

Agriculture, world food security, bio-energy and climate change: some inconvenient facts

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At the UN World Food Summit in Rome in 1996 an ambitious goal was formulated, namely to cut in half the number of malnourished people in 1995 by 2015. It has now become clear that this objective is no longer within reach. In fact, the opposite is happening. The number of malnourished people is increasing by about four million annually.

Moreover, the agricultural treadmill of ever declining food prices has come to an end. The turn of the millennium also marks the beginning of a new trend of increasing food prices (VON WITZKE et al., 2008). Increasing food prices, naturally, imply an increase in the severity of malnutrition in the world.

It is now widely accepted that climate change is a reality and that human action has a lot to do with it. Agriculture and climate change are interrelated in at least three ways. First, agriculture is a victim of climate change. Second, agriculture in many countries is subsidized in order to produce bio-energy, considered by many to be very climate friendly. And third, agriculture is the most important source of greenhouse gas emissions; that is world agriculture contributes more than any other industry to global warming at the same time that it suffers from the very same more than virtually all other industries.

Climate change is affecting world agriculture in a variety of ways. Atmospheric CO₂ is a plant fertilizer which acts to stimulate plant growth. In the very far northern and southern latitudes global warming extends the vegetation period resulting in higher yields. As the air warms up it contains more water. It rains more. Weather extremes increase in frequency and intensity. The polar ice caps are melting which raises the water table and causes significant losses of farm land in many parts of the world. While moderate warming may in effect increase agricultural production in some regions of the world, the perspective is for an overall decline in world food production and thus for higher prices of foods (e.g. STERN, 2007). Obviously this aggravates the problem of hunger and malnutrition.

To make things worse, the countries whose agricultural production will suffer most from continued global warming are in the tropical and subtropical regions of the world. Unfortunately, these are the regions in which hunger and malnutrition are

already prevalent, and for which a significant increase in food import needs is to be expected even in the absence of climate change (BRUINSMA, 2003). This is aggravated by the fact that these countries do not invest much in agricultural research (e.g. CRAIG et al., 1991; PARDEY and BEINTEMA, 2001) which puts their farm economies in a position in which they can only insufficiently adapt to changing climatic conditions, thus further widening the food import gap.

In many countries there is a rapidly growing production of bio-energy. With the exceptions of the use of agricultural by-products (such as manure or straw) for bio-gas, and ethanol production in Brazil which is based on sugar cane, the production of bio-energy is not competitive and has to be subsidized. There are two main reasons for these subsidies. One is to stimulate domestic production in an attempt to diversify the energy sources and thus to become less dependent on foreign oil and gas. The other is to reduce the use of fossil fuels in an attempt to combat global warming.

The growing bio-energy production allocates agricultural land and other inputs away from food production. Hence, the price of food increases even further. This not only aggravates the global problem of malnutrition, it also acts to increase the incentives for the rural poor in developing countries to burn forests in an attempt to claim additional land for food production. This, of course, counteracts the environmental effect of increasing bio-energy production. Already today deforestation is the second most important source of greenhouse gas emissions in the world, contributing about 18% to the anthropogenic global warming (e.g. STERN, 2007).

Obviously, both national energy supply security and climate change are public goods. In such circumstances markets allocate resources only sub-optimally and government action has the potential to significantly improve on the market outcome. However, as the impact of bio-energy on the reduction of global warming is limited, due to the growing incentives for deforestation, the only remaining justification for subsidies on bio-energy production is the energy security argument.

The public debate on global warming is focused on the mitigation of greenhouse gas emissions by electric power plants, manufacturing, transportation and private households. Yet on a global scale, agriculture continues to be the single most important industry. Hence, it is not all too surprising that world agriculture contributes more than any other industry to global warming. World agriculture alone accounts for almost one third of the anthropogenic climate change. Of this crop and animal production on the present acreage account for 14% of the total anthropogenic greenhouse effect. This is as much as global manufacturing contributes to global warming and this is also as much as the global transportation industry contributes to climate change.

With regard to CO₂, agriculture's impact on climate change is usually fairly small. Although agriculture is an emitter of CO₂ through the use of fossil fuels in tractors, combine harvesters and other farm machinery or the use of synthetic nitrogen fertilizer, agriculture may also sequester considerable amounts of CO₂ in the soil.

The main culprits are laughing gas (N₂O) and methane (CH₄). Globally, agriculture accounts for about 50% of all CH₄ emissions and 70% of all N₂O emissions (e. g. LEAD, 2007). The problem is that methane and laughing gas are very potent climate gases. CH₄ is 21 times as powerful as CO₂ and N₂O even 310 times as powerful (e.g. IPCC, 2001). The main sources of laughing gas and methane emissions are the enteric fermentation in the digestive tracts of ruminants, wet rice, animal manure and synthetic nitrogen fertilizers.

Adding to the 18% of climate effect caused by deforestation, the 14% of global warming resulting from farming on the present agricultural acreage makes agriculture by far the single most important source of global greenhouse gas emissions. A climate policy which is credible and effective must not disregard an entire industry which is the most important emitter of climate gases. Hence, it becomes obvious that there is a need for an agricultural climate policy. VON WITZKE and NOLEPPA (2007) as well as PEREZ and HOLM-MÜLLER (2007) have argued that incentive based instruments of environmental policy such as emission taxes or emission rights trading are suitable instruments for this purpose.

Whichever instrument is employed for the reduction of agricultural greenhouse gas emissions, food production will become more expensive, reducing the global supply of food and, thus, contributing to even higher food prices. As agriculture is such a major source of greenhouse gas emissions, a lack of agricultural climate policy will also act to increase food prices because in this case global warming will be more pronounced and, therefore, food production will decline. In other words, agricultural climate policy will increase food insecurity in the world; but no climate policy will do the same.

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