The impact of changing diets on health and the environment - where do we need to go?

Jennie Macdiarmid

Italian Association of Agriculture and Applied Economics, 2019
Starting point: Unhealthy & environmentally damaging

### Nutrition

**Triple burden of disease**

- Undernourishment (800 million)
- Nutrient deficiency (2 billion)
- Obesity (600 million)

### Climate change

**Paris agreement 2015**

*Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C.*
The challenges we are facing today

- **climate change**
- **economics, politics**
- **industry, resources**
- **sustainable diets, culture**
A whole food systems approach
Global food supply

Sugar, Wheat flour, Dried whole Milk, Cocoa mass, Cocoa butter, Vegetable fats (Palm kernel), Whey (from Milk), Whey powder (from milk), Emulsifiers (Sunflower lecithin, Soya lecithin), Butterfat (from Milk), Natural flavourings, Yeast, Skimmed milk powder, Raising agent (Sodium bicarbonate), Natural vanilla flavouring, Salt.
1. Greenhouse gas emissions

2. Land use change/ deforestation

3. Water scarcity

4. Biodiversity losses

- loss of species
- loss of cultivars/crops

(i.e. maize, wheat and rice)

https://www.bto.org/science/monitoring/developing-bird-indicators
Global Warming: emissions in the food system

- Agriculture: 45%
- Manufacturing: 10%
- Home: 13%
- Retail: 9%
- Transport: 8%
- Packaging: 5%
- Catering: 8%
- Waste disposal: 2%
Greenhouse gas emissions associated with food

Mean GHGE (kg CO₂ eq kg⁻¹)

- Beef: 26.1
- Butter: 36.0
- Pork: 34.0
- Fresh & frozen fish: 10.5
- Salad and cooking oils: 4.0
- Fresh bananas: 0.5
- Lettuce: 0.5
- Legumes: 0.5
- Total wheat flours: 0.5
- Fresh citrus: 0.5
- Fresh apples: 0.5

>200 food commodities sampled across range of geographic locations, with different production methods; bars show min/max values


Slide: A. Jones (ICN 2017)
The issue with livestock production

Why target meat?

Growth of population and meat supply, Indexed 1961=100 (FAO 2012a, UN 2012)

- 14.5% of global GHGE comes from livestock
- 70% of global agricultural land is used for livestock
- Methane production by ruminants

[Diagram showing crop allocation (by % calories)]

FAO 2013
Healthy and sustainable diets

Diets with **low environmental impacts** which contribute to **food and nutrition security** and to **healthy life** for present and future generations.

*They are:*

- protective and respective of biodiversity and ecosystems
- culturally acceptable
- accessible
- economically fair and affordable
- nutritionally adequate, safe and healthy

......... while optimizing natural and human resources.
Moving from unsustainable diets to sustainable diets

We know where we want to go ...........

but how do we get there????
Define nutritionally adequate and low GHG emissions diet?

**Computer solution**
- no animal products

90% reduction in GHGE
limited food items
- no meat, no milk (or much else)

**Human intervention**

25% reduction in GHGE
many food items
- incl. meat, dairy

Macdiarmid et al. (2012) AJCN
Diets not diet!

![Diagram showing the relationship between healthy/sustainable diets and unhealthy/unsustainable diets.](image-url)
No one size fits all: *minimise dietary change*

- Remove foods
- Reduce amount of a food by max 75%
- Add new foods
- Max 50% change

Horgan *et al.* (2016) IJBNPA
Sustainable diets in Italy

observed diet = current diet
optimises diet = nutritionally adequate & 30% reduction in GHG emissions

**Energy (kcal/d)**

<table>
<thead>
<tr>
<th></th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>observed diet</td>
<td>163 490 543 147 572 87 189</td>
<td></td>
</tr>
<tr>
<td>optimises diet</td>
<td>323 556 247 126 158 55 246 89 85</td>
<td></td>
</tr>
<tr>
<td>observed diet</td>
<td>157 617 659 153 231 129 277</td>
<td></td>
</tr>
<tr>
<td>optimises diet</td>
<td>269 739 462 183 126 128 129 300 70</td>
<td></td>
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</tbody>
</table>

**GHG (gCO₂eq/d)**

<table>
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<th>Men</th>
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<tr>
<td>observed diet</td>
<td>273 217 1095 578 117 413</td>
<td>234 94 222</td>
</tr>
<tr>
<td>optimises diet</td>
<td>569 205 234 324 314 239 463 1842 63</td>
<td></td>
</tr>
<tr>
<td>observed diet</td>
<td>268 273 1351 388 510 1802</td>
<td></td>
</tr>
<tr>
<td>optimises diet</td>
<td>402 288 905 467 216 434 357 193 342</td>
<td></td>
</tr>
</tbody>
</table>

Legend:
- Green: fruit & veg
- Orange: starch
- Brown: planted based dishes
- Blue: dairy
- Purple: fish
- Red: meat
- Beige: animal based dishes
- Dodger blue: sugar, fat
- Pink: tea, coffee

Vieux et al. (EJCN 2018)
The total water footprint of the food supply in Italy

Capone et al. JFNR (2013)
Achieve sustainable and healthy diets; production & technology or change our diets?

**Production**
- efficient production methods
- increase yields/genetics
- reduce food waste
- nutrition focused agriculture

**Consumption**
- dietary patterns
- food choices
- reduce food waste
- reduce overconsumption

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Bajzelj et al. Nature Climate Change 2014
Changing dietary patterns in the ‘real world’
Food is an emotive subject........
Meat: the perception is we all need to be vegan.....
Eating less meat: protein!!

“Protein gap.........”

“Protein deficiency??”
How worried should we be about protein?

protein supply for human consumption in Italy

total protein

plant protein

FAO Stats 2019
Identity and image: *what is in a name?*

"I don’t want people to think I’m strange or a hippy."  Leo et al. 2006

"If I become vegan, my family and friends would hate me."  Markowski & Roxburgh 2019

**Boys:** “outgoing, popular, physically impressive and attractive to girls.”

**Girls:** “fat, bald old man sitting at the bar”  Elliot 2014
Nutrition transition – food cultures are changing

“nutrition transition”
### Framing information: choice architecture

<table>
<thead>
<tr>
<th>Control Menu</th>
<th>Descriptive Menu</th>
<th>Recommendation Menu</th>
<th>Vegetarian Menu</th>
</tr>
</thead>
</table>
| **Ricotta & spinach ravioli (v)**  
Asparagus, butter & sage sauce 13.50  
v – suitable for vegetarians | **Fresh seasonal risotto primavera (v)**  
Pea, mushrooms, lemon 14.00 | **Chef’s Recommendation**  
**Ricotta & spinach ravioli (v)**  
Asparagus, butter & sage sauce 13.50  
v – suitable for vegetarians | **Lobster & crab roll**  
Avocado, lettuce, lemon mayonnaise 17.00 |
| **Lobster & crab roll**  
Avocado, lettuce, lemon mayonnaise 17.00 | **Lobster & crab roll**  
Avocado, lettuce, lemon mayonnaise 17.00 | **Lobster & crab roll**  
Avocado, lettuce, lemon mayonnaise 17.00  
Chili, garlic & parsley, basmati rice 22.50 |
| **Sauteed king prawns**  
Chili, garlic & parsley, basmati rice 22.50 | **Sauteed king prawns**  
Chili, garlic & parsley, basmati rice 22.50 | **Sauteed king prawns**  
Chili, garlic & parsley, basmati rice 22.50 |
| **Deep fried haddock**  
Minted peas, hand cut chips, sauce tartar 15.50 | **Deep fried haddock**  
Minted peas, hand cut chips, sauce tartar 15.50 | **Deep fried haddock**  
Minted peas, hand cut chips, sauce tartar 15.50 |
| **Chicken cacciatore**  
Roasted chicken breast, mushrooms, tomato, olives 14.50 | **Chicken cacciatore**  
Roasted chicken breast, mushrooms, tomato, olives 14.50 | **Chicken cacciatore**  
Roasted chicken breast, mushrooms, tomato, olives 14.50 |
| **Steak frites**  
Rump pavé, hand cut chips, béarnaise sauce 19.50 | **Steak frites**  
Rump pavé, hand cut chips, béarnaise sauce 19.50 | **Steak frites**  
Rump pavé, hand cut chips, béarnaise sauce 19.50 |
| **Hamburger**  
Relish, hand cut chips 13.50 | **Hamburger**  
Relish, hand cut chips 13.50 | **Hamburger**  
Relish, hand cut chips 13.50 |

<table>
<thead>
<tr>
<th><strong>Non-Vegetarian Choice</strong></th>
<th><strong>Vegetarian Choice</strong></th>
</tr>
</thead>
</table>
| **Control Menu**  
87%  
13% |
| **Recommendation Menu**  
88%  
12% |
| **Descriptive Menu**  
85%  
15% |
| **Vegetarian Menu**  
94%  
6% |

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Bacon & Krpan 2018

Macdiarmid
Greta Thunberg, the teenage Swedish activist at the head of a worldwide youth movement against climate change, will lead a rally in Rome on Friday, April 19th.

Students gather for the climate march in Rome. Photo: Andreas Solano/AFP

Thousands of students across Italy walked out on Friday morning as part of a global school strike to demand action on climate change.

Climate activist Greta Thunberg meets Pope Francis at Saint Peter’s Square at the Vatican, April 17, 2019. | Photo: Reuters
Willingness to change diets

“I am aware that ruminants cause a problem with methane, that wouldn't stop me eating meat.”

“I probably won't eat less meat. I'm aware of the environment I take other steps, fine I do my bit, recycling, driving less but I probably wouldn't change my diet.”

Macdiarmid et al. (2016) Appetite
We need a Food Systems Approach

Agricultural production → Storage → Processing → Retail & distribution → Consumption

Healthy and sustainable diet

Unhealthy and unsustainable diet

impact of processing for health
The challenge is to join up sectors

- climate change
- economics, politics
- trade-offs, tensions, priorities
- industry, resources
- sustainable diets, people
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- Nutrition
- Sociology
- Psychology
- Public health
- Climate change
- Land use
- Economics
- Agriculture
- Statistics