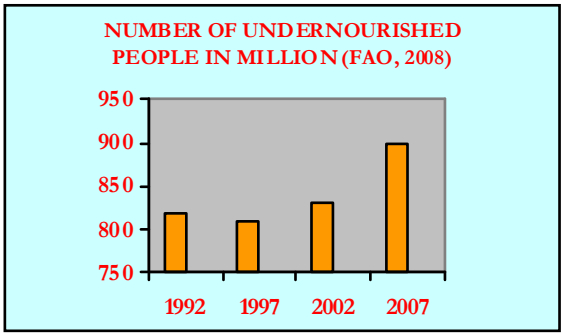
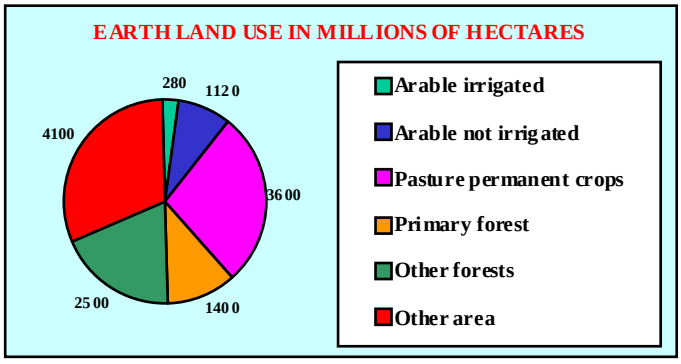
FOOD SECURITY AND AGRICULTURE.



Food security depends very much on the number of people needing food, the level of consumption of people (especially animal diets), and the availability of (fertile) lands. According to the FAO (The state of food insecurity in the world, 2008) food insecurity is rising and around 900 Million people are undernourished nowadays. The number of people in the world is expected to rise from more than 6 billion to around 9 billion in 2050, which means a much higher production of food is needed.

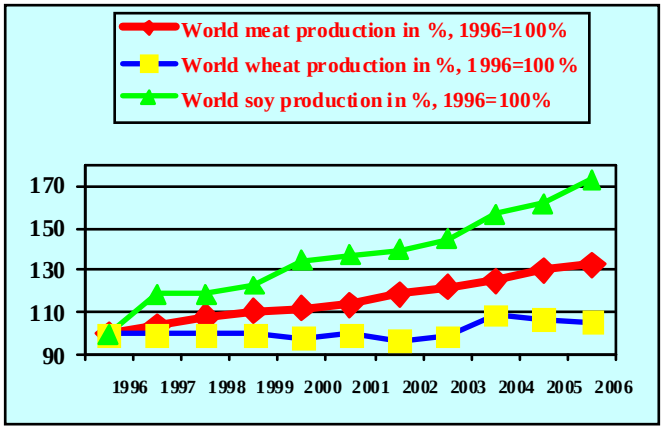
It should be noted also that feeding the hungry, is as much about alleviating poverty, helping poor families in developing countries gain access to food, getting resources to rural households for productive farming and empowering family farmers to influence agriculture and trade policies, than it is about increasing food supply. This PAN-Europe Perspectives however focuses on food supply.

Food production in the world is limited to fertile soils and favourable climates and presently around 5000 Million of hectares can be used for food production (L. Brown, "Outgrowing the earth" Norton ed. 2004).



Increasing the use of land is not easy because much land is unsuitable for production (desert, mountain areas) or severely degraded. Even, of the 5000 Million hectares in use for agriculture around 2000 Million hectares is already severely degraded (FAO, "Livestock's long shadow", 2006) by wind erosion, water erosion or chemical degradation.

This is mainly caused by bad land management.
Rather than trying to restore degraded land, generally new area is developed in biodiversity rich forests like the Amazon region and Indonesia (ca. 7 Million hectare per year). So it is unlikely we will have much more fertile land to our disposal (if we want to keep some area left for biodiversity) and food production needs to be done mainly on the present available agricultural area.

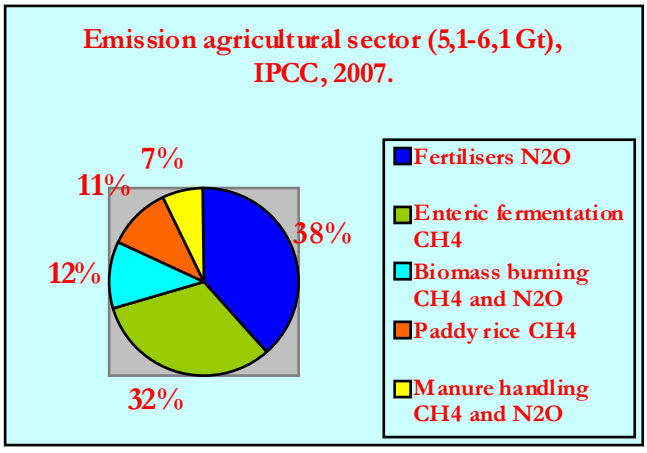


The growth of production per hectare of wheat is around 1,2 % per year (and slowing down) and can just keep up with the growth of the world population. If consumption in the world was mainly based on a plant-diet, the number of malnourished would at least not rise. But it is not. Rich countries consume a lot of animal products and growingly people in other countries tend to follow this consumption pattern. Meat and milk production require much more land than using plants for human consumption (cows> pigs > chickens> plants). Meat production grows yearly at around 2,7% and animal feed like soy beans even grows at a bigger speed (4,5% per year). This leads to an enormous `land grabbing` in areas where fi. soy beans can be grown, and sometimes even complete villages removed with force. A growing meat consumption and feed production means even less fertile lands is left for the poor and undernourished.

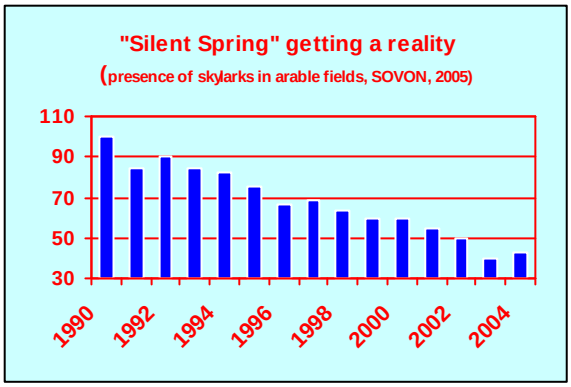
So if no substantial new land is available (keeping biodivers grassland and forests untouched & also forgetting about the idea of using land for biofuels), we consider the options available.

- **<u>Option 1: Increasing the yield in agriculture.</u>**

Although at a first glance it looks like a good idea to stimulate the highest yield possible in a given soil, it is not. Present-day standard agriculture in rich industrial economies is a high-input type of crop growing. It delivers a high yield but is not sustainable over a long period of time. The many negative effects are not accounted for and the costs are moved to society as a whole. First of all high-input agriculture is a big contributor to climate change. According to the International Panel on Climate Change (IPCC, Fourth Assessment Report, 2007) agriculture accounts for 10-12% on all anthropogenic greenhouse gas emissions. Land-use change (cutting forests) even contribute more and bringing the contribution of agriculture to around 18%.



Arable crop in high-input agriculture deplete the soil of organic matter (L.M.Vleeshouwer et al. Global Change Biology, 8, 519, 2002) and nitrogen-fertilizer even contributes to a faster depletion of soil carbon (S.A.Khan et al. J.Environ. Qual. 36, 1821, 2007).
High-input also is very detrimental to biodiversity. A typical arable field bird like the Skylark is threatened to extinction because of the lack of wild plants and the large use of pesticides.



The costs of high-input agriculture are externalised. For the UK Pretty et al. (J.N.Pretty et al., Agricultural Systems, 65, 2, 113, 2000) calculated external costs of minimal 12% of the consumer price through costs of drinking water pollution, damage to wildlife, erosion and food poisoning. Chronic health damage of pesticides, biodiversity and antibiotic resistance were not calculated yet but are potentially a high contributor to external costs. As a conclusion high-input agriculture is not sustainable and not in the interest of society as a whole. The –much promoted- idea of even increasing yields must be rejected and considered as a dead-end street. Standard western high-input agriculture can never be an answer to food insecurity because of its unsustainability. For the part of the production in rich industrial countries a slight decrease in yield needs to be accepted.

The situation however is much different in developing countries. They possess most of the arable lands and could in many cases increase their yield. Badgley et al. , (Renew. Agric. And food Systems, 22 (2), 86, 2007) show reviewing 293 cases that in developing countries organic production can increase the yield for 80%. Pretty et al. (Environm. Science and Techn., 40, 4, 1114, 2006) review 286 cases of resource-conservation agriculture in developing countries and show a yield increase of 79%. So there is huge potential there for improvement. However these countries should prevent making the same mistakes as rich countries, not copying the high-input system and focus directly on sustainable production. Additionally self-sufficiency should be an objective in stead of focussing on production for export.

What needs to be realised in the whole world is a transition to low-input conservation agriculture (or Integrated Production). Integrated production (IP) is based on low input of fertilizers and pesticides, on conservation tillage, crop rotation, resistant varieties and among others recycling of nutrients. IP is a integrated system in a hierarchy of methods and practices. IP can help mitigating climate change mainly by less use of N-fertilizer and increase of soil organic matter and is must more stable in case of adaptation to climate change. IP delivers healthier food (without residues) and can restore biodiversity (Lewis et al. , PNAS, 94, 12243, 1997). IP also provides opportunities for farmers to get paid an extra for quality products. Yields of IP are slightly lower than the high-input type (10%: we calculate 5% for buffer zones and 5% less yield for using more resistant varieties).

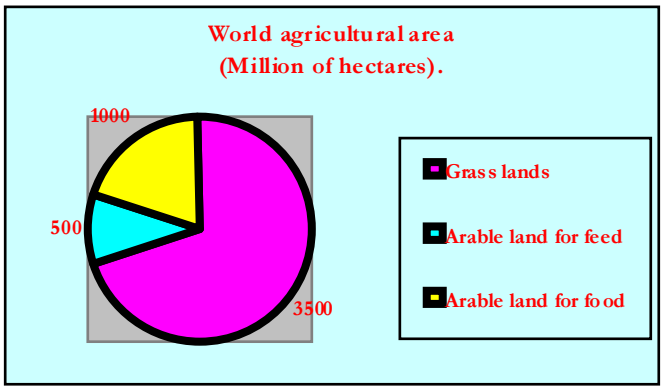
IP hierarchy & Type of measures
1. Prevention
2. Technical measures for cultivation
3. Systems for early warning and deciding
4. Non-synthetic chemical crop protection
5. Chemical crop protection and application techniques
6. Emission reduction

Agricultural crop production should be completely redesigned and use all elements from crop rotation, strong varieties, mixed crops, etc. Farmers –of course- need to be compensated for this reduced yield, best by selling their products as 'premium' in the supermarket shelves.

- **<u>Option 2: Increasing yield by genetically modified crops</u>.**

Biotechnology is another –much promoted- answer to the problems of food insecurity. Available assessment of its performances (for the presently available GM-crops) do not show a contribution to food insecurity and evaluate it

as similar to high input agriculture. P.S.Bindrabon ("GM-related sustainability: agro-ecological impacts, risks and opportunities of soy production in Argentine and Brazil". University Wageningen, 2009) observes no higher yield for GM-soy (glyphosate-resistant) and no clear pattern on the use of pesticides (no-till even higher use of pesticides). D.Gurian-Sherman ("Failure to Yield", Union of concerned scientists, 2009) gets to similar conclusions on GM-soy while on Bt-Corn (corn producing the toxin from a soil organism) only a slight increase in yield (3-4%) could be seen only in areas highly infested with corn borer. Resistance to GM shows that GM-crops are a short-term solution. Iowa State University reports growing glyphosate resistance (waterhemp, giant ragweed), and even resistance to Bt toxin (B.E.Tabashnik, PNAS, July 2009) is observed threatening an important alternative in organic production to turn into a useless tool.
Interesting to note is that none of the GM-crops so far have addressed staple food crops in developing countries or adaptations for drought or salinity tolerance.

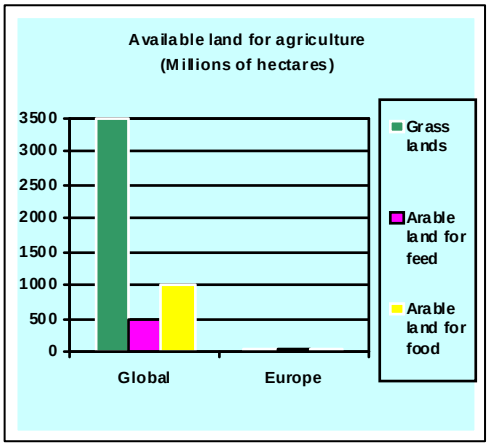


- Option 3: Change consumption of animal products.

An enormous contribution to food security can be made by reducing the consumption of animal products. Animal products take most land, 70% for cattle grazing and milk/meat production and 10% for other animal production (feed). If all consumers in the rich countries (OECD using 800 MHa for pasture & 130 MHa for feed) would do one day per week without meat and milk, we would already save more than 100 Million of hectares of land. Much of this land is located in developing countries because the rich countries like in Europe have little own fertile land and use huge areas in foreign countries like in Africa and Latin-America.

- Option 4. Reduce waste of food in the food chain.

A lot of food is wasted in the food chain, like bread which is partly returned to sender at the end of the day in retail. In rich countries it is estimated that 30% of food is wasted.



- Conclusion:

A simple calculation might be useful for identifying the potentials for making more fertile land available for the poor.
For food the rich countries (OECD) need to reduce yield a bit (10%) to get to sustainable production. Because OECD uses around 5% of the global land for their food, this will reduce the global land availability by 0,5%. In the developing countries the increase of yield by adapting to IP or organic methods could be around 80%. Because developing countries use 15% of the land for food, this will increase the global land availability by 12%.
If the rich countries would reduce the consumption of meat and milk (1 day a week no animal products), it would increase the global land availability by 2%. Only having meat and milk two times a week would increase land availability to10%. This would also help preventing health problems like obesity and heart diseases much. If food waste in rich countries could be halved, it would increase global land availability by 1,5%.

Giving the 1 billion undernourished on the moment, all potentials should be used without delay:

1. Increasing yields in developing countries by introducing sustainable practices (IP & organic)
2. Reduce the consumption of meat and milk, to start in the rich countries
3. Reduce food waste from field to consumer's plate, by being more efficient in all stages of the chain

AND abandon high-input agriculture by realising a transition to IP and organic as a basic requirement.