The weather
Food production will have to increase by 70% over the next 40 years to feed the world's growing population, the United Nations food agency predicts. The Food and Agricultural Organisation says if more land is not used for food production now, 370 million people could be facing famine by 2050. The world population is expected to increase from the current 6.7 billion to 9.1 billion by mid-century.

The FAO said net investments of $83bn (£52.5bn) a year - an increase of 50% - had to be made in agriculture in developing countries if there was to be enough food by 2050.
Today three companies, Archer Daniels Midland (ADM), Cargill, and Bunge control 90 percent of the world's grain trade.

The one certainty going forward is volatility. Daily price moves of above £10 per mt and yearly moves of £100 per mt could become the ‘norm’. For the grain grower and consumer alike risk management strategies will become much more important. Margins wins for some will become a margin squeeze for others. Higher production costs will have to find their way to the ultimate consumer at some stage whether that be in the form of higher food or fuel prices.

Irish Extension Service

The Chinese Government this year distributed 15.5 billion yuan ($2.3 billion) in subsidies for farmers to purchase agricultural machinery, compared with 70 million yuan ($10.4 million) in 2004. It also bumped up the minimum purchase price of rice and wheat.
Sintal Agriculture is slashing wheat area for oilseeds, despite soaring global prices of the grain, citing margins a fraction of those gained from crops such as rapeseed and soybeans.

The Ukraine farm operator revealed it had halved, to 19,400 hectares, the amount of land sown to winter wheat, which last year suffered relatively high rates of losses in Ukraine to a cold winter.

Soybean delays prompt switch to cotton in Brazil

Crop prices to stay firm into 2012, says SocGen

Kansas wheat growing as 'potential flashpoint'

The winter wheat crop in Kansas looks increasingly a market "flashpoint" in the making thanks to the dry start to the season, which has left its condition already well below average with a freeze on its way.
International experts debate food security
6 December 2010 | By Farming First
A major food security conference is being held in London to debate how to match food supply to demand, amongst the climate and environmental pressures faced.

**Scarcity of Phosphorus Threat to Global Food Production**
ScienceDaily (Mar. 17, 2010) — Phosphorus is just as important to agriculture as water. But a lack of availability and accessibility of phosphorus is an emerging problem that threatens our capacity to feed the global population. Like nitrogen and potassium, it is a nutrient that plants take up from the soil and it is crucial to soil fertility and crop growth.

Biophysical limits to global food production
Global food production, so far, has increased continuously because cropped area has expanded and productivity per unit area has increased. In some regions of the world, however, there is little scope for further spatial expansion of agriculture. In other areas, crop yields are stagnating.

**World set for new food crisis in 2010, UN warns**
2009 Hunger Map

Almost one billion people regularly suffer from hunger; most are women and children.

Malnutrition prevents children from reaching their full developmental and cognitive potential.

One child dies every six seconds from hunger-related causes.

More people die of hunger every year than from AIDS, malaria and tuberculosis combined.

On any given day, WFP has an average 5,000 trucks, 70 aircraft and 30 ships delivering food across the globe.

Fill the cup
Be part of the solution

Category
Undernourished
Description
Extremely low
5-9%
10-19%
20-34%
≥35%
Insufficient data

Sources: The State of Food Insecurity in the World 2009; Food and Agriculture Organization of the United Nations and FAOSTAT
© 2009 United Nations World Food Programme

wfp.org
GLOBAL TRADE
Metric tons of grain imported and exported by region, in millions, 2007

WORLDWIDE GRAIN PRODUCED VS. GRAIN TRADED, 2007
The amount of grain traded on the global market is a small percentage of the total produced because countries keep most of their crop for domestic needs.

<table>
<thead>
<tr>
<th>GRAIN</th>
<th>Metric Tons Traded</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sorghum</td>
<td>64.4 million</td>
<td>8.9 million</td>
</tr>
<tr>
<td>Wheat</td>
<td>607 million</td>
<td>108.6 million</td>
</tr>
<tr>
<td>Corn</td>
<td>772 million</td>
<td>96 million</td>
</tr>
<tr>
<td>Rice</td>
<td>425.3 million</td>
<td>27.5 million</td>
</tr>
</tbody>
</table>

Going Hungry
Consequences of the food crisis

- Unrest/protests
- Export ban/restrictions

Map showing countries affected by food crisis with red indicators.

Graph showing grain prices in dollars with a marked increase in 2007-2008.

Source: Thomson Financial Datastream, FAO

*one bushel of wheat weighs around 27 kg.
In 1999 the Chinese Ministry of Agriculture stated that they needed a minimum of 180 million hectares of land to feed the country. They currently have 121 million hectares cultivated.

China expects its annual grain consumption to reach 572.5 million tons by 2020, and to maintain a food self-sufficiency rate of 95 percent, at least 540 million tons of grain output will be needed, said Zhang Ping, Chairman of the NDRC.
# Main Crops in China (2009)

<table>
<thead>
<tr>
<th>Crop</th>
<th>Area (ha)</th>
<th>Yield (t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>rice</td>
<td>29 627 000</td>
<td>195 103 000</td>
</tr>
<tr>
<td>wheat</td>
<td>24 291 000</td>
<td>115 115 000</td>
</tr>
<tr>
<td>corn</td>
<td>31 183 000</td>
<td>163 974 000</td>
</tr>
<tr>
<td>rape</td>
<td>7 278 000</td>
<td>13 657 000</td>
</tr>
<tr>
<td>cotton</td>
<td>4 952 000</td>
<td>6 377 000</td>
</tr>
<tr>
<td>Vegetables</td>
<td>18 414 000</td>
<td>444 000 000</td>
</tr>
<tr>
<td>apple</td>
<td>2 667 000</td>
<td>31 681 000</td>
</tr>
<tr>
<td>citrus</td>
<td>2 067 000</td>
<td>25 211 000</td>
</tr>
<tr>
<td>tea</td>
<td>1 849 000</td>
<td>1 359 000</td>
</tr>
</tbody>
</table>
Types of Asian Farming System

Top 10 Systems by Number of Stunted Children
- Rice - wheat
- Rainfed mixed
- Upland intensive mixed
- Lowland rice
- Rice
- Cereal-root crop mixed
- Maize mixed
- Highland mixed
- Root crop
- Sparse (forest)

Rice-Wheat system house largest number of stunted children in Asia
Marginal upland areas house small numbers but largest concentration of poor

Source: Hyman et al. forthcoming

Directly related to malnutrition outcomes
Important Pests on Crops in China

Important crop pests: > 1600 species

- Insects: 830
- Pathogens: 720
- Weeds: 60
- Rodents: 20

Invasive species from abroad: > 40

ZAAS
Pesticide Registration, Production and Sale in China

**Pesticide Registration**
- Pesticide ingredients: about 600
- Pesticide products: about 22,000

**Pesticide Production**
- Companies: over 2700
- Annual production: million tons
- Pesticide technical materials: 1.3
- Pesticide formulation: over 2.0

**Pesticide Production**
- Annual sales: 72.9 billion RMB (2006)
Agricultural R&D System in Brazil

- Ministry of Agriculture, Livestock & Food Supply (MAPA)
- Brazilian Agricultural Research Corporation (EMBRAPA)
- Several MAPA’s National Laboratories

- + 17 State-based Public Organizations of Agricultural Research
- + Public Research Institutes, Science & Technology Ministry
- + Public Universities
- + Private Universities
- + Private Companies

~ 5500 researchers in Agriculture
Agribusiness Sustainable Intensification

No-tillage practices, N2 biological fixation
Integrated Crop-Livestock Intensive Systems

Perennial crop, for example, coconut, palm oil, eucalyptus, fruits, etc

Cross bred Holstein X Zebu, heat tolerant

Improved African Brachiaria grass + potential: N2 fixing + P releasing microbes
The CGIAR Centers

- IFPRI
  Washington D.C., United States

- CIMMYT
  Mexico City, Mexico

- CIAT
  Cali, Colombia

- CIP
  Lima, Peru

- Bioversity
  Rome, Italy

- WARDÁ
  Bouake, Cote d'Ivoire

- ICARDA
  Aleppo, Syrian Arab Republic

- ICRISAT
  Patancheru, India

- IRRI
  Los Banos, Philippines

- ICLARM
  Penang, Malaysia

- IITA
  IBADAN, Nigeria

- ILRI
  Nairobi, Kenya

- ICRAF
  Nairobi, Kenya

- CIFOR
  Bogor, Indonesia
In collaboration with INRA-Morocco, 3 bread wheat and 6 durum wheat Hessian fly resistant varieties released
Water framework directive
What price an argument?
### Wheat Case Study

**Pesticide use on winter wheat in 4 countries**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Herbicides</td>
<td>2.43</td>
<td>1.5</td>
<td>1.9</td>
<td>1.71</td>
</tr>
<tr>
<td>Fungicides</td>
<td>2.26</td>
<td>1.6</td>
<td>1.9</td>
<td>0.56</td>
</tr>
<tr>
<td>Insecticides</td>
<td>1.08</td>
<td>0.3</td>
<td>1.2</td>
<td>0.15</td>
</tr>
<tr>
<td>PGRs</td>
<td>0.97</td>
<td>0.7</td>
<td>0.8</td>
<td>0.2</td>
</tr>
<tr>
<td>Total</td>
<td>6.74</td>
<td>4.1</td>
<td>5.8</td>
<td>2.62</td>
</tr>
<tr>
<td>Yield (ton/ha)</td>
<td>8.0</td>
<td>6.9</td>
<td>7.3</td>
<td>7.3</td>
</tr>
</tbody>
</table>

**Fungicide use versus disease pressure/yield response**

[Map showing disease pressure and yield response]
Future of European Agriculture?
Global Alliance of Independent Agricultural Consultants

We make a living by what we get, we make a life by what we give.

Winston Churchill