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*"The target is food for all: what's new in agriculture?
 A pacific army of farmers"*

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 Director - Nufarm España S.A.

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Francesc Llauradó Duran

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 Soils from the University of Strasbourg (1983), a specialist in marketing of food
 products (MBA) in 1987. He has worked in South America, France, Switzerland, and
 Italy in the Seeds and Agrochemical industry and now in Spain as Managing Director of
 Nufarm (agrochemical company).

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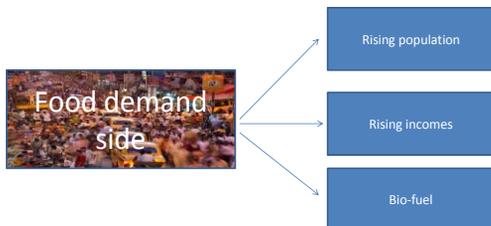
The difficult balance



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What's our current situation?



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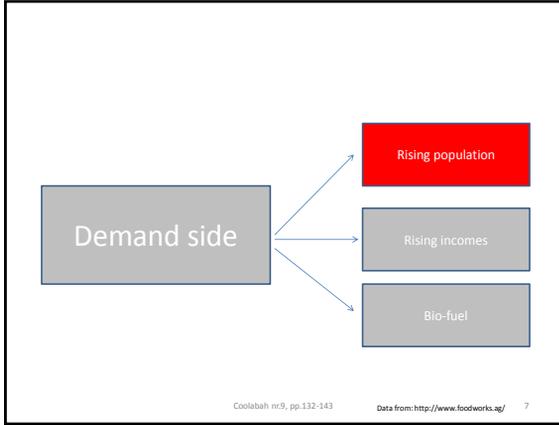
Data from: <http://www.foodworks.ag/>

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Some information from: <http://www.foodworks.ag/>



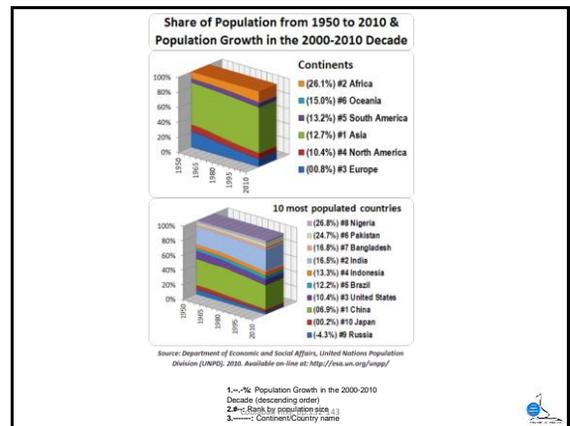
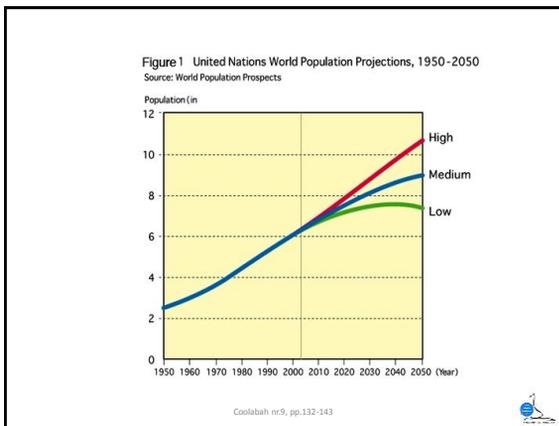
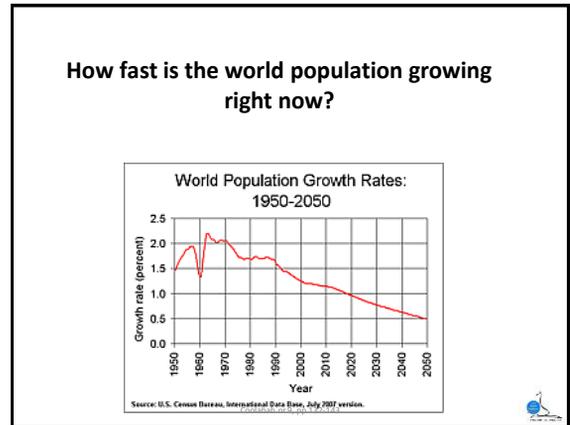
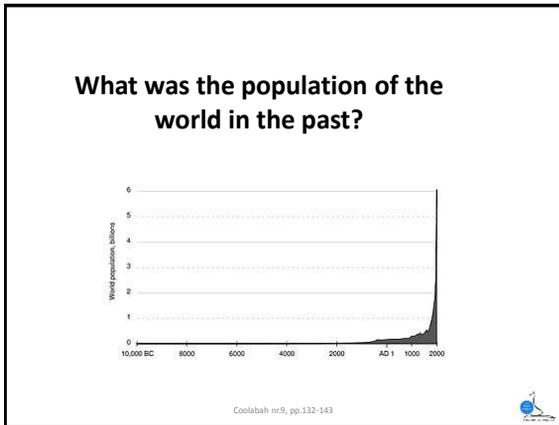
Rising population

We are 7 billion !
 And 80 more millions every year...
 most in developing countries with less agricultural resources—water, land, technology etc.

However, the world population will go on rising, but less rapidly, growing at an average of 1.1 percent a year up to 2030, compared with 1.7 percent a year over the past 30 years



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How is the population distributed around the world?

Refer to this population density map:

Population density (persons per km²)

< 1	1	2 - 4
4 - 7	7 - 12	12 - 25
25 - 50	50 - 125	> 125
No data		

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What's our current situation?

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    graph LR
      A[Demand side] --> B[Rising population]
      A --> C[Rising incomes]
      A --> D[Bio-fuel]
  
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Data from: <http://www.foodworks.ag/> 14

Rising incomes

Developing countries with large and growing population are increasing food demand; principally eggs, meat and milk; poor converters of food (from cereals) adding pressure to the demand for staple foods, whereas countries with high income are cutting back in food consumption (obesity issues etc.).

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Increase of food demand

Food: Diet food, Ready to eat; Meat, dairy, oils, sugar; Rice, bread, beans

Income: Western Europe, Japan, North America; Eastern Europe; Latin America, India, China; Africa (Sub-Saharan)

Growth markets

Consumption stage: Surviving, More staples, Variety, Quality, High tech

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However, future demand for agricultural products is expected to slow further—to 1.6 percent a year for the period 1997-99 to 2015 and to 1.4 percent for 2015 to 2030. In developing countries the slowdown will be more dramatic, from 3.7 percent for the past 30 years to an average 2 percent for the next 30 due to the less rapid growth of population.

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As income grows consumers eat more meats and processed foods

Urban consumption in China

Category	1990 (kg/capita)	2005 (kg/capita)
Vegetables	~140	~120
Grain	~130	~80
Fruits and melons	~40	~60
Meat	~10	~45
Dairy	~5	~20

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Source: Rabo

Major Country Population and Consumption Statistics

Country	Population		Consumption Growth 2009/05 % p.a.					
	Millions	Annual Growth %	Beef	Pork	Chicken	Wheat	Rice	Maize
China	1338.6	0.66	2.4	0.5	6.6	0.1	-0.2	3.0
India	1166.1	1.55	3.9	n.a.	7.8	-0.7	2.7	3.2
Japan	127.1	-0.19	0.1	-0.3	0.6	n.a.	0.2	-0.1
EU-27	491.6	0.11	-0.1	0.0	1.2	0.7	n.a.	-0.5
United States	307.2	0.98	-0.3	-0.2	0.4	1.4	1.9	3.3
Brazil	198.7	1.20	1.7	4.7	3.2	1.6	-0.6	2.9
World	6790.1	1.17	0.6	0.7	3.5	0.9	1.2	2.5

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World Grain Stocks to Stay Low Through 2012-13

Global grain stockpiles will remain low through the coming year on increased demand for crops to make fuels and foods...

"This is the third year in a row that world grain demand was not met by production," ...

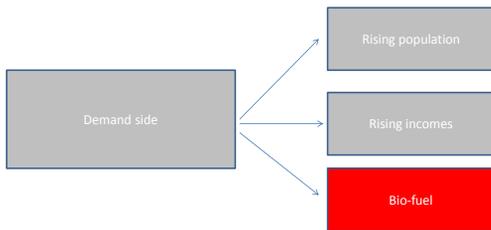
"The agricultural bull market is still alive, but we're at a crossroads. World grain demand is forecast to rise, which leaves little tolerance for adverse weather."

AgResource (Chicago Nov. 16th 2011)

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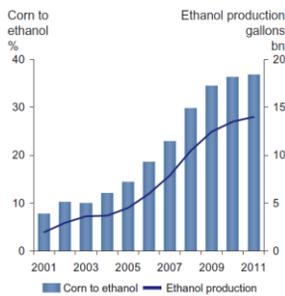
Bio-fuel

28% of the grains production in USA is coming to Bio-fuel production.

This production represents a significant part of the demand for natural resources and some impact for the environment.



Biofuel Demand – US Ethanol Impact

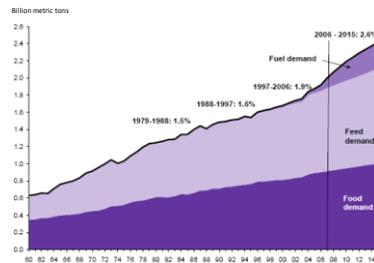


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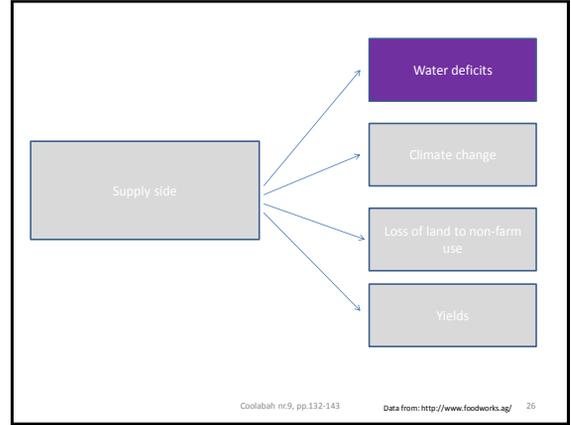
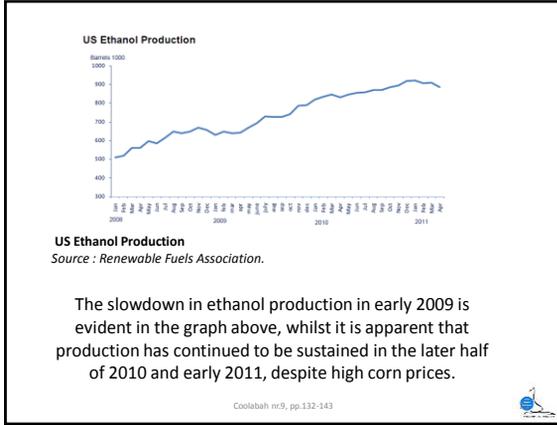
Doane Market Research, USDA, ProReportNetwork 23

Growth drivers

Food, feed and fuel consumption have led to a trend increase in demand for agriculture commodities



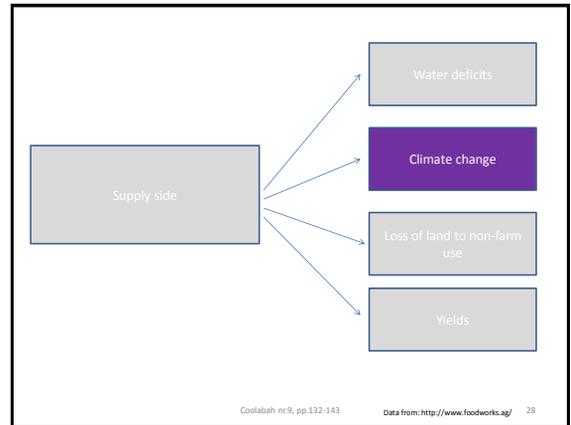
Coolabah nr9, pp.132-143 Source: USDA and Goldman Sachs Commodities Research estimates



Water deficits

Water is the key to food production. Irrigation systems demand large investment and water availability. Absence of water is causing starvation in some countries.

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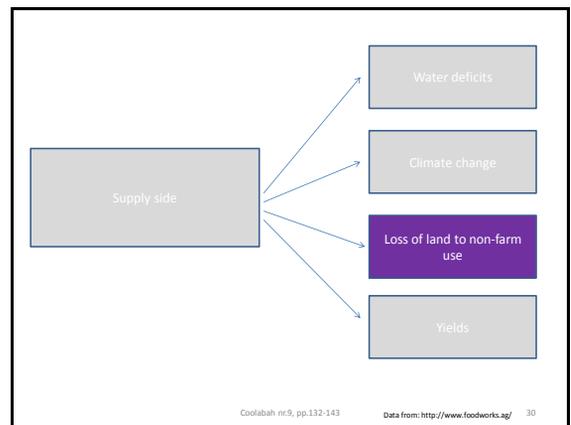


Climate change

There is no doubt the world climate is changing. We have enough evidence.

Change is affecting all the world but more strongly developing countries.

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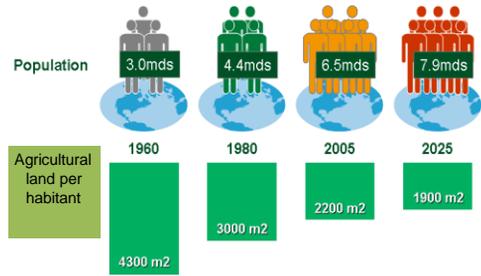


Loss of land to non-farm use

The world population mainly grows in cities. Urban and industrial activities are significant consumers of land that cannot be used to produce food.



... more people, less land



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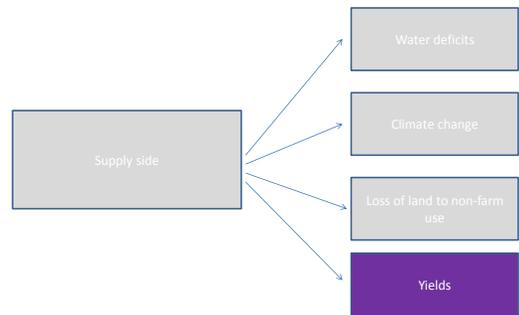
"If we can fight wars on oil we will fight much bigger wars over water and food".

Neither China nor India can possibly find sufficient arable land to satisfy their internal requirements for grains and will thus be net importers in the future.

China is already importing significant amounts of soybeans and has recently become a net importer of corn and wheat.

(Sunny Verghese, CEO of Olam International)

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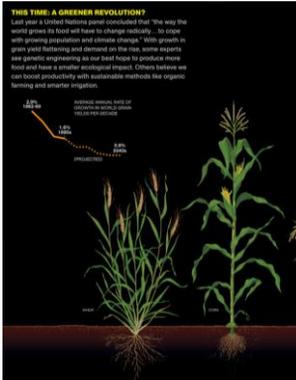
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Data from: <http://www.foodworks.ag/> 34

Yield

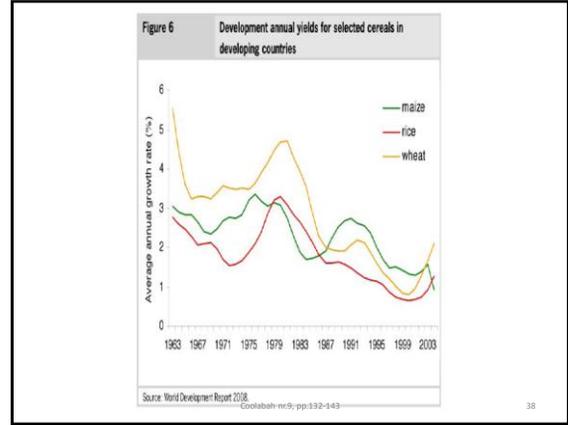
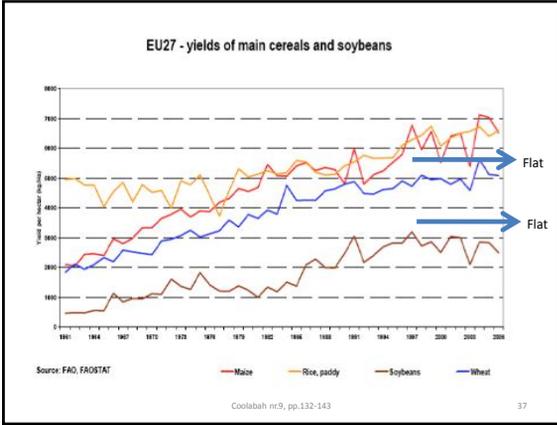
Yields reach the limits of growth in some crops. The Green Revolution of the 60s and 70s, based on increases in land productivity, is obsolete.

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Grain yield flattening and demand on the rise...

(National Geographic – 2009/06 Cheap food: 'the end of plenty') 36



TO MEET RISING FOOD DEMAND, WE NEED ANOTHER GREEN REVOLUTION, AND WE NEED IT IN HALF THE TIME.

HOW WE DID IT BEFORE
The agricultural technologies that have been so productive as the green revolution, the farming system of irrigation, high yield varieties, pesticides, and fertilizers that more than doubled yields in Asia during the 1960s and 1970s, leaving plenty of arable land to feed most of the world today. But these breakthroughs have come with ecological costs.

IRRIGATION can double yields compared with those in un-irrigated fields, but also causes soil salinization, waterlogging, and depletion of aquifers and surface waters.

HIGH YIELD VARIETIES of wheat and rice have been bred to use water more efficiently, but also require more pesticides and fertilizers to grow.

CHEMICAL PESTICIDES have been used to control pests, but also cause environmental damage and health problems. Chemicals are used in 30 million tonnes a year.

SYNTHETIC FERTILIZERS have been used to increase yields, but also cause environmental damage and health problems. Chemicals are used in 100 million tonnes a year.

We need a new green revolution to increase productivity...

Solutions?

- Irrigation
- Performing Seeds
- + Chemicals
- + Fertilizers

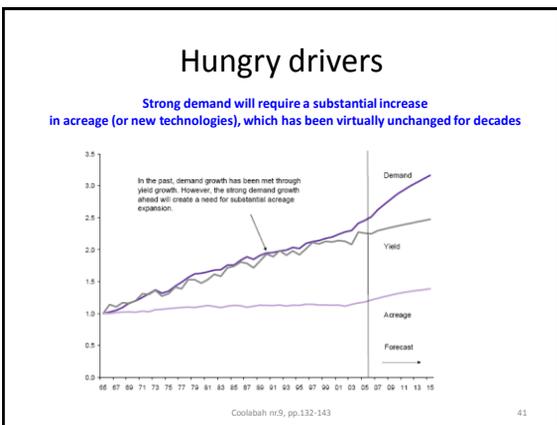
BUT environmentally friendly !!!

(National Geographic - 2009/06 Cheap food: the end of plenty)

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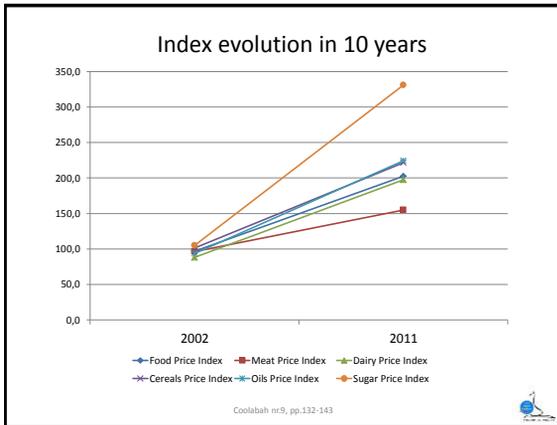
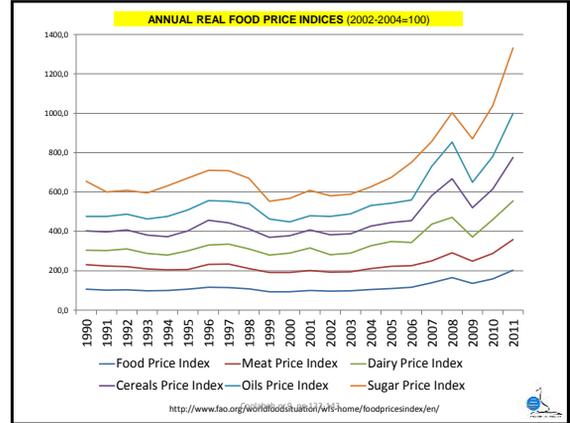
Yield conclusions

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The crisis of prices

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Date	Food Price Index	Meat Price Index	Dairy Price Index	Cereals Price Index	Oils Price Index	Sugar Price Index
2002	95.6	95.2	88.4	101.5	93.5	105.1
2011	202.5	154.8	197.4	221.3	224.1	330.8
%	48%	62%	45%	46%	42%	32%

This situation means that today we are having the most expensive breakfast in the history of humanity... and we will have the most expensive lunch ever... 48% more expensive than 10 years ago calculated with unchanging prices

Impact for consumers is critical... But different following the income situation

Impact of Higher Food Commodity Prices On Consumers' Food Budgets*

	High-income countries	Low-income food-deficit countries
I. Base scenario		
Income	\$40,000	\$900
Food expenditure	\$4,000	\$400
Food costs as % of income	10.0%	50%
Disaggregate retail food spending (staples vs. non-staples)		
Staples as % of total food spending	20%	70%
Expenditures on staples	\$800	\$280
Expenditures on non-staples	\$3,200	\$120
II. Scenario: 50% price increase in staples, partial pass through on staples		
Assumed % pass through	60%	60%
Increase in cost of staples	\$240	\$84
New cost of staples	\$1040	\$384
New total food costs	\$4,240	\$484
Food costs as % of income	10.6%	60.8%

*These are illustrative food budgets that characterize the situations for consumers in high- and low-income countries.
Source: As compiled by ERS.

Staples = Basic food: rice, maize, sugar, soybeans etc.

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The State of Food Insecurity in the World 2011

Key messages of FAO 2011 report

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Small import-dependent countries, especially in Africa, were deeply affected by the food and economic crises.

Some large countries were able to insulate themselves from the crisis through restrictive trade policies and functioning safety nets, but trade restrictions increased prices and volatility on international markets.

High and volatile food prices are likely to continue. Demand from consumers in rapidly growing economies will increase, population will continue to grow, and further growth in bio-fuels will place additional demands on the food system. On the supply side, there are challenges due to increasingly scarce natural resources in some regions, as well as declining rates of yield growth for some commodities. Food price volatility may increase due to stronger linkages between agricultural and energy markets, as well as an increased frequency of weather shocks.

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Price volatility makes both smallholder farmers and poor consumers increasingly vulnerable to poverty.

Because food represents a large share of farmer income and the budget of poor consumers, large price changes have large effects on real incomes. Thus, even short episodes of high prices for consumers or low prices for farmers can cause productive assets – land and livestock, for example – to be sold at low prices, leading to potential poverty traps. In addition, smallholder farmers are less likely to invest in measures to raise productivity when price changes are unpredictable.

Large short-term price changes can have long-term impacts on development.

Changes in income due to price swings can reduce children's consumption of key nutrients during the first 1 000 days of life from conception, leading to a permanent reduction of their future earning capacity, increasing the likelihood of future poverty and thus slowing the economic development process.

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High food prices worsen food insecurity in the short term. The benefits go primarily to farmers with access to sufficient land and other resources, while the poorest of the poor buy more food than they produce. In addition to harming the urban poor, high food prices also hurt many of the rural poor, who are typically net food buyers. The diversity of impacts within countries also points to a need for improved data and policy analysis.

High food prices present incentives for increased long-term investment in the agriculture sector, which can contribute to improved food security in the longer term. Domestic food prices increased substantially in most countries during the 2006–08 world food crisis at both retail and farmgate levels. Despite higher fertilizer prices, this led to a strong supply response in many countries. It is essential to build upon this short-term supply response with increased investment in agriculture, including initiatives that target smallholder farmers and help them to access markets, such as Purchase for Progress (P4P).

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Safety nets are crucial for alleviating food insecurity in the short term, as well as for providing a foundation for long-term development.

In order to be effective at reducing the negative consequences of price volatility, targeted safety-net mechanisms must be designed in advance and in consultation with the most vulnerable people. Safety nets redistribute income to the poorest and most vulnerable, with an immediate impact on poverty and inequality

A food-security strategy that relies on a combination of increased productivity in agriculture, greater policy predictability and general openness to trade will be more effective than other strategies. Restrictive trade policies can protect domestic prices from world market volatility, but these policies can also result in increased domestic price volatility as a result of domestic supply shocks, especially if government policies are unpredictable and erratic. Government policies that are more predictable and that promote participation by the private sector in trade will generally decrease price volatility.

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Investment in agriculture remains critical to sustainable long-term food security. For example, cost-effective irrigation and improved practices and seeds developed through agricultural research can reduce the production risks facing farmers, especially smallholders, and reduce price volatility. Private investment will form the bulk of the needed investment, but public investment has a catalytic role to play in supplying public goods that the private sector will not provide. These investments should consider the rights of existing users of land and related natural resources.

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What's new in agriculture?

Many challenges, many solutions...

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The broader picture....
Agriculture remains a strong growth industry

- Declining stock-to-use ratios
- Rising crop prices
- Increased use of biofuels
- Declining availability of arable land
- Growing global population
- Urbanisation and increased wealth
- Emerging agricultural markets




The battle for YIELD

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- Optimising inputs is key to maximising YIELD



University of Arizona, Credit: John C. Fabris



- Water management:** Better water management and increase of irrigation system will be key to increase efficiencies and efficacy.
- Soil management:** New technologies to reduce the risk of erosion, increase the organic soil and protect the structure of soil to increase yield.



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- Chemistry:** Protecting the seed/crop and securing increased efficiencies; efficacy; and safety
- Seeds:** Both conventional and GM breeding programs leading to a step-wise increase in a farmer's investment in seed

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The Future of the CAP after 2013

The future of direct payments

Direct payments under pillar 1 enable EU farmers to provide a series of public benefits as a result of their farming activity which are valued by society but are not currently rewarded by the market and, in many cases, will never be:

- ◆ food security for 500 million consumers by maintaining production capacity throughout the EU
- ◆ greater market stability for consumers and farmers
- ◆ sustainable production which meets the highest standards in the world of food safety, traceability, environmental protection and animal welfare
- ◆ employment and economic viability to rural areas – nearly 30 million people find employment on farms; over 40 million work in the agri-food chain altogether
- ◆ the management of over three-quarters of land in the EU in a way which provides an attractive countryside and diverse landscape for rural dwellers, visitors and tourists

Coolabah nr9, pp.132-143 CAP = Common Agricultural Policy

New design of direct payments

Direct payments contribute to **keeping farming in place** throughout the EU territory by supporting and **stabilizing farmers' income**, thereby ensuring the longer term economic viability of farms and making them less vulnerable to fluctuations in prices.

The new CAP aims to move away from systems of the Single Payments Scheme based on historical references, or a payment per hectare or combination of the two

A new "Basic Payment Scheme" will apply after 2013. This will be subject to "cross compliance" (**respecting certain environmental, animal welfare & other rules like crops diversification**)

All Member States will be obliged to move towards a uniform payment per hectare at national or regional level by the start of 2019. (until now it has been a difference between the EU-12 and the rest of the countries in the EU-27)

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However, all farmers (and some states) are against because:

- Not always possible to diversify the crops.
- Not always possible to have permanent pastures.
- Not always possible to have "ecologic" areas representing at least 7% of total surface.

=

New concept of agriculture and the farmer

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APPLICATION OF NANOTECHNOLOGY IN AGRICULTURE

Nanotechnology is the manipulation or self-assembly of individual atoms, molecules, or molecular clusters into structures to create materials and devices with new or vastly different properties.

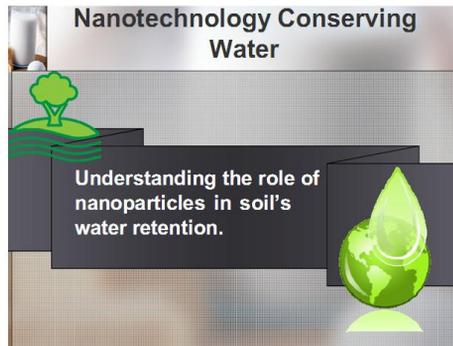
Nanotechnology has the potential to revolutionize the agricultural and food industry with new tools for the molecular treatment of diseases, rapid disease detection, enhancing the ability of plants to absorb nutrients etc. Smart sensors and smart delivery systems will help the agricultural industry combat viruses and other crop pathogens.

Nanotechnology will also protect the environment indirectly through the use of alternative (renewable) energy supplies, and filters or catalysts to reduce pollution and clean-up existing pollutants.

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Nanotechnology Conserving Water

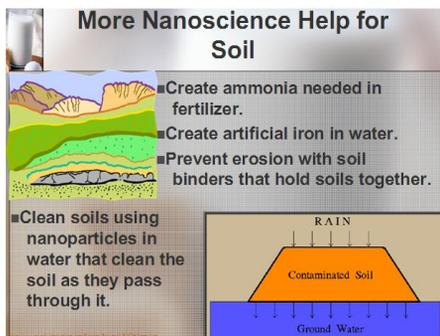


Understanding the role of nanoparticles in soil's water retention.

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http://e3.scribd.com/doc/29216598/Nano-Agriculture



More Nanoscience Help for Soil



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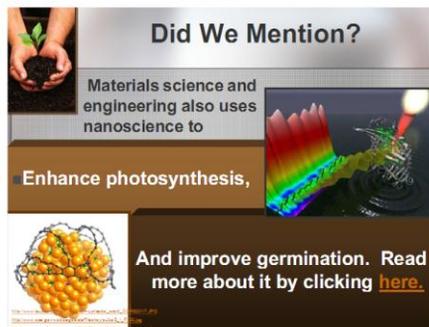
Fewer Pesticides With Nanotechnology



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Did We Mention?



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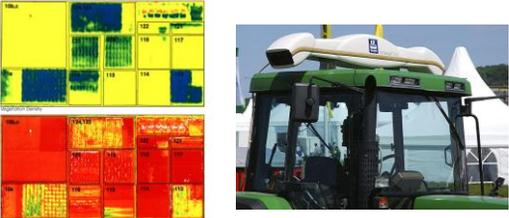


Precision farming

Precision farming has been a long-desired goal to maximize output (i.e. crop yields) while minimizing input (i.e. fertilizers, pesticides, herbicides, etc) through monitoring environmental variables and applying targeted action.

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Precision farming makes use of computers, global satellite positioning systems, and remote sensing devices to measure highly localized environmental conditions thus determining whether crops are growing at maximum efficiency or precisely identifying the nature and location of problems.

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Summary

A pacific army of farmers is working hard to permanently produce the food we need to cover the requirements of humanity.

Keeping the attractiveness of the rural life is a critical factor to produce food in the future.

A combination of new technologies, investment in agriculture, fair trade and control of price volatility can assure the production of food for all.

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