



AGS
secure
ecoservices





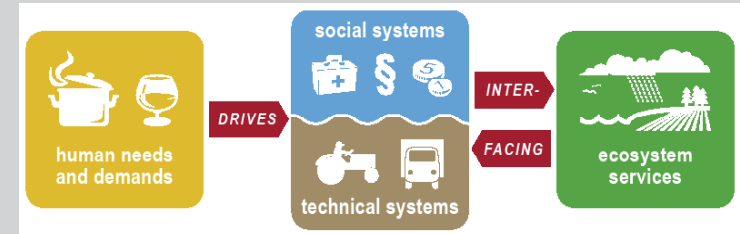
THE ALLIANCE FOR GLOBAL SUSTAINABILITY

The issues around global sustainability – energy efficiency, clean water, fresh air, efficient transportation, sufficient food, and liveable cities – are among the most challenging problems on Earth today. The core of the AGS strategy addressing these issues is a fully integrated style of re- search, education, and outreach aimed at strengthening the knowledge base needed for better decisions, policies, and the development of new technologies.

The Alliance for Global Sustainability (AGS) is a collaboration of four universities that brings together world-class expertise from the member institutions – the Massachusetts Institute of Technology, The University of Tokyo, Chalmers University of Technology, and the Swiss Federal Institute of Technology – to develop research and education in collabora- tion with government and industry on the challenges of sustainable development.

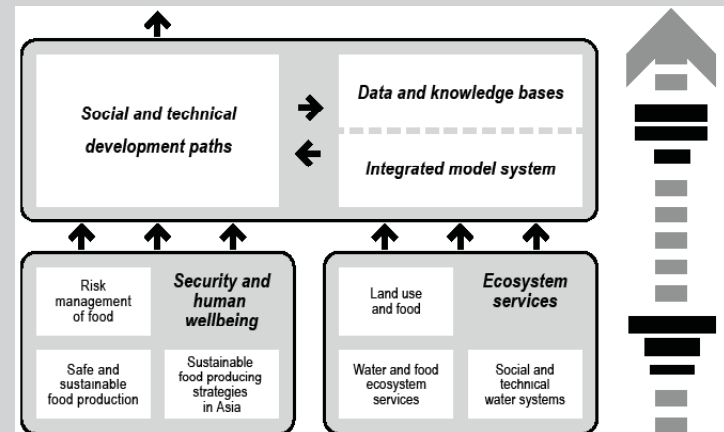
AGS offers a new paradigm of multi-disciplinary and multi-geographical research that draws on the diversity and commonality of the AGS mem- bers. The AGS universities have significant intellectual resources in engineering, social sciences, and natural sciences. The AGS is therefore uniquely positioned to offer not just detailed assessments of technological impacts, but also insights into the challenges associated with the successful deployment of those technologies, in a way that is accessible by decision makers.

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Human needs and demands drive linked social/technical systems and ecosystem services. Food and water, which are the focus for this flagship program, are defined in the Millenium Ecosystem Assessment as provisioning ecosystem services.

The structure of the food and water flagship program. The development paths, databases and modeling components are central to the program and are fed by the supporting projects.



Secure ecosystem services for a nourished world

This flagship program addresses critical issues of food and water for a burgeoning world population over the next 5–15 years. It is increasingly evident that these critical issues require an understanding of the interface between ecosystem services (food and water), society and technology.

The flagship is positioned at the global level and looks to probable development paths during the near-term future, while still considering long-term projections.

A central factor affecting the demand for the provisioning ecosystem services of Food and Water is the development of global population, which will likely reach 9 billion in the next 40 years. Food demand, catalysed by recent economic development in highly populated regions such as India and China, is projected to increase at a greater rate than population growth.

The pressure on Food and Water will also be affected by changing diets and the exploitation of stressed or new ecosystem resources.



"I believe that this program will provide a global platform for identifying development paths that can lead to a nourished world. We build on a decade of AGS research on the provisioning ecosystem services, Food and Water"

Greg Morrison, Chalmers
Secure ecoservices writer



"The survival of our human species relies on us being able to secure safe Food and Water. We will study how the globalization of diets and increasing human demands on food yields and water use can be balanced with the ecosystem services, Food and Water"

Ken Fukushi, The University of Tokyo
Secure ecoservices writer



FOOD AND WATER
FLAGSHIP PROGRAM

Secure ecosystem services
for a nourished world



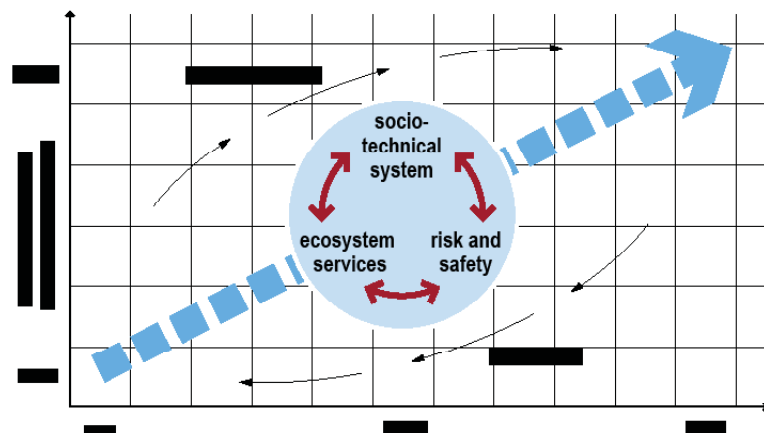
Key questions for a nourished world

Three key areas of questions have been identified which form the starting point for the Food and Water flagship. Sub-questions will be identified with relevant stakeholders, although some examples are given here:

- á. **What are the needs and demands of the global population in a near-term perspective (5-15 years)?**
 - What are the future nutritional needs of a healthy human?
 - What changes in diets are necessary, likely and desirable?
 - How do different diets influence the balance between human demands and available ecosystem resources?
- ć. **What are the full potential resources for food and water services?**
 - What are the global food and water ecosystem services and where are they located?
 - What are the possible and likely substitutions in resource use?
 - What are the limiting factors for food and water services? Examples might include availability and competition for land area, energy, climate, investments, institutions.
- č. **How will we achieve a secure balance between ecosystem resources and human demands?**
 - What are the alternative futures for secure food and water services? What do these futures imply?
 - Who are the actors and institutions involved in a secure future and what needs to be done?
 - What are the pathways to nutritious food and clean water for the poor?
 - What are the social and technical innovations that will make a difference for food and water?
 - What are the social and technical barriers and challenges for optimizing ecosystem services?
 - Will new cropland and aquifers need to be brought into use to meet global human demands in 2020?

Secure ecoservices development paths

The analysis of social and technical development paths is the multi-disciplinary hub for the Food and Water flagship. Technical system development paths will be identified through a unique integrated modelling system that includes bio-physical, economic and geographic perspectives. Social system development paths will involve multi-stakeholder dialogues. The development paths will consider stepwise development, focusing on social and technological changes, on risks and safety and on ecosystem services.



The basis for the program is the identification of development paths towards global nourishment. This requires an understanding of the links between social/technical systems and ecosystem services, as well as risks and safety aspects for the ecosystem services food and water.





1. Security for human well-being:

Risks and safety for secure food and water supply

There is a concern that the current trend towards improved food yields can increase risks through the increased use of agricultural chemicals and d'ggs. Further, the globalization of diets and advances in preservation technologies has lead to a growth of food trade volume.

In Ecoservices we will consider the development paths towards common safety standards for Food and Water and towards sustainable food production systems. The following project areas have now been established:

Risk management of food

The major focus of the project will be the development of identification and determination methods for agricultural chemicals and infectious organisms and their compounds.

Supporting projects include development of determination methods for chemicals in food products, development of a database for the detection of infectious materials in food.

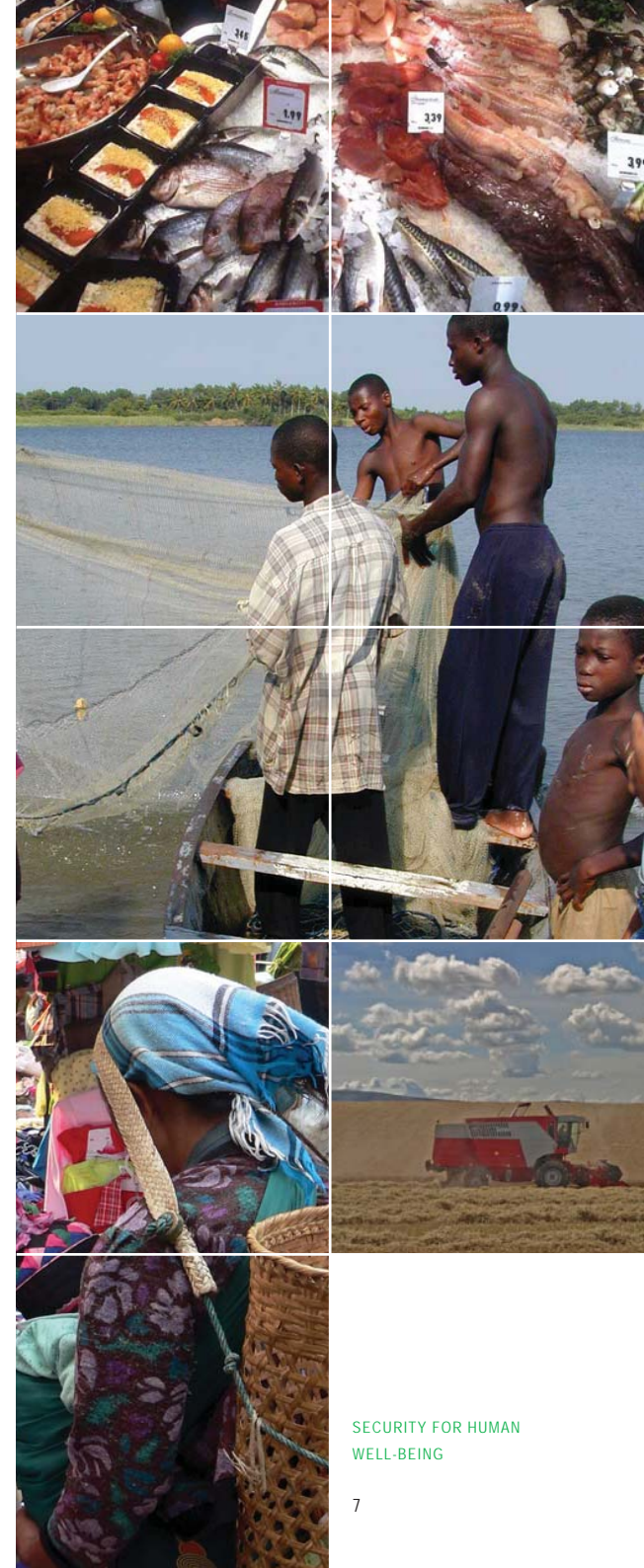
Safe and sustainable food production

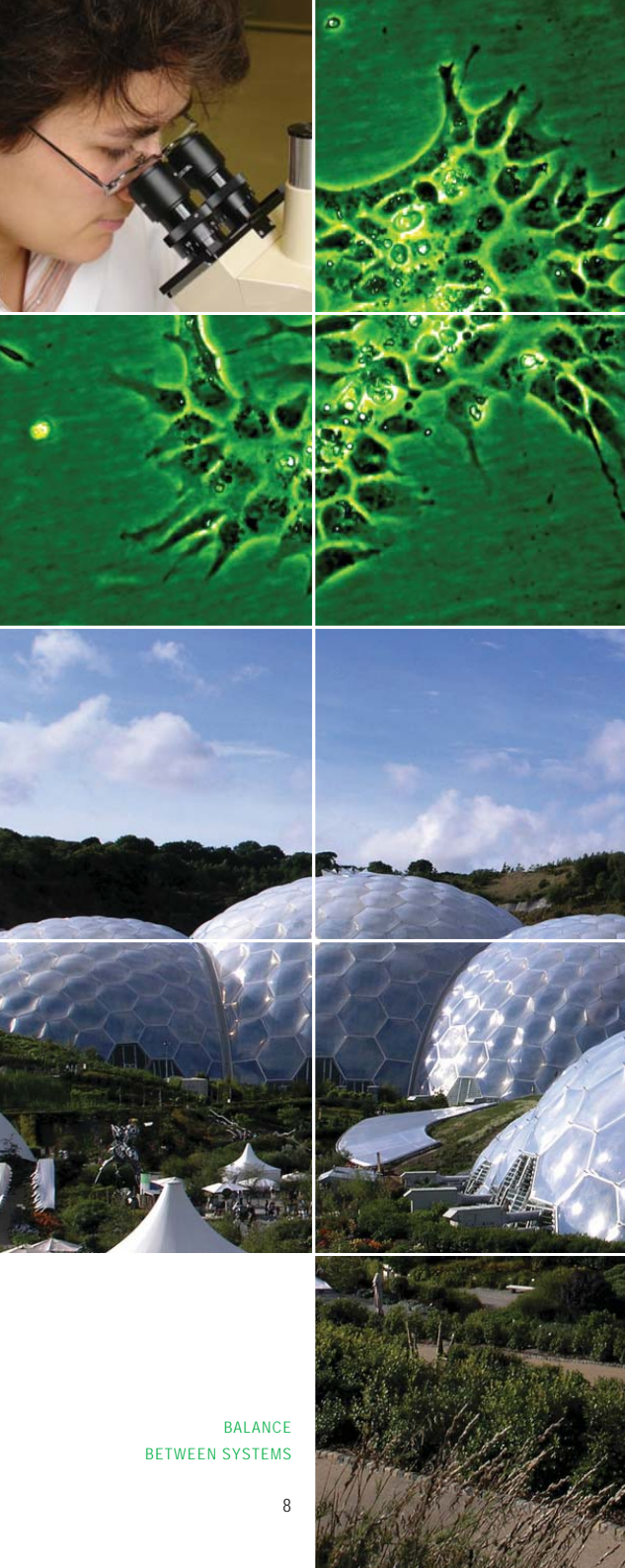
Agricultural fields, coastal areas, lakes and rivers are utilized for food production. In order to provide safe food, the cleanliness of these production areas is very important. Careful consideration will be made to changes in water distribution for food production in the latter part of this century as a result of global warming.

Supporting projects include the identification of methods for safe soil and groundwater environments, development of remediation technologies for soils, sustainable clean water management, water distribution for sustainable food production in Asia.

Agricultural economics for sustainable food production in Asia

This area looks to integrate the other supporting projects on human well-being with predictions of and strategies for food supply in an economic context. A special focus will be Asia with extension to other continents.





2. Balance between systems:

Social and technical systems for provisioning ecoservices

Global evaluations of ecosystem service delivery and their value are becoming a reality. This study will use available scientific and assessment tools and models to undertake a global integrated study and to project future changes in ecosystem services and their associated social and technical systems.

The program will be underpinned by a conceptual project which outlines development paths through the near-term future (5–15 years). The central focus will be the social and technical systems for food and water and their balance with respective ecosystem services.

The program will be supported by central knowledge and databases which will be fed by supporting projects. The knowledge and databases will also be linked to an integrated model system which includes available biophysical, economic and geographic models for the food and water ecosystem services. Supporting projects include:

Strategies for decreasing global land requirements for food while eradicating undernourishment and meeting the demands of a growing world population.

Potentials and strategies for reducing nitrogen losses and related greenhouse gas emissions in the food chain.

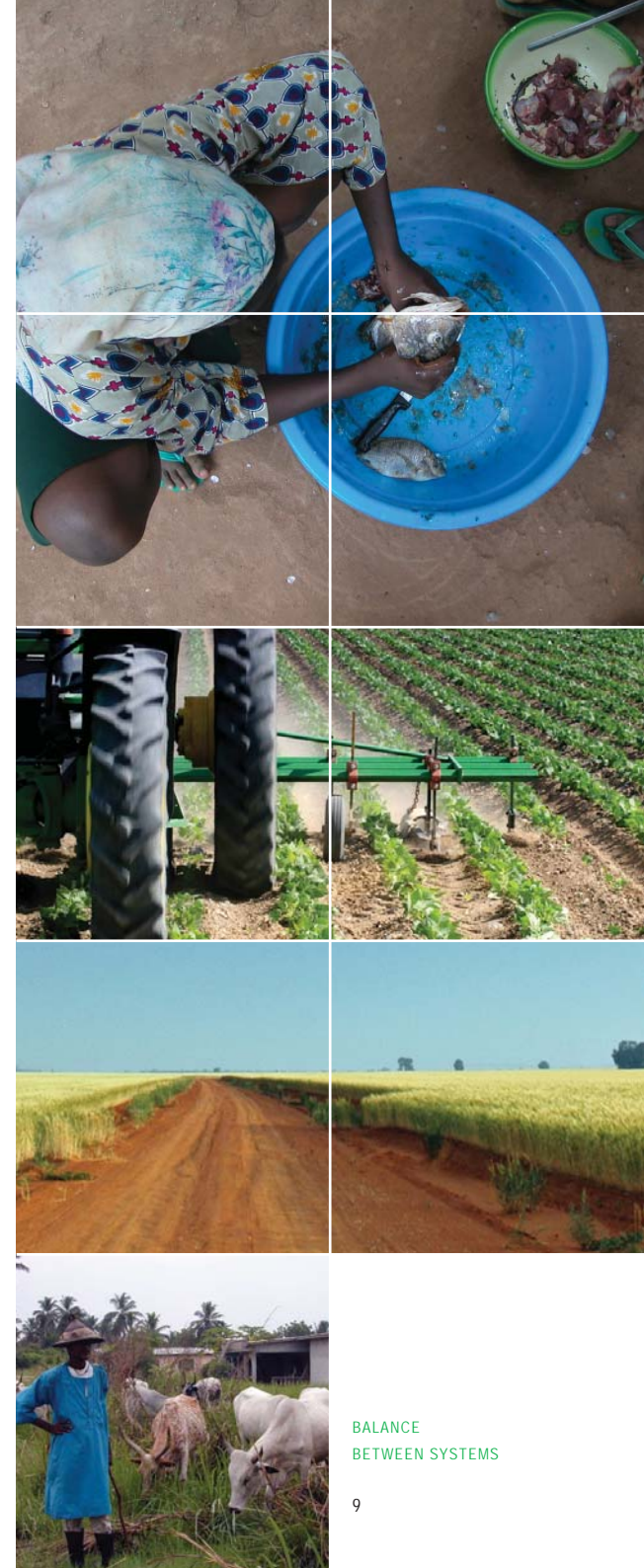
The potential of organic farming; relations to pesticide use and genetically modified crops.

Strategies and policies for delivering multiple services (food, fiber and bioenergy) from scarce land and water resources while decreasing under-nourishment.

Social and technical systems for water and their relation to ecosystem resources.

Evaluation of potential and available ecosystem resources in West Africa.

Improved ecosystem services; innovations in the water sector that lead to a decreased pressure on water resources.





& Education and outreach:

Workshops and dialogues for secure ecosystem services

The identification of development paths for food and water involves a process where the relevant stakeholders interface with the findings from supporting projects and modelling. The aim being to provide projections for the social and technical systems into the near-term future. This actor-oriented procedure provides a suitable platform for outreach with research results integrated into a form for shaping social and technical systems.

The supporting projects will provide a solid research base for global issues in food and water. The two foci on human well-being and ecosystem services will feed directly into education (Education for Sustainable Development, *ĉiĉ*) activities and initiatives, including international workshops and web-based courses.



FOUR UNIVERSITIES

The Alliance for Global Sustainability is an international partnership of four leading science and technology universities:

CHALMERS Chalmers University of Technology, was founded in 1829 following a donation, and became an independent foundation in 1994. Around 13,100 people work and study at the university. Chalmers offers Ph.D and Licentiate course programmes as well as MScEng, MArch, BScEng, BSc and nautical programmes.

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ETH Swiss Federal Institute of Technology Zurich, is a science and technology university founded in 1855. Here 18,000 people from Switzerland and abroad are currently studying, working or conducting research at one of the university's 15 departments.

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MIT Massachusetts Institute of Technology, a coeducational, privately endowed research university, is dedicated to advancing knowledge and educating students in science, technology, and other areas of scholarship. Founded in 1861, the institute today has more than 900 faculty and 10,000 undergraduate and graduate students in five Schools with thirty-three degree-granting departments, programs, and divisions.

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UT The University of Tokyo, established in 1877, is the oldest university in Japan. With its 10 faculties, 15 graduate schools, and 11 research institutes (including a Research Center for Advanced Science and Technology), UT is a world-renowned, research oriented university.

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