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How Can We Secure Food for All? The Challenges of Climate Change and Bioenergy

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Organization (FAO) of the United Nations



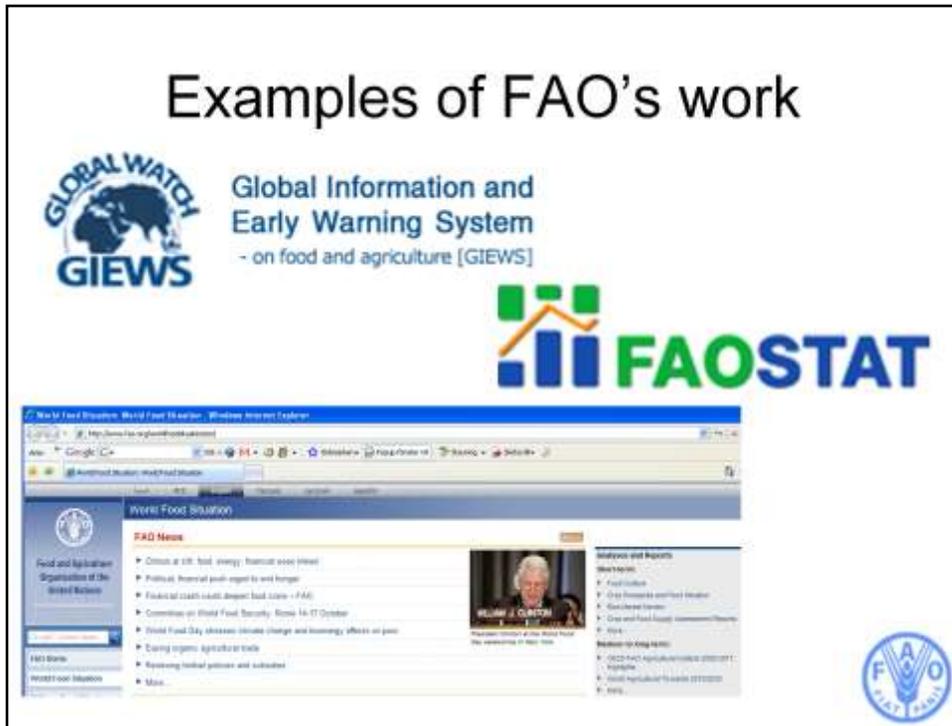
[slide 1] Introduction and background to FAO

Thank you for the invitation to speak at the Jubilee Symposium!

Topics that will be covered:

1. Are we making progress towards eradicating hunger?
2. What have been the causes and consequences of high food prices?
3. What has been the role played by bioenergy? Is it sound to recommend expanded bioenergy production?
4. How will climate change threaten world food security?

Examples of FAO's work



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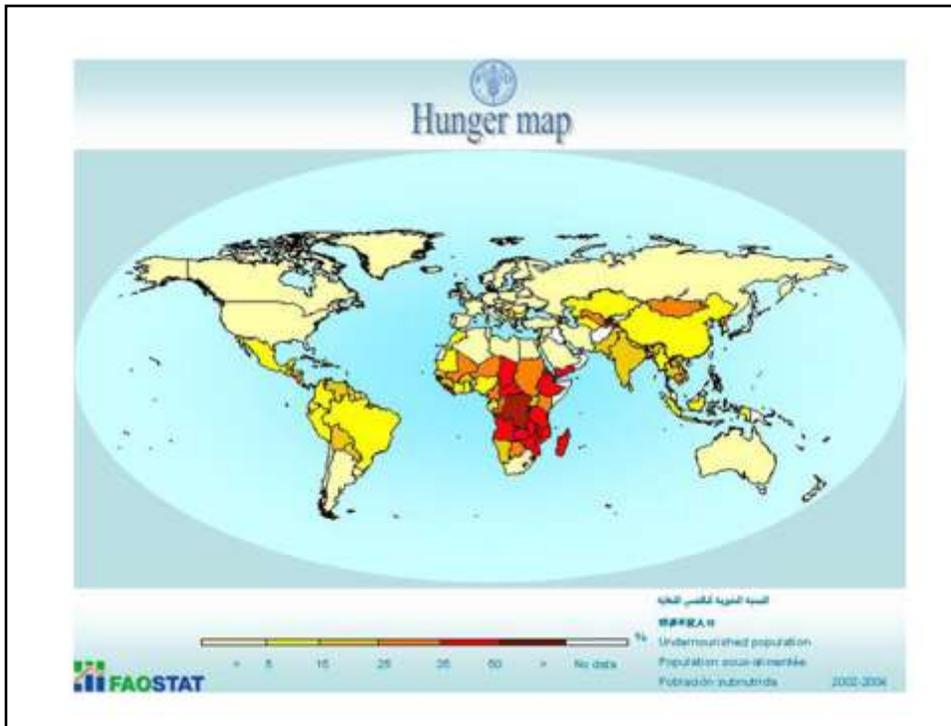
Background on FAO – History and its purpose

In the summer of 1943, Franklin Roosevelt invited representatives from 44 states in order to design guidelines for how countries affected by the war could ensure food security for their citizens at the end of the war. The Food and Agriculture Organization (FAO) of the United Nations was founded in 1945, one week prior to the UN itself. The mandate of FAO is agriculture, forestry and fishery, within a sustainable development framework. The goal is a world without hunger.

An important FAO initiative is the **Global Information and Early Warning System (GIEWS)**, that reviews the world food supply and demand situation. This can be found online and in several regular publications such as the Crop Prospects and Food Situation, among others. It also provides early warnings of impending food crises in specific countries, and information in other forms that can be used by for example governments and the international community to take appropriate actions.

FAOSTAT, the FAO statistics division, provides a database for food and agricultural data for around 200 countries. It includes many indicators related to production, trade, consumption, prices etcetera.

There is also the **World Food Portal**, which includes relevant analyses, reports and media news related to world food insecurity.



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The state of world hunger today

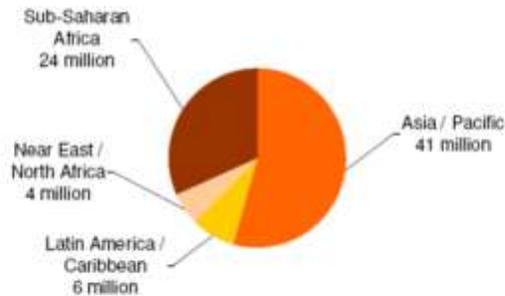
Securing access to food in light of climate change is one of the greatest challenges of our time. Some recent food security statistics from the FAO can give us insights into the scope of the current hunger situation.

923 million people are afflicted by hunger – with 907 million in developing countries.

Over 237 million of these are in Sub-Saharan Africa, which makes it the region with the highest proportion of undernourished in relation to the total population.

The world as a whole produces a sufficient amount of food. However, poverty, a lack of infrastructure, and a lack of land rights contribute to the current unequal distribution. For example, women lack the possibility of owning land or property, and therefore also lack access to credit, in many countries – This illustrates the lack of fulfillments of many richer countries' commitments to eradicating hunger and malnourishment.

An additional 75 million people fell below the hunger threshold in 2007



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An additional 75 million people fell below the hunger threshold in 2007.

From the early 1990s, the world seemed to be making progress towards the goal of eradicating hunger. But in the past years, world hunger has actually increased. In 2007, an additional 75 million people became chronically undernourished. The total amount of hungry in the world is now 923 million people, compared to 854 million people in 2006.

The numbers are essentially increasing in all parts of the world, with the exception of developed countries. The worrisome trend is continuing this year, and it is directly related to high food prices.

This graph shows that in Sub-Saharan Africa, the amount of undernourished increased with 24 million this year. In Asia, an additional 41 million people have become undernourished.

FAO's food price index



[slide 6] (continued)

As seen on the left graph, food prices seem to have started to stabilize – although on an extremely high level – in the last months. That the price increase has slowed down is fortunate for the large proportion of the world's poor that are net buyers of food.

Some statistics of specific commodities reveal that:

Cereal production has gone up by 3.8 percent from 2006 to 2008, but prices by 83 percent.

The price of sugar has increased by 20 percent since 2007.

The prices of oils and fats have gone up by 98 percent over the same period.

While the price boom for meat has not been as significant, FAO still predicts the price to soar since production costs are increasing in many developing countries.



These shifts are particularly significant in developing countries. Poor countries are more sensitive to soaring food prices, and overall inflation can be heavily affected by inflation in agricultural commodities. This is because food often accounts for two thirds of the overall consumer price index, while having only a 15 percent weight in richer countries. As a result we have seen protests and riots in many developing countries. For net food-importing countries, costs have soared due to the combination of higher food prices and higher freight costs. Food import bills are now the highest in history.

Here are some specific examples on the negative impacts of the food crisis on poverty):

In Liberia, the costs of a typical food basket have increased with 25 percent in January alone.

In East and Southern Africa, 12 million AIDS orphans are extremely vulnerable to rising food prices.

In Somalia, 2.6 million people are already affected by a nutrition crisis from droughts and conflicts, i.e. around 35 per cent of the population.

UNICEF estimates that 1.5 to 1.8 million more children in India are currently at risk of malnourishment.

Causes of soaring food prices



- Increasing oil and transport prices
- Historically low stock levels
- Increasing prices for fertilizers, feeds and other inputs
- Export restrictions and trade barriers
- Extreme weather shocks affecting harvests
- Increased speculation
- **Demand from biofuel industry**



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Causes of soaring prices

What can explain this dramatic situation? Demand from the biofuel industry and climate change has certainly started to be apparent: But there are of course a range of factors are important:

First, oil and input prices have increased. Prices for fertilizer, seeds and animal feed have risen by 98, 72 and 60 percent respectively since 2006. The price of some fertilizers have gone up by more than 160 percent, and the FAO's input price index – i.e. an average of all goods – doubled in the first four months of 2008 compared to the same period in 2007. Transport costs have also increased. Average freight rates doubled within one year beginning in February 2006. Reuters-CRB energy price index more than tripled from 2003.

Second, food stocks have gone down. The level of stocks, particularly cereals, has been falling since the mid-1990s, with 3.4 percent per year. It is estimated that levels at the end of 2008 will be the lowest in 25 years.

Third, Prices for fertilizers, feeds and other inputs have increased rapidly.

Fourth, many food-exporting countries set up export barriers to maintain domestic food security for the poorest segments. This has a downward pressure on international prices, hence also an upward one on prices. Meanwhile, however, import tariffs have in many cases been reduced.

Fifth, speculation in agricultural commodities has boomed. This is due to the depreciation of the US dollar and the current economic worldwide recession. Global trading activity more than doubled in the past five years.

Sixth, weather shocks can have dramatic effects. I will discuss this point further below, but it is likely to increase with climate change. For example, the past few years have seen several droughts in Australia.

Seventh, the impact of the biofuel industry on food prices will also discussed further below. Studies disagree on the exact impact, but it is nevertheless likely to be substantial.

...and long-term factors

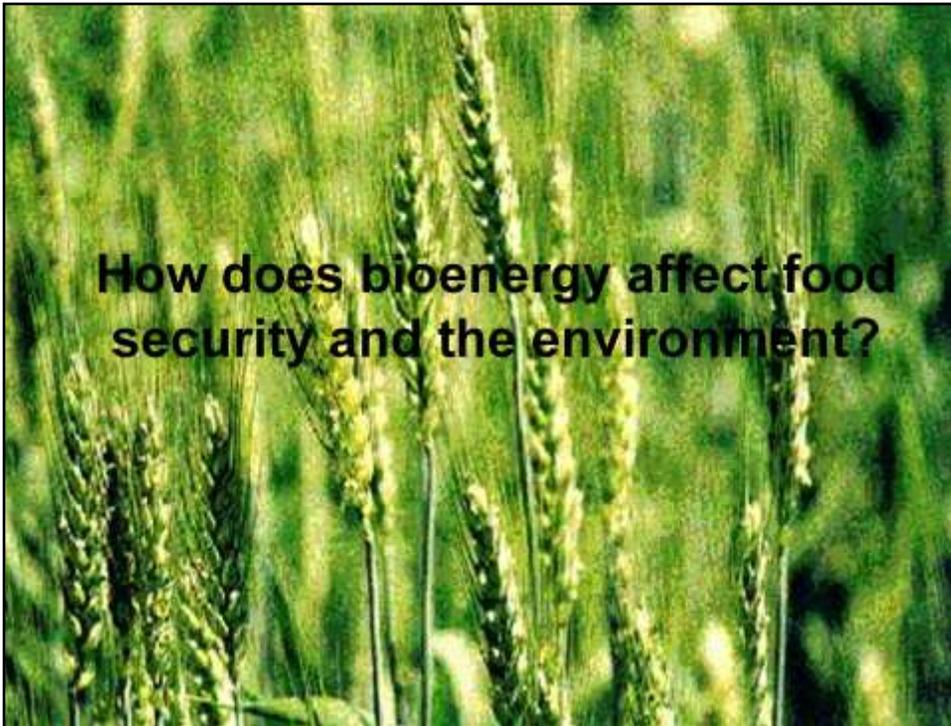
- Decreased aid and investment in agriculture
- Economic growth and changing dietary patterns
- Population growth
- **Climate change**



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...and long-term factors.

There are also long-term changes which are worrisome for the future, but do not explain the current price shocks. For example, rapid growth in some developing countries leads to a more varied diet, e.g. more meat and milk, hence more varied demand. Also, population growth – from 6 billion today to approximately 9 billion in 2050 will have a significant effect. The world will have to produce 60 per cent more food to feed the growing population. Finally, lack of investments and support to the agricultural sectors for boosting production and productivity, together with agricultural subsidies in OECD countries, are other important factors.



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As mentioned, the rapid expansion of the biofuel industry is likely to have had an important effect on the high food prices. Then, the question of how bioenergy affects the goal of FAO, namely to increase food security, is indeed relevant. Also, the environmental effects from bioenergy are far from clear-cut and not always positive.

Estimates of biofuel impacts on food prices

Source	Estimate	Commodity	Time period
World Bank (April 2008)	75 %	global food index	January 2002 – February 2008
IMF (2008?)	70 %	corn	?
	40 %	soybeans	?
IFPRI (May 2008)	39 %	corn	2000 – 2007
	21-22 %	rice & wheat	2000 – 2007
OECD-FAO (May 2008)	42 %	coarse grains	2008 – 2017
	34 %	vegetable oils	2008 – 2017
	24 %	wheat	2008 – 2017
Collins (June 2008)	25-60 %	corn	2006 – 2008
	23-35 %	US retail food	2006 – 2008
Glauber (June 2008)	23-31 %	commodities	April 2007 – April 2008
	10 %	global food index	April 2007 – April 2008
	4-5 %	US retail food	January – April 2008
CEA (May 2008)	35 %	corn	March 2007 – March 2008
	3 %	global food index	March 2007 – March 2008

Borrowed from Kostas Stamoulis



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Has bioenergy contributed to high food prices?

This is a summary of some important studies that try to quantify the impact of expanded biofuel production on food prices. While the exact contribution varies across the studies, a majority suggests that bioenergy affect food prices with around 25-40 percent, in some cases even more – up to 75 percent in the World Bank study.

A significant share of agricultural land is used for biofuels

	Share of crop to biofuels
Brazil	50% of sugarcane
USA	30% of maize
EU	60% of rapeseed
World	5% of cereals, 9% of vegetable oils, but <u>over half of the increase</u> during 2005-2007

Borrowed from Peter Holmgren



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A significant share of agricultural land is used for biofuels

Most biofuels are produced by the United States, Brazil, and the European Union, but many other countries are beginning or expanding production as well.

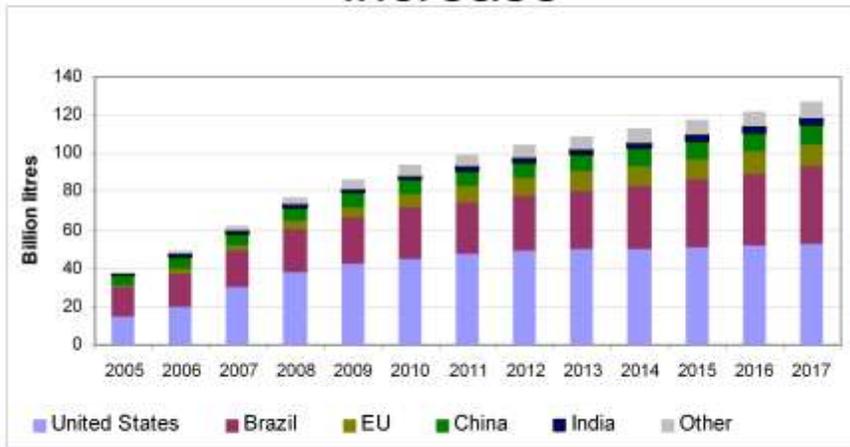
This rapid growth in biofuel production, occurring at a time when food prices are high and pressure on natural resources is increasing, has generated concerns about impacts on food security and the environment.

It seems that increased demand for crops has been important for the current increase in food prices. Statistics reveal that:

Especially demand for maize and for rapeseed, which are used for ethanol and biodiesel production respectively – have boomed. For the former, 30 of the 40 million tons in production increase in 2007 were for ethanol plants alone. This happened primarily in the US.

Globally, 12 percent of all maize used was for ethanol. In the EU, biodiesel has absorbed around 60 percent of all rapeseed oil in 2007.

And ethanol production will increase



Source: OECD-FAO, 2008



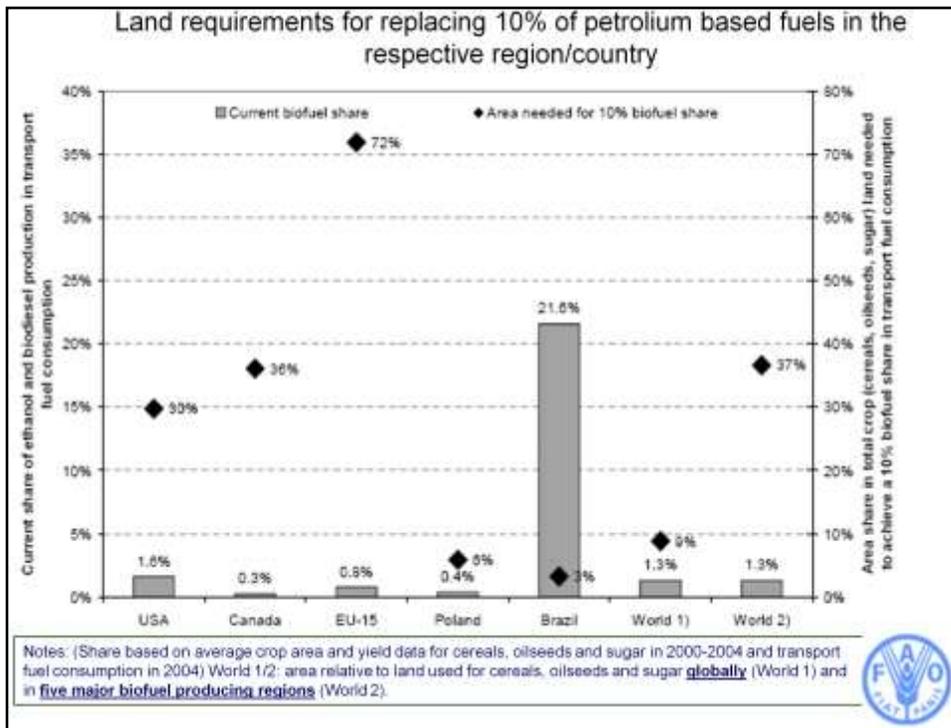
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The increase in ethanol production will continue

The conflict between food and biofuel – together with the high input costs – could in the future mean that food prices will remain high for as long as oil prices remain high.

World production of ethanol tripled between 2000 and 2007, and is expected to double again in 2017, to a level of 127 billion liters per year (according to OECD-FAO, 2008).

Biodiesel production is seen to expand from 11 billion litres a year in 2007 to around 24 billion litres by 2017. The growth in biofuel production adds to demand for grains, oilseeds and sugar, so contributing to higher crop prices (OECD-FAO, 2008).



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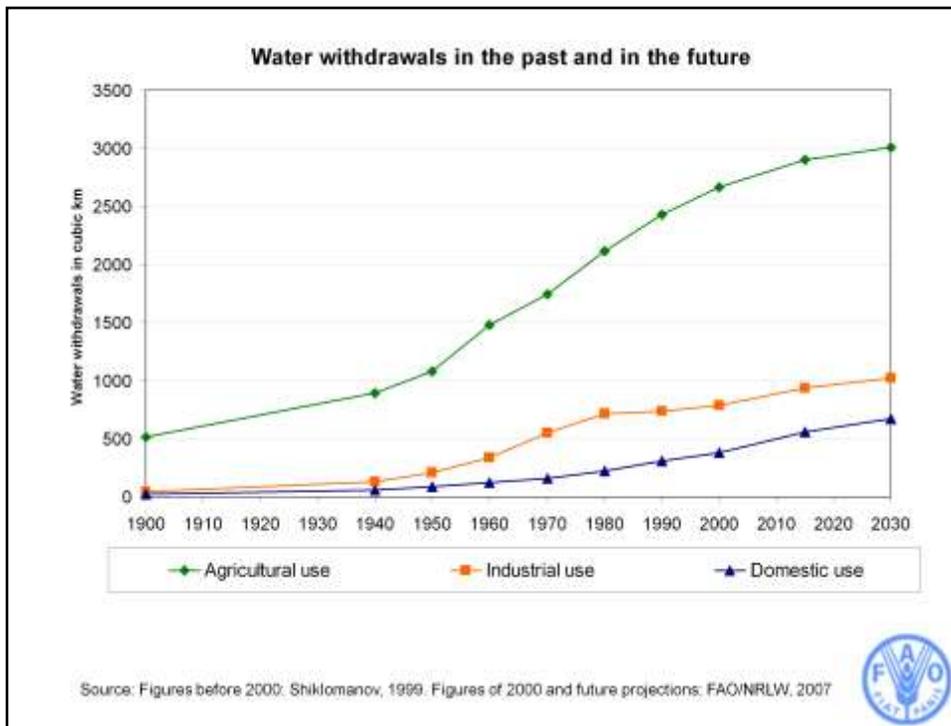
Biofuel expansion requires land

Regarding demand for land, it is projected that over 120 million hectare will be required in the next 30 years. This corresponds to a 13 percent increase. Demand from the bioenergy industry would further raise the pressure for land.

In the EU, FAO projects a twelvefold increase in wheat for biofuel, up to 18 million tonnes in 2016. The grey staples show the current proportion of biofuel. And the black points for each country or region are estimates of how much land that would be required if 10 percent of petroleum based fuels would be achieved.

We would need 15 times as much sugar cane plantations as we have today, and 5 times as much maize. The area dedicated to palm oil would have to be 20 times bigger than today.

Such expansions could have dramatic consequences for the poor, natural resources, food production and world food security.



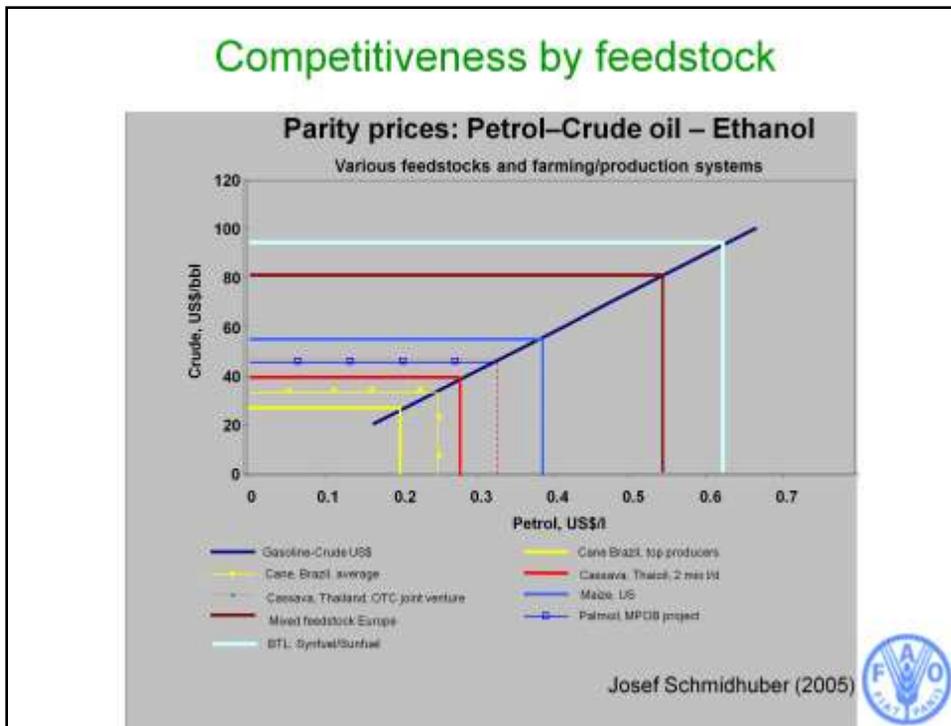
[slide 15 Water withdrawals in the past and in the future

Agriculture demands substantial amounts of water. For example, one kilogram of beef requires around 13 000 to 16 000 liters of water. One liter of ethanol demands around 5 000 liters of water. Expanded biofuel production, then, increases pressure for water resources.

Today, agriculture utilizes around 70 percent of the available fresh water.

This graph also shows that, over time, there has been a significant increase in how much water that is needed for agriculture. It appears as if the increase will level off and become less dramatic over the next couple of decades, but this would change if we take biofuel into the equation. Is there enough water for both food and biofuel production?

Competitiveness by feedstock



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Competitiveness by feedstock

Different biofuels differ in their degree of cost efficiency. Also, it is related to which region or country it is produced in. Biofuel produced by cereals in the EU is represented by the brown line, and is neither particularly efficient nor sustainable. On the other hand, more resources could be devoted into increasing efficiency of available energy sources could decrease greenhouse gas emissions.

There is no lack of research...



[slide 17]

There is no lack of research.

Then, is it sound to subsidize biofuel expansion? Or do the negative effects outweigh the positive ones? There are both positive and negative hypothetical effects. For example, bioenergy can be important for improving the energy, rural development and infrastructure situation for many of the world's poor. But do the benefits from expanded biofuel production go to the poor? And what is the prospect for decreasing greenhouse gas emissions through expanding biofuel consumption?

A recent **UN-Energy report** (2008), entitled *Sustainable Bioenergy: A Framework for Decision Makers*, was initiated with the support of FAO. It applies a holistic perspective to the effects of bioenergy, and looks at environmental, economic and social consequences, among others. It emphasizes the need for adopting measures for limiting the potentially negative environmental and social effects from expanded use of bioenergy. Crops that are used for meeting energy needs, even if they seem "sustainable", can have negative effects if they mean that primary forests have been cut down. Areas with extremely valuable natural resources must then be protected.

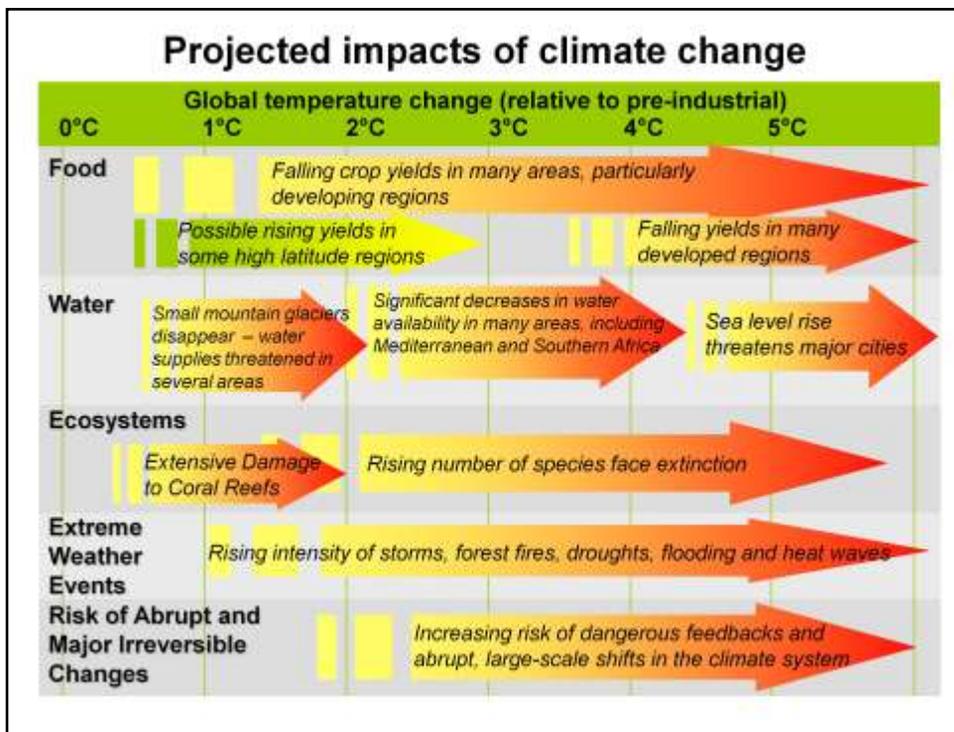
An **OECD study by Doornbosch and Steenblik** (2007) highlights how more technological advances are needed in order to mitigate the in many cases negative effects from first-generation technologies.

The International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) is a substantial review of the state of the world's agriculture, and its threats, challenges and opportunities. It includes numerous leading scholars. It states that "next generation biofuels such as cellulosic ethanol and biomass-to-liquids technologies allow conversion into biofuels of more abundant and cheaper feedstocks than first generation. This could potentially reduce agricultural land requirements per unit of energy produced and improve lifecycle GHG emissions, potentially mitigating the environmental pressures from first generation biofuels. However, next generation biofuels technologies are not yet commercially proven and environmental and social effects are still uncertain."

The EEA Scientific Committee has stated that the 10 percent increase of the share of biofuel by 2020 should be abolished, due to uncertain environmental (and food security) effects. It should also be noted that "investments in biofuel capacities are running far ahead of investments in research to enhance agricultural productivity" (Braun & Pachauri, 2006).

One study, **Rossi and Lambrou (2008)**, argues that there is also a risk for a negative gender impact from bioenergy expansions. Large-scale plantations for the production of liquid biofuels such as bioethanol and biodiesel require an intensive use of resources and inputs to which small farmers, particularly women, traditionally have limited access. These resources include land and water, chemical fertilizers and pesticides.

An important report is also the FAO flagship publication, **The State of Food and Agriculture 2008**. The focus is on biofuels – prospects, risks and opportunities. A major conclusion is that "rapidly growing demand for biofuel feedstocks has contributed to higher food prices, threatening the food security of poor net food buyers in both urban and rural areas". More investments are needed to ensure that the negative effects do not outweigh the positive ones, as currently is the case in some places (although it differs widely).



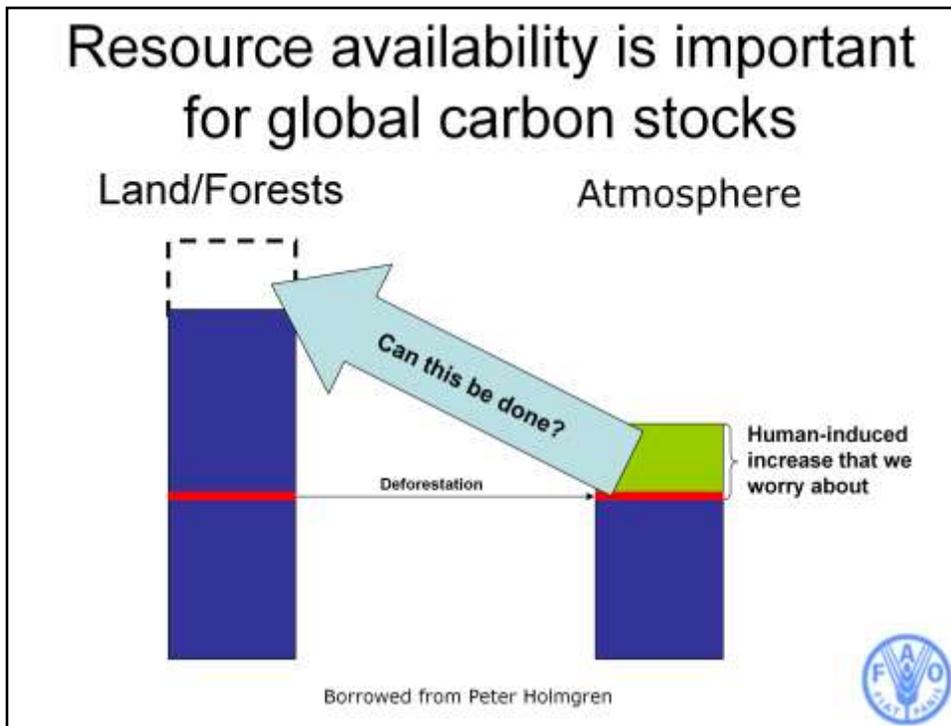
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Climate change can seriously threaten world food security.

Climate change has also begun to influence food prices. Higher temperatures have lead to a loss in yield. Weather-related shocks can, especially with low stocks, have a significant impact. Droughts in Australia have meant that wheat yields are particularly low, yet the trend is ambiguous for many other cereals.

FAO estimates that about three-quarters of the varietal genetic diversity of agricultural crops have been lost over the last century and that hundreds of the 7000 animal breeds registered in its databases are threatened by extinction. Just twelve crops and fourteen animal species now provide most of the world's food. Less genetic diversity means fewer opportunities for the growth and innovation needed to boost agriculture at a time of soaring food prices. In the future, temperature changes in the oceans could affect the fish stocks many coastal communities depend on for their survival. Adaptation at an accelerated and more targeted pace is seen as critical for the secure development of vulnerable populations, like the estimated 1.4 billion rural people who depend on small-scale farming in developing countries.

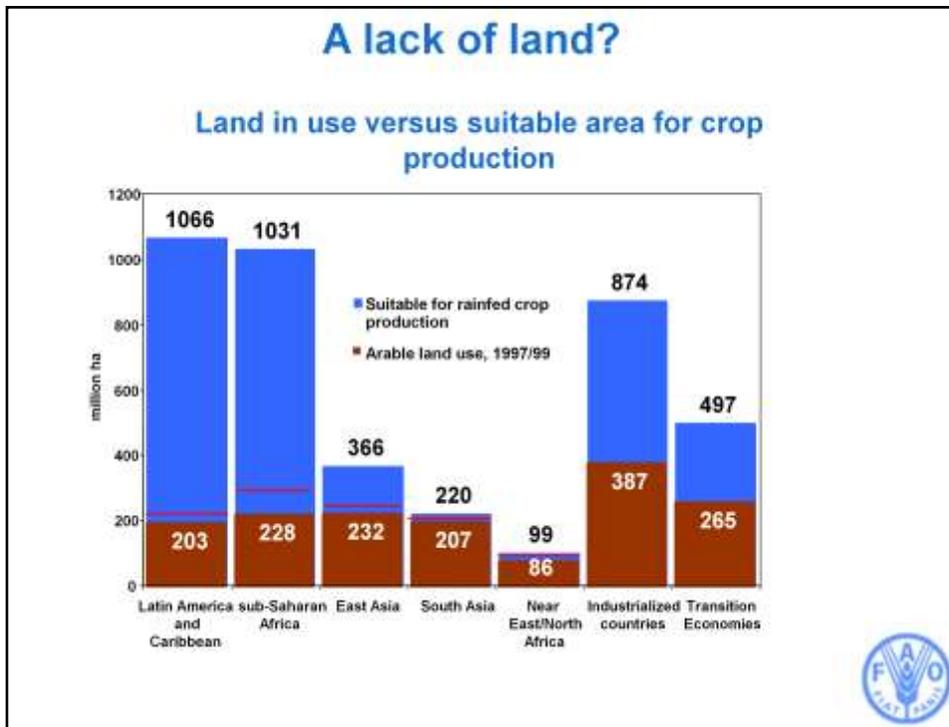
Recent years show a falling trend for global wheat yield, especially after droughts. Average global coarse grain yields, however, remained above their long-term trend over the past four years. The final report by IAASTD states that "The relationship between climate change and agriculture is a two-way street; agriculture contributes to climate change in several major ways and climate change in general adversely affects agriculture." Water scarcity will restrain production, and extreme climate events will threaten food security. In addition, diseases may spread and biodiversity decrease. Therefore, expansion of agriculture has to be balanced against the need for maintaining natural habitats and increasing reforestation.



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Resource availability is important for global carbon stocks

Carbon sequestration becomes more and more important. Some proportion of the world's land and forests has to be dedicated to food production. And the biofuel expansion further increase pressure for such resources. This very simplified picture shows that the amount of human-induced increase that we worry about could be compensated by expanding – or making better use of – our land or forests. The question is if not perhaps demand for biofuel is a step in the wrong direction, considering what needs to be done.



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A lack of land?

In some parts of the world, particularly northern Africa and South Asia, virtually all available land and water is used.

But in Sub-Saharan Africa, there is more potential. On a global level, around 11 percent of the world's surface is used for farming, corresponding to around 1.5 billion hectares. In the next 30 years, another 120 million hectares will be needed.

This is under the assumption that biofuel won't compete with food production for land resources.

The Director-General of FAO



Jacques Diouf

"Should we focus on

- Biofuel for 800 million cars?
- Or developing methods for using bioenergy for heating and electricity that the 1.6 billion people without electricity can benefit from? Or helping the 2.4 billion people that lack secure energy sources for heating and cooking?"



[Slide 21]

Policy makers must guarantee that food security always is prioritized. But if biofuel production expands, there is also the issue of who gets the benefits. Jacques Diouf, FAO's Director-General, has stated that the main question is whether bioenergy should be used for the 800 million cars, mostly in the developed world, or if it should benefit the 1.6 billion people in rural areas that lack access to electricity in the developing world, or perhaps the 2.4 billion people that do not have energy for heating or cooking. It should be remembered that 92 percent of the population in Sub-Saharan Africa lack access to electricity.

The outcome of the World Food Security Summit



The UN family working together to ensure world food security



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FAO arranged a Summit on World Food Security, 3-5 June this year, which large parts of the UN family supported. The final declaration concluded that it is important to acknowledge the challenges and possibilities that bioenergy can have in terms of the world's energy needs, sustainable development and food security. More research is needed in order to guarantee that production and consumption of biofuels is sustainable and do not threaten the need of global food security.

The fact that the struggle for world food security is supported by such a wide range of UN bodies is in many ways historical.

According to FAO, 30 billion US dollar per year is needed to ensure food security and agricultural development in the world's poorest countries. Such investments would have other significant benefits, such as helping to achieve the Millennium Development Goals in areas like poverty reduction, possibilities for education and improved maternal health.

Thank you!

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Thank you!