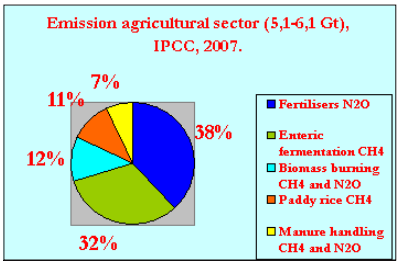
Pesticide Action Network Europe

Climate Change and Agriculture

Fact Sheet

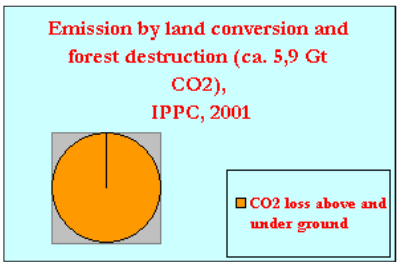
Agriculture is a major contributor to climate change. According to the International Panel on Climate Change it accounts for up to 12% of all man-made greenhouse gas emissions.



How does agriculture contribute to climate change?

The use of synthetic nitrogen fertiliser is the biggest contributor to climate change in agriculture owing to the potent greenhouse gas N_2O (nitrous oxide). Enteric fermentation (methane from cows and sheep) is the second largest source because cows and sheep digestive tracts produce CH_4 (methane) through anaerobic fermentation.

A major agriculture-related source, and on an even larger scale, is land conversion. For the most part, extensive grasslands (6m hectares a year) and forests (7m hectares) are converted to crop land. The loss of CO_2 into the atmosphere above ground (trees and plants) and underground (soil organic matter) is enormous. Peat soils in particular carry huge loads of soil organic matter which is released under crop growing over subsequent decades.



Can agriculture help reduce climate change?

Fortunately, agriculture also offers major potential for mitigation. The only way to halt the release of climate gases caused by land conversion is to halt land conversion and forest destruction. This means our consumption, especially in the rich countries, must be reduced to curb pressure on newly converted land. Meat consumption must be slashed because meat production draws heavily on feed production which consumes huge areas of land (eg soybeans and corn). First generation biofuel production must also be abandoned as it combines huge land-use and offers no real carbon gain.

The Fourth Assessment of the IPCC (2007) recommends mitigation measures on:-

- crop rotation and design
- nutrient management
- livestock growing
- maintaining fertile soils

The box below shows the most important examples of practices for these four areas of mitigation. These measures and practices make the case for low-input agriculture, conservation measures at soil level and recycling nutrients. Measures of this kind are combined in a systemic approach known as integrated production (IP, covering integrated pest management and integrated crop management), also including organic production.

Mitigation climate change in agriculture

I. Crop rotations & design
* improving crop varieties
* use of cover crops
* avoiding bare fallow land
* perennials in rotation
* legume crops in rotation

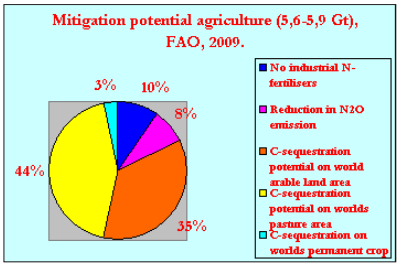
II. Nutrient management
* reducing tillage or no-tillage
* adjusting application to needs
* avoid leaching
* using slow-releasing fertilisers

III. Livestock farming
* preventing methane emission from manure
* introducing legumes in grasslands
* composting manure
* breeding cattle for efficiency

IV. Fertile soils
* applying substrates like compost
* reduced tillage or no-tillage
* retaining crop residues as covers
* sequestering CO_2 into the soil
* initiating re-vegetation

The manufacture and application of pesticides represents a tiny proportion of fossil fuel use and greenhouse gas emissions in farming, compared with fertiliser use. But reducing our reliance on synthetic fertilisers in European farming and replacing them with animal manure, compost, green cover crops and more legumes in crop rotation would also help reduce our reliance on pesticides. This is because increasing the soil's organic matter from natural sources increases the number of beneficial micro-organisms in the soil, which helps crops cope better with disease-causing organisms. Excessive use of synthetic fertilisers often produces lush crop foliage which attracts more pests and diseases, leading farmers to apply more insecticides and fungicides. Managing soil fertility more carefully and cutting back hard particularly on nitrogen-based fertiliser, can help produce a healthier, more robust crop, resulting in a virtuous circle.

A study by Niggli et al, 'Low greenhouse gas agriculture', published by the FAO, May 2009, shows that full transition to organic agriculture would completely re-balance all of agriculture's negative climate change effects. The potential of, eg, leguminous intercropping (saving 140 megatonnes of nitrogen per year) is far greater than the complete industrial production of nitrogen (90-100 megatonnes per year). No tillage is another important mitigation measure.



Agriculture: A source of car fuel?

Using fertile land to grow fuel crops is not a useful contribution to mitigating climate change. It was initially considered a good idea, but it has gradually been recognised that climate gases released during production and the indirect change of land-use (where food production is moved elsewhere, sometimes to places with high carbon stocks like forests) outweigh any benefits. This is true of most of the current 'first generation' fuels from food crops. The large-scale monoculture production of these fuels in developing countries has an extremely harmful environmental and social impact. In Europe, renewable fuel quota policies are encouraging some farmers to practise shorter crop rotation and may be increasing fertiliser and pesticide use to maximise income from maize and oilseed rape for the biofuel market.

Agriculture and animal products

Dietary preferences and data from California show that a non-vegetarian diet required 2.9 times more water, 2.5 times more primary energy, 13 times more fertiliser, and 1.4 times more pesticides than did a non-vegetarian diet. The greatest contribution to the differences came from the consumption of beef (Marlow et al Am. J. Clin Nutr, 89, 2009).

Product	Global warming potential (kg CO_2-eq. per kg of product)
Sheep	17.4
Beef	13.0
Pig	06.4
Poultry	05.0
Milk	01.3
Bread	00.8
Potato	00.2

Comparing food products ('Cool Farming', Greenpeace, 2008, based on Manchester Business School research) makes clear the huge impact on climate change of most animal products. Eating mutton and beef produces many times more climate change effects than eating plant products. JRC research (Weidema et al, 'Environmental improvement potentials of meat and dairy products', Technical report 46650, 2008) also shows this enormous impact caused by animal products. Meat and dairy products are responsible for 24% of the overall environmental impact of EU's total final consumption. The report also shows that the environmental impact cannot for the most part be avoided since even if all available mitigation potential is used, this will only restore the environmental impact to 19%. Lower consumption of meat and milk is the most effective way of reducing climate change and environmental effects. Reducing consumption of meat and dairy produce means eases pressure on scarce land and cuts pressure to plough up biodiversity-rich grasslands, and forests with their high-carbon stocks.

What must we do?

- **Crop management**
  To reduce climate change impact, agriculture should make a full transition to integrated production (and ultimately organic farming) abandoning high-input agriculture, and move away from our current dependency on synthetic agrochemicals. The transition can deliver climate-neutral agriculture, producing high-quality food and feed. It is time the EU seriously considered developing the concept of integrated production.
- **Climate change adaptation**
  Adapting to climate change requires a robust agricultural system which can deal with changes in climate and pests. Integrated production is a hardy system which deploys preventive measures as a priority and is the best choice for preparing for adaptation to climate change. The EU must focus on delivering a strong agricultural system capable of coping with climate change. Integrated production is one such system.
- **Animal products**
  Most of the land used for crop production is devoted to animal feed, 70% for cattle grazing and milk/meat production and 10% for meat production (feed). The current growth in consumption of animal products is the greatest threat to climate change but also offers major potential for a change if we substitute eating animal products by eating plant products. If all consumers had one meat and milk-free day each week, we would save 100m hectares of land and some 1 gigatonnes of CO_2-equivalent (FAO, 2006, 'Livestock's long shadow') and the related climate change gases. Wealthier countries should of course lead the way given their huge meat consumption, but other countries including Brazil and China should strive for lower per capita meat consumption. The substitution of soy beans from Latin America with leguminous crops (eg beans, peas) in Europe also contributes greatly to reducing climate change and forest destruction (2.4 gigatonnes CO_2, FAO, 2006). Additionally the CH_4-production of ruminants can be reduced by 5-10% by modifying feed (c 0.1 gigatonnes CO_2). So the EU must strengthen its work on sustainable consumption and production, and begin by focusing on action.

For further information:

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PAN Europe is a network of grassroots organisations working to replace the use of harmful pesticides with ecologically sound alternatives. Our network brings together consumer, public health, and environmental organisations, trades unions, women's groups, and farmer associations from across 19 European countries.