Climate Change, Food Security, Nutrition

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## Summary of Direction, Magnitude, and Certainty of Projected Climate impacts on Health *(IPCC, 2007)*

<table>
<thead>
<tr>
<th>Negative Impact</th>
<th>Positive Impact</th>
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<tbody>
<tr>
<td><strong>Very High Confidence</strong></td>
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<tr>
<td>Effects on geographic range &amp; incidence of malaria</td>
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<tr>
<td><strong>High Confidence</strong></td>
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<td>Undernutrition &amp; consequent children developmental disorders</td>
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<tr>
<td>Injuries, deaths, disease - Extreme events (heatwaves, floods, droughts, fires, etc)</td>
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<td>Cardio-respiratory diseases - poor air quality</td>
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<td>Cold-related deaths</td>
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<tr>
<td><strong>Medium Confidence</strong></td>
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<td>Diarrheal diseases</td>
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Pathways through which climate change affects nutrition

(Tirado et al. 2013 adapted from Black and UNICEF)
Effects of Carbon Dioxide on Protein and Minerals

US Global Climate Change Research Program- Climate and Health Assessment 2015

Doubling of CO2 concentration from preindustrial levels (Meinshausen et al. 2013)

Average effect on 125 plant species and cultivars (Ziska et al. 2004, Taub et al. 2008, and Loladze 2014.)
Changes in number of malnourished pre-school children by 2020 under two scenarios compared to the baseline levels (%)

Source: IFPRI IMPACT projections
Calorie availability in 2050 is likely to decline throughout the developing world. 21% more undernourished children with CC.

Number of Malnourished Children in Sub-Saharan Africa (millions)

- 2000: 33
- 2050 (without climate change): 42
- 2050 (with climate change): 52

Source: Nelson et al., 2009; graphics by WFP
Climate Change and Stunting

Severe stunting estimated to increase by 23% central sub-Saharan Africa to 62% South Asia in 2050 compared to a future without climate change

model for estimating future stunting driven by two principle inputs:

1) estimates of undernourishment
calorie availability estimates from Nelson et al. (2009)

2) socioeconomic conditions
based on GDP per capita projections and estimates of the Gini index for income distribution.
(Lloyd et al. 2011)

2-3% loss of global GDP (11% of GDP in Africa/Asia)
The costs of malnutrition

**COGNITION**
- Iodine deficient children lose 13 IQ points

**SCHOOLING**
- 0.7 grades schooling loss
- 7 month delay in starting school

**PRODUCTIVITY**
- Losses of 10% over lifetime earnings
- 2-3% loss of global GDP (11% of GDP in Africa/Asia)
- Obesity costs 2.8% of global GDP

**HEALTH**
- Underlying cause of 3.1 million / 45% of deaths of children <5
- Underlying cause of 11 percent of DALYs globally

There is a *huge* opportunity to permanently lock-in human capital before age two to minimize these consequences.

Climate Change & food and water contamination

Food- and water- borne  Bacterial, viruses, parasites
Biotoxins (mycotoxins- aflatoxins, marine toxins, )
Other Zoonotic diseases – vector borne
Chemical contamination

FAO 2008; Tirado, Clarke et al.2010
Climate Change and diahorreal diseases
Diarrhea increases 8% for 1C temperature increase

Temperature variations in hospitals in Peru (Checkley et al 2000, Lancet)
Zoonosis and transboundary animal diseases

Climate change alters, vector distribution, abundance, migration patterns of birds and other wildlife, and the survival time of pathogens outside the host

- West Nile Virus
- Rift valley Fever
- Blue tongue

2008-2009

$\geq 310$ milion €

(Purse et al. Nature 2005)
Climate Change and Mycotoxins

- Temperature, humidity
- Drought stress
- Pests and plant diseases
- Soil conditions - nutrient status
- Flowering & Harvests season

Aflatoxins
- Carcinogens
- Might cause growth retardation in children (Khlangwiset et al 2011; Smith et al. 2012; Gong et al. 2002; 2004)
Climate Change and Risk of Aflatoxin B1 maize contamination (2000-2100) EFSA 2012

+2 C Climate scenario

+5 C Climate scenario
Nutrition-sensitive climate adaptation

- Integrated family farming (synergies of agro-forestry horticulture, aquaculture and livestock systems)
- Mangrove repopulation: Aqua-silviculture – Disaster risk reduction
- Extension services - food diversity promotion - Good Agriculture Practices - food safety (e.g. aflatoxins, FBD) –Gender equality
- Education - local food systems, biodiversity & micronutrient-rich foods
Climate Risk Management

Livelihoods, Early Assessment and Protection (LEAP) comprehensive national weather RM framework

LEAP links Ethiopia’s Productive Safety Net Program to a contingency fund. Based on a weather index, LEAP software program estimates the costs of scaling up the Productive Safety Net Program, allowing for a timely food aid response in case of droughts or floods.
Nutrition-sensitive mitigation

increase diet diversity while reducing GHG

- Conservation Agriculture
- Agro-ecology
- Agro-forestry/Silvi-culture
- Rice Intensification/fish farming
- Integrated farming systems
- Integrated food/energy systems
## Nutrition Indicators – SDGs (UNSCN, 2015)

<table>
<thead>
<tr>
<th>AREA</th>
<th>PRIORITY INDICATOR</th>
<th>SDGs AND TARGETS</th>
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<tbody>
<tr>
<td><strong>GLOBAL NUTRITION TARGETS</strong>&lt;br&gt; endorsed by Member States at the 65th World Health Assembly (WHA 2012)</td>
<td>Prevalence of stunting (low height-for-age) in children under 5 years of age</td>
<td>Goal 2, Target 2.2</td>
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<tr>
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<td>Prevalence of wasting (low weight-for-height) in children under 5 years of age</td>
<td>Goal 2, Target 2.2</td>
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<td></td>
<td>Percentage of infants less than 6 months of age who are exclusively breast fed</td>
<td>Goal 2, Target 2.2 and Target 2.1 and Goal 3, Target 3.2</td>
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<tr>
<td></td>
<td>Percentage of women of reproductive age (15-49 years of age) with anaemia</td>
<td>Goal 2, Target 2.2 and Goal 3, Target 3.1</td>
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<td></td>
<td>Prevalence of overweight (high weight-for-height) in children under 5 years of age</td>
<td>Goal 2, Target 2.2 and Goal 3, Target 3.4</td>
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<td></td>
<td>Percentage of infants born with low birth weight (&lt; 2,500 grams)</td>
<td>Goal 2, Target 2.2 and Goal 3, Target 3.2</td>
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<tr>
<td><strong>DIETARY DIVERSITY</strong></td>
<td>The percentage of women, 15-49 years of age, who consume at least 5 out of 10 defined food groups</td>
<td>Goal 2, Target 2.1</td>
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<td><strong>POLICY</strong></td>
<td>Percentage of national budget allocated to nutrition</td>
<td>Goal 2, Target 2.2a</td>
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Co-benefits of Sustainable diets

- Healthy – **diet rich in fruits & vegetables (400gr/day)** can save 2.7 million lives (WHO, 2008)
- Environmentally sustainable (e.g. legumes - soil N fixing)
- Biodiversity/ traditional crops/ indigenous peoples / socio-cultural values
- Socially equitable
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<th>Dietary Recommendations</th>
<th>Swedish National Food Administration (2009)</th>
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| Meat (beef, lamb, pork) | Eat less, reduce portion size.  
Eat locally produced and grass fed animals |
| Fish and shellfish      | choose seafood with sustainable eco-labels |
| Fruits, vegetables      | Seasonal and locally produced  
Pesticide free |
| Potatoes, cereals       | Locally grown – reduce rice intake |
| Cooking fat             | Choose rape seed and olive oil– reduce palm |
| Water                   | Choose tap water  
Locally produced/packed |
Health and nutrition Indicators for sustainable agriculture, food security and nutrition

Nutrition and Health outcomes:
• anemia in women of reproductive age;
• stunting in children under 5 years;
• obesity in children under 5 and in adults;

Food access, dietary quality and sustainable food production:
• adequate access to protein supply;
• excessive adult saturated fat consumption;
• household dietary diversity - Minimum Dietary Diversity for Women

Food market/trade policies supporting health and sustainability:
• countries that have phased out use of antibiotics as growth promoters;
• health impact assessment in agricultural policies, trade plans.
• compliance with food safety standards (additives, residues, etc)
Minimum Dietary Diversity – Women

Global Dietary Diversity Indicator for Women

<table>
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<th>MDD-W food groups</th>
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<tr>
<td>1. All starchy staple foods</td>
<td>6. Eggs</td>
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<tr>
<td>2. Beans and peas</td>
<td>7. Vitamin A-rich dark green leafy vegetables</td>
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<tr>
<td>3. Nuts and seeds</td>
<td>8. Other vitamin A-rich vegetables and fruits</td>
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<tr>
<td>4. Dairy</td>
<td>9. Other vegetables</td>
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<td>5. Flesh foods</td>
<td>10. Other fruits</td>
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Gender equality - access to resources and extension services

Equal access to agriculture land, training, credit, information will increase farm productivity by 20-30% and 100-150 million fewer people would be hungry

FAO, 2011
Reduction of in relative risk of health conditions relative to conventional-omnivorous diets

(Tilman & Clark, Nature 2014)
Definitions

**Food security** exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO, 2002; FAO, 2009; UNSCN, 2010).

**Nutrition security** exists when food security is coupled with a sanitary environment, adequate health services, and proper care and feeding practices to ensure a healthy life for all household members (WB 2009; UNSCN, 2010; SUN, 2010).
“opportunities to achieve co-benefits from actions that reduce emissions and at the same time improve health by shifting consumption away from animal products, especially from ruminant sources, in high-meat consumption societies, toward less emission intensive healthy diets”  (IPCC AR5 WGII chapter 11, 2014)

Healthy – diet rich in fruits & vegetables (400gr/day) can save 2.7 million lives  (WHO, 2008)
Values
- Establish a culture of healthy living
- Embrace equitable solutions
- Support universal food security
- Encourage to steward natural resources
- Transparency in the work

Supply-Chain Participants
- Conserve natural resources
- Use capital and labor responsibly
- Innovate in R&D
- Enhance Biodiversity

Consumers
- Sustainability & healthy diets
- Healthy dietary patterns
- Increased demand for sustainable food
- Minimize food waste

Policies
- Informed by best evidence
- Engage multiple sector stakeholders
- Local, regional, national, global
- Monitoring & accountability systems
- Align polices to promote health & sustainability

US Dietary Guidelines
Advisory Committee
2015
Climate change changes in Food Production
2003-2080
Increasing Temperature and CO2

* A key culprit in climate change – carbon emissions – can also help agriculture by enhancing photosynthesis in many important (...) crops such as wheat, rice, and soybeans. The science, however, is far from certain on the benefits of carbon fertilisation.*

This map represents the case of beneficial carbon fertilisation processes.

Change in agricultural productivity
between 2003 and the 2080s

Source: Cline W., 2007, Global Warming and Agriculture.
Salmonellosis increase by 12% for each degree increase above 6ºC ambient temperature

Source: EU/WHO cCASHh, 2004
about **805 million people** are chronically undernourished

**1 billion adults** and **20 million children** are estimated to be overweight.

Diets low in fruit and vegetable intake – high in meat & saturated fats