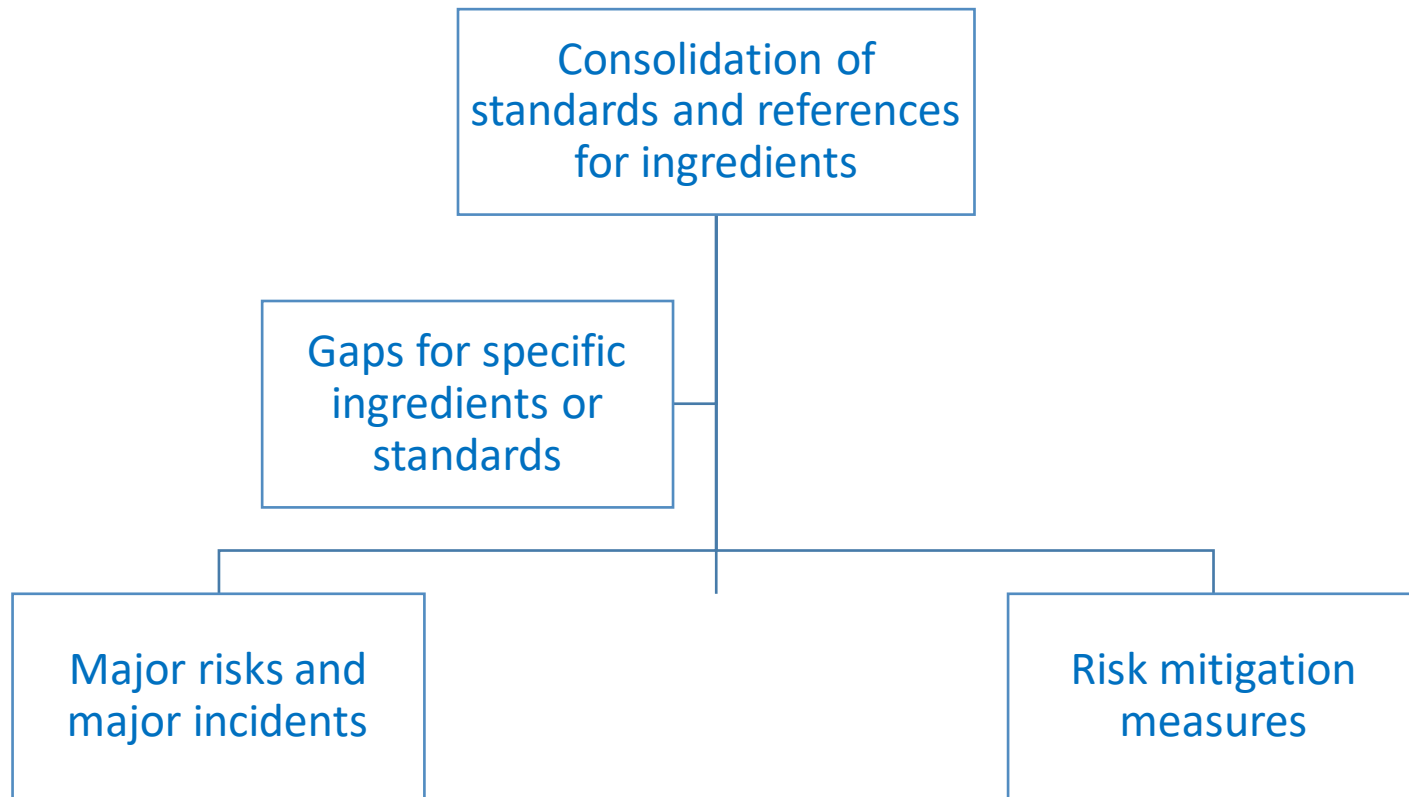
Soy and chickpeas are cheaper than peanuts and also mean less milk is required in the formula

Ingredient (as written in the UNICEF PDCAAS calculator)	RUTF Peanut	RUTF Chickpea	RUTF Soy	RUTF Soy-maize-sorghum
	Content in grams			
Milk, skimmed milk powder (India)	25	23	23	
Estimated PDCAAS	0.94	1	0.99	0.94
Estimated protein content (g/100 g)	14.62	13.17	15.19	14.13
Estimated dairy protein content (% total protein)	56.4	57.6	50	0
Estimated added sugar content (%)	22	18	21	25
Estimated n-3 fatty acid (g/100g)	0.62	0.82	0.59	0.67
Estimated n-6 fatty acid (g/100g)	4.31	4.05	4.15	4.28
Estimated n-6/n-3 ratio	6.9	4.9	7.0	6.3

Food Safety Ingredient Assessment



Food safety assessment included physical, chemical and microbiological assessment of alternative ingredients for RUTF and LNS products



Definitions

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graph LR; A[Definitions] --- B[Microbial hazard]; A --- C[Chemical hazard]; A --- D[Physical hazard];
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Microbial hazard: growth of undesired microbes in foods and the production of their toxic metabolic by-products

Chemical hazard: substances unintentionally present in food or feed from production, processing, transport, or environmental contamination.

Physical hazard: foreign materials unintentionally or naturally introduced to food that are hazardous to the consumer from any stage in production. (eg: metal fragments in ground meat or bones in fish)

Twenty-eight Ingredients were included in the Nutrition assessment



Carbohydrates:
(sugar maltodextrin)



Rapeseed, soy,
flaxseed, perilla)
Refined veg oil(palm,
canola



Fish (dried Siamese
mud carp)



Plantain/ green
banana



Additives flavours
(vanilla)

Microbial risks

Not significant

Contaminant risks

Not significant

Physical hazards:

Foreign bodies (Stalks,
glass fragments, insects,
rodents faeces

Microbial risks

Not significant

Contaminant risks

Arsenic, Lead
Glycidol, Dioxins
and PCBs, PAH
Erucic,
Zearalenone
(maize)

Physical hazards:
not significant

Microbial risks

Salmonella spp

Listeria
monocytogenes.

Contaminant risks

Lead, Cadmium,
Mercury, Dioxins and
PCBs; PAH

Physical hazards:

Wood, fish scales
shells

Microbial risks

Salmonella spp.

Contaminant risks

Not significant

Physical hazards: none
significant

Microbial risks

Salmonella spp.

Contaminant risks:

Nonsignificant

Physical hazards:

Stones

Food Safety Risks for Alternative Ingredients



Legumes (lentils, Chickpeas, yellow peas, mung beans, **cowpeas**)



Oil seeds: Peanuts, peanut paste, soy four, protein isolate, coconut (desiccated)



Dairy/Milk products (Skimmed milk powder, whey powder)



Poultry (Chicken eggs, duck eggs)



Cereals (Wheat, semolina, maize, sorghum, millet, oats, rice)

Microbial risks:

Bacillus cereus, Escherichia coli, Salmonella spp

Contaminants

Lead, Cadmium

Arsenic (in rice); Lead; Cadmium, aflatoxin

Physical hazards:

Field debris, extraneous vegetable materials, metal and glass

Microbial risks:

Salmonella spp

Contaminant risks

Aflatoxins (B1, B2, G1, G2)

Physical hazards:

Extraneous vegetable (mesocarp and exocarp) material or debris, stones

Microbial risks:

Cronobacter spp, Bacillus cereus, Escherichia coli, Salmonella spp, Staphylococcus aureus, Campylobacter, Listeria monocytogenes.

Contaminants

Aflatoxins M1, Lead
Dioxins and PCBs

Physical hazards:

Hair, rubber, plastic

Microbial risks:

Salmonella spp

Contaminant risks

Dioxins and PCBs

Physical hazards: egg -hell fragments

Microbial risks:

Bacillus cereus, Escherichia coli, Salmonella spp, Staphylococcus aureus, Campylobacter, Listeria monocytogenes, Clostridium spp. Cronobacter spp.

Contaminant risks

Arsenic and lead
Deoxynivalenol (DON) ;
Aflatoxins (B1, B2, G1, G2);
T-2 toxin and HT-2 toxin;
Fumonisin (maize)
Ochratoxin A

Physical hazards: Weeds, stalks, sand, soil, metal, glass

Key Points

- Protein content is a cost driver in specialized nutritious foods, including RUTF
- Use of local sources of protein rich ingredients is the way forward, but requires consistent quality to meet the AA requirements
- The main route of entry of Food Safety hazards into RUTF are via the raw ingredients themselves and can persist throughout the manufacturing process.
- Replacing dairy with a plant sources would greatly reduce the cost, but food safety measures need to be addressed first



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Thank You