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Earth Sciences



Scientific Committee
on Problems of the Environment

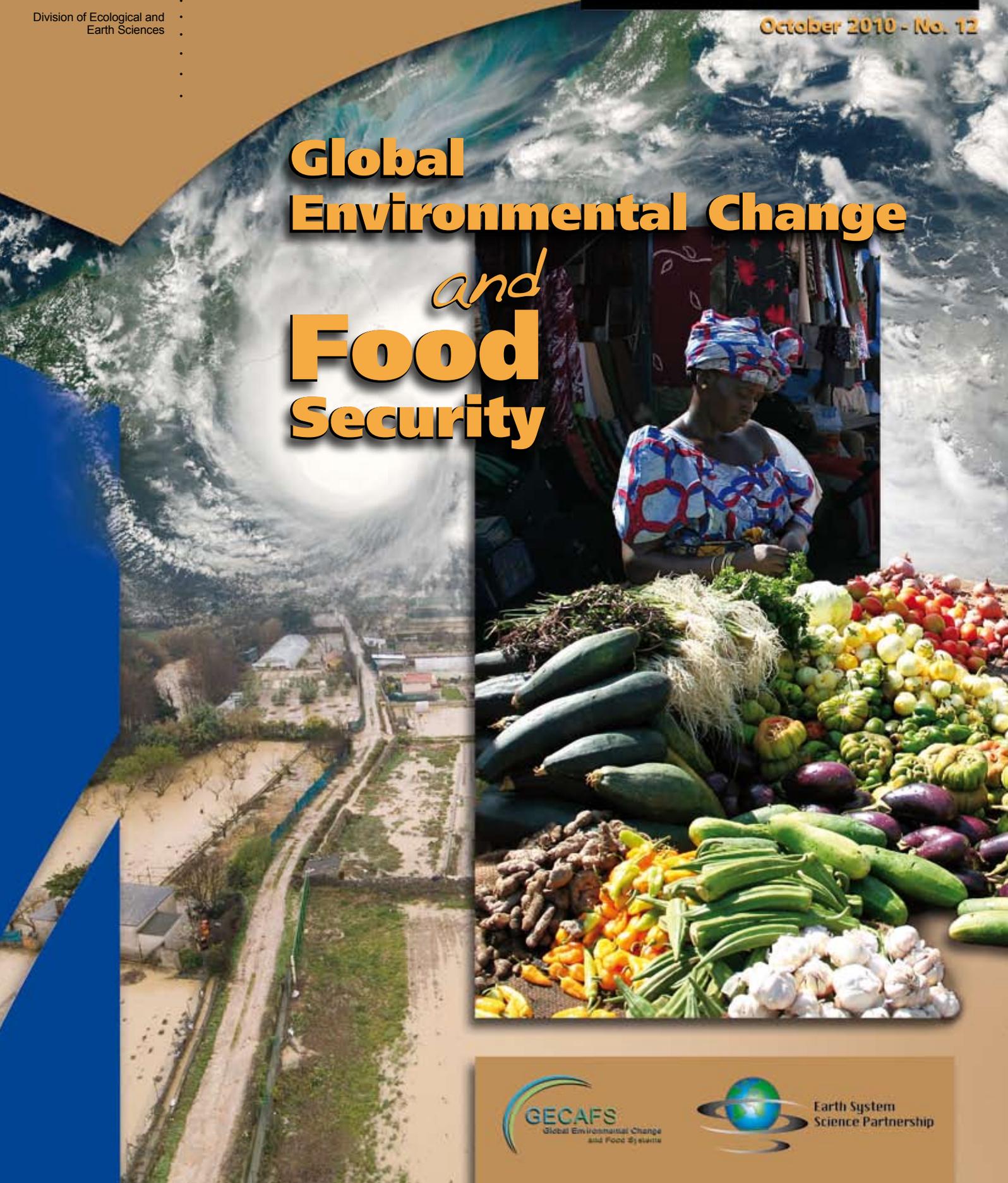


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Global Environmental Change *and* Food Security



Global environmental change: Additional stress for food security

The world produces more than enough food for everyone, yet – even today – over one billion people do not have access to sufficient food and go to bed hungry.

Attaining **food security** for all is clearly more complicated than just producing more food. Besides food production, **food availability** and **food affordability** are critical prerequisites for ensuring food security.

Strongly influenced by social, cultural, political, economic and environmental determinants, food availability depends on food production, distribution and trade, while food affordability relates to food pricing and consumers' purchasing power.

It can be argued that social and economic factors are the main determinants of food security, particularly in the short term.

However, there is growing evidence and concern within and beyond the scientific community that food security will be additionally threatened by **global environmental change (GEC)**.

It is also now well recognized that human activities related to **producing, processing, packaging, distributing, retailing and consuming food**, are partly responsible for changing the world's climate through emissions of greenhouse gases (GHG) and changes in land use. They also contribute to other aspects of GEC, such as changes in freshwater supplies, air quality, nutrient cycling, biodiversity, land cover and soils.

Food security

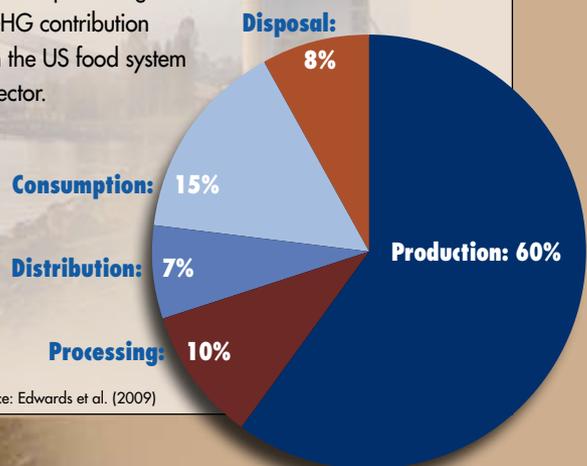
- ▲ **exists** when "all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life". (FAO, 1996);
- ▲ **is based** on stability of three components:
 - food availability;
 - food access; and
 - food utilisation;
- ▲ **is underpinned** by food systems, not just food production;
- ▲ **is diminished** when any component of the food system is stressed.

Global environmental change (GEC)

includes changes in the physical and biogeochemical environment, either caused naturally or influenced by human activities such as:

- ▲ deforestation,
- ▲ fossil fuel consumption,
- ▲ urbanisation,
- ▲ land reclamation,
- ▲ agricultural intensification,
- ▲ freshwater extraction,
- ▲ fisheries over-exploitation, and
- ▲ waste production.

Estimated percentage of GHG contribution from the US food system by sector.



Source: Edwards et al. (2009)

Food system approach as a response to GEC interaction

Risk of conflicts

Three contrasting, dominant discourses about food need to be resolved:

- food as a global commodity;
- food as a product of environmental services; and
- food security as a basic human right.

The close interactions among increasingly globalized food commodity markets have accelerated the transfer of risk for potential conflicts between multiple regions and communities.

In coming years, GEC will increase the potential for associated food-related conflict. In regions of the world that are already food insecure these tensions can – and do – spill over into violence.

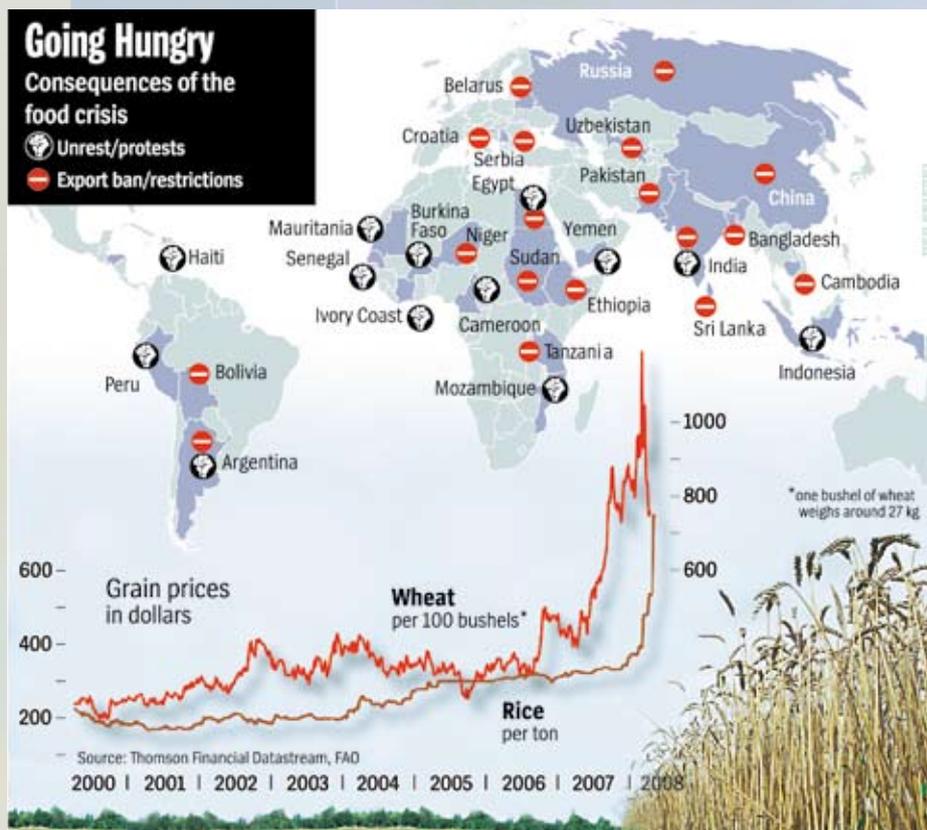
New forms of governance are urgently needed to better manage these tensions as both globalisation and global environmental change continue apace.

Food system approach

Inadequate policy development in one sector can accentuate food insecurity by failing to take account of the full range of food system drivers. It can also lead to unforeseen negative environmental, social and environmental consequences. Trade-offs and synergies need to be considered. These relate to food choices and diets, other socio-economic factors and environmental concerns.

A food system approach systematically connects the activities of food producers, processors, distributors, retailers and consumers involved in food systems to food security and environmental outcomes. It can frame these activities as dynamic and interacting processes embedded in social, political, economic, historical and environmental contexts.

A food system approach can help improve our understanding of the interactions between GEC and food security. It can thus help identify a wider range of technical, management and policy options available to address those interactions.



2008 saw conflict erupt in many countries due to food shortages and price increases. © Der Spiegel 16-2008

Value of a food system approach

Provides a framework for adaptation policy development by:

- ◆ focusing on the food security outcomes of the integrated set of food system activities (producing, storing, processing, packaging, trading and consuming food);
- ◆ encompassing the full set of food security components (food access, utilisation and availability) rather than just food production;
- ◆ identifying the impacts of GEC on food systems, focusing on multiple vulnerabilities in the context of socio-economic stresses;
- ◆ identifying feedbacks to the earth system from food systems (e.g. GHG emissions, impacts on biodiversity); and
- ◆ helping to analyse synergies and trade-offs between food security, ecosystem services and social welfare outcomes of different adaptation pathways.

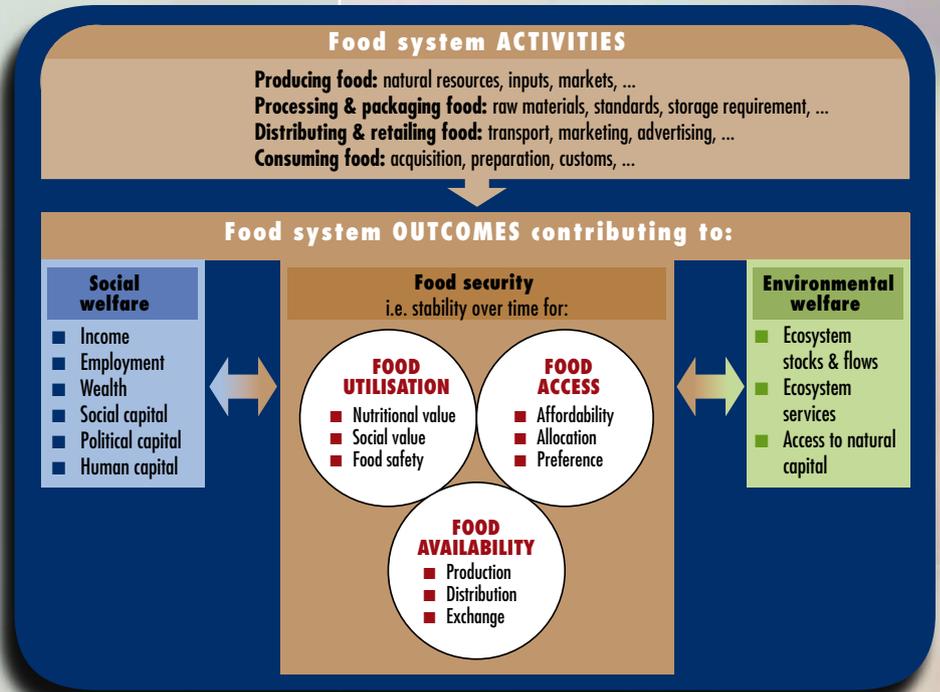
... with food security

Food system concept

Food systems include:

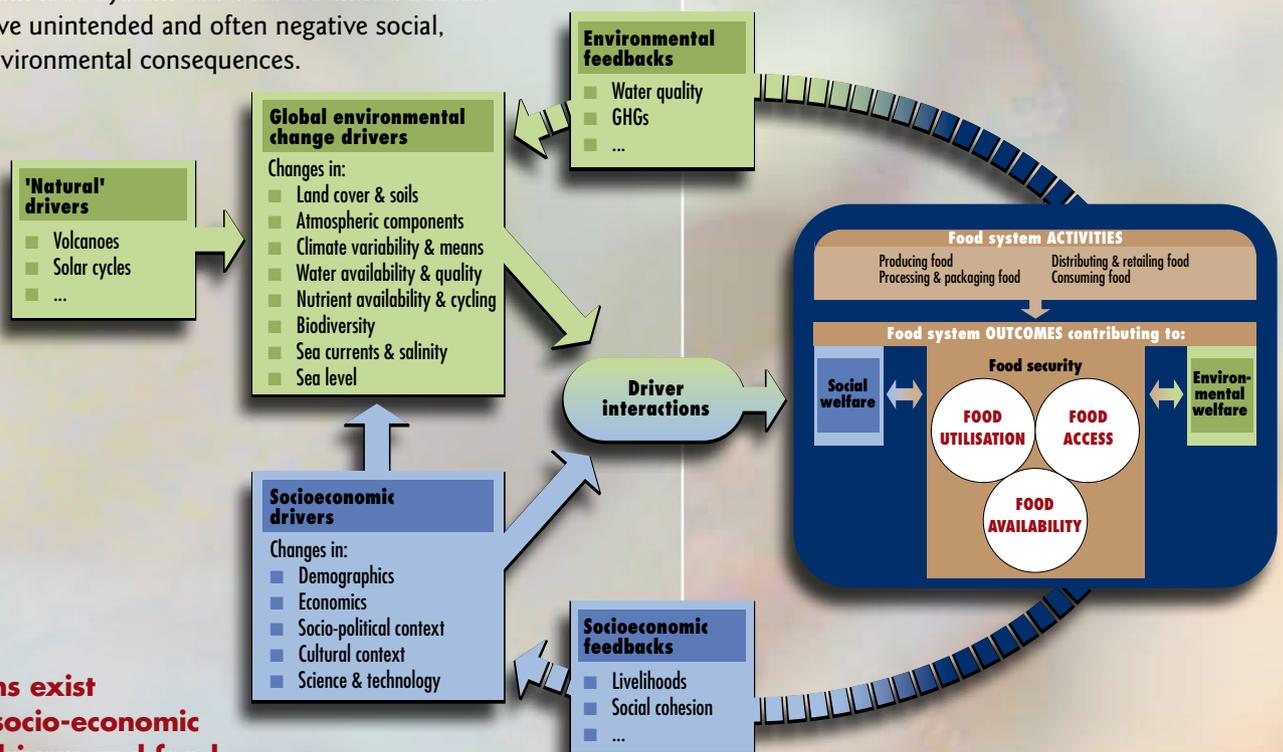
- a set of **activities** relating to producing, processing, distributing, marketing, preparing and consuming food; and
- the **outcomes** of these activities contributing to food security: food availability, food access and food utilisations – all stable over time.

The activities also contribute to a range of other socio-economic (e.g. livelihoods) and environmental (e.g. GHG emissions) issues.



Interactions between GEC and the food system

Feedbacks from food system activities are critical because they may have unintended and often negative social, as well as environmental consequences.



Two-way interactions exist between socio-economic and GEC drivers and food system activities and food security outcomes.

Importance of scales and levels in food security

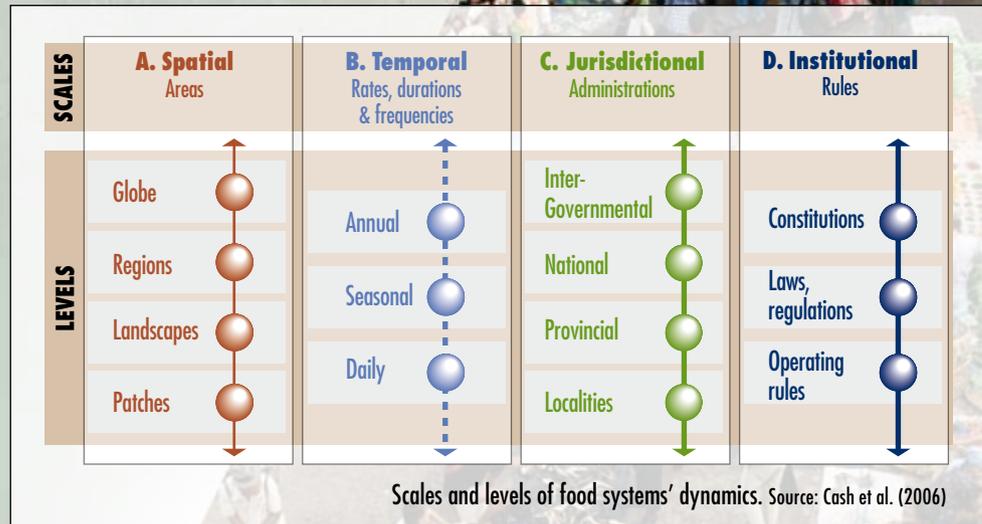
Economic conditions and trade are critically important in ensuring food security.
Market: Photo courtesy of AA World Travel Library

Food systems involve critical interactions between different levels at a range of scales (e.g. spatial, temporal, jurisdictional, institutional).

Policy formulation has to recognize, understand and engage with a wide range of stakeholders operating at different scales and levels.

While a vast body of information is available under the 'food security' banner to assist in policy formulation, it mainly addresses crop or animal productivity (i.e. yield), and mainly reports research conducted at the experimental plot level (i.e. very local) for a given growing season.

However, many issues related to food security involve non-agricultural factors and operate at higher spatial and temporal levels. Cross-scale (e.g. space-time) and cross-level (e.g. local-global; annual-decadal) interactions are crucial and have to be central to food security policy development and management.



Acting at regional level

The regional (sub-continental) level is critical for food security considerations. While clearly not homogeneous in all ways, regions are often defined by shared cultural, political, economic and biogeographical contexts.

Regional governance structures and jurisdictional limits in many parts of the world (e.g. the Caribbean Community, CARICOM; or the Southern African Development Community, SADC) help define a spatial level for innovative food security discussions, especially in the context of GEC.

Region-specific approaches can help identify and raise awareness among policy-makers and resource managers of regional food security strategies that may not be apparent at national or local levels.

Examples of regional-level food security strategies include:

- improving intra-regional food trade to enhance regional economies while reducing dependence on external sources of food;
- reducing food insecurity in time of crisis through e.g. more harmonized quarantine controls at national borders and improved transport facilities speeding the movement of food in an emergency;
- establishing strategic food reserves at regional level.

Key messages for science and policy

The multiple pathways to achieve greater synergy between enhanced food security and improved environmental outcomes require more coordination than presently exists.

Four key challenges:

- Improving the interactions between research, policy and other stakeholder communities by developing or strengthening existing platforms and mechanisms for the exchange of information and ideas.
- Improving the understanding of interactions among food systems operating at local, regional and global levels.
- Addressing mismatches between the capacity of current institutions to manage for both food security and environmental goals.
- Creating an approach to respond to these issues which is sufficiently sophisticated and nuanced but not so complex as to be unachievable.

Innovative research, enhanced science-policy dialogue, and greater institutional and societal flexibility are all needed to address the additional stress GEC is bringing to everyday lives.

- Efficient action on the coupled GEC-food security agenda calls for integrated research at a range of spatial and temporal levels. This more complex type of research requires enhanced engagement of all stakeholders and stronger support from donors.
- Policy and decision-makers who struggle daily with meeting both food security and environmental objectives must be involved in setting research agendas. Including the private sector is also increasingly important.
- Coping and adaptation require changing behaviours. Real research impact will only occur once intended beneficiaries see the benefits of making such changes.

Further reading

- Ingram, J.S.I., P.J. Ericksen and D. Liverman (Eds). (2010) *Food Security and Global Environmental Change*. Earthscan, London.
- Ericksen, P.J. (2008) Conceptualizing food systems for global environmental change research. *Global Environmental Change* 18, 234–245.
- Cash, D.W., W.Adger, F. Berkes, P. Garden, L. Lebel, P. Olsson, L. Pritchard and O. Young (2006) Scale and cross-scale dynamics: governance and information in a multilevel world. *Ecology and Society*, 11, 2.

Useful links

Global Environmental Change and Food Systems (GECAFS):
www.gecafs.org

way forward

COVER

Interactions between GEC and food systems at regional, landscape and local levels bring opportunities as well as threats. Market conditions are as important as agricultural performance in underpinning food security.

Photo credits

Market: Burkina Faso, Wikimedia Commons, Marco Schmidt.
Hurricane Katrina, NASA.
Inundated fields in Navarra, Spain, Gobierno de Navarra.

This

policy brief

highlights key aspects

of the relationship between GEC and food security. It builds on the work of the multi-year international, interdisciplinary research of Global Environmental Change and Food Systems (GECAFS). It addresses the broader issues based on a food systems concept and stresses the need for actions at a regional, as well as international and local levels.

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Edwards, J., J. Kleinschmit and H. Schoonover. 2009. *Identifying our Climate "Foodprint": Assessing and Reducing the Global Warming Impacts of Food and Agriculture in the U.S.* Institute for Agriculture and Trade Policy.