Module 10: Food security & malnutrition

In Module 10 we're going to look at the important issue of food security, and its relationship with climate change and malnutrition.

Key messages in Module 10

- Nutrition-related factors are together responsible for about 35% of child deaths & 11% of the total global burden of disease
- Millennium Development Goal 5 on Child Mortality will not be reached
- Food security is already a significant challenge & climate change is likely to worsen global food security
- There are clear steps that can be taken to help mitigate the anticipated challenges to food security attributable to climate change

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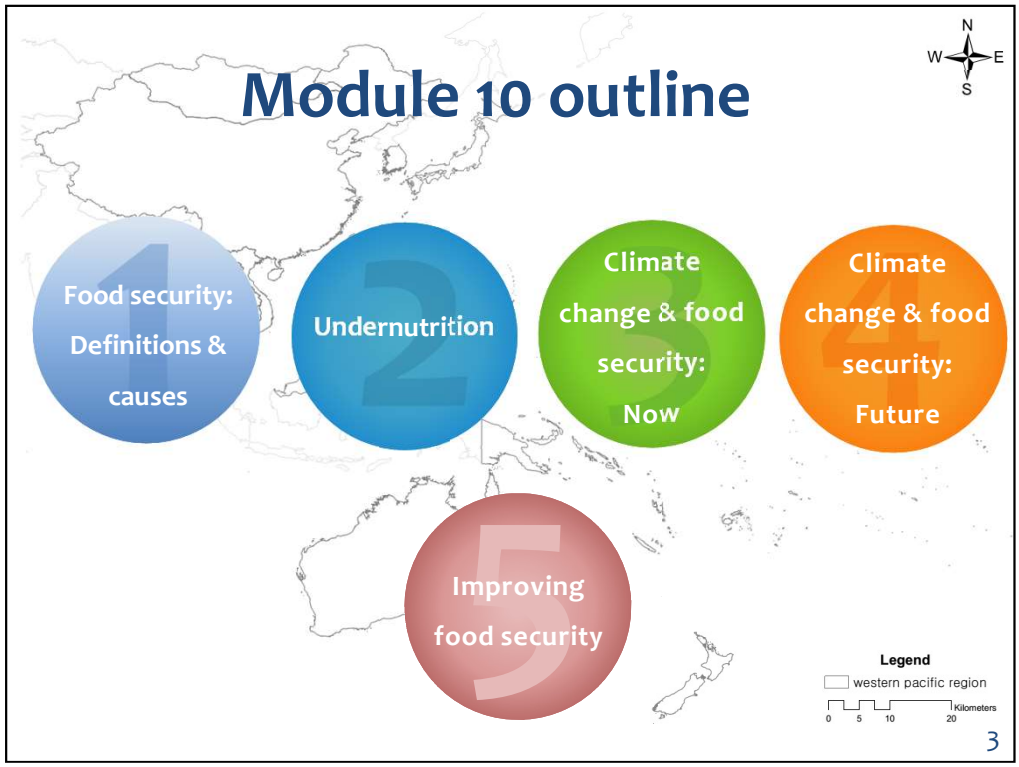
The key messages we'll be covering in Module 10 are: (**CLICK** for each of the four)

- Nutrition-related factors are together responsible for about 35% of child deaths & 11% of the total global burden of disease
- Millennium Development Goal 5 on Child Mortality will not be reached
- Food security is already a significant challenge & climate change is likely to worsen global food security
- There are clear steps that can be taken to help mitigate the anticipated challenges to food security attributable to climate change



In Module 10 we will look at the following five areas:

1. Define terms related to food insecurity, and look at its causes
2. Learn about the burden of disease from undernutrition
3. See how climate change is affecting food security
4. Look at how climate change is likely to affect crop production and food security
5. Examine steps that can improve food insecurity

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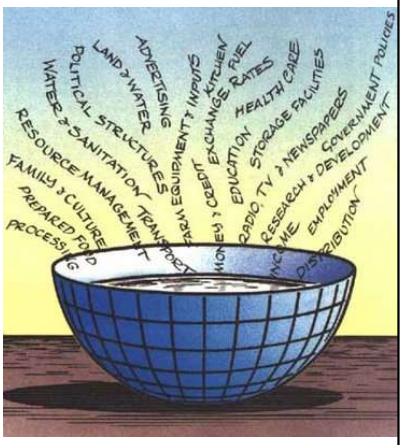
Food security: Definitions & causes



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Let's start off by defining some key terms related to food insecurity, and look at its causes.

Malnutrition: Definitions

- **Undernutrition:** deficiencies of essential vitamins & minerals (collectively referred to as micronutrients)
- **Obesity:** over-consumption of specific nutrients: another form of malnutrition
- **Hunger:** discomfort from not eating
- Undernutrition is an important determinant of maternal & child health

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Here are some key definitions related to malnutrition – read.

Forms of malnutrition

- **Under-nutrition**
  - of "food energy" (calories) or protein
  - of micro-nutrients
    - Iron — vital for stamina, learning capacity
    - Vitamins (especially vitamin A)
    - Iodine
- **Malnutrition of indulgence**
  - Increased risk of diabetes, cancer, arthritis & stigma

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The word "malnutrition" is often used, rather loosely, to refer to hunger and undernutrition. However, many obese people are also poorly, or ***mal***nourished.

The number of people with micronutrient deficiency greatly exceeds those with macronutrient deficiency — perhaps by a factor of three (especially with iron deficiency). Virtually all people with macronutrient deficiency will also experience a degree of micronutrient deficiency.

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Characteristics & impacts of undernutrition

- Undernourished often have co-existent disease, including parasites
  - Increased demand for calories
  - Can limit nutrient absorption
- Both forms of undernourishment:
  - Often co-exist
  - Reduce cognitive potential, height, strength, stamina & learning capacity, causing a multiple burden
  - Increase stigma

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People, often the poor in a society, who suffer from diseases such as malaria, upper respiratory illnesses, diarrhoea, tuberculosis, and HIV/AIDS, especially if associated with fever, have increased caloric demand.

Those chronically ill from some parasitic infections are unable to absorb nutrients, even if swallowed. Those needing to perform physical labour and in challenging settings will also have increased caloric demand.

Chronic under-nourishment often leads to or contributes to obvious poverty, and often physical and cognitive stunting. People who are significantly overweight are also often stigmatised.

Food security & right to food

- **Food security** defined as:

  "When people, at all times, have physical, social & economic access to sufficient, safe & nutritious food preferences for an active & healthy life"

  (FAO, 2002)

- The right to food is universal
  - International Covenant on Economic, Social & Cultural Rights (UN-OHCHR, 2008)
  - The related concept of food entitlement was identified by 1998 Nobel Laureate Amartya Sen

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The Food and Agriculture Organization (FAO) defines food security as a ''situation that 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." This definition comprises four key dimensions of food supplies: availability, stability, access, and utilization (FAO, 2002).

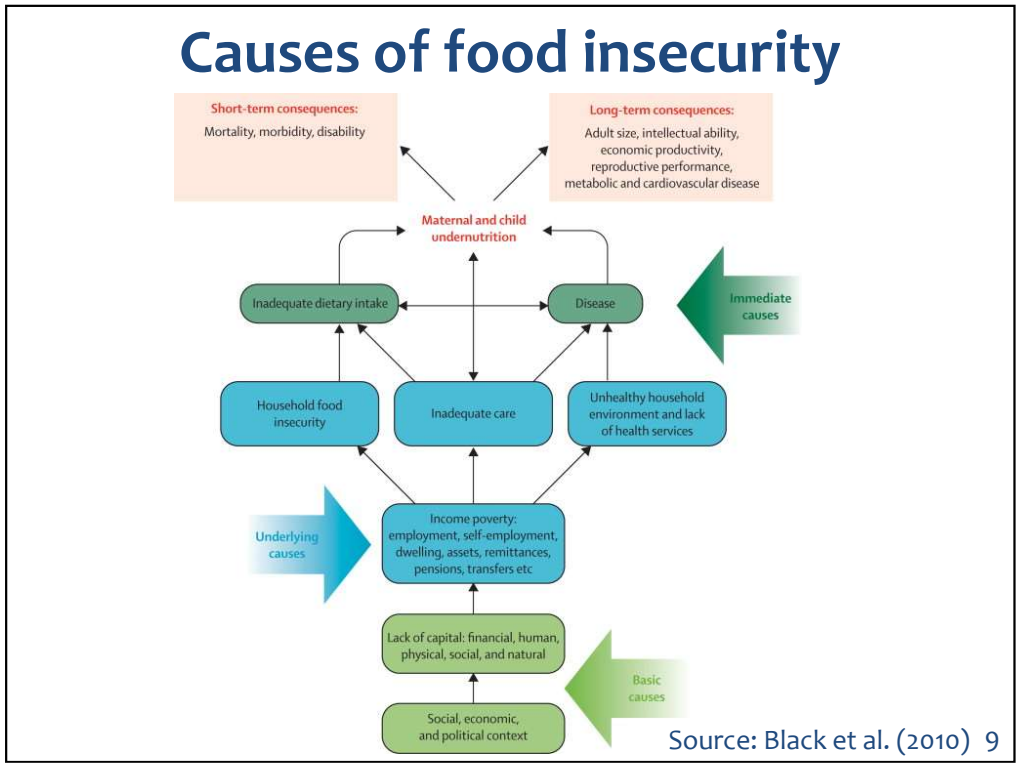
Right to adequate food is a human right, inherent in all people, to have regular, permanent, and unrestricted access, either directly or by means of financial purchases, to quantitatively and qualitatively obtain adequate and sufficient food corresponding to the cultural traditions of people to which the consumer belongs, and which ensures a physical and mental, individual and collective fulfilling and dignified life free of fear (more at FAO, 2008d).

Entitlement means that in a well-governed society, people do not starve because the food that exists is distributed sufficiently evenly to avoid famine. People may either be given food, vouchers, or provided with publicly funded work, which enables them to buy food.

Sen's analysis originally focused on the famine in WWII in Bengal, which Sen witnessed as a child, and in which about 3 million people died. Although there had been poor harvests at the time, Sen showed that in the year of the maximum number of deaths, the harvest had improved. There are numerous other examples of national and regional famine which have occurred during times of adequate national or regional food production – among the best known are the Irish famine of the late 1840s and exports of food from India during periods of severe famine in the 19th century (see Davis, 2000), and appropriation of crops from occupied Vietnam by Japan, during WWII.

Sen's work was important in challenging an opinion which until then was overly-influential – that famines were most often caused by "natural" disasters. In reality the explanation is often more complex. The primary cause of the great Chinese famine (1959-1962) was social/political, but it also had secondary environmental factors. The more recent North Korean famine has complex social, political, and environmental causes, including recurrent flooding. However, the disconnection of North Korea from the global economy, including the global system of food relief, has been a major factor, together with a gross national maldistribution.

An important cause of the lack of food entitlement is that the chronically hungry lack the cognition, social connections, and political influence to organise in ways that are sufficiently effective to remedy their situation. More "proximal" causes of lack of entitlement include scarcity of fertile land, water, seeds, credit, and access to markets.



This figure is a framework of the relations between poverty, food insecurity, and other underlying and immediate causes to maternal and child undernutrition and its short-term and long-term consequences. I'll enlarge is now so we can see it in more detail.

A framework (from Black et al., 2010) recognizes the basic and underlying causes of undernutrition, including the environmental, economic, and sociopolitical contextual factors, with poverty having a central role (UNICEF).

There is no "single" cause of food security. Instead, there are numerous causal factors, all of which are inter-connected. It is more accurate to think of these factors as a system – a network of related, connected factors, rather than a hierarchical list. Nevertheless, of the many factors which contribute, it is still necessary to list them in order. But the order used here does not mean that there is necessarily quantitative evidence to show that these causes are ranked in priority. The following slides will provide more detail about these factors.

Lack of “food entitlement” – inequality, appropriation, poor governance, and subsidies by powerful countries which distort production geography – discussed in some detail.

The “stork and plow” – struggle between increases in population and food. This theme is mentioned several times, but not in detail. Note, however, that a major cause of continuing population growth is poverty, poor education, poor nutrition, and inequality. Thus the causes contribute to the consequence, leading to what some commentators call “entrapment” (Ehrlich et al., 1995; King, 1990).

Total (growing) consumer demand combines with apparent proximity to further yield growth of key crops. Some scientists argue that there are apparent flattening in the yields of some crops – meaning additional land will need to be harnessed for further crop growth. Others argue that genetic engineering may overcome some of these limitations; however, to date, the success of GMO crops has not equaled hope.

Under-investment in agricultural research; excessive reliance on long hoped for “Gene Revolution” – this overlaps a point in the previous slide.

Conflict and poverty — this is often presented as an external factor, a surprise which undermines food security or poverty relief. Instead, it can be argued that poverty and periodic conflict are highly likely, though temporally unpredictable manifestations of under-nutrition, and local, regional, and global inequality.

Diversion of human and other forms of energy to grow food crops for animal feed or vehicle fuels. This practice could become increasingly unacceptable in a food constrained world, unless there are major technological breakthroughs.

Global environmental change: climate change, plus + (atmospheric, water, and soil factors) climate change models are discussed in detail; many other cautionary elements are mentioned as caveats.

Global economic failure, rising cost of oil, fertiliser, transport, and other inputs contributed to the recent food price bubble. Given the long-term trajectory of these inputs is upward is another reason to be concerned about future global food security.

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Burden of disease from undernutrition

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In this second section we'll look at the burden of disease that stems from undernutrition

Global burden of disease - undernutrition

- 21% disability-adjusted life-years (DALYs) for children younger than 5 years
- 35% child deaths – 11% of total global Burden of Disease (BoD)

Source: Black et al. (2008) 11

According to Black et al., 2008, in 2005 stunting, severe wasting, and intrauterine growth restriction together were responsible for 2.2 million deaths and 21% of DALYs for children younger than 5 years.

Deficiencies of vitamin A and zinc were estimated to be responsible for 0.6 million and 0.4 million deaths, respectively, and a combined 9% of global childhood DALYs.

Suboptimum breastfeeding was estimated to be responsible for 1.4 million child deaths and 44 million DALYs (10% of DALYs in children younger than 5 years).

In an analysis that accounted for co-exposure of these nutrition-related factors, they were together responsible for about 35% of child deaths and 11% of the total global disease burden (Black et al., 2008).

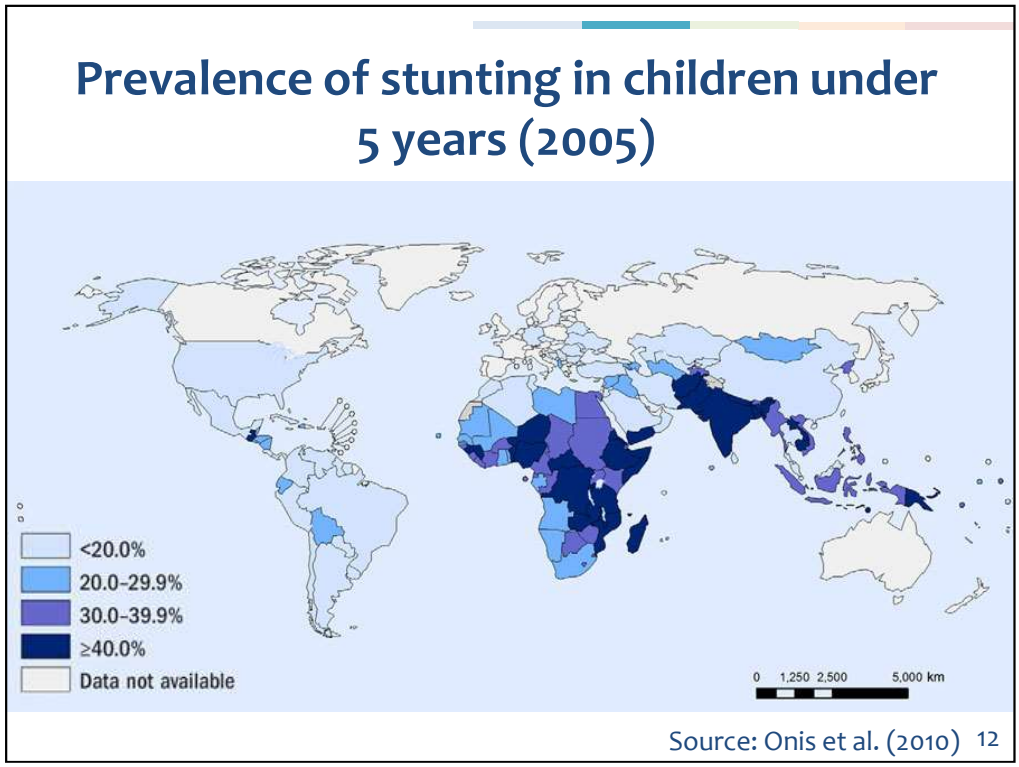
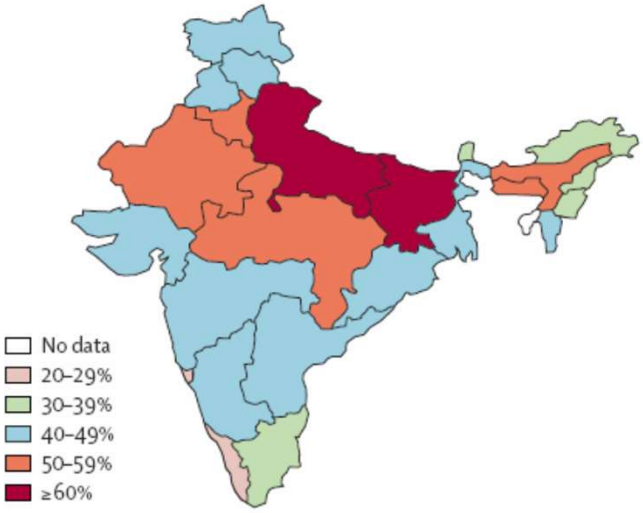


Figure shows the distribution of stunting in children.

Relatively high levels of stunting are seen throughout the Southeast Asia (SEA) region along with some countries in Africa.

Prevalence of stunting in children under 5 years in India (2005)

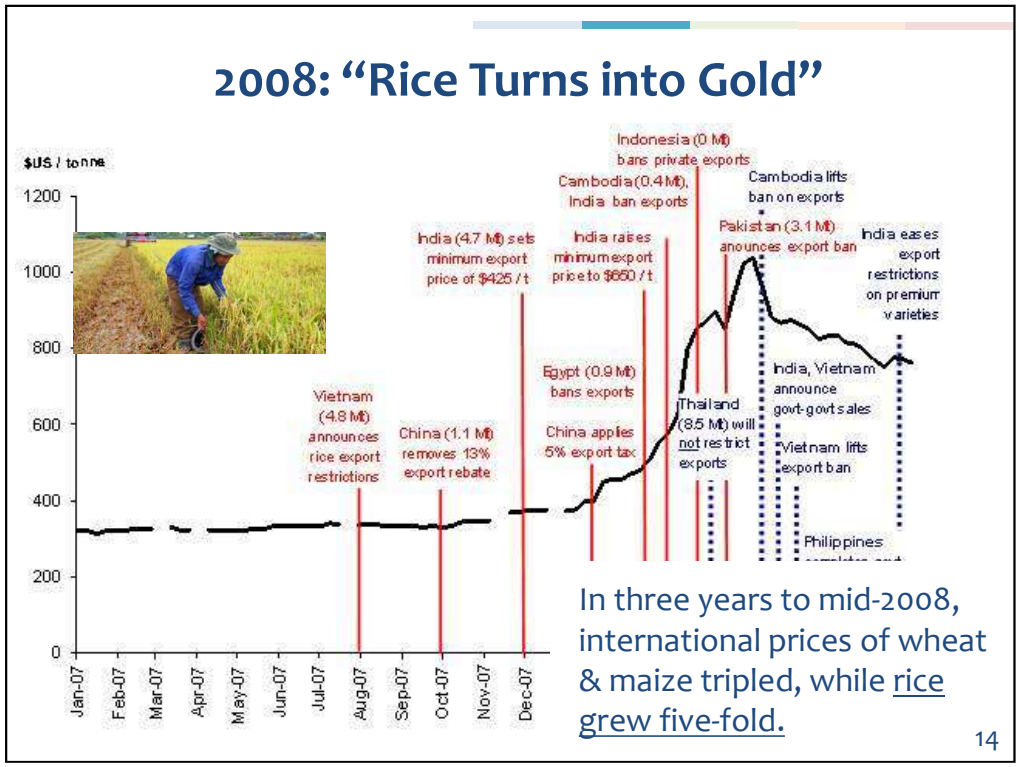


India has more than 61 million stunted children - 51% of the national population & 34% of the global total.

However, stunting prevalence varies substantially by state.

Source: Black et al. (2008) 13

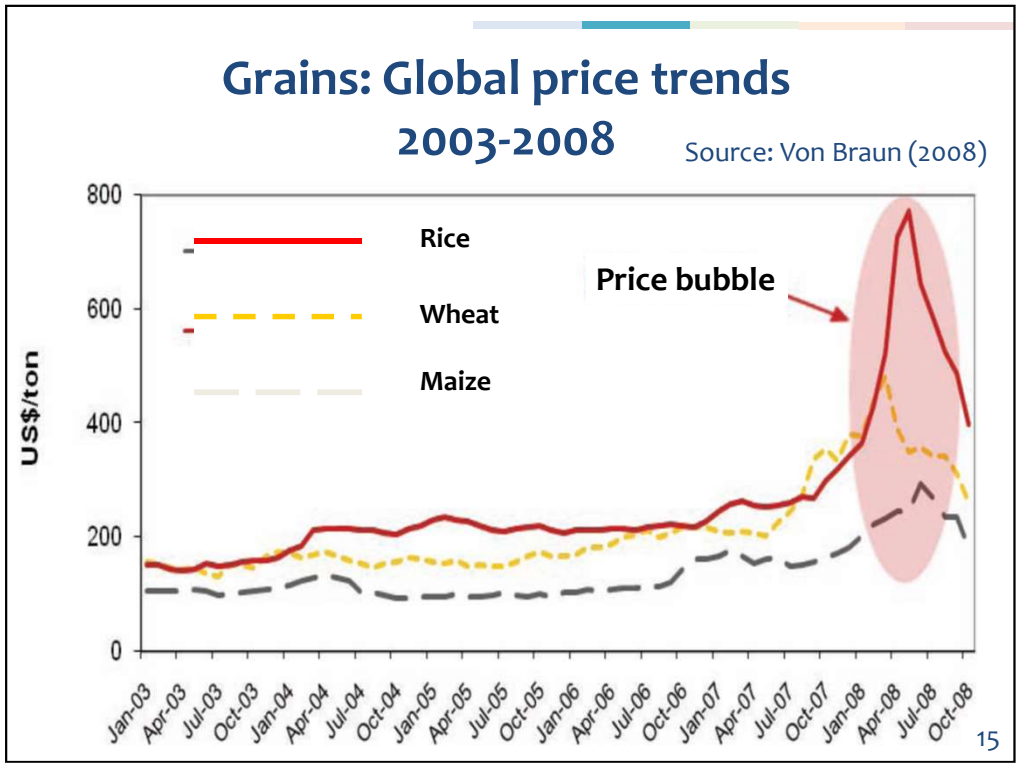
India has more than 61 million stunted children, 51% of the national population & 34% of the global total. However, stunting prevalence varies substantially by state. Northern states facing Himalayas has highest prevalence and next higher in adjacent states.



SOURCE?

Food prices dramatically increased in early 2008, resulting in a dramatic escalation of the number of hungry, globally. **CLICK** to show text box over right hand side of graph.

The director of the World Food Program wrote in early 2008, "In the fight against hunger we could now be facing a perfect storm of challenges, including climate change and increasingly severe droughts and floods, soaring food prices and the tightest supplies in recent history, declining levels of food aid, and HIV/AIDS, which also aggravates food insecurity."

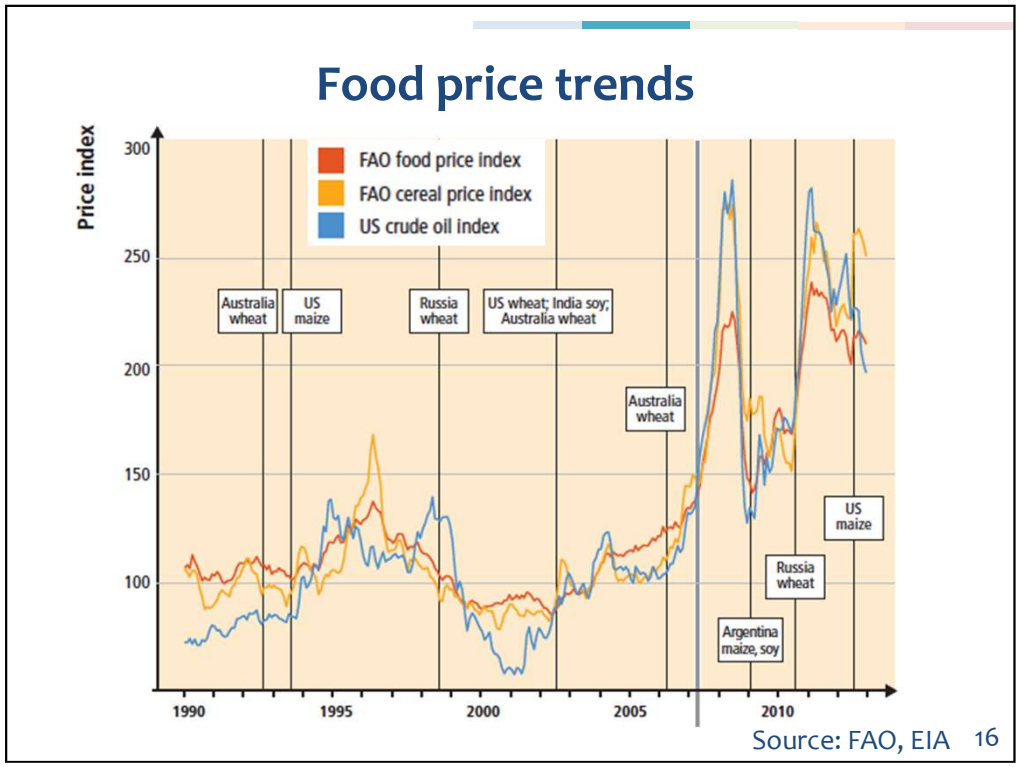


According to von Braun (2008): The price of nearly every agricultural commodity sharply increased in the past two years, creating a global food price bubble. At their peaks in the second quarter of 2008, world prices of wheat and maize were three times higher than at the beginning of 2003, whereas the price of rice was five times higher (Figure). Dairy products, meat, palm oil, and cassava also experienced sharp price hikes. The prices of butter and milk, for example, tripled between 2003 and 2008, and the prices of beef and poultry doubled. Food inflation has put upward pressure on general inflation around the globe. In 2007–2008, average food inflation has been higher than average overall inflation in 27 of the 31 countries with a high proportion or number of undernourished people.
(Source: IFPRI, 2008)

More recently, the price of food and other commodities have declined by about 30 to 40% as a result of the economic slowdown and favorable weather conditions, but they remain high compared with three years ago. This short-term price relief is insufficient, however, to ensure that the poor have access to adequate amounts of

nutritious food.

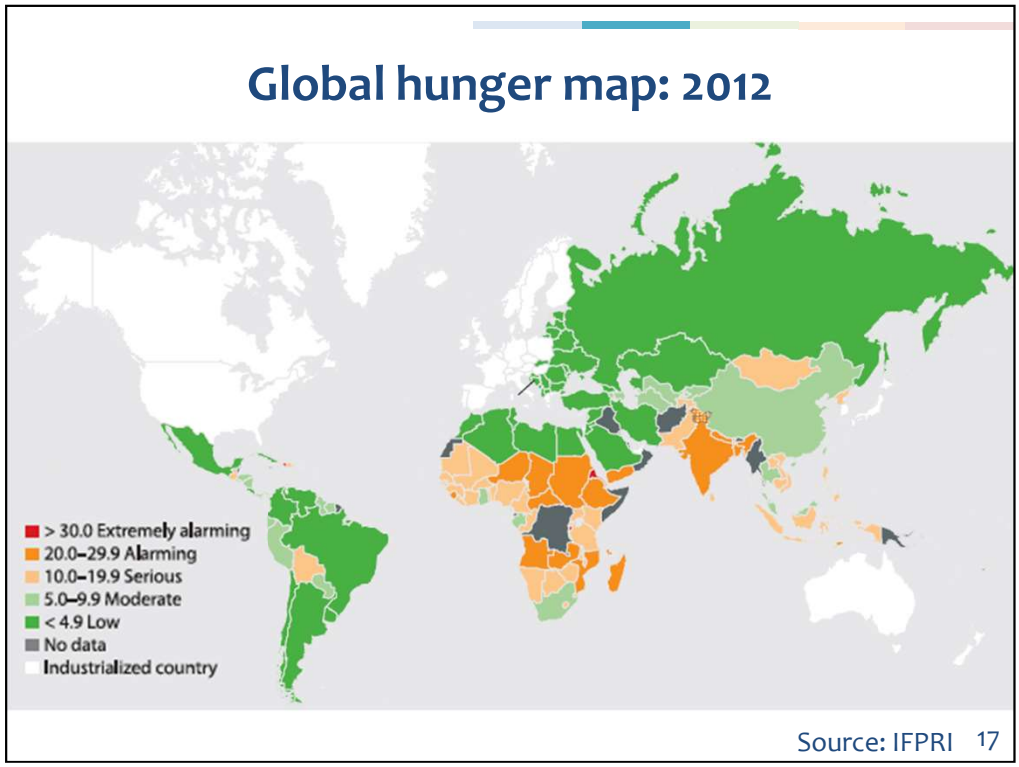
For 2009, FAO estimates that despite the decline of international cereal prices, food prices remain at high levels in developing countries and in several continue to increase, affecting the food security of large numbers of vulnerable populations.



Since the AR4, international food prices have reversed historical downward trend. The plot shows the history of FAO food and cereal price indices (composite measures of food prices), with vertical lines indicating events when a top five producer of a crop had yields 25% below trend line (indicative of a seasonal climate extreme). Australia is included despite not being a top five producer, because it is an important exporter and the drops were 40% or more below trend line. Prices may have become more sensitive to weather-related supply shortfalls in recent years. At the same time, food prices are increasingly associated with the price of crude oil (blue line), making attribution of price changes to climate difficult. Thus, there is clear evidence since AR4 that prices can rise rapidly, but the role of weather in these increases remains unclear. All indices are expressed as percentage of 2002–2004 averages.

Source: Food price and crop yield data from FAO (http://www.fao.org/worldfoodsituation/foodpricesindex and http://faostat.fao.org/)

and oil price data from http://www.eia.gov.>



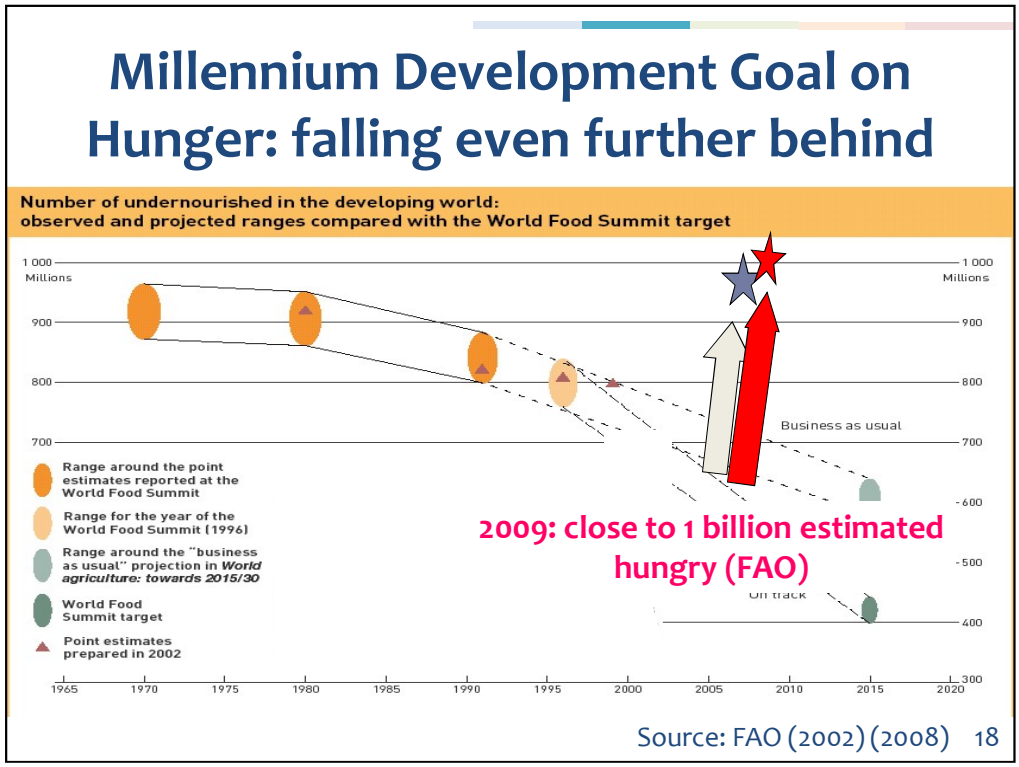
Most hunger is concentrated in South Asia and sub-Saharan Africa. For the last decade, the population of North Korea has also suffered persistent famine. Haiti also suffers consistently.

In addition, ≈ 840 million are undernourished from insufficient calories or protein.

And additional 1-2 billion experience under-nourishment from inadequate micronutrients (vitamins, minerals).

The situation has worsened since 2006.

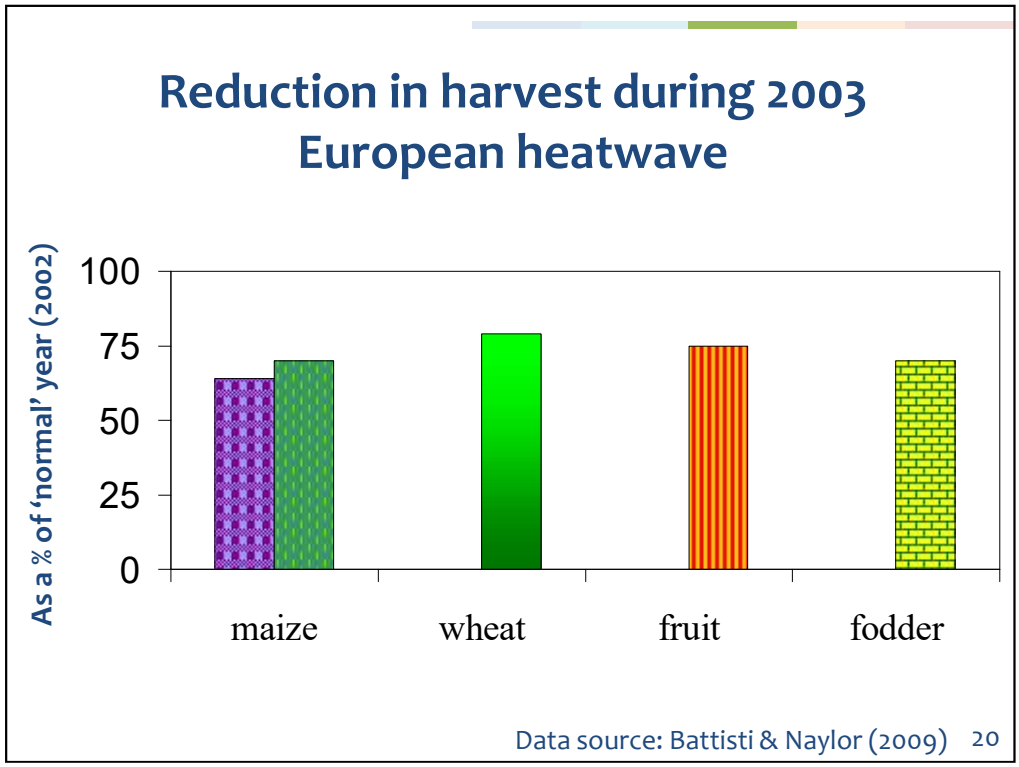
Source: IFPRI website



In 2002 when this slide was produced, there was already concern that the Millennium Development Goal related to hunger was slipping out of reach. In the last two years, the trend of falling hunger in absolute terms has worsened.

Between 1990 and 2015, the proportion of people whose income is less than one dollar a day and who suffer from hunger reduced by 50%. A much more modest goal than from the 1996 World Food Summit (Pogge, 2004)

We've seen how climate change is likely to affect food security in the future. Let's now look at how climate change is already affecting food security.



Record high daytime and nighttime temperatures over most of the summer growing season reduced leaf and grain-filling development of key crops such as maize, fruit trees, and vineyards; accelerated crop ripening and maturity by 10 to 20 days; caused livestock to be stressed; and resulted in reduced soil moisture and increased water consumption in agriculture.

Italy experienced a record drop in maize yields of 36% from a year earlier, whereas in France maize and fodder production fell by 30%, fruit harvests declined by 25%, and wheat harvests, which had nearly reached maturity by the time the heat set in, declined by 21%.

A global food crisis is brewing

"The stress on crops & livestock will become global in character. It will be extremely difficult to balance food deficits in one part of the world with food surpluses in another, unless major adaptation investments are made soon to develop crop varieties that are tolerant to heat."

Battisti & Naylor (2009)

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Self explanatory

Climate impact of global livestock

Responsible for 20% GHG emissions:

- CO_2 from land clearance, fertiliser, harvest, shipping
- CH_4 from digastrics (sheep, cattle, goats)
- CH_4 from manure
- NO_2 from fertiliser

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Livestock production is a major source of GHG emissions, responsible for 20% GHG emissions. These four sources are specifically large contributors:

- CO_2 from land clearance, fertiliser, harvest, shipping
- $CH_{4\ from}$ digastrics (sheep, cattle, goats)
- $CH_{4\ from}$ manure
- $NO_{2\ from}$ fertiliser

Climate impact of global livestock

- Creates incentives for forest clearance
  - Loss of biodiversity, carbon sinks, other ecosystem services
- Livestock production requires the most water resources in the food chain

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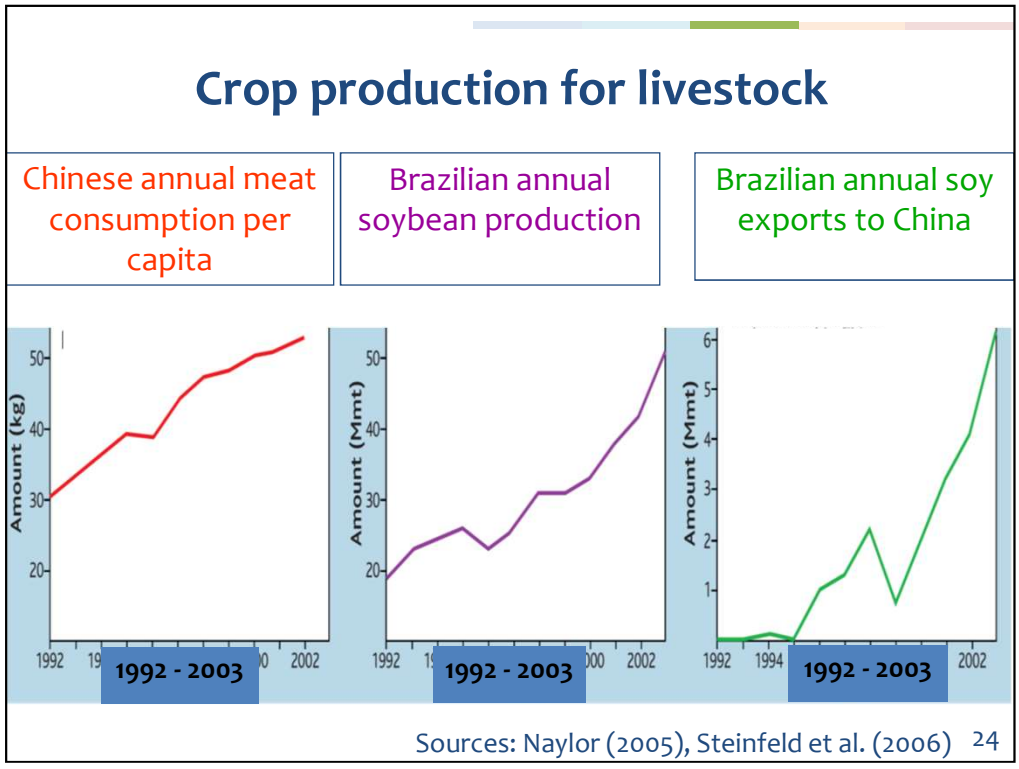
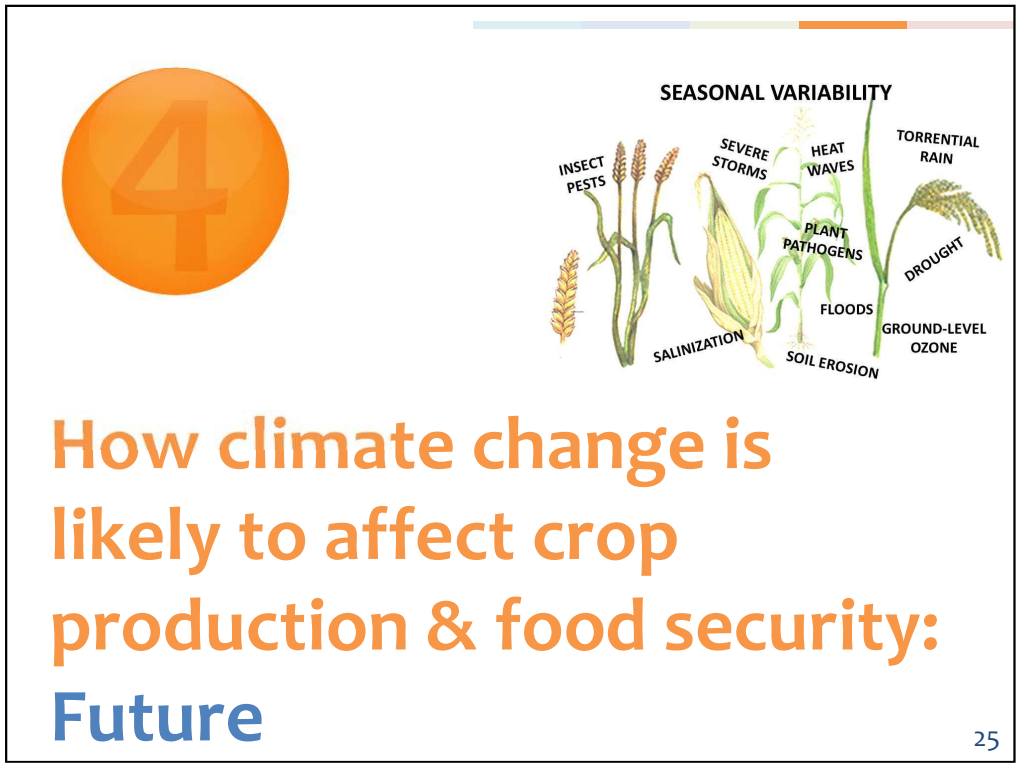
Livestock production also contributes to climate change by reducing the capacity of existing carbon sinks as native habitat is converted for pasture/feed uses.

In addition, excess meat consumption also harms human health (e.g., heart disease, cancer, obesity). Consequently, a “contract and converge” policy to stabilise global meat consumption at 90 gm per capita per day has been called for (Steinfeld et al., 2006; McMichael et al., 2008a; Meyer, 2000).



"If the world's population today were to eat a Western diet – roughly 220 gm meat per capita per day, the land required for feed production would be about 2.5 billion hectares – two-thirds more than is presently used."

The increasing demand for meat consumption is paralleled by an increase in soy bean production that is mainly used as animal feed. An expansion of agricultural land used for soybean production could reduce the land reserved for staple food production.



In the fourth section of Module 10 we'll look at how climate change is likely to affect crop production and food security

Climate change: Likely to harm many vulnerable populations

- Four out of five major global climate models project consistent expansion of arid areas in developing countries
  - Areas home to almost 1 billion people
  - More than 180 million people in Africa alone

Source: Fischer et al. (2005) 26

A consistent conclusion running through the climate change food modelling literature is that already vulnerable populations will be among those most harmed.

Climate change & global cereal production: Change from 1990 to 2080

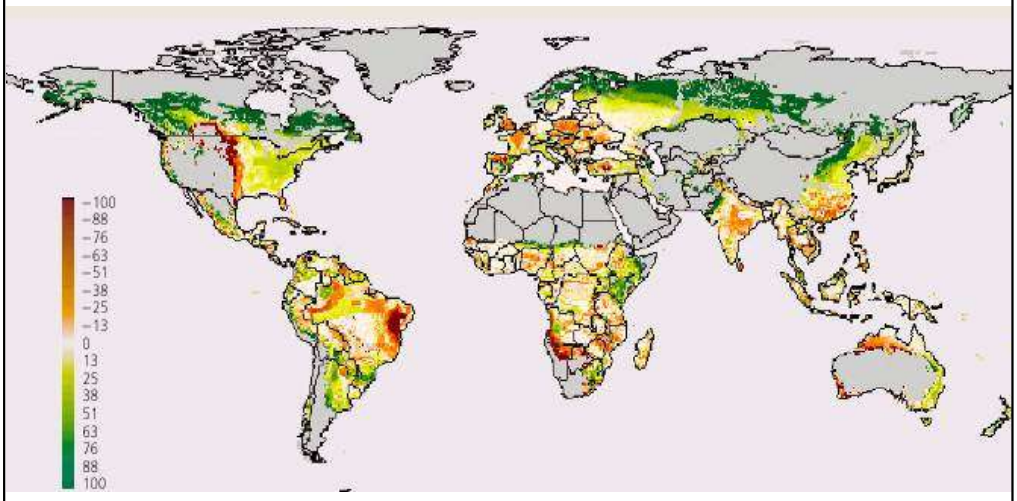
	Range (% change)
World	**-0.6 to -0.9**
Developed countries	+2.7 to +9.0
Developing countries	-3.3 to -7.2
Southeast Asia	-2.5 to -7.8
South Asia	-18.2 to -22.1
Sub-Saharan Africa	-3.9 to -7.5
Latin America	+5.2 to +12.5

Source: Tubiello & Fischer (2007) 27

Here you can see the likely impacts of climate change on cereal production, globally and in South and South East Asia.

The negative impact of predicted decline in grain production in South Asia and Southeast Asia will be exacerbated by anticipated population increases.

Rain-fed cereal production & climate change model: 2080



Source: Fischer et al. (2001) 28

This 2001 model shows rain-fed potential cereal production by 2080. It assumes one crop per year with a high level of inputs on land currently under cultivation, and shows a net decrease of some 100 million tons at the global level. However, again, the greatest decrease is in developing countries, especially India and sub-Saharan Africa.

Method for figure: Climate change impacts by grid cell are visualized using a normalized difference index. They are calculated by dividing the difference in cereal production capacity between future and current production potential by their sum. The index ranges from a value of –100 to +100; the former indicates complete loss of production, the latter occurs in areas where cereal production is not possible under current climate conditions but would be feasible with climate change.

Model: ECHAM4 (Max Planck Institute of Meteorology).

Modelling climate change & future food security

- Current models vary by:
  - Pathways of greenhouse gas emissions
  - Climate 'sensitivity' to CO_2 equivalent levels
  - Strength of carbon fertilisation effect
  - Incorporation of food trade

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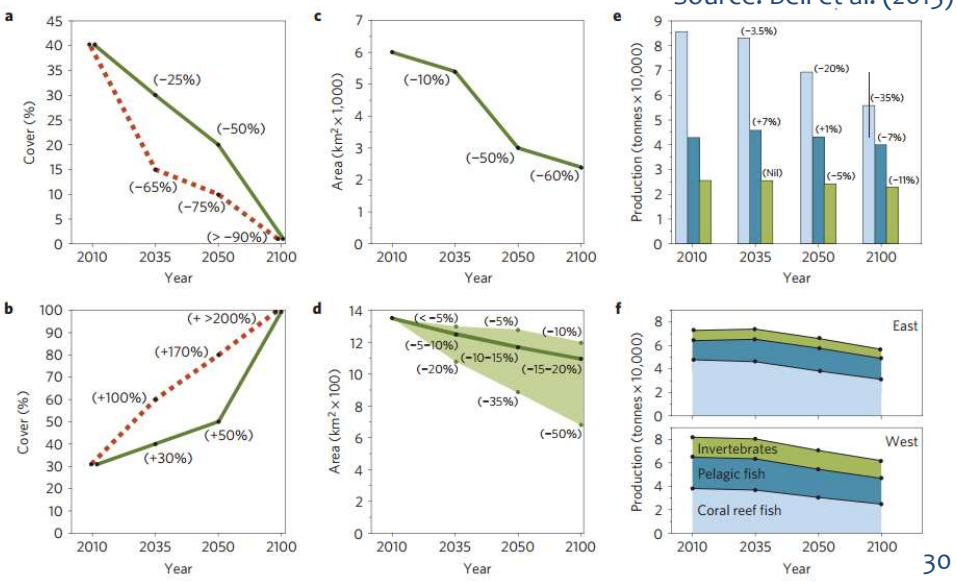
Models of climate change and food production include:

1. Pathways of greenhouse gas emissions (depending on different scenarios, described in the IPCC, such as the SRES scenarios).
2. Climate "sensitivity" to CO_2 equivalent levels: any given future CO_2 equivalent level will have different effects on temperature and rainfall.
3. Strength of carbon fertilisation effect: CO_2 has been considered as having a natural "fertilising" effect, as CO_2 is vital for photosynthesis.
4. Incorporation of food trade. Global food security also depends on how food is traded; this trading system can greatly compensate the under-production of food in any region. Most of the maps available today show food productivity in different regions, under different climate change scenarios; some, but not all, specifically mention that food trade is incorporated into the models.

Modelling climate change & future food security

Source: Bell et al. (2013)



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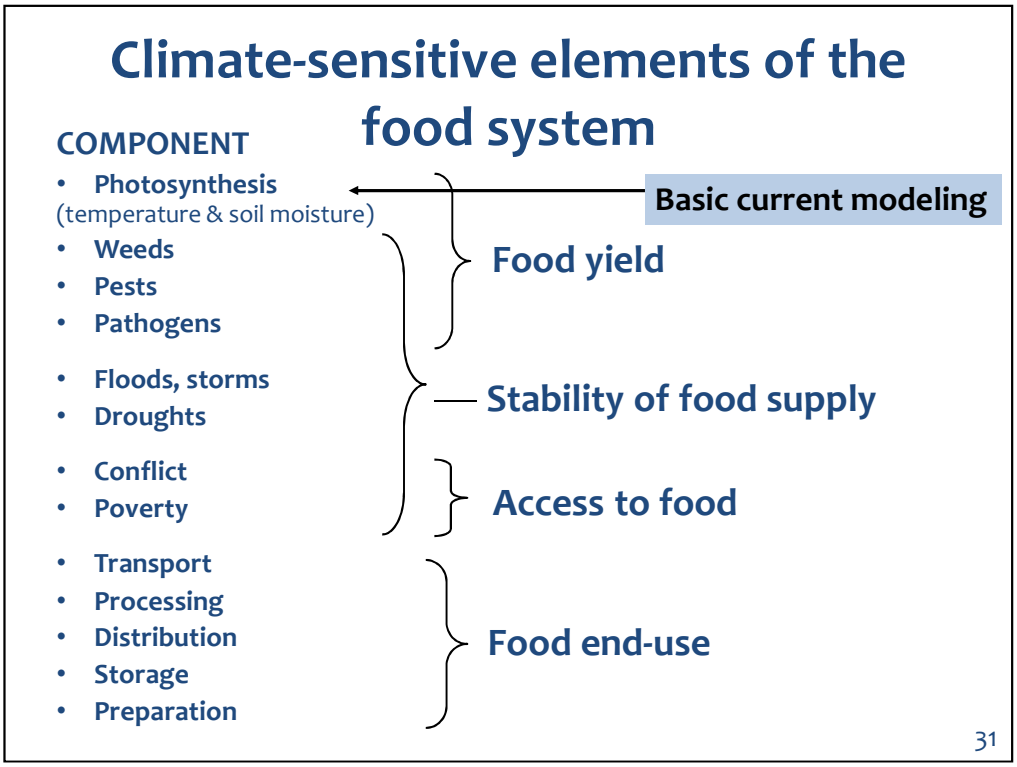
YEAR of source?

Climate change will also modify future global fish production. However, models incorporating climate change as a factor affecting global fish production were not identified. Limits to global fish production include falling per capita global wild fish catch and limits to aquaculture.

In addition, global fish production is also at risk from ocean acidification, overfishing, and other ecosystemic damage. Fish is a major source of protein and valuable fatty acids, and is especially important for many poor coastal populations. Recent modelling on the production from fisheries in the tropical Pacific shows that climate change will facilitate live coral cover (a), seaweed cover (b), total mangrove area (c), and seagrass area (d), which in turn results in marked decrease in the total catches of from coastal fisheries € and catches in pelagic fish catch (f).

Source: Bell et al. Mixed responses of tropical Pacific fisheries and aquaculture to climate change. Nature Climate Change 2013;3:591-599



So far, modeling to date has focused on climate change impacts based mainly on the photosynthetic yield, a function of temperature and soil moisture.

There are many other paths by which climate change can affect food yields, such as constancy of supply, storage, distribution, access to production factors, etc.

Limits of current crop models with climate change

- Current models do not account for likely impacts from climate change, including:
  - Heat stress – to rice yield, flowering & pollinators
  - Extreme weather events (e.g. winds, waterlogging)
  - Sea level rise, salt water intrusion
  - Aquifer depletion & water contamination
  - Loss of land due to urbanisation & to biofuels production
  - Rising cost of oil & fertiliser
  - Future shortage of potassium — an essential element
  - Atmospheric brown cloud ('solar dimming')
  - Political economy & conflict — 'entitlement' factors

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These factors are also not explicitly included in the models.

These factors, combined, mean that forecasts of food security arising from climate change need to be considered as likely to be too optimistic.

Simulated yield changes in the three major crops by regions

Source: IPCC AR5 (2014)

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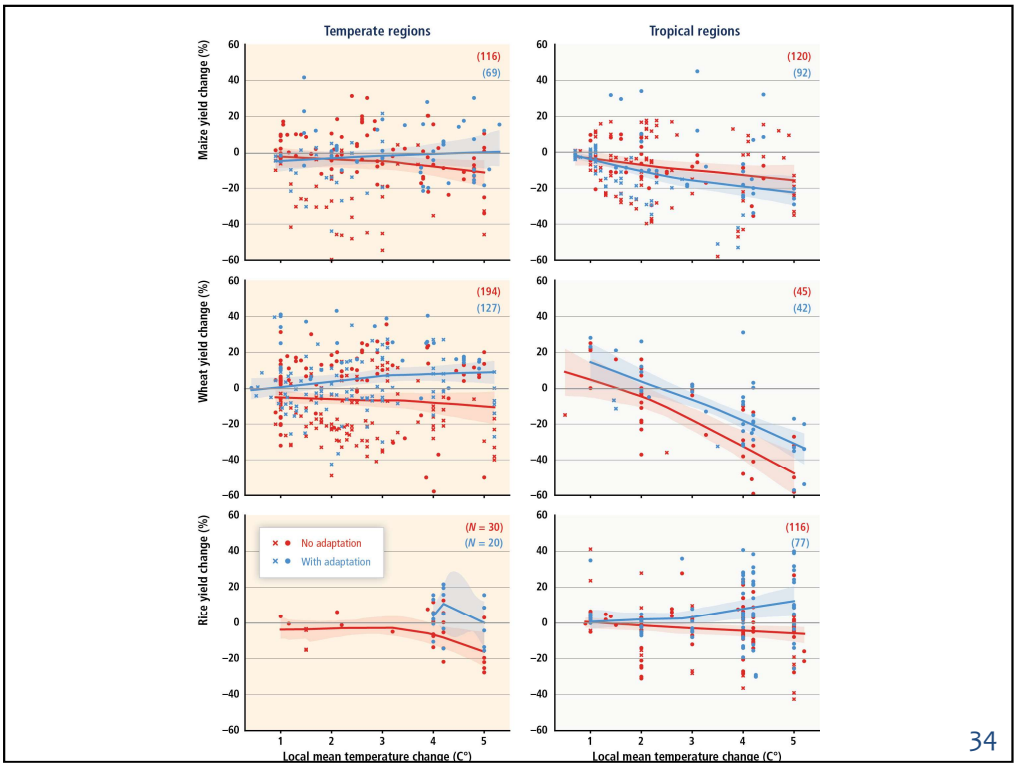
The recent Assessment Report of IPCC describes that the yield from three major crops is likely to change under climate change modelling.

CLICK to go to next slide with full screen figure



With medium confidence, in mid- to high-latitude regions moderate warming will raise crop and pasture yields compared to the summary points from AR4. Sight warming will decrease yields in low-latitude regions. Extreme climate and weather events will, with high confidence, reduce food production. The benefits of adaptation vary with crops and across regions and temperature changes; however, on average, they provide approximately a 10% yield benefit when compared with yields when no adaptation is used (WGII AR4 Section 5.5.1).

Source: WGII_AR5_Fig7-4

Climate change & current crop models: Summary

Most models:

- Predict a small benefit, little change, or slight harm to the North
- Predict varying degrees of harm in the South
- Thus predict increased global inequality
- Assume strong carbon fertilisation

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Many minor factors are excluded from the models of climate change.

Some of these factors (such as the adverse relationship between excessive nocturnal temperature and yield) are covered in more detail in the following slides. Most are not. Together, it seems likely that the cumulative effect of these excluded factors is significant, and is likely to be adverse.

5

The role of the health sector

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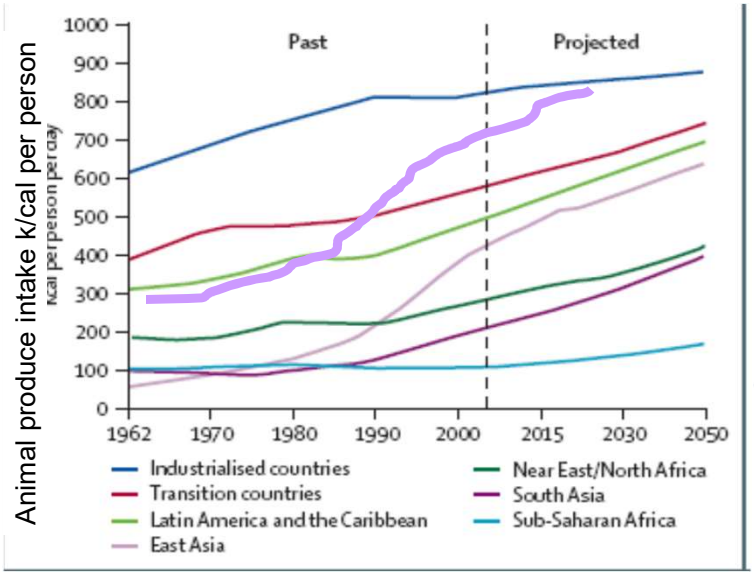
We've looked at the causes of malnutrition, and the current and likely future impacts of climate change on food security and malnutrition. Let's finish by examining steps that can improve food insecurity.

Future food security



Projected global increase in average animal product consumption

Adapted from FAO (2006) 37

This graph show trends in consumption of livestock products per person (milk, eggs, and dairy products, excluding butter).

This shows a projected global increase in average animal product consumption

Contraction & convergence of meat consumption

- Reduce average daily meat consumption to 90 grams/day by those consuming more
- Increase meat consumption for those below 90 grams/day threshold ('under- consumers')
- Limit global livestock 'climate footprint' to current level, accounting for population growth
- Benefits
  - Improved human health
  - Climate change mitigation

Source: McMichael et al. (2008) 38

Source: McMichael et al., 2008a

Steps to improve future food security

- Improve governance & leadership
- Secure food entitlement
- Pursue & encourage technological breakthroughs
  - Water quantity & water quality
  - More investment in research for sustainable agriculture

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Global food security is already very poor, manifestly deteriorating, and likely to get even worse.

Here are some of the things that can be done to improve future food security. **CLICK** to animate the first three improvement steps.

The world should hope and work for fairer entitlement, which will also lower global population growth. It should work and hope for technological breakthroughs, but these will not, on their own, be enough. In particular, there should not be excessive reliance on a "gene revolution" – much more can be done with conventional plant breeding, and investing more in research for sustainable agriculture.

Steps to improve future food security

- Address food demand & supply
  - Population growth not 'fixed': can be reduced by reducing global inequality
  - Limit meat consumption to 90 grams/day
- Improve food production models
  - Account for likely climate change impacts
- Pursue climate change mitigation

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Further things that can be done to improve future food security include…. (**CLICK** to animate the last two improvement steps)

Population growth at the medium projection (of 9.2 billion by 2050) is not "fixed," and can be lowered by increased academic and political leadership, and by more investment in education and in family planning.

Also not "fixed" is an increased global consumption of livestock – if global meat consumption by the poor converges toward 90 gramms per day, while it contracts among the over-fed toward a similar level, then the climate footprint of the global livestock industry need not increase.

There is a need to account for likely impacts of climate change in food production models to avoid overly optimistic projections that are integrated into large-scale planning efforts.

Steps that help limit future climate change will improve food security.

Conclusions

- Food security is already a significant challenge
- All else equal, climate change is likely to worsen global food security
- There are clear steps that can be taken to help mitigate the anticipated challenges to food security attributable to climate change

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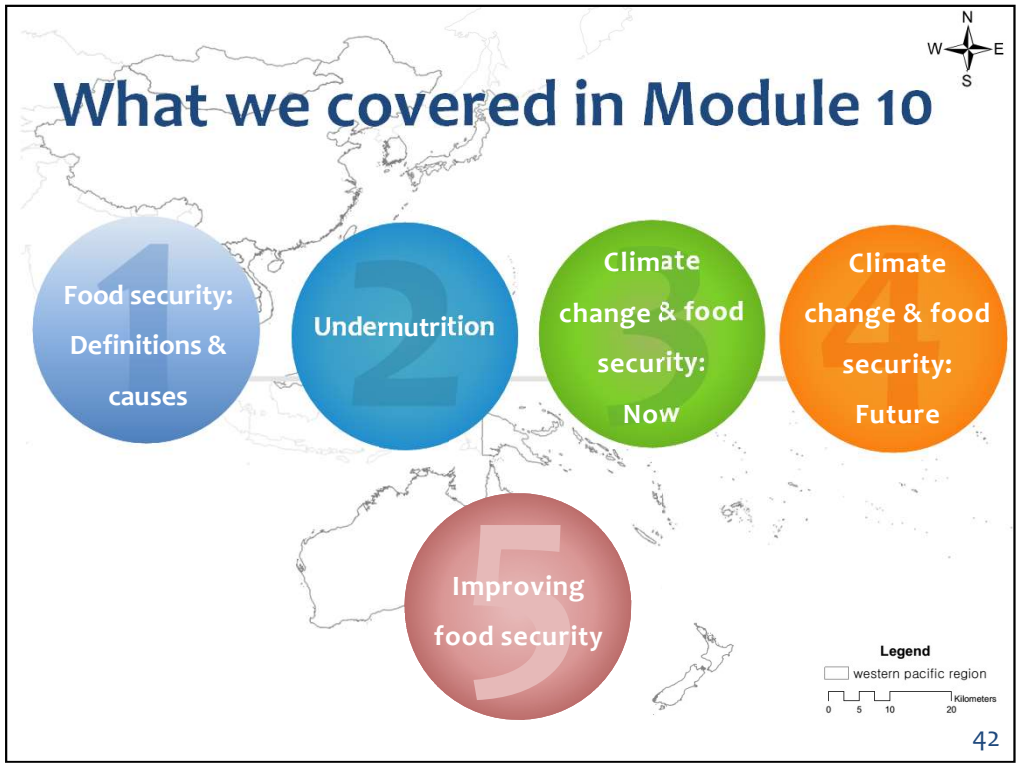
So to conclude, if the adverse climate change scenarios for developing countries come to pass, then much global cooperation and goodwill will be needed to avert widespread famine, including the potential radicalisation of some disentitled populations.

However, important steps can be taken to improve future food security in the face of the challenges that climate change will present.

Recommended further reading: 2007 IPCC reports: The Physical Science Basis, FAQ 5.1, page 111



In Module 10 we covered:

1. Defining terms related to food insecurity, and look at its causes
2. The burden of disease from undernutrition
3. How climate change is affecting food security
4. How climate change is likely to affect crop production and food security
5. Steps that can improve food insecurity

Learning from Module 10

- Nutrition-related factors are together responsible for about 35% of child deaths & 11% of the total global burden of disease
- Millennium Development Goal 5 on Child Mortality will not be reached
- Food security is already a significant challenge & climate change is likely to worsen global food security
- There are clear steps that can be taken to help mitigate the anticipated challenges to food security attributable to climate change

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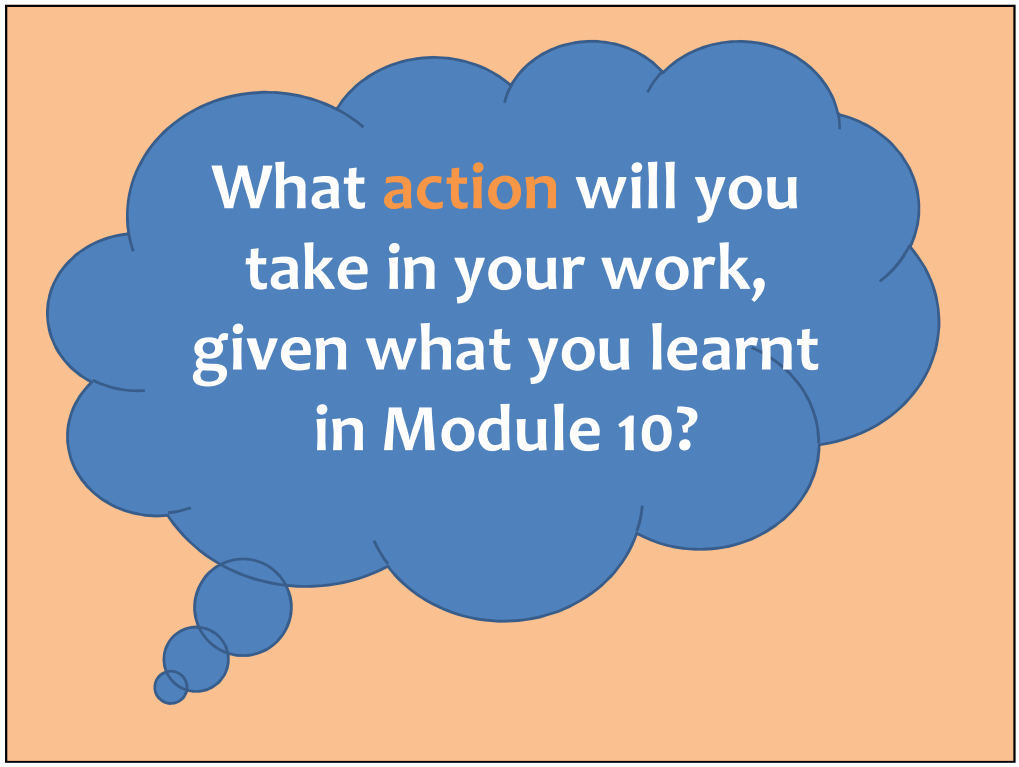
The key messages to take away from Module 10 are: (**CLICK** for each of the four)

- Nutrition-related factors are together responsible for about 35% of child deaths & 11% of the total global burden of disease
- Millennium Development Goal 5 on Child Mortality will not be reached
- Food security is already a significant challenge & climate change is likely to worsen global food security
- There are clear steps that can be taken to help mitigate the anticipated challenges to food security attributable to climate change



To finish off Module 10, I'll ask you to spend the next few minutes looking over your notes and reflecting on the key learnings from this module for you.

Please take some notes on any action steps you'd like to take once you're back at work, based on what you've learnt around food security and malnutrition under climate change.

Encourage quiet reflection (verbally if needed). At the end of **2 minutes**: "Thanks. I look forward to hearing some of the actions that were captured over the coming days."

Coming up tomorrow…

Day 5:

- Air quality
- Communicating what we know about climate change & health
- Reviewing what we've learnt

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Next tomorrow…

Module 11:

Air quality