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High Level Panel of Experts on Food Security and Nutrition

Extract from the Report[1]
Food Security and Climate Change

Summary and Recommendations for Policymakers

With many of the resources needed for sustainable food security already stretched, the food security challenges are huge. Climate change will make it even harder to overcome them, as it reduces the productivity of the majority of existing food systems and harms the livelihoods of those already vulnerable to food insecurity. The likelihood of the nations of the world being able to meet the 2°C target of maximal average temperature rise set by the UNFCCC negotiations in Cancun is diminishing with time. If negotiations for global climate policies fail, temperature rises of the order of 4°C by the end of the century, corresponding to the best estimate of the higher emissions scenarios of the IPCC, cannot be discarded. While some might benefit, people in some regions will be affected more than others by changes in average temperature and precipitation. In addition, the likelihood of increased variability and extreme events means that management of risk, both locally and internationally, will be even more important than it is today.

Population growth will continue through 2050 and be accompanied by unprecedented rates of urbanization. These changes will take place mostly in today's developing countries, many of whom will very likely achieve middle-income status. The outcome will be rapid growth in demand for food, both in quantity and quality. Government policies to raise the share of biofuels in energy consumption increase the challenges to our collective ability to achieve sustainable food security.

Contemporary climate change is a consequence of greenhouse gas (GHG) emissions from human activities. According to the IPCC, most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic GHG concentrations. Agricultural activities including indirect effects through deforestation and other forms of land conversion account for about one third of total global warming potential from GHG emissions today so reducing the direct and indirect emissions from agriculture is an essential part of the larger effort to slow the pace of climate change.

[1] HLPE, 2012. Food security and climate change. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome 2012. Full report freely available at www.fao.org/cfs/cfs-hlpe.

Principal observations

1. Food security vulnerability to climate change begins with biophysical effects at the level of individual farms on plants and animals and the systems in which they are managed. These effects alter livelihoods in rural areas directly and urban areas indirectly. International markets transmit the effects of climate change elsewhere and can affect local food security, both for better and worse, by altering domestic prices and influencing livelihoods.

2. Climate change affects plants, animals and natural systems in many ways. Changes in temperature and rainfall regime may have considerable impacts on agricultural productivity. Average temperature effects are important, but there are other temperature effects too. Little is known in general about the impacts of climate change on the pests and diseases of crops, livestock and fish, but they could be substantial. Climate change will result in multiple stresses for animals and plants in many agricultural and aquatic systems in the coming decades. There is a great deal that is yet unknown about how stresses may combine. Irregular precipitation that already affects the livelihood and production of a large number of rural families is expected to become more serious in the face of climate change.

3. A social vulnerability lens is essential to understand why certain individuals, households, or communities experience differences in food insecurity risks, even when they are in the same geographic region. Vulnerability to food insecurity arises both from biophysical and socio-economic reasons with both nutritional and livelihood effects. Pre-existing conditions of vulnerability make poor people more exposed to the effects of climate change, as social, economic and agro-environmental circumstances may become more severe with climate change.

4. The poor and other vulnerable groups are likely to be at high risk to food insecurity brought about by climate change. Who are the poor? They are people who have few assets and low income earning potential. They include small-holders and landless people in the countryside and marginalized ethnic and Indigenous Peoples. Today they are likely to be located in rural areas and be female and children, but the share of urban poverty is growing and the poor are urbanizing more rapidly than the population as a whole. From a geographic perspective, the vast majority are located in two regions – Sub-Saharan Africa and South Asia - where climate change is likely to be especially pronounced. But food insecurity is reported even in the richest countries and it is possible that development pathways that worsen inequality ignore marginalized groups, or result in degradation of the environment will make more people susceptible to food insecurity from climate change in the future. Small-scale farmers and landless laborers, with limited resources of their own and also likely to be underserved by public and private activities, are particularly susceptible to the socioeconomic effects of climate change, especially if increased variability is not accompanied by improved social safety nets (see the HLPE Report on Social Protection for Food Security). Dryland agriculture in arid and semi-arid regions, where over 40 percent of the world's population and more than 650 million of the poorest and most food insecure people live, is particularly vulnerable to the risks of climate change and variability, drought in particular. In some regions of the world, significant agricultural production takes place in low-lying coastal areas and where current population densities are high. In these regions, and particularly in small island states, a major threat of climate change is from saline intrusion, sea level rise and increased flooding.

5. Adaptation of the food system will require complex social, economic and biophysical adjustments to food production, processing and consumption. Such changes will be most difficult for the poorest and most vulnerable regions and populations. Moreover, climate change models suggest that severe effects are likely to be felt in tropical regions, especially the expected further drying of the arid tropics. Many of the poorest countries are found in these regions and hence the nations least able to adapt may be the

most affected. Any hope of making substantial progress on the poverty and hunger Millennium Development Goals thus requires successful adaptation in least-developed countries. But all countries will eventually be challenged by climate change.

6. There are important uncertainties in the way climate will change, magnified at regional and local scales where individual decisions are made. Adaptation should thus be seen in the broader context of building a more resilient food system. Lack of sustainability in food production is a key threat to resilience and needs to be addressed by changes in the way we produce food, by moderating demand for foods such as ruminant products whose production generates especially large contributions to GHG emissions, and in the design of national and international food system governance. Identifying and supporting food production and distribution practices that are more resource efficient *and* have fewer environmental externalities should be high priority. Considering the diversity of environmental and social settings in which food production takes place, solutions for improving sustainability will differ. No single approach will be universally applicable and a much better and sophisticated evidence base is needed to help guide the implementation of the most appropriate, context-specific measures. The communities at greatest risk of food insecurity tend to be in low-income countries. Most measures that facilitate sustainable development with an emphasis on improving the livelihoods of the poorest sectors of society will increase general resilience and assist in climate change adaptation.

7. Examples of strategies for community based adaptation include improving water management practices such as building infrastructure for more efficient irrigation systems and small-scale water capture, storage and use, adopting practices to conserving soil moisture, organic matter and nutrients, using short-cycle varieties and setting up community-based seeds and grain banks. Farmers and food producers alone cannot adapt successfully to climate change. They need to be supported by government and by the private sector, and there is also an important role for civil society organisations.

8. Agriculture is an important driver of climate change. Crop and livestock agriculture globally accounts for about 15 percent of total emissions today. Direct GHG emissions from agriculture include methane (CH_4) emissions from flooded rice fields and livestock, nitrous oxide (N_2O) emissions from the use of organic and inorganic nitrogen fertilizers, and carbon dioxide (CO_2) emissions from loss of soil organic carbon in croplands as a result of agricultural practices and in pastures as a result of increased grazing intensity. Agriculture also causes emissions that are accounted for in other sectors (industry, transport, and energy supply, etc.), from production and transport of fertilizers, herbicides, pesticides, and from energy consumption for tillage, irrigation, fertilization, and harvest. Land use change, much of which is driven by expansion of agricultural area, adds another 15 to 17 percent. And future income and population growth will increase agricultural emissions dramatically unless low-emissions growth strategies for agriculture are found.

9. The dramatic effect of land use change on GHG emissions[2] emphasizes the importance of finding agricultural development strategies that reduce conversion of non-agricultural land to agricultural activities.

10. In the future, most direct increases in agricultural GHG emissions can be expected to take place in regions where crop and livestock production increases, leading to more CH_4 and N_2O emissions. Hence policies and programs to manage CH_4 and N_2O emissions will be particularly important.

[2] Other negative consequences include loss of biodiversity and changes in ground and surface water availability.

11. To compare practices and systems there is a need to consider all emissions generated both directly and indirectly. There is an urgent need for a better assessment of various farming systems taking into account all emissions, direct and indirect.

12. Producing animal products from vegetal and feed input involves biological processes and associated energy requirements and losses, meaning that 1 calorie of animal product requires the production upstream of more than 1 calorie of plant origin to feed the animal. Therefore the proportion of livestock products in a diet is one of the key drivers of its emissions. Slowing the global growth in consumption of livestock products will help to slow the growth of agricultural and food sector emissions. However, many livelihoods depend on livestock, and ruminant animals are very valuable since they can digest cellulose and agricultural residues. Furthermore, in developing countries where indigenous diets include animal protein, high quality protein from livestock products (milk, meat and eggs) will help to improve nutrition.

13. Reduction of food losses and waste could also contribute significantly to mitigate GHG emissions.

14. The last decade has seen a very large increase in the amount of cropland devoted to growing crops for biofuels, both ethanol and biodiesel. Biofuel policies have been criticized on the grounds that they can lead to increased food prices (and hence reduce food security) and that they do little to reduce and may even increase greenhouse gas emissions. There is little evidence that the majority of current policies associated with first generation biofuels contribute to climate change mitigation. The HLPE will review the role of biofuels with respect to food security in a study to be released in 2013.

Recommendations

1. Integrate food security and climate change concerns

Policies and programs designed to respond to climate change should be complementary to, not independent of, those needed for sustainable food security. Climate change is one of a variety of threats to food security. Interventions designed to increase general food system resilience are highly likely to contribute to climate change adaptation as well. Efforts to increase expenditure just on adaptation would be better directed toward increasing overall expenditures on sustainable food security with particular attention being paid to the unique and uncertain threats from climate change that require action today (public, private and other sectors). In doing so, farmers should be put at the center and location-specific approaches ensuring the needs of communities devised, and taking advantage of their knowledge.

1 a) Increase immediately investments for food security and resilience to climate change

Even without the threats from climate change, meeting food security goals will require substantially more investments to increase productivity. They should also be aimed at increasing the general resilience of the food system.

Investment in the physical infrastructure that allows food producers to be connected to markets and for large urban areas to be supplied with food is critical for general food system resilience and food security. Investments are needed to improve the transportation and marketing infrastructure.

The likely greater frequency of extreme events will increase the risk of disruption of supply networks and place an increased premium on diversified sourcing. Food chain intermediaries and retailers may need access to greater reserve stocks. Investments are also needed to facilitate stock holding and reduce food losses.

1 b) Refocus research for adaptation and mitigation to address a more complex set of objectives, and invest in public research for adaptation.

Research on agriculture should fully integrate climate adaptation and mitigation aspects. Though research to increase yields is essential to meet broader food security goals, a continuing and accelerating refocusing of research to address a more complex set of objectives is required to meet the challenges of making food production sustainable and responding to climate change. Assessment of neglected crops, fruit and vegetable productivity; effects of stress combinations; biodiversity and agrosystem efficiency and the efficient provision of ecosystem services, deserve more attention.

Research on mitigation practices should take into account their impacts on food security.

Refocusing research will require meaningful engagement and involvement from the start with farmers and the intended beneficiaries, and a genuine dialogue to understand their needs, taking into account the difficulties that can exist in obtaining the views of women and disadvantaged groups.

1 c) Modernize extension services

Modern revitalized extension services based on different funding models that can involve the public, private and civil society sectors, are urgently needed to face the food security challenges from climate change. To make sure that productivity and resilience enhancing technologies are adopted, extension programs should target those who make the management decisions. A 21st century extension service should work closely with research and the private sector and civil society to increase skills in raising yields sustainably and in dealing with the challenges of climate change.

1 d) Build capacities

In many countries, the physical, institutional, social, biological, and human capacity to deal with climate change and food security challenges is not adequate. Also essential is investment in human capital, particularly education and health infrastructure to build resilience to food insecurity and be aware of and respond effectively to climate change risks.

Information for adaptation and mitigation is an essential element in building resilience and the capacity of populations and nations to anticipate and manage climate change. Knowledge systems with regard to climate change are dynamic and emerging as more information and research becomes available. Governments and other actors need to strengthen their capacity for responsive and innovative information collection, management and dissemination systems, which can reach everyone, with particular focus on the most vulnerable groups.

Deliberate efforts to build these capacities are urgently needed.

2. Increase resilience of food systems to climate change

Adverse effects of climate change are already apparent in some regions and the eventual effect in all regions is likely to be very negative. Increasing resilience of food systems must be done at every level, from the field to landscape and markets. It generally involves a comprehensive set of actions which have to be coordinated. Farmers and food producers alone cannot adapt successfully to climate change. They need support from government and from the private sector, and there is also an important role for civil society organisations. Climate-change adaptation will certainly require new practices and changes in the livelihood strategies of most if not all food producers as well as other actors throughout the food chain, involving farmers, retailers and intermediaries in the food chain, agri-business, the financial sector and

civil society. It will require action and oversight by governments, international organizations, and civil society organizations concerned with food security and sovereignty, hunger and sustainable development. Adaptation measures have to be specific to local circumstances. Climate change adaptation must take into account socially disadvantaged groups, gender differences and in particular the role of women as decision makers in food systems. Many of the recommendations below would be no-regret as they contribute to sustainable food security even without considering climate change, but all have increased urgency with the growing effects from climate change

2 a) Base adaptation measures on assessment of risks and vulnerabilities

Anticipatory adaptation to climate change requires regular assessment of both risks and vulnerability, updated as more information become available. Middle- and high-income countries are increasingly carrying out regular assessments but nations without this capacity need external assistance. Careful communication of the inevitable uncertainties to policy makers and more broadly is of great importance.

2 b) Facilitate exchange of practices

Examples of strategies for community based adaptation include improved water management practices such as building infrastructure for more efficient irrigation systems and small-scale water capture, storage and use, adopting practices to conserving soil moisture, organic matter and nutrients, using short-cycle varieties, and setting up community-based seeds and grain banks. The main issues here are dissemination of existing information and knowledge, improving human and social capacity and putting in place the policies that support best practices.

2 c) Facilitate greater diversity in the field and give broader access to genetic resources

Diversification of production is a way to increase resilience of farming systems to shocks in an environment of increasing uncertainties. Efficient adaptation will require access (both physical and legal through appropriate intellectual property rules) to genetic resources, both of existing crops, livestock and their wild relatives, as well as varieties that may be used in the future. Crop genes for drought and flood tolerance should be identified and shared. Yield stability traits of species under variable conditions are particularly important domains where more understanding and research is needed. Food producers, public and private sector institutions, research communities, and governments need to increase cooperation and ensure dissemination, distribution and creation of knowledge and transfer of technologies to characterize, conserve and curate genetic resources both in situ and in seed banks, germplasm stores and related facilities to support adaptation to climate change. All that is possible must be done to minimize genetic erosion of the remaining biodiversity both *in situ* and in gene banks. Adoption by all countries of the International Treaty on Plant Genetic Resources for Food and Agriculture, as well as urgent implementation of its articles 5 (conservation), 6 (sustainable use) and 9 (farmers' rights) would be positive steps in this regard. To increase agricultural biodiversity, measures to develop markets for underutilized species and educate consumers about the importance of dietary diversity would help. The Commission on Genetic Resources for Food and Agriculture could consider identifying priority measures and developing a plan of action on the conservation and use of genetic resources for adaptation to climate change. There is an on-going debate on whether the current intellectual property rights regimes support or hinder development and use of improved plant and animal varieties and agriculture biodiversity. The issue of genetic resources, including intellectual property rights and farmers' rights, is a topic the CFS may wish to recommend for an HLPE study.

2 d) Make weather forecasting available to farmers

One of the challenges of climate change is likely to be coping with a more variable pattern of weather. Access to weather forecasting can improve farmers' ability to cope with increased variability and extreme events provided the information can be disseminated in time to those who need it. Suitably resourced and designed information and communication technology (ICT) can provide this link to national meteorological services.

2 e) Develop integrated land-use policies for adaptation

Efficient climate change adaptation will put a greater premium on the development of integrated land-use policies. Changes in precipitation patterns (in particular the frequency of extreme events) and in seasonal rivers flows will increase the importance of optimising water resources at catchment and aquifer scale. Passive policy measures such as the preservation of forests and mangroves can be as important as active interventions. Mechanisms such as REDD (to protect forests) and other means of payment for ecosystem services should also be included among the tools to increase ecosystem and community resilience to climate change. Urban and peri-urban agriculture can also play an important role in the adaptation of cities.

2 f) Facilitate access of farmers to financial services

To enable farmers to make the necessary changes in their systems, governments need to make financial markets more accessible to small-holders. This includes better access to credit and to insurance schemes to cover these investments and better manage financial consequences of weather risk.

2 g) Promote an international trading regime that incorporates the concept of food security and contributes to the resilience of food systems

As a result of the food crisis of 2008, food security has become a more critical issue in agricultural trade negotiations than in the past. The notion of access to supplies is considered today as important as the traditional notion of access to markets. Current WTO provisions and rules are unclear or deficient regarding food security matters and the Doha negotiating mandate does not allow much room to make progress in addressing these concerns. Moreover, climate change will make the challenge of achieving food security much harder, and it is clear that global food trade will have an important role to play in a world facing climate change. Incorporating all these important issues in any future agricultural trade negotiations would be a step in the right direction.

2 h) Prioritize the actions proposed in National Adaptation Programs of Actions (NAPAs)

Adapting agriculture to climate change and having national adaptation plans is globally very important. The NAPAs, submitted to the UNFCCC by the least developed countries, have highlighted agriculture and food security investments as a priority. They provide a starting point for prioritizing new national investments. Priority measures designed by LDCs in their NAPAs should be financed and implemented. Countries should build upon the experience of the NAPAs to prepare national adaptation plans.

2 i) Food and water security in inland areas

Setting up drought contingency funds and building regional strategic grain reserves, as well as farm and household level grain storage facilities, will be important for food security under climate change.

Both the increase of supply and demand management of water should receive concurrent attention for strengthening water security for crops, farm animals, domestic needs and industry. A sustainable water security system should be developed for each agro-ecological region. There should be a participatory water management system that includes farm families, so that local communities have a stake in both water conservation and sustainable and equitable use.

2 j) Ensure people are more resilient to climate-change enhanced water availability risks

Water is a limited natural resource and a public commodity fundamental to life and health, essential to the realization of the right to adequate food. CFS and national governments should promote and develop research and support programmes aiming at promoting universal access to good quality and sufficient water in rural areas. Participatory methodologies and a leading role for communities are key elements in development of efficient and equitable means of collecting, storing, managing and distributing clean water in ways that respect and protect biomes, preserve natural resources and stimulate the recovery of degraded areas.

2 k) Climate change and water in coastal areas

Nearly one third of the human population lives along the coast. Sea level rise is likely to adversely affect both coastal agriculture and the livelihood security of coastal communities. Anticipatory research and action will be needed to prepare coastal communities to meet the challenges from sea level rise and saline water intrusion. Anticipatory action plans for coastal ecological and livelihood security should include the following: (i) Mangrove bio-shields along seacoasts in compatible agro-climatic zones; (ii) Breeding saline-tolerant rice and other crop varieties; (iii) Development of agro-forestry and coastal aquaculture systems of land and water management; (iv) Conservation and use of halophytes – plants that are adapted to high concentrations of salt. Appropriate organizations, such as the CGIAR, may be encouraged to support and participate in such initiatives.

Nearly 97 percent of the global water resources is seawater and there is need for research on sea water farming involving the spread of agri-aqua farms. The cultivation of economically valuable halophyte and salinity tolerant fish species will help to strengthen the food and livelihood security of coastal communities. We therefore recommend the launching of a scientifically designed seawater farming for coastal area prosperity movement, along coastal areas and small islands.

3. Develop low-emissions agricultural strategies that do not compromise food security

Under a “Business as usual” scenario, an increase in food production will mechanically translate into an increase in emissions, but there are many options possible to enable a decoupling of food security and emissions. In considering mitigation policies and programs for agriculture, care should be taken to choose those that do not negatively affect food security. Fortunately, many of these options create synergies between mitigation and enhanced food security.

Considerable GHG emissions from agriculture can be mitigated by better efficiency in the use of resources (particularly land, livestock and fertilizers) and by good management practices that in many cases also increase productivity and enhance resilience. Public policies and programs should target the development and dissemination of these practices and systems.

Mitigation options must not increase vulnerability to food insecurity. Incentive-based systems that target the vulnerable while mitigating emissions and increasing climate change resilience have multiple benefits.

3 a) Reduce land use change for agriculture

Land use change from systems with extensive above-ground carbon (particularly forests) is second only to fossil fuel emissions as a source of atmospheric CO_2 and much of that conversion is into croplands and pastures. Improving crop yields from land already under cultivation is nearly always a more effective way to mitigate GHG emissions from agriculture than expanding cultivated land area. Ending most conversion of forest to cultivation should be a mitigation priority. Any new land brought under production should adhere to the good practices outlined below.

3 b) Adopt farming and grazing practices to, prevent loss of soil carbon and build carbon soil carbon banks and to prevent land degradation

Soil organic carbon content in agricultural lands is highly dependent on management practices. With well-chosen agro-ecological practices, degraded lands can be restored, contributing to food security, adaptation and to mitigation by increased carbon sinks. Urban organic wastes free from pollutants should be brought back to agricultural land to improve agricultural productivity and mitigate climate change, taking into account the direct and indirect costs of doing so.

Policies and programs that increase nitrogen use efficiency have multiple benefits – reducing simultaneously farm input costs, direct and indirect GHG emissions, and off-farm damage to the environment

3 c) Improve livestock and manure management

Emissions associated with livestock agriculture are likely to grow rapidly because of population growth and diet change. Improving productivity to allow farmers to reduce substantially the GHG emissions per unit of output (meat and milk) should be a priority. The benefits of converting manure into bioenergy/biogas and fertilizers through biogas plants include lower net emissions, substitutions of emissions, improved availability of local energy sources, and higher quality fertilizers. Further research is needed in this regard.

3 d) Improve water management in rice fields

Modifying irrigation schemes can significantly reduce emissions from rice fields while saving water and without reducing yields.

3 e) Assess and compare farming systems

There is an urgent need for better assessments and comparisons of various farming systems taking into account all emissions, direct and indirect.

3 f) Manage food consumption for lower emissions in food systems

The role of diet change in reducing the demand for the most GHG intensive food types needs greater attention. Governments should promote responsible consumption, efficiencies throughout the food chain, and reduction of food waste. The private sector should be encouraged to develop products and distribution systems that result in fewer GHG emissions.

3 g) Assess the contribution of various types of biofuels to mitigation and food security

Accounting for the GHG efficiency of biofuels is very complex and compounded with many uncertainties, due to the direct and indirect use of energy in irrigation, inputs, transportation, process, especially nitrogen for the first-generation biofuels, as well as the induced loss of land carbon stocks in case of conversion of forests, wetland, carbon-rich lands in order to grow biofuel crops. Concerns have also been raised on the impact of biofuels on the other environmental challenges including biodiversity, often due to associated conversion to mono-cropping, to the increase of deforestation, threats to natural reserves, and to increase pressures on water supply and water quality problems. Efforts to assess the contribution of various types of biofuels to mitigation are important and must be continued.

3 h) Support farmers to adopt technologies with multiple benefits

Farmers need to be supported to adopt practices that enhance their resilience and food security and that also provide long-term climate benefits. Implementing these changes generally requires an enabling environment, including services and institutions to support farmers, for instance extension services. Also, even if the new practices provide better future incomes, there are barriers to their adoption: up-front costs, income foregone or additional risks during the transition period. These costs have to be covered. Great expectations have been put in carbon finance to bring additional sources of financing, from emitters in developed countries to individual farmers in exchange of emission reduction or carbon storage. However experience has shown that these mechanisms are difficult to implement and not well suited for smallholder agriculture due to the small size of enterprises which increase transaction costs, difficulty and costs of measurement and reporting, and carbon price volatility. Amongst finance tools, market and non-market mechanisms are being explored with different governance schemes (voluntary carbon schemes, Green Fund, etc.). Whatever the type of support or incentives for improving the overall efficiencies of the food system and internalizing the externalities associated with GHG emissions and sinks, it is recommended that mechanisms take into account both the conditions of small holders and the need for prioritizing measures that improve food security while contributing to mitigation.

4. Collect information locally, share knowledge globally, and refocus research to address a more complex set of objectives

The information base available to facilitate policy and program developments to reduce the food security effects of climate change is woefully inadequate. National governments need to improve their efforts. But there is also a need for international data gathering on climate change and its effects to improve information on vulnerable communities, populations and regions.

Local lessons learned can be made much more valuable when shared. The knowledge already gained by farmers about practices that work in their conditions today could prove invaluable to farmers elsewhere in the future. But some consequences of climate change are outside the realm of recent human experience and focused, systematic data generation efforts are needed to develop effective response efforts. Because the benefits cross national borders, knowledge gathering and sharing requires global coordination as well as national programs.

A major increase in the quality and quantity of the biophysical, economic and social data available to policy makers is required. Particular challenges include (i) linking existing and future data sources using global metadata standards; (ii) making use of modern technology (ICT, remote sensing) to harvest real time data; (iv) enabling disaggregated data collection, including at the intra-household level, to identify

drivers of social vulnerability to food security and challenges to mitigation and adaptation; and (v) improving the pipeline from data gathering, analysis and feeding into policy making.

4 a) Collect more biophysical data

Substantial genetic diversity exists in the plants and animals we use for food. But their performance under a range of agroclimatic conditions has not been systematically evaluated. Existing experimental trial data should be supplemented with collection of additional performance information and new trials set up to capture performance characteristics outside of current climate ranges. The quality of existing data about current and historical weather is mixed, with some countries doing a better job than others on collection and dissemination. More needs to be collected and much more needs to be made freely available.

4 b) Monitor existing practices and performance

Adaptation is a learning process. There is much that can be done to adapt agriculture to changing climate using existing knowledge about the social, economic and biophysical aspects of food production. Skills and knowledge currently appropriate for one region might be important in another region in the future. Rigorous evaluation of the effect of mitigation and adaptation interventions for their impacts on the relevant outcomes as well as on food security is needed to ensure there are no unintended negative consequences. Systematic collection and widespread dissemination of this information is essential with modern ICT providing unprecedented opportunities.

4 c) Improve information about vulnerable communities/populations and regions

Major shortcomings in information affect our ability to understand the consequences of climate change for vulnerable regions or groups. Successful adaptation requires greatly improved knowledge of who the vulnerable are and where they live.

4 d) Improve models that facilitate understanding of climate change effects on agriculture

There is a need to improve models and incorporate information about vulnerable communities, populations and regions. Climate models generate vast amounts of data about possible future outcomes but not always summarized in ways that are useful to understanding potential effects on agricultural systems and vulnerable populations. Models that link climate change outcomes to biophysical effects and then to human well-being require much greater development. Modest investments would provide great support to policy makers everywhere.

There is a need for capacity building on the use of models and scenarios, including proper understanding of their limitations and uncertainties.

4 e) Organize regional sharing of experience and knowledge

Adaptation planning is country driven but, in regard to medium to long term needs, it is necessary to promote subregional and regional exchange of views, sharing of experience, cooperation, coordination on transboundary issues such as water, genetic resources, fisheries, transboundary pests and diseases, etc.

4 f) Refocusing research to address a more complex set of objectives

See recommendation 1 b)

5. Facilitate participation of all stakeholders in decision making and implementation

Addressing food security and climate change requires concerted and coordinated involvement and action of many actors, farmers, private sector, and public actors national and international, civil society and NGOs. It is especially challenging as they are very different, sometimes have conflicting interests and there is a need to work with a long term perspective while most of them have to consider short term outcomes first.

5a) Promote debate on the roles of the public and private sectors in safeguarding food security in the context of climate change

The actions of all sectors of society play a role in shaping the food security and climate situation. An important question for the future is how the different sectors of the society can mobilize efforts in the same direction for both world food security and climate change and on how they can complement one another.

Climate change implies greater focus on long-term issues and on socio-economic and environmental vulnerabilities. Given controversies over the evolving roles of the public and private sector for food security in a context of climate change, it would be wise to promote greater debate on the actual effectiveness of public-private partnerships by reviewing experiences on the ground.

The participation of the communities affected, including prior and informed consultation about risks, and the direct and indirect impacts on resilience of small-scale farmers and rural communities, should be ensured.

5 b) Involve all stakeholders in public sector decision-making

The changes on the ground needed for both adaptation and mitigation will be undertaken by many actors along the marketing chain from producers to consumers. The public sector develops and implements the policy and program environment in which private sector decisions are made. Civil society is critical in its many roles from monitor of government and private sector actions, to integrator across diverse interests, and to institutional innovator. Activities to address climate change should be done with explicit attention to addressing the needs of the disadvantaged; it is especially important to focus on the role of women as agricultural decision makers and thus integral to the planning, design, and implementation of policies and programs to address climate change challenges to food security.

5 c) Encourage public-public information- and technology-sharing partnerships to share the value of public goods developed and knowledge gained locally

International cooperation between governments on adaptation and mitigation best practices, as well as sustainable technology transfer, is essential to address the impacts of climate change on food security. Regional programs on climate change and food security can be done as part of regional integration initiatives. Learning the lessons of successful national programs that can work regionally can be shared and can help countries to develop their own programs. But lessons learned in one region today might be important in other regions in the future. Institutions that can transfer learning internationally will be needed for both adaptation and mitigation.

5 d) Increase transparency and civil society participation to improve efficiency and equity

Transparency in public sector decision-making about adaptation and mitigation policies and programs is crucial to improve efficiency and equity. Participation by farmers, fisherfolk, and foresters gives them a voice on design that fosters efficient use of resources. Participation by civil society allows other groups that might be affected by climate change, either directly or through the actions of others, to be better informed about potential activities, and to steer the process towards more equitable outcomes.

Governments should ensure that all stakeholders have a voice in order to guarantee the transparency of the process, exchange information and experiences on the relevant issues related to the policies and actions on food security and climate change.

6. Recommendations for the CFS

6 a) Include climate change recommendations in the Global Strategic Framework for Food Security and Nutrition

The CFS is currently preparing a Global Strategic Framework for Food Security and Nutrition. We strongly encourage the inclusion of the recommendations provided here as key elements of this framework.

6 b) Encourage more explicit recognition of food security in UNFCCC activities

Over the past few years of the UNFCCC negotiations, the need for agricultural adaptation and mitigation has figured more prominently. At COP17 in Durban, the negotiators solicited inputs from member countries and observers on issues related to agriculture, in a view of a decision at the COP18 in Doha (December 2012). A work program of the UNFCCC Subsidiary Body for Scientific and Technological Advice that more clearly identifies the pros and cons of various adaptation and mitigation measures and possible synergies with food security could provide a forum both for organizing existing research and motivating new research of relevance to the negotiations. We recommend it be implemented. We also recommend more progress under the Work Program on Loss and Damage, emphasizing the impacts of adverse effects of climate change in agriculture and food security. Finally, the CFS should request UNFCCC to charge national governments with reporting on how initiatives and policies that are proposed as part of the National Climate Change Action Plans and National Adaptation Plans also address food security efforts.

Developed countries have already accepted the responsibility for financial support for adaptation activities in developing countries as part of the Copenhagen Accord and the Cancun Agreement under the UNFCCC. The CFS should endorse this position and encourage countries to design their support so that it also supports sustainable food security.

6 c) Support climate change adaptation and mitigation in international trade negotiations

The World Trade Organization has ongoing negotiations on improving the world trading regime (the Doha Round). With increasing variability in agricultural production due to climate change, and the potential for trade flows to partially compensate for climate-related shocks in agriculture, we recommend that the CFS support inclusion of negotiating outcomes in the WTO that recognize this role. Similarly, we recommend that the CFS encourage the WTO to support trade policy reforms that facilitate rather than hinder mitigation.

6 d) Enhance the role of civil society

The CFS is unique among UN organizations in that it has an official role for civil society. We encourage the CFS to strengthen the existing channels of participation such as the CFS Advisory Group and to support more civil society activities related to the CFS, such as side events at official CFS and other UN meetings, in particular the UNFCCC conferences, to generate more publicity for, and debates on the reports published by HLPE and the decisions taken by the CFS.

6 e) Support the development of a collection sharing mechanism on international data gathering for climate change and food security

The consequences of climate change cross national boundaries. The effects can only be addressed if data gathering is coordinated internationally using commonly agreed metadata standards. Furthermore, there are great synergies to be achieved by coordinating food security data collection with that of climate change to benefit the most vulnerable regions and populations. The CFS should facilitate a dialogue on improved global data collection efforts for climate change and food security.