How to make the food system more sensitive to nutrition?

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1. The current food systems are not optimal / key facts on nutrition

2. How to make food system more sensitive to nutrition?
   a) Dietary diversity in traditional food system
   b) Food fortification to address micronutrient deficiencies
   c) Labelling to improve food environment

3. Conclusions
Key facts on nutrition

**Undernutrition**
462 millions adults underweight
250 millions women
52 million children under five wasted (17 million severe forms)

**Micronutrient deficiencies** (vitamin A, iron, zinc, iodine)
2 billions people
155 million children under five stunted
1.6 billion people concerned by anemia (women in child bearing age and children)

**Overweight / obesity**
1.9 billions overweighted people
600 millions obese people
41 millions children under five overweight

Malnutrition contributes to premature deaths of children and women
Urgent need to improve food systems
Conceptual framework of food system and nutrition

HLPE (2017)
Examples - Research or actions to improve food system

**Food Supply Chains**
- food fortification
  - formulation, packaging, logistics and retail

**Food Environments**
- food classification
  - labelling

**Consumer behaviour and diet**
- traditional food system
  - Production by family farmers
  - Food environment
Example 1 – Diet assessments in traditional food system

Children under five and women
- Africa (Burkina Faso, Madagascar, Benin) and Cambodia
- 24h recall: nutrient and micronutrient intakes, dietary diversity
- description of raw food and traditional recipes

Main conclusions
- people are mainly family farmers
- dietary patterns not optimal (almost vegan, vitamin A, B₉, B₁₂, iron, zinc issues)
- great seasonality according to territories and climates

(Avallone et al., 2007 a and b; Avallone et al., 2008; Randrianatoandro et al., 2010; Amoussa-Hounkpatin 2012)
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- feeding function of ecosystems (forests / lakes)

(Avallone et al., 2007 a and b; Avallone et al., 2008; Randrianatoandro et al., 2010; Amoussa-Hounkpatin 2012)
How to increase diet diversity in traditional food system?

- strengthen local traditional food systems
  - diversify the crops and animals in family farming **along the year**
  - connect farmers to basic post harvest technologies
  - **protect fragile ecosystems** links to sustainable development goals 13 (climate), 14 (life below water), 15 (life on land)

- valorize traditional recipes
  - based on local food and generate incomes for farmers
  - integration in food composition tables, dietary guidelines, nutritional education programs

- healthy diet not reachable for poor people
  - in chronic malnutrition = fortification contributes to **prevention**
  - in food crisis and emergency = ready to use therapeutic food to **cure**

(Baldi et al, 2013; Fill the nutrient gap of World Food Programme)
Example 2 - food fortification to address micronutrient deficiencies

Fortification strategy
Design by processors or NGOs to target nutritional disorders of consumers

Country Nutrition Profiles + public health issue

HLPE (2017)
Fortification strategy

- a way to deliver nutrients to the overall population or more specific groups
- no need to change dietary patterns and local food system
- quick to set up, easy to implement and well accepted
- can yield rapid nutritional and health effects

- technicity and coordination of several stakeholders
- long-supply chains between producers and consumers
Nine studies on the fortification strategy

**Initial food quality**
- oxidative status
- natural antioxidant
- water contents

**Additives**
- vitamins
- minerals
- antioxidants

**Packaging**
- composition (glass, cellulose, PP, PET)
- structure (simple or multilayers)

**Logistic conditions**
- Temperature (20 and 45°C)
- time
- light

**Culinary practices**
- cooking < 100°C
- frying > 120°C
Lessons learned from stability studies in lab

Soya oils fortified with vitamins ADE
2-month / PET packaging

Main conclusions for fortified oils
• good safety and sensory properties
• unstable nutrients: vitamins A D + polyunsaturated fats
  – protection from light and temperature increase
  – use only for seasoning

(Renaud et al 2013; Bacigulapi et al 2016; Hemery et al., 2015; Hemery et al., 2018)
Lessons learned from stability studies in lab

Soya oils fortified with vitamins ADE 2-month / PET packaging

Wheat flour fortified with minerals and vitamins ${AB_9}B_{12}$ / 6-month / 25 °C and 40°C / cellulose and aluminium bags

Main conclusions for wheat flours

• stable compounds: protein, mineral, vitamins B9 and B12 with PET aluminium packaging only
• unstable compounds: vitamins A + polyunsaturated fats

(Renaud et al 2013; Bacigulapi et al 2016; Hemery et al., 2015; Hemery et al., 2018)
Main conclusions for infant formula

- safety and sensory properties were good
- stable compounds: protein, minerals
- unstable compounds: vitamins AD + polyunsaturated fats
- shelf life should be shorten (< 1 year)
- unit dose = very efficient → environmental issues with packaging

(Moustiés et al, 2019; Moustiés et al, 2020)
Example 3 - labelling to improve food environment

Food classification and labelling

Food supply chains
- Production systems: Farmers, indigenous peoples, agribusiness, land and plantation owners, fisheries, financial entities
- Storage and distribution: Transporters, agribusiness, distributors
- Processing and packaging: Packing plants, food and beverage industry, small and medium enterprises
- Retail and markets: Retailers, vendors, food outlet owners, traders, restauranters, wholesalers

Food environments
- Food availability and physical access (proximity)
- Economic access (affordability)
- Promotion, advertising and information
- Food quality and safety

Consumer behaviour
- Choosing where and what food to acquire, prepare, cook, store and eat

Diets
- Quantity
- Quality
- Diversity
- Safety

Nutrition and health outcomes
- Impacts
  - Social
  - Economic
  - Environmental

Availability → Access → Utilization
What about processed food?

- Distinct types of processors: small, medium or large enterprises

- Distinct products (processing and formulation)
  - unprocessed or minimally processed (close to the nature)
  - basically processed
  - moderately processed
  - highly processed: long list of ingredients / additives and complex processing

- Current trends worldwide
  - increasing contribution of processed foods to the consumer’s diet
  - ultraprocessed food are becoming predominant

- Ultra-processed foods characteristics
  - high contents in energy, fat, sugars, salt
  - no matrix effect = high bioavailable nutrient in human gut
  - poor sources of protein, fibre, micronutrients
  - long shelf-life and sometimes big portion size

(Monteiro et al., 2013; Moubarac et al, 2014)
Lessons learned from epidemiological studies

• Ultra-processed food consumption is linked to
  – weight gain, obesity and non-communicable diseases in Brasil, Sweden and US
  – cancer risk in NutriNet cohort

• Non-communicable diseases → increasing number of deaths and public health costs

• News tools to help consumers in making healthier food choices
  – nutrient profiling and food labelling
  – French NUTRISCORE (− salt sugar fat, + fiber fruit vegetables)
    • adopted in Belgium, Germany, Spain, Netherland
    • adopted by 200 food companies (reformulation step by step)

(da Costa Louzada, 2015; Juul et al., 2015; Jull et al. 2018; Fiolet et al., 2018)
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    - adopted in Belgium, Germany, Spain, Netherlands
    - adopted by 200 food companies (reformulation step by step)
  - risk of focusing on the quality of a single food (≠ healthy diets)
  - labelling should not be used only to communicate: companies have to really integrate nutrition issues in their strategy

(da Costa Louzada, 2015; Juul et al., 2015; Jull et al 2018; Fiolet et al., 2018)
Nutrition and health are multifactorial issues

Educate the overall society on food system and leverages
- to build competencies of stakeholders (universities, private sector, policy makers) and to motivate them to maximize nutrition outcomes
- Erasmus capacity building project to train a new generation of entrepreneurs in sustainable agriculture and food engineering (FoodSTEM, Institute of Technology of Cambodia)
- Massive Open Online Course under preparation (FAO and partners)
Conclusions

- No single food or strategy will improve nutrition in the next decade
  - combine complementary approaches
  - efficiency on different time scales
  - make the difference between emergency / development
  - strengthening the traditional food system should be prioritized: advantage to stimulate local economy (jobs, incomes), valorize food identity and culture with less negative externalities (food miles, packaging)

- Food system should be a part of the solution of the global issues = seek win-win situation between nutrition / health / poverty / environment