FAO POLICY BRIEF

Harvesting agriculture's multiple benefits:
Mitigation, Adaptation, Development and Food Security



Food and Agriculture Organization of the United Nations

Farming practices, which capture carbon and store it in agricultural soils, offer some of the most promising options for cost effective, early action on climate change in developing countries. These practices are already available and can have multiple benefits for climate change mitigation, adaptation, sustainable development and food security.

To accelerate mitigation and adaptation action, climate financing mechanisms need to target agriculture, reward synergistic action and leverage investment for up-scaling.

Opportunities exist to build confidence, capacity, and commitment for early action on agricultural mitigation and adaptation in developing countries, while meeting development and food security requirements. To this end, FAO advocates:

- the early establishment of a work programme on agriculture, within the climate change convention process, in order to clarify technical and methodological issues;
- an inter-linked suite of country-owned and led pilot projects to develop readiness to implement agricultural mitigation options with adaptation, food security and development synergies

Agriculture will need to meet multiple demands, generate multiple benefits

Today 1 billion people, out of a world population of 6.5 billion, live in chronic hunger. Every six seconds a child dies from hunger. The future demands placed on agriculture will be no less daunting: feeding a population that is estimated to number 9.1 billion in 2050 (FAO projects that a 70 percent increase in food production will be needed); providing income, employment and economic growth in many developing countries, most Least Developed Countries, and livelihoods for 75 percent of the poor. Agriculture is expected to achieve this without degrading or depleting natural resources and with only very limited support from research and extension systems, weakened from decades of declining investment in the sector.

Agriculture, in a number of areas, already needs to adapt to more rapid and intense changes in climate (temperature, rainfall) and related changes in distribution patterns of pests, weeds and diseases. While in some areas yields may initially improve, the overall impacts of climate change on agriculture and food security are expected to be increasingly negative, especially in areas that are already prone to climate-related disasters (droughts, floods, cyclones) and food insecurity.

The sector will also need to contribute to stabilization of greenhouse gases in the atmosphere through emission reduction and removal (mitigation). Agriculture has readily available and cost-effective mitigation options, positioning it positively for early action, compared to other sectors that may require long-term research and capital-demanding mitigation technologies (such as carbon capture and storage in the energy sector). The sector contributes 14 percent of global greenhouse gases, of which 74 percent comes from developing countries. However, the technical mitigation potential of agriculture is high and 70 percent of this potential is in developing countries.

Adaptation should enable agricultural systems to be more resilient to the consequences of climate change. Mitigation addresses its root causes, thereby limiting over time the extent and cost of adaptation, as well as the onset of catastrophic changes. Both are needed and a number of agricultural management practices can do both, while helping to meet development and food security requirements. They are likely to receive increasing priority within holistic approaches to food security and climate changes (see new FAO paper)[1]. Increased agricultural resilience and productivity, under changing climatic conditions, can benefit poverty reduction, especially among vulnerable smallholder farmers. A wide range of options in agriculture offer such potential synergies. Others may involve trade-offs, some of which can be managed.

[1] FAO 2009. Food security and agriculture mitigation in developing countries: Options for Capturing Synergies. ftp://ftp.fao.org/docrep/fao/012/ak596e/ak596e00.pdf

Maximizing climate change and food security synergies in agriculture is a promising option for early climate change action:

Overlaying FAO Carbon-Gap and Hunger Maps, which respectively show (i) soils lacking carbon ("carbon-gaps") and (ii) the geographic incidence of hunger, reveals that countries or regions with large food insecure populations often also have large "carbon-gaps," which result in low-yield production and may increase climate vulnerability.

A number of agricultural management practices, including those employed in organic and conservation agriculture, capture carbon from the atmosphere and store it in agricultural soils. These practices involve increasing the organic matter in soils, of which carbon is a main component. This, in turn, increases fertility, water retention and the structure of soils, leading to better yields and greater resilience. This "soil carbon sequestration" is estimated to be nearly 90 percent of the technical mitigation potential of agriculture

The IPCC Fourth Assessment Report identified four main categories of terrestrial mitigation options: improved cropland and grassland management, restoration of degraded and organic soils. FAO found that within these main categories, improved agricultural management practices required for mitigation are often the same as those needed to increase productivity, food security and adaptation. Practices having these potential synergies include: restoring degraded agricultural land and grasslands with a high production potential, switching from bare to improved fallows (cultivation of fast-growing plant or tree species — usually legumes — for rapid replenishment of soil fertility), integrated nutrient and soil management, introducing agroforestry options, conservation tillage and residue management. As these synergies differ across localities, a necessary first step is to identify where these synergies (as well as potential trade-offs) may occur.

To limit global warming to 2°C above pre-industrial levels, scaling-up agricultural mitigation actions is among the promising options for abatement required by 2020. Targeting those actions synergistic with improving food security, can contribute to climate resilient growth in agricultural production. Beyond soil carbon sequestration, more efficient fertilizer use and management of livestock systems are also promising options that enhance emission reductions per product unit. Many of these activities, due to productivity/efficiency gains, may also reduce pressures for deforestation and forest degradation.

Financing for agriculture's multiple benefits can offer significant returns

Funding that rewards synergistic action across mitigation, adaptation, agricultural development, and food security can help vulnerable countries to respond more comprehensively to the dual challenges of climate change and food security. Innovative ways of sourcing and delivering funding (including for smallholders) require further development and field testing.

FAO recently estimated that the agricultural sector in developing countries will require an annual gross investment of nearly US$210 billion to feed the world by 2050[2]. IPCC estimates that at a price of $20/tCO$_2$ equivalent (e), implementation of agricultural mitigation actions from the four main terrestrial categories could generate annual revenues of approximately US$30 billion[3]. Mitigation finance could provide significant incentives to leverage agricultural investments that have a positive impact on mitigation and simultaneously increase climate resilience. Assuming that agricultural investment can leverage five times its value in carbon revenues[4], carbon finance may provide incentives to leverage US$150 billion worth of climate smart agricultural investments in developing countries.

[2] This estimate assumes an 11 percent per capita calorie increase and food insecurity remaining at 4 percent of the population by 2050. About 39 percent of the investment demand is in China and India, 61 percent has to be invested in agriculture across all other developing countries. Investment costs for agricultural research, rural infrastructure and capacity to trigger the transition are not included. Costs for bringing degraded land into production are also not considered.

[3] Economic agricultural mitigation potential in non-OECD countries at a carbon price of US$20/tCO adds up to 1.5 Gt/CO$_2$e/yr covering: cropland improvement incl. rice management 0.62 GtCO$_2$e/yr., grazing land improvements 0.62 GtCO$_2$e/yr, organic soil restoration 0.17 GtCO$_2$e/yr, and restoration of degraded lands 0.17 GtCO$_2$e/yr, (IPCC, 2007)

[4] Based on the experiences with ongoing land-based carbon finance projects (World Bank 2009: Review of 10 years experiences with CDM projects)

Agriculture, specifically soil carbon sequestration, has been largely excluded from the main climate financing mechanisms, while support for changing agricultural systems to feed the world is insufficient. Current levels of agricultural investments in developing countries will need to increase, following decades of decline and considering the sector's key role in development and food security. Synergistic use of ODA and new/additional climate funding could be explored.

A key issue associated with financing for mitigation is measurement, reporting and verification (MRV) of emission reductions and removals. Financing of agricultural mitigation will not be an exception. The type and cost of MRV systems are likely to vary by financing source and over time (as capacity is built). National inventories and systems for monitoring agricultural soil carbon mitigation exist, but countries would benefit from a phased approach, through which confidence and capacity in the use of such systems is gradually developed. Developing countries and farmers are more likely to undertake action to build MRV capacity, where there is confidence and direct access to adequate and predictable financing for capacity building, technology development/transfer, and adoption of mitigation actions.

Building confidence, capacity and commitment to support and implement action in the post-Copenhagen period

It is evident that developing countries and farmers will have to deal with climate change regardless of the outcome decided in Copenhagen. Given its potential to generate important multiple benefits and for early action, agriculture offers unique opportunities for building confidence around commitment and action in a post-Copenhagen period. A number of steps could exploit these opportunities:

At the international level,

- Anchoring agriculture and food security appropriately in a Copenhagen outcome, could help to accelerate early action on agricultural mitigation and adaptation;
- An early mandate for a work programme on agriculture, within the UNFCCC process (the Subsidiary Body for Scientific and Technological Advice- SBSTA) could build confidence at the international level around agriculture's role in climate change adaptation and mitigation;

At country level,

- Initiating a suite of pilot projects could move from words to deeds in building confidence, capacity and commitment for readiness to implement nationally appropriate agricultural mitigation action with sustainable development, adaptation and food security synergies. Possible design elements for such pilots might include: voluntary basis; country-owned and led; use of a phased approach, based on country capacity and circumstances, to gradually develop/implement strategies; reference levels; use of MRV; and financing mechanisms, as deemed appropriate by countries and adequate international support for capacity building, technology development/transfer and incentive systems.

For further information, see:

FAO 2009. Anchoring Agriculture within a Copenhagen Agreement. ftp://ftp.fao.org/docrep/fao/012/k6315e/k6315e00.pdf

FAO 2009. Enabling Agriculture to contribute to climate change mitigation. http://unfccc.int/resource/docs/2008/smsn/igo/036.pdf

FAO 2009. Food security and agricultural mitigation in developing countries: Options for Capturing Synergies. ftp://ftp.fao.org/docrep/fao/012/ak596e/ak596e00.pdf