FrieslandCampina

Institute
for dairy nutrition and health

Sustainable Healthy Diet - Nourishing a Better Planet

Rolf Bos | 4th July 2023

FrieslandCampina Institute is designed to engage with nutrition, health and medical professionals around the globe

Global unbranded engagement platform towards professionals (nutrition, health, medical)

Goal

Stimulating **knowledge exchange** for better nutrition.

What?

Communication platform for nutrition, health and medical professionals on topics linked to health, sustainable diets and dairy.

Why?

Dairy plays an important role in worldwide nutrient security. We believe that by unleashing science-based information on the role of dairy in a healthy and sustainable diet can **contribute to a better nutritional status**.

How?

Scientific (online) conferences

(Accredited) Education programs

Educational tools for professionals and their clients

Round table debates on scientific topics

FrieslandCampina Institute for dairy nutrition and health

We work with partners to develop tools and learning programs that are local relevant, interesting and of high quality

FrieslandCampina Institute for dairy nutrition and health

FrieslandCampina Institute is focusing worldwide on many different topics…

- Role dairy in healthy diet (incl. breakfast)
- Sustainable diets
- Immunity
- Recovery (& role of protein)
- Grass to glass story
- Sport & Nutrition
- Maternal nutrition
- Early life nutrition & development
- Healthy ageing
- Plant-based alternatives
- Affordable nutrition

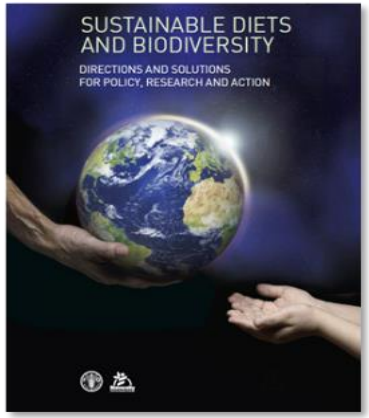
THE STATE OF
FOOD SECURITY AND NUTRITION IN THE WORLD 2022

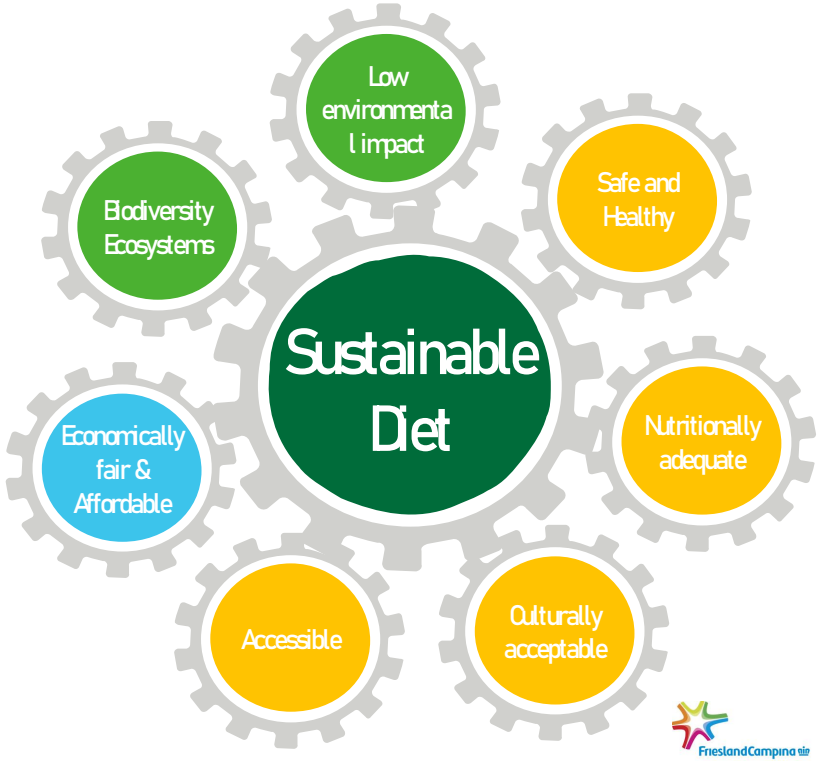
REPURPOSING FOOD AND AGRICULTURAL POLICIES TO MAKE HEALTHY DIETS MORE AFFORDABLE

A grim picture emerges

Sustainable Diets as defined by FAO and Biodiversity International in 2012

Sustainable Diets are those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources.



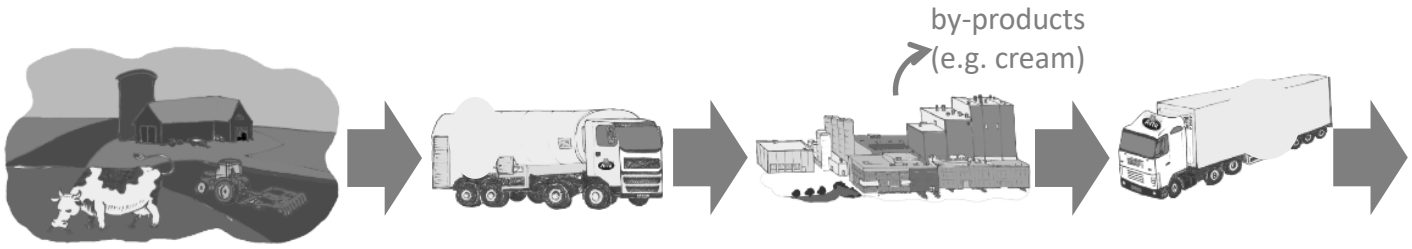


For consumers but also for us as professionals, it is a challenge to balance all these factors

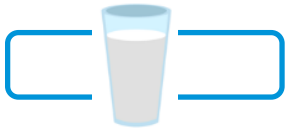
Sequence of today

- Environmental impact: Life Cycle Assessment (LCA)
- Adding Nutrients in the equation
- Nutrients do not equal health: the case of the food matrix
- Adequate & accessible
- Economic reality
- Take home messages
- Overarching theme: collaboration is key in facing this enormous challenge

LCA in a nutshell - calculating the carbon footprint



Functional unit:



CH_4 (methane)

N_2O (nitrous oxide)

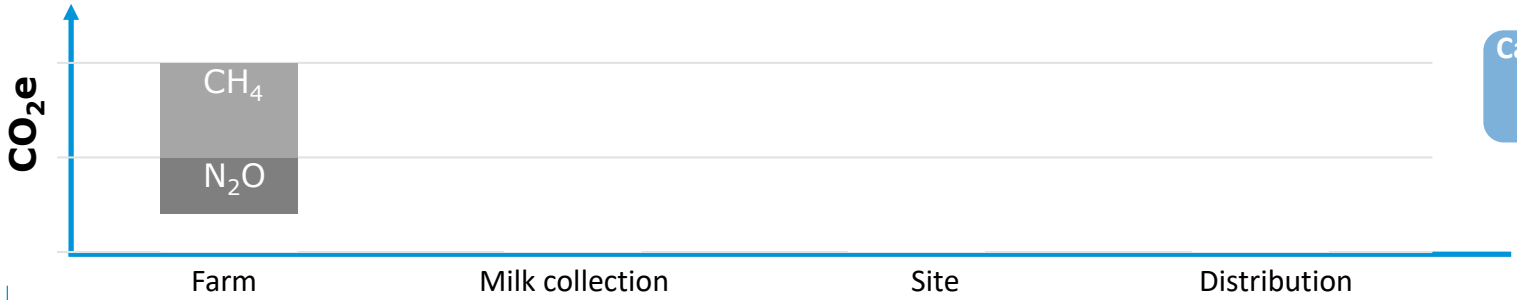
CO_2

CO_2

CO_2

CO_2

CO_2e



Carbon footprint:
1 **kg CO_2e**
per litre milk

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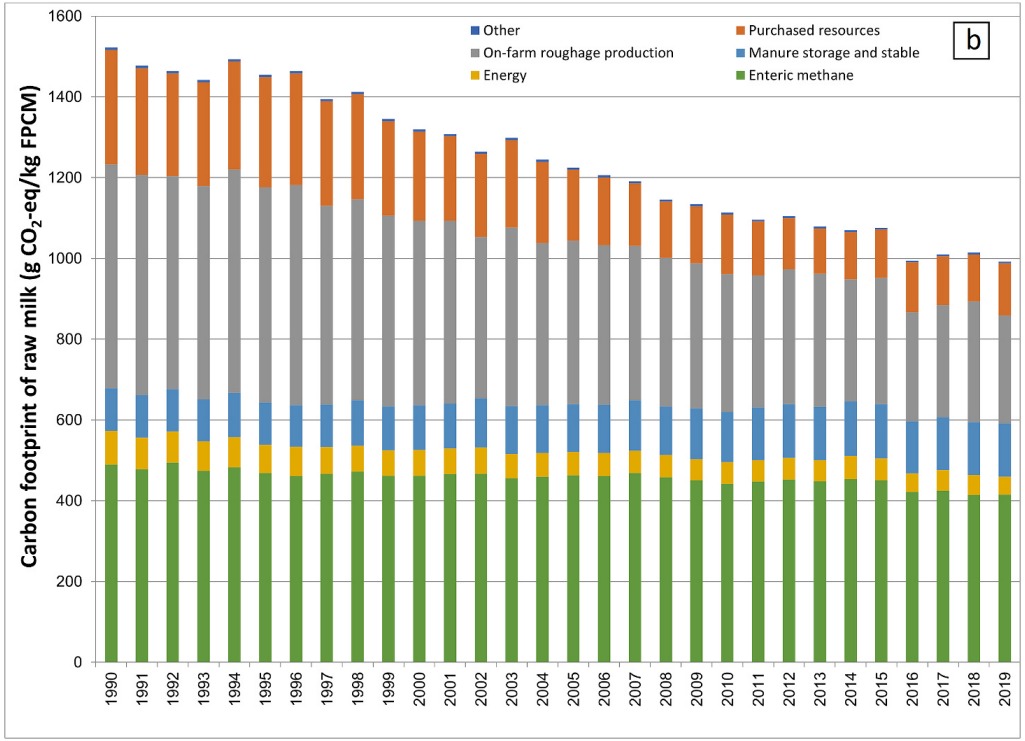
An LCA value is not an static but subject to improvement / change



Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

The evolution of the carbon footprint of Dutch raw milk production between 1990 and 2019

Jeroen Hospers [a], Lody Kuling [a], Pablo Modernel [a, *], Jan Peter Lesschen [b], Hans Blonk [c], Laura Batlle-Bayer [c], Wilfried van Straalen [d], Sanne Dekker [a]

Comparing products based on their carbon footprint per kg delivers surprising outcomes

Coke:
0.5 kg CO2-eq/kg

Milk:
1.0 kg CO2-eq/kg

Orange juice:
1.2 kg CO2-eq/kg

Choose coke over milk and orange juice because of lower CO_2-eq per kg?

Data from RIVM (www.rivm.nl/voedsel-en-voeding/duurzaam-voedsel/database-milieubelasting-voedingsmiddelen)

Which product is ‘more sustainable’?

Milk:
1.0 kg CO_2-eq/kg

Soy drink:
0.5 kg CO_2-eq/kg

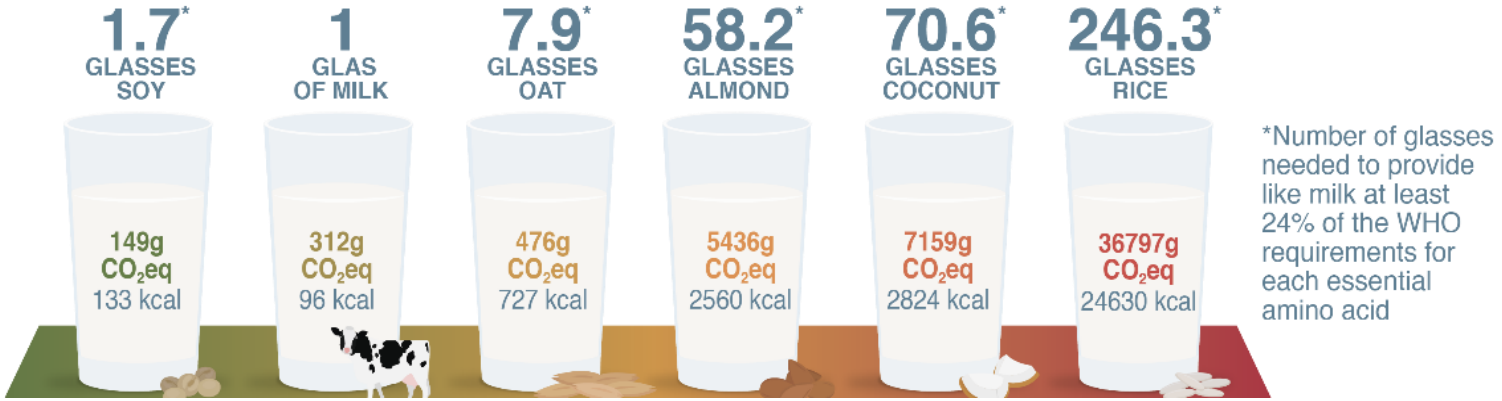
oat drink:
0.3 kg CO_2-eq/kg

almond drink:
0.5 kg CO_2-eq/kg

Are plant-based drinks ‘more sustainable’ than milk because of lower CO2-eq/kg?
Not if we consider nutritional value?

Data from Singh-Povel et al. Public Health Nutr. 2022, doi: 10.1017/S1368980022000453

When we take a nutrition perspective a different picture emerges



Low carbon footprint per kg becomes challenged when e.g., protein requirements are considered

Data from Singh-Povel et al. Public Health Nutr. 2022, doi: 10.1017/S1368980022000453

A watch out when reviewing LCA data

- Make sure to use the relevant carbon footprint value
- The functional unit of standard LCA's does not reflect the function of food
- The function of food is not simply **mass-based**, but is to provide (essential) nutrients and maintain or improve human health
- To allow proper interpretation and usage of LCA's on food products, a different complimentary functional unit is required that includes nutrition and/or health impact
- From LCA to nutritional LCA (nLCA) or health hLCA: possible?

Food and Agriculture Organization of the United Nations

Integration of environment and nutrition in life cycle assessment of food items: opportunities and challenges

Integration of environment and nutrition in life cycle assessment of food items: opportunities and challenges

Authors:

Sarah McLaren, Andrew Berardy, Andrew Henderson, Nicholas Holden, Thom Huppertz, Olivier Jolliet, Camillo De Camillis, Marguerite Renouf, Benedetto Rugani, Merja Saarinen, Jolieke van der Pols, Ian Vázquez-Rowe, Assumpció Antón Vallejo, Marta Bianchi, Abhishek Chaudhary, Canxi Chen, Margot Cooreman-Algoed, Hongmin Dong, Tim Grant, Ashley Green, Elinor Hallström, Hong Minh Hoang, Adrian Leip, John Lynch, Graham McAuliffe, Brad Ridoutt, Sophie Saget, Laura Scherer, Hanna Tuomisto, Peter Tyedmers, Hannah van Zanten

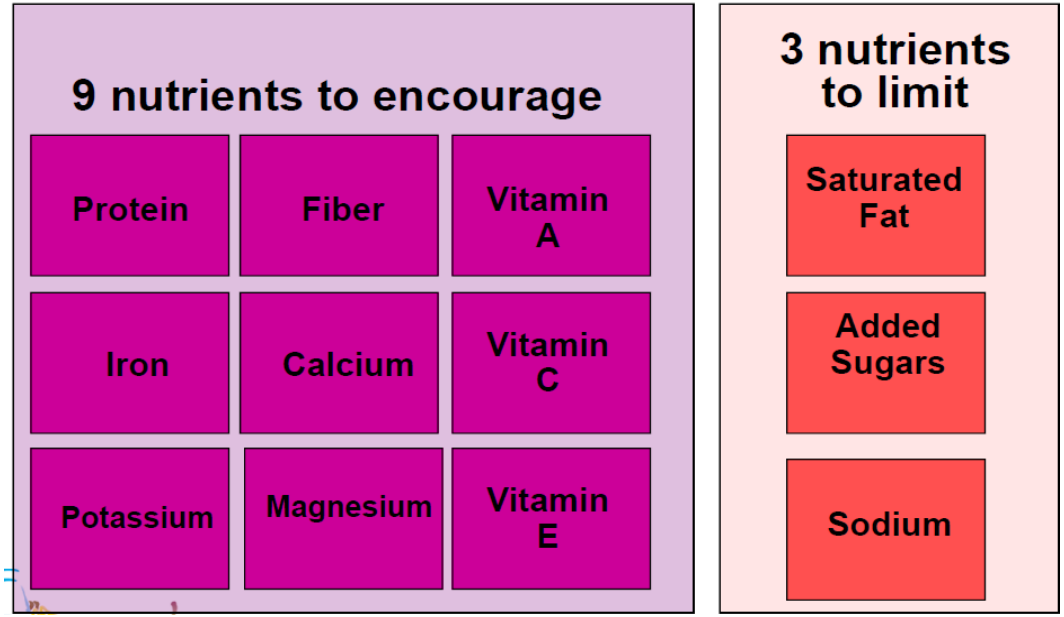
Food and Agriculture Organization of the United Nations
Rome, 2021

Functional unit in nutritional LCA's

- We know '/kg' is not the right functional unit, but which functional unit is right?
- Options:
  - Nutrition or health
  - Serving size based (e.g., /serving)
  - Energy based (e.g., /100 kcal)
  - Single nutrient (e.g., /100 g protein, /100 mg Ca)
  - Nutrient profiling (e.g., Nutrient Rich Food index, NRF9.3)
- Some pros and cons for every approach, but Nutrient profiling considered OK at present

Nutrient profiling: nutrient-rich food index

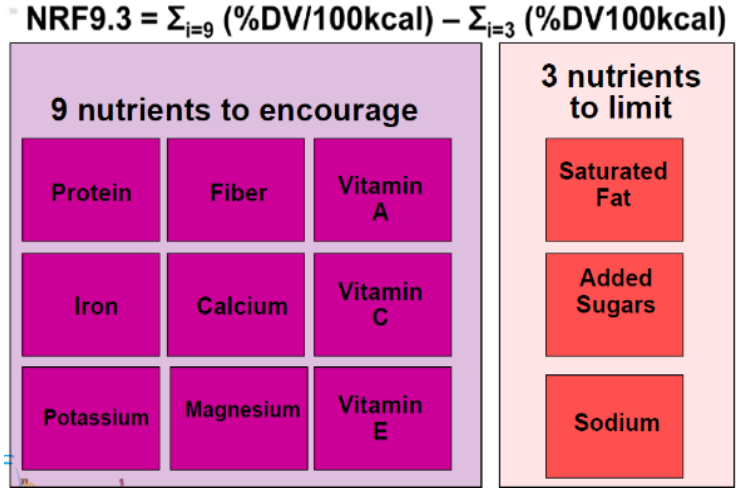
$$NRF9.3 = \Sigma_{i=9} (\%DV/100kcal) - \Sigma_{i=3} (\%DV100kcal)$$



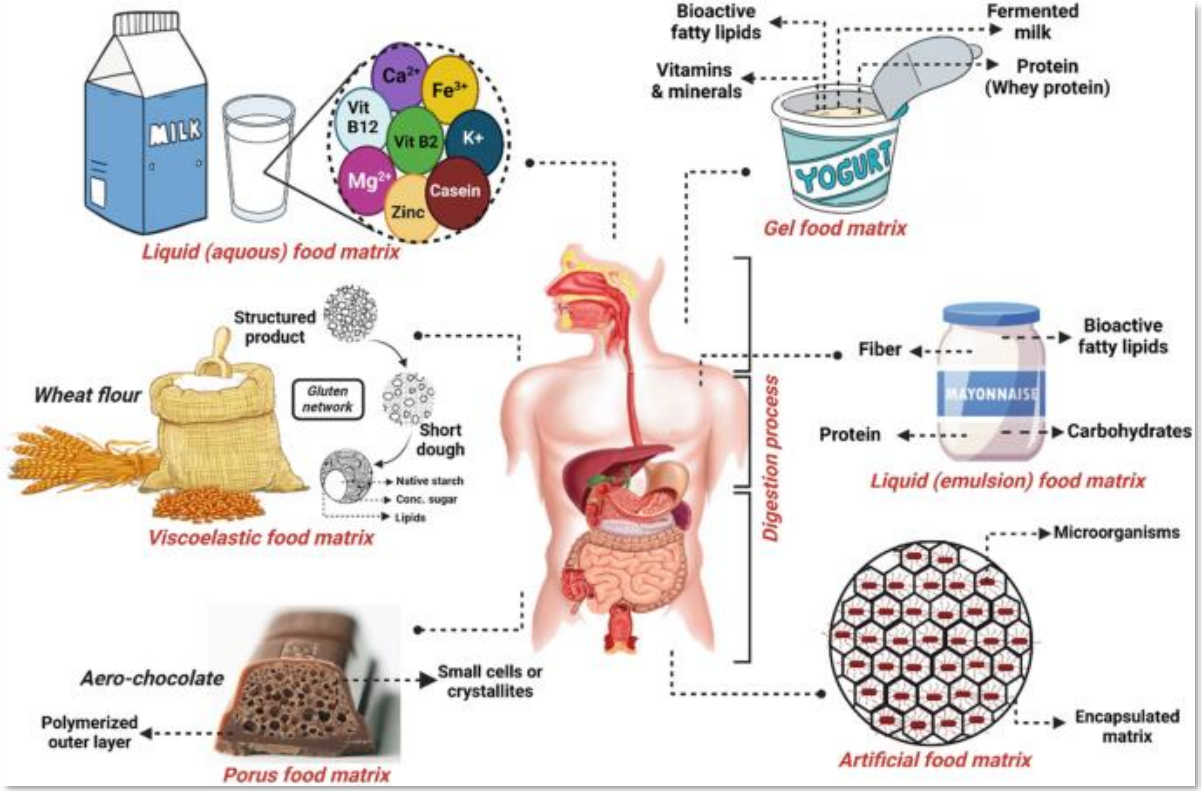
- Consider nutrients to encourage and nutrients to limit in relation to recommended daily values
- Various options for nutrient selection

Linking nutrient profiling to LCAs: the concept seems easy to apply, but further thought raises some challenges

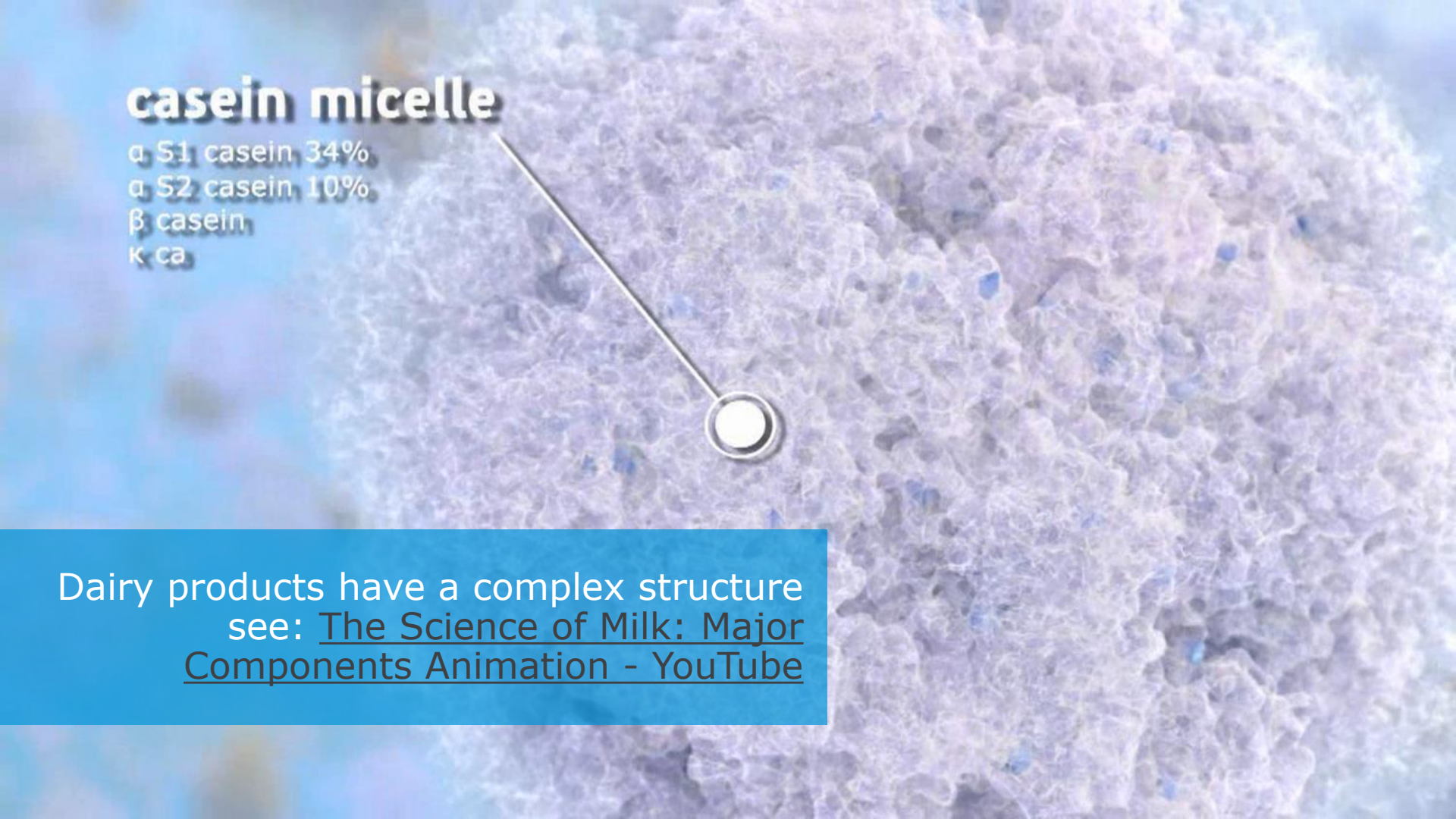
1. A fundamental issue is the bridge from the composition of foods towards their health effects in a diet
2. Nutrient sufficiency (product level) and dietary risk factors (diet level) given equal impact
3. **Effects of saturated fat, added sugars and sodium strongly dependent on food matrix and overall diet composition → the totality of evidence**



What do we mean by food matrix?



Krishnan et al, 2022, Food matrix: implications for nutritional quality



Dairy products have a complex structure see: The Science of Milk: Major Components Animation - YouTube

Relevance dairy matrices: associations between dairy product consumption and clinical outcomes

	CVD	CAD	Stroke	Hypertension	MetS	T2D
Total dairy	+++	++++	+++	++++	+++	+++
Regular- or high fat dairy	+	++++	+++	+++	+	+++
Low-fat dairy	+	++++	+++	+++	+	++++
Milk	+	+++	+++	+++	+++	+++
Cheese	++++	+++	+++	++++	+	+++
Yogurt	+++	+++	+++	+++	+	++++
Fermented dairy	+	+	+++	+++	+	+++

Neutral
Favorable
Uncertain

+	very low evidence
+++	moderate evidence
++++	strong evidence

Adapted from Drouin-Chartier et al (2016)

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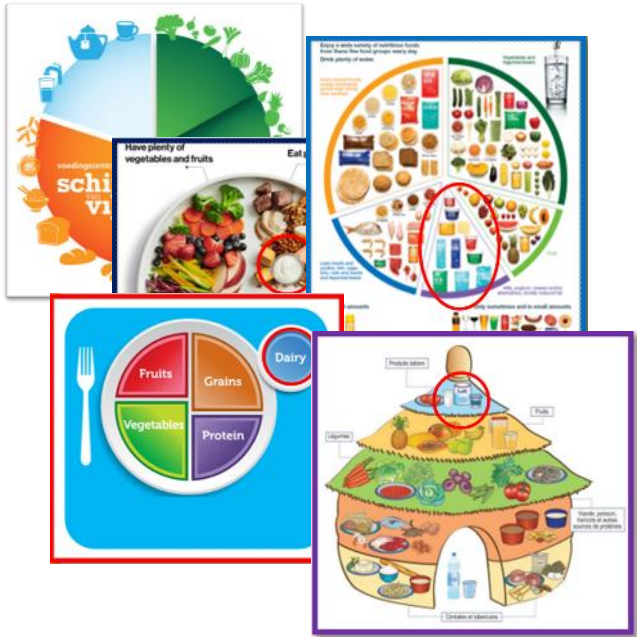
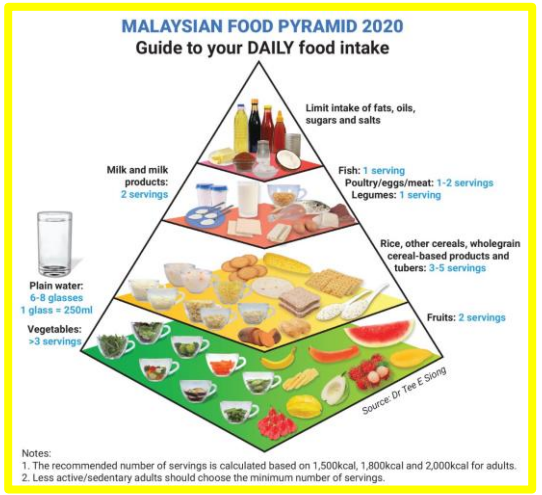
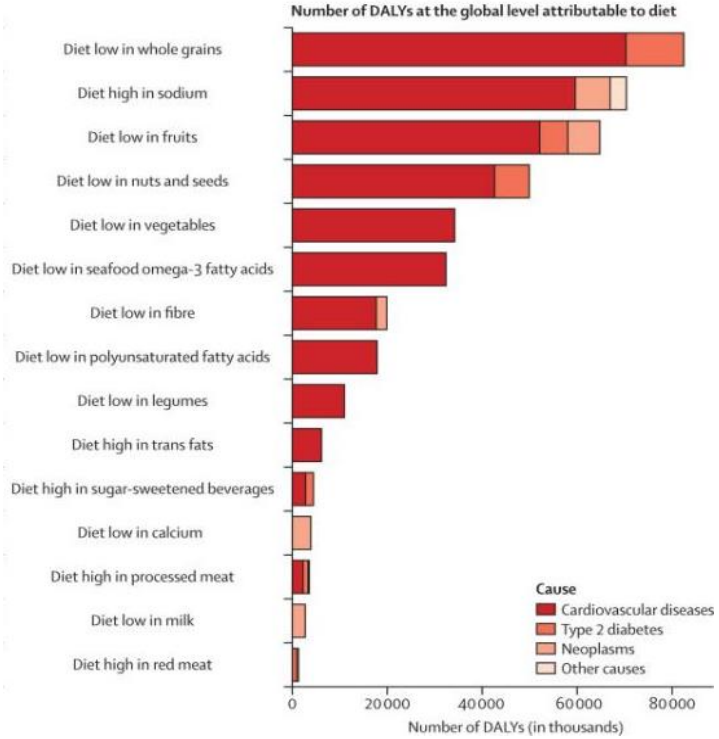
In view of the totality of evidence with respect to health, its nutrient density & relative environmental impact, dairy remains part of many dietary guidelines world-wide

It's also aligned with recommendation in the latest **Malaysian Dietary Guidelines 2020** and **Food Pyramid Malaysia 2022**



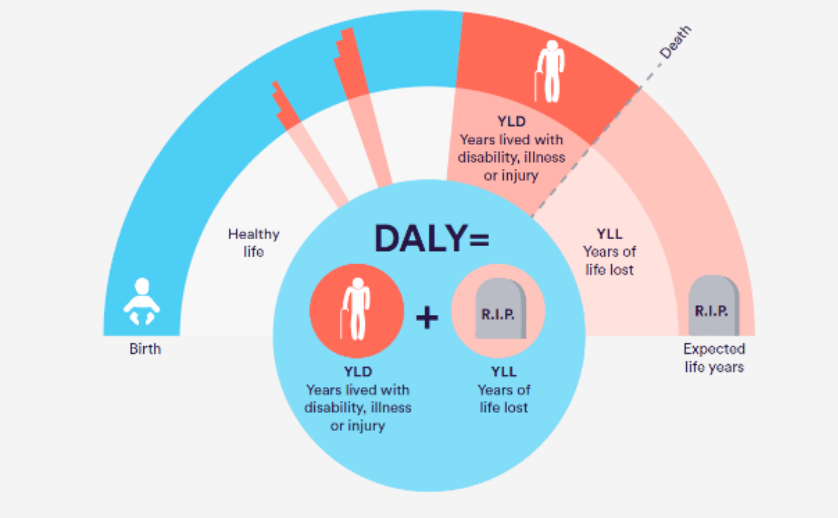


Turning back on the question of a measure for health, dietary risks: DALY



From Afshin, Lancet, 2019

Disability-adjusted life years

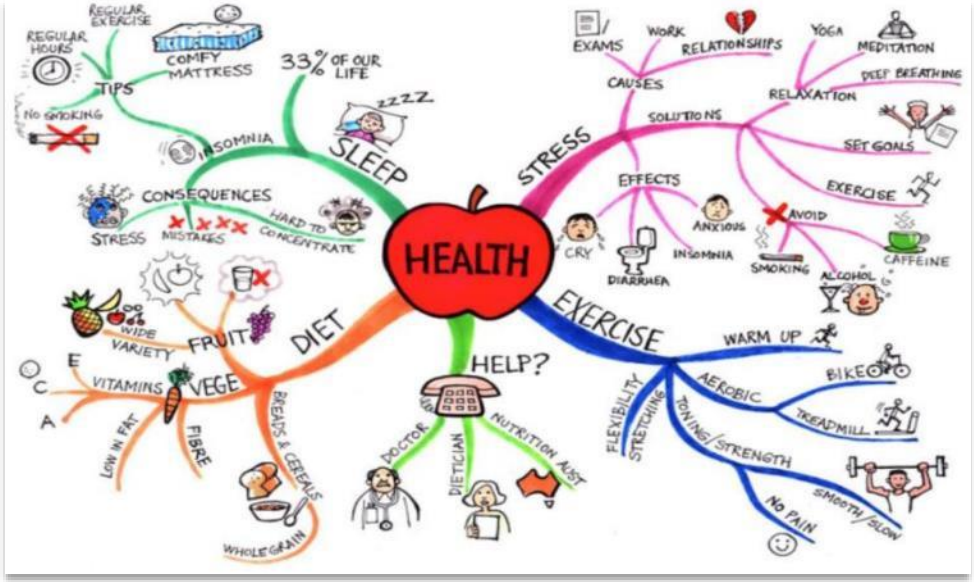


Source: Public Health England (2015). Reproduced under Open Government License

To understand the relation between food composition and DALYs more data is required

- Environment ➔ CO2
- Food items ➔ modified NRF index
- Diet / Health ➔ DALY

  Food and health are intertwined and can not be isolated from their context



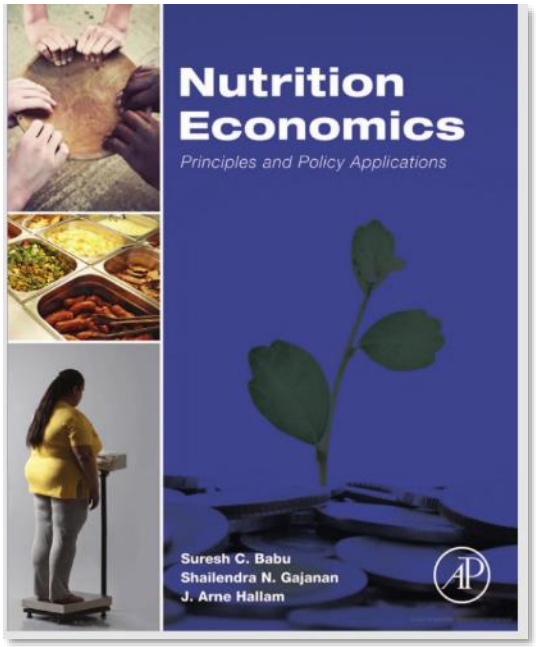
- M. Muller, 8th NuGo week

A watch out when integrating LCA, nutrients & health

- Sustainability, nutrition and health cannot be grouped into a single parameter
- When considering health, the totality of evidence needs to be included
- We need to consider diets not food items or nutrients
- Food labelling may introduce another layer of confusion for consumers
- When assessing diets we need to consider food prices as well

Let’s turn to accessibility and nutrient adequacy

Accessibility and nutrient adequacy policies add **value** to societies in multiple ways



MACROECONOMIC ASPECTS OF NUTRITION POLICY

5

These kids have fewer – literally fewer – neuronal connections than their non-stunted classmates... For every inch that you're below the average height, you lose 2 percent of your income... This is fundamentally an economic issue... We need to invest in gray-matter infrastructure. Neuronal infrastructure is quite possibly going to be the most important infrastructure.

Jim Yong Kim, President of the World Bank, in an interview to *Foreign Policy Magazine* (2016)

Create insights, the National Health & Morbidity Survey 2022

ASSESSMENT FOR CHILDREN

Children below 5 years old

NUTRITIONAL STATUS

Prevalence of low birth weight among full term infants: **6.6%**

Prevalence of nutritional status among under-five children

- Stunting : **21.2%**
- Wasting : **11.0%**
- Underweight : **15.3%**
- Overweight : **6.0%**

Ref: Institute for Public Health (IPH), MOH 2023. National Health and Morbidity Survey (NHMS) 2022: Maternal and Child Health – Key Findings

Table 15.1: Nutritional Status (Children Under 5 Years of Age) Trend in Malaysia

	2011	2015	2019
Underweight	11.6	12.4	14.1
Stunting	16.6	17.7	21.8
Wasting	12.4	8.1	9.4

Stunting issue: Increasing trend over the years and not improving in the recent national survey

Ref: Institute for Public Health (IPH), MOH 2020. National Health and Morbidity Survey (NHMS) 2019

Creating insights Seanuts II, a collaboration between academia and a company

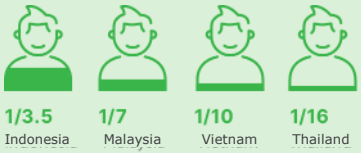
Large-scale nutrition and health survey in Southeast Asia

Stunting

In children younger than five years of age

Stunting (impairment of growth) is a primary manifestation of malnutrition. Children with stunting are at risk of poor development, poor school performance and reduced intellectual capacity.

Proportion of children under 5 with stunted growth

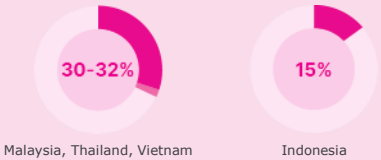


Overweight and obesity

In children 7-12 years old

Childhood obesity is associated with higher chances of obesity in later life. Being overweight or obese is a risk factor for developing noncommunicable diseases, such as cardiovascular diseases and diabetes.

Percentage of children aged 7-12 years being overweight or obese



Calcium and vitamin D

In children aged 0.5-12 years

Calcium and vitamin D are important for the growth and development of bones. In addition, vitamin D is an important nutrient for supporting the functioning of the immune system.

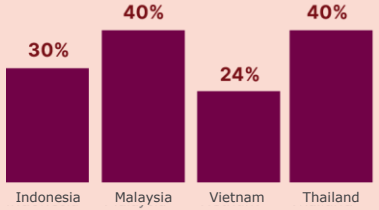
Percentage of children aged 0.5-12 years not meeting the average needs for

Anaemia

In children younger than four years of age

Study results show that >24% of children younger than four years have anaemia. Anaemia can impact children's cognitive development, physical growth and immunity.

Percentage of children under 4 having anaemia



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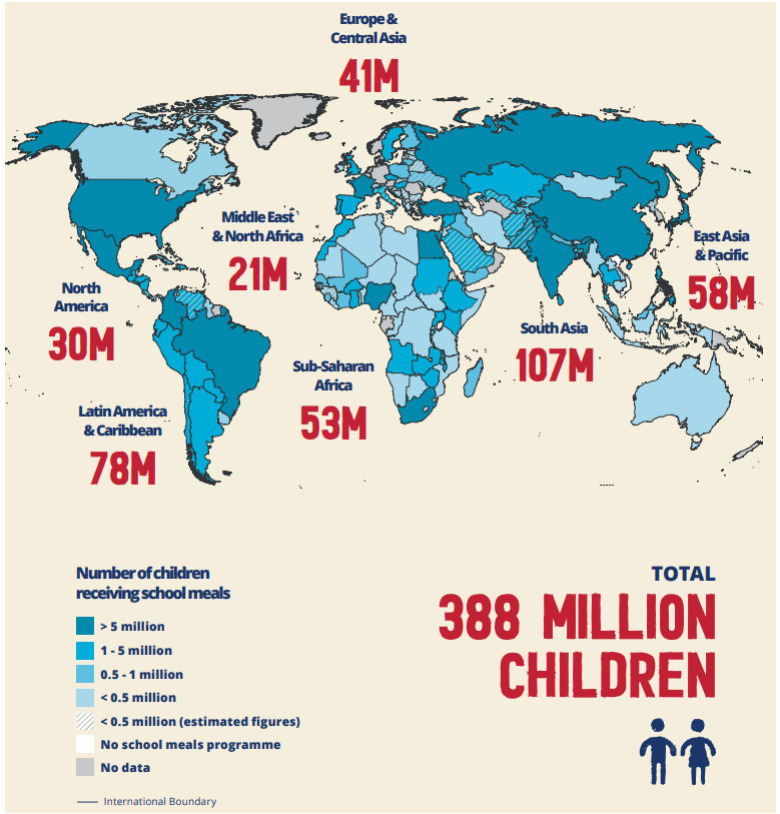
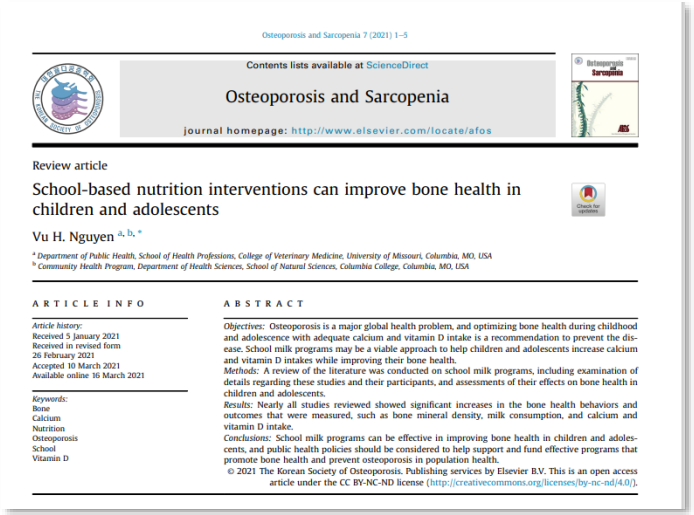
School-based nutrition interventions are effective





Osteoporosis and Sarcopenia 7 (2021) 1–5

Contents lists available at ScienceDirect

Osteoporosis and Sarcopenia

journal homepage: http://www.elsevier.com/locate/afos

Review article

School-based nutrition interventions can improve bone health in children and adolescents

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ABSTRACT

Objectives: Osteoporosis is a major global health problem, and optimizing bone health during childhood and adolescence with adequate calcium and vitamin D intake is a recommendation to prevent the disease. School milk programs may be a viable approach to help children and adolescents increase calcium and vitamin D intakes while improving their bone health.
Methods: A review of the literature was conducted on school milk programs, including examination of details regarding these studies and their participants, and assessments of their effects on bone health in children and adolescents.
Results: Nearly all studies reviewed showed significant increases in the bone health behaviors and outcomes that were measured, such as bone mineral density, milk consumption, and calcium and vitamin D intake.
Conclusions: School milk programs can be effective in improving bone health in children and adolescents, and public health policies should be considered to help support and fund effective programs that promote bone health and prevent osteoporosis in population health.

Taken from: State of School Feeding Worldwide 2020, WFP

School milk programs: in many countries a collaboration between government and companies

1970's – Establishment of School Milk Program by Veterinary Dept.

1983 – Kick start of School Milk Program as part of supplementary food program

2007 – Suspension of program to address milk contamination problems & food poisoning

2010 – The Malaysian Government relaunched its School Milk Program

2011 - MoE awarded DLMI as one of the supplier for PS1M

2013-2017 – School Milk Program contract for Kelantan & Terengganu states

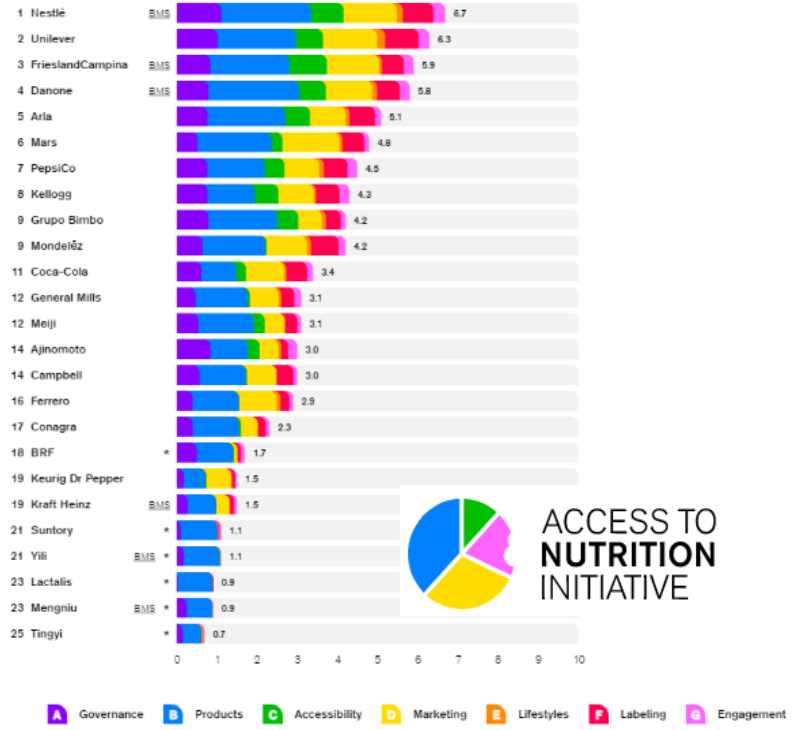
DLMI & MOE: Sayangi Sekolahku@3K, MyDMBS, World School Milk Day & World Milk Day events in schools

Sept 2018 – Sept 2019 Contributing 155,520 pack of milk to urban poor families at Public Housing Projects (PPR)

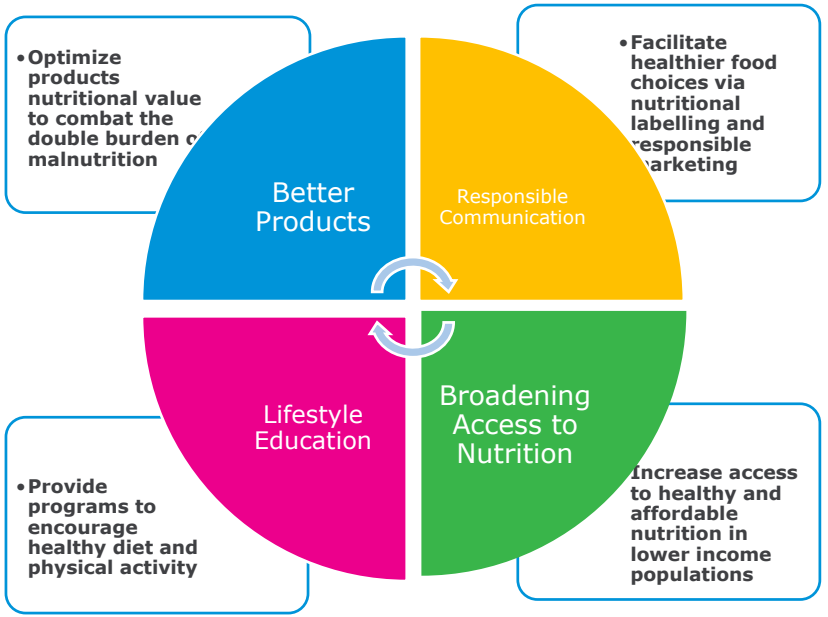
2022 School Milk Program for Zone 5 (Perak, Selangor, KL and Putrajaya)

From 2011-2022, DLMI nourishing **4.4 million** school children by supplying **189 million packs of quality milk**

The **Access to nutrition initiative** reviews companies with respect to their performance to address nutrition accessibility and adequacy



ACCESS TO NUTRITION INITIATIVE



FrieslandCampina Global Nutritional Standards (GNS)

FrieslandCampina Institute for dairy nutrition and health

The other side of nutrition adequacy: over consumption/food waste

The total quantity of food consumed in excess by Italian citizens due to overnutrition is calculated as **1.553 million tons per year**, which is comparable to the current national household food waste assessments. The environmental impact arising from production and consumption of this food accounts for **6.15 Mt of CO2-eq per year**, as estimated by a Life Cycle Analysis conducted on the 46 food categories which compose the typical Italian diet.

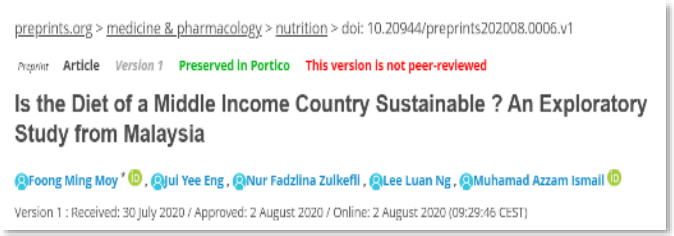
For comparison that equals to the footprint of approx. the food consumed in a year by **5,7 million Malaysians**


scientific reports

OPEN

Overnutrition is a significant component of food waste and has a large environmental impact

Silvio Franco[1], Marco Berbenera[1], Roberto Moscetti[1], Clara Cicatiello[1,2], Luca Secondi[1] & Riccardo Massantini[1]


preprints.org > medicine & pharmacology > nutrition > doi: 10.20944/preprints202008.0006.v1

Preprint Article Version 1 Preserved in Portico This version is not peer-reviewed

Is the Diet of a Middle Income Country Sustainable ? An Exploratory Study from Malaysia

Foong Ming Moy *, Jui Yee Eng, Nur Fadzlina Zulkefli, Lee Luan Ng, Muhamad Azzam Ismail

Version 1 : Received: 30 July 2020 / Approved: 2 August 2020 / Online: 2 August 2020 (09:29:46 CEST)

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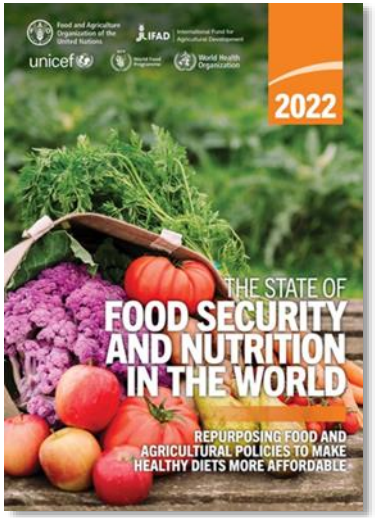
A few words on the economic aspects of a sustainable diet economically fair and affordable

The amount of money available for food is a strong determinant for choice

Energy sufficient	Nutrient adequate (minimum diversity)	Healthy (FAO/Dietary Guidelines)
Starchy staples	Starchy staples	Whole grains
Vegetable oils	Animal source foods(eggs, dairy)	Meat, poultry, seafoods, dairy,
Sugar	Legumes	Legumes, beans, plant proteins
	Vegetables	Vegetables (dark green)
	Fruits	Fruits (whole)
	Fats and oils	PUFA+MUFA/SFA ratio
		Limit starchy staples, sugar, satfat
Lowest cost ~1$	**Medium cost 3$**	**Highest cost 5$ (FAO report)**

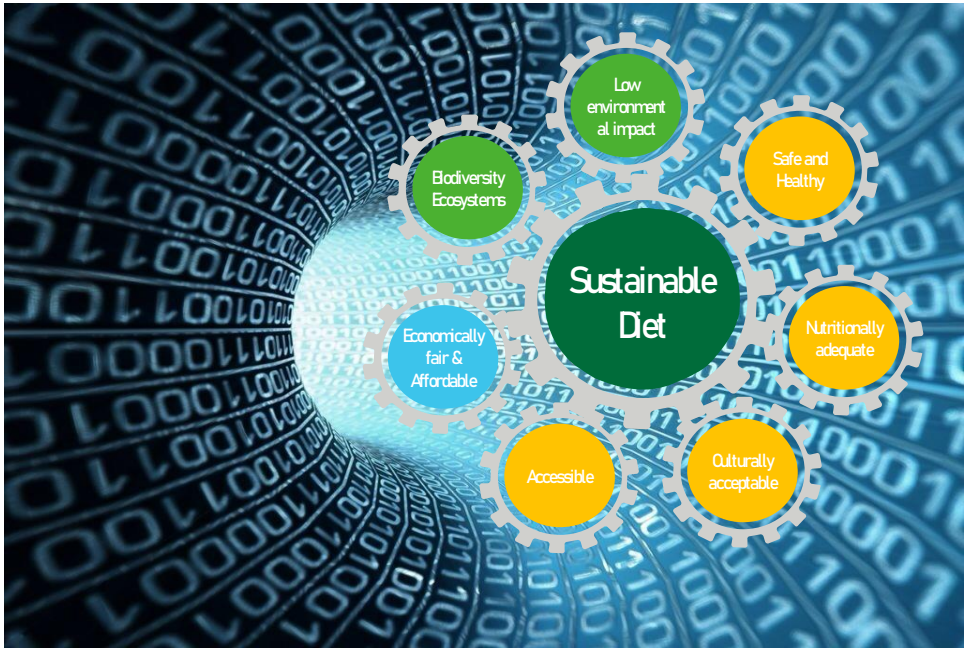


Will Masters: Food Price in Nutrition project

In the end a healthy sustainable diet is an optimization problem at an individual/group level, some examples:

- Optimeal: NZO Optimeal Tool (EN) - YouTube
- Zero hunger lab project ENHANCE: Project ENHANCE: The Tech4PositiveFutures entry of Capgemini Netherlands - YouTube

  Frontiers | Bi-objective goal programming for balancing costs vs. nutritional adequacy (frontiersin.org)
- Riddet institute: Delta model: The role of dairy in a sustainable food system - Jeremy Hill - YouTube
- Will AI bring light at the end of the tunnel??



An example from Malaysia

- Only **40-60%** of all participants achieved the **RNI for calcium**
- **Less than half** the female aged <50 years **fulfilled the RNI for iron**
- The mean total carbon footprint from the participants' diets was **2.96 kgCO2eq/day**
- The highest contributions of carbon footprint were from **rice and vegetables, beef and sugars**, followed by other cereals, poultry, seafood, wheat, milk, fruits, legume and snacks

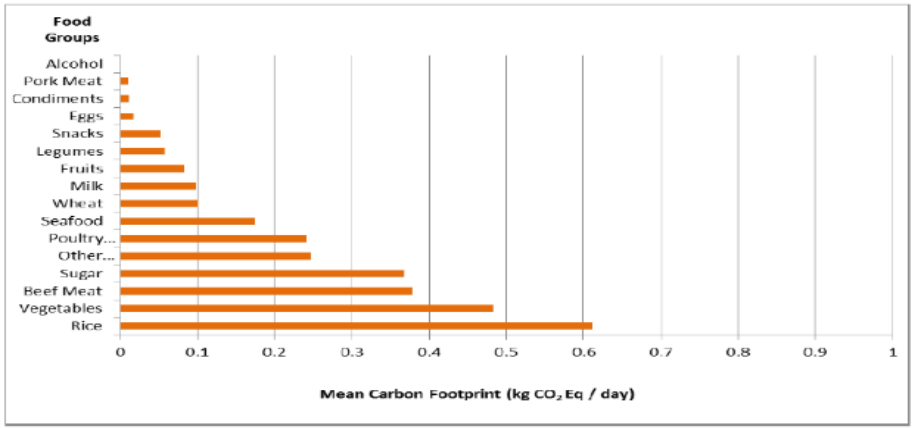


Figure 5: Contribution of carbon footprint from food groups ($kgCO_2eq/day$)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Is the Diet of a Middle Income Country Sustainable ? An Exploratory Study from Malaysia

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Sustainable healthy diets: lots to consider, yet let's stay pragmatic

- The standard LCA unit, CO2-eq per kg, is not a good measure for food items
- There are metrics available to assess the nutrient density of food items but please apply them at diet level!
- Local dietary guidelines should include the totality of evidence available
- People from all ranks need nutrient dense foods in stead of calorie dense
- Dairy, as a nutrient dense food item, is recommended in many nutritional guidelines;
- A healthy sustainable diet is an optimization problem at an individual / group level and depends on local circumstances. In many cases cost is determining factor.

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TOGETHER!