

## A MONUMENTAL CHALLENGE

The year 2009 was a benchmark in the history of food security – but in the worst way and the number of food insecure people surpassed the 1 billion mark. This year will also be remembered for a global economic crisis, deepening poverty as well as the climate change negotiations.

The pressure on the agricultural sector is unprecedented. Not only is it expected to provide sufficient, good quality food for a population of 9.1 billion in 2050,



but it must provide income and employment for the 70 percent of the world's poor whose livelihoods depend upon it.

Thus increased efforts must be put in place to shape agricultural systems that can meet the increasing demands for food, feed, fibre and fuel while addressing land degradation, water scarcity, loss of agricultural biodiversity and the consequences of climate change and climate variability.

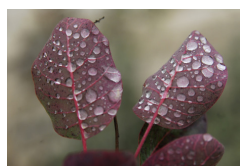
## RESPONDING WITH “WIN-WIN” OPTIONS

It is well accepted that - depending on agroecological zone - climate change can have either positive (e.g. increased growing seasons, greater rainfall) or negative impacts (e.g. shorter growing seasons, greater frequencies of droughts and floods) on agriculture and ecosystem processes and services. There is therefore an urgent need to capitalize on agricultural practices that capture synergies among adaptation, mitigation and food security. Value and incentives must be provided to farmers and pastoralists who manage their resources in a sustainable way. A few indicative practices that will enhance the resilience of ecological processes in a way that simultaneously **increase adaptation, mitigation and food security** are:



### ENHANCING NUTRIENT CYCLES

Implementing a progressive shift from Nitrogen (N) fertilizers to N-fixing species can reduce emissions from fertilizer manufacture and transport while enhancing agrobiodiversity and productivity. Biological nitrogen fixation (BNF) can be enhanced through the integration of leguminous plants and trees within cropping systems and rotations. Current global nitrogen fixation by legumes is estimated at 20-22 million tonnes of N each year. It is predicted that by 2050, 6.5 billion people will rely on N fertilizer for their survival thus fertilizer efficiency will need to increase. In the context of increasing prices (and reduced availability) of fossil fuels and fertilizers, the adoption of legumes and manure management in farming and grazing systems will be a “win-win” practice.



### MANAGING EFFECTIVE WATER CYCLES

Farmers can manage ‘effective’ water cycles that capture water in the soil and in crops – reducing losses from evaporation. Improving the capacity of soils and crops to hold water and sequester carbon is dependent on maintaining soil cover (minimizing disturbance), increasing organic matter content, and diversifying crops and crop rotations to increase the presence of deep rooted species. Farmers can manage water harvesting and irrigation techniques and adapt their cropping systems according to local temperature and rainfall patterns. Adapted integrated management practices such as conservation agriculture and agroforestry can increase agricultural resilience and reduce risks associated with climate change.



### PEST REGULATION AND CONTROL

Climate change will affect the presence and patterns of pests and diseases. Farmer community organizations have worked with FAO, national agricultural systems, research institutions and NGOs to implement practices that increase soil and plant health and take advantage of naturally occurring biological pest control. Farmers will continue rely on integrated pest management to optimize and adapt their agricultural systems and further build on available natural regulation processes including predation.



## TAKING ADVANTAGE OF RENEWABLE ENERGY

Farmers can manage agricultural operations to help contain costs, minimize energy consumption and lower GHG emissions. Such practices include controlled traffic farming; water lifting and pumping using windmills; and solar and thermodynamic dryers for hay production. Efficient technologies and equipment need to be developed that respond to the priorities of small-farmers, building on local knowledge and adapted to the ecological and social context.



## CAPITALIZING ON CROP/LIVESTOCK-BASED SYSTEMS AND EXTENSIVE GRASSLANDS

Grassland systems occupy 70 percent of the world's agricultural area and hold 20 percent of the world's soil carbon storage. Almost one billion people depend on them for their livelihood and yet a large percentage of these areas are degraded. Reversing degradation and improving grazing land management will prove an important contribution to mitigation and food security while enhancing adaptation and contributing to rural development. Management practices of extensive grasslands include managed grazing intensity and recovery periods. Management options for cultivated pastures include species selection, integration of perennial and annual plants, fertilization and harvesting methods. Because of the extensive nature of grasslands, better quantitative information on sequestration responses to different management options is needed, as well as capital investments especially for pastoral and smallholder farmer systems.

## PRACTICAL STEPS FORWARD

Independent of the outcome of Copenhagen, farmers and pastoralists will have to adapt and mitigate the impacts of climate change while producing food of sufficient quantity and quality. Therefore, it will be crucial to ensure that these hands-on ecosystem managers have the necessary tools to adapt to climate change. They must do this through local solutions and appropriate technologies and practices that improve the resilience of farming systems, thus enhancing their food security as articulated in the World Summit on Food Security Declaration, FAO Rome 18 November 2009.

In the wider context, the global research and development community should focus on:

- developing and applying models and adapting planning tools that can predict the performance of different farming systems including C and N accounting, provide information about mitigation and adaptation capacity, and support the establishment of farmer-based pilot approaches;
- understanding “win-win” practices that enhance synergies among adaptation, food security and mitigation and making technical assistance available;
- exploring financing options and possible elements in designing country implementation processes that address adaptation, mitigation and food security;
- enhancing investments in rural areas and rural-urban linkages to allow countries to increase their capacity to produce sufficient, good quality food for their citizens while minimizing the impacts of climate change.

*This brief draws on a publication in print “Agriculture and Climate Change: Win-win practices” by FAO in collaboration with Villy Jorgensen and Jorgen Olesen from Aarhus University, Denmark. If you wish to learn more about our work on Plant Production and Protection and Climate Change, please visit [www.fao.org/agriculture/crops](http://www.fao.org/agriculture/crops) and [www.fao.org/climatechange](http://www.fao.org/climatechange)*

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