

Managing Food in a Climate Constrained World

Sections 47 and 51 Summary

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Through comparative place-based analyses and modeling studies that span the physical and social sciences, the presentations in this session illustrated an expanding understanding of the impacts of climate change on agriculture, the development of new approaches that will be useful in tracking, predicting, and managing climate impacts in agricultural systems, and the dramatic need for integrative analytical frameworks that include evaluation of trade-offs and engagement of decision makers in the development of appropriate responses.

A number of analyses presented in this (and other sessions at the Congress) indicate that the impacts on the agricultural sector are likely to be very large in some regions, with some estimates suggesting crop yield reductions even greater than suggested by the IPCC. Unfortunately, uncertainties are high in such analyses, influenced by nonlinear response thresholds, uncertainties in precipitation predictions and water availability, and assumptions about crop response to elevated CO₂ and temperature. Speakers in the session presented a variety of tools and approaches to track or predict the response of the food system to climate change, including global analyses of hot spots for water scarcity and vulnerability of crop systems, and analyses of the interaction of climate change with other changes in human population and consumption. Such analyses provide important tools for decision-making, as they help identify the most vulnerable people and places, and could potentially assist in setting priorities for investment in adaptation or vulnerability reduction strategies.

Many of the presentations also delved into the question of adaptation and response. Their analyses illustrated some of the management, technological and policy responses that could help to maintain food production under climate change; some of these responses, however, raise concerns about unintended consequences in other resources or parts of the Earth system. For example, regional scale food production systems may be able to adjust to climate change impacts by shifting crops varieties and production areas, but such changes may lead to important trade-offs with environmental water uses or with land use for carbon storage, energy production, or biodiversity conservation. Responses that call for maximized fertilizer inputs may lead to trade-offs with emissions of non-CO₂ greenhouse gases.

To date, we have not established strategies for evaluation or decision making around such complicated trade-offs, and no process for priority setting or for the

site-specific identification of the real win-win opportunities (e.g., such as between increased food production and carbon sequestration). Lifecycle assessment (LCA) was discussed as a tool for evaluating trade-offs between land use decisions related to food, feed, fibre, fuel, other commodities, ecosystem services and conservation, but it is clear such tools need to be standardized (perhaps by an intergovernmental body) before they are useable for comprehensive land use planning by policy makers, employed to incentivize best management practices among agricultural producers, and applied to consumer decision making.

The sessions ultimately called for the development of adaptation strategies that seek to optimize food production under climate change, but that emphasize win-win situations, and avoid to the extent possible trade-offs with other critical aspects of the planet's life support systems. Such strategies will of necessity include metrics and models for prediction and early warning; regional research at the interface of agricultural breeding, management, climate change and social and environmental needs; and decision support and technology transfer efforts.

Most importantly, the development of such strategies will require explicit engagement of managers and decision makers with the research community, so that knowledge, tools and approaches developed by that community are useful, usable, and actually used by decision makers of all kinds. It is clear that the international agricultural research community needs to refocus some of its effort toward in the development of mitigation tools and response strategies; governments must invest significantly in the research and action communities working on adaptation in world food and related agricultural systems, and those communities must take an integrative and coordinated approach in their work.