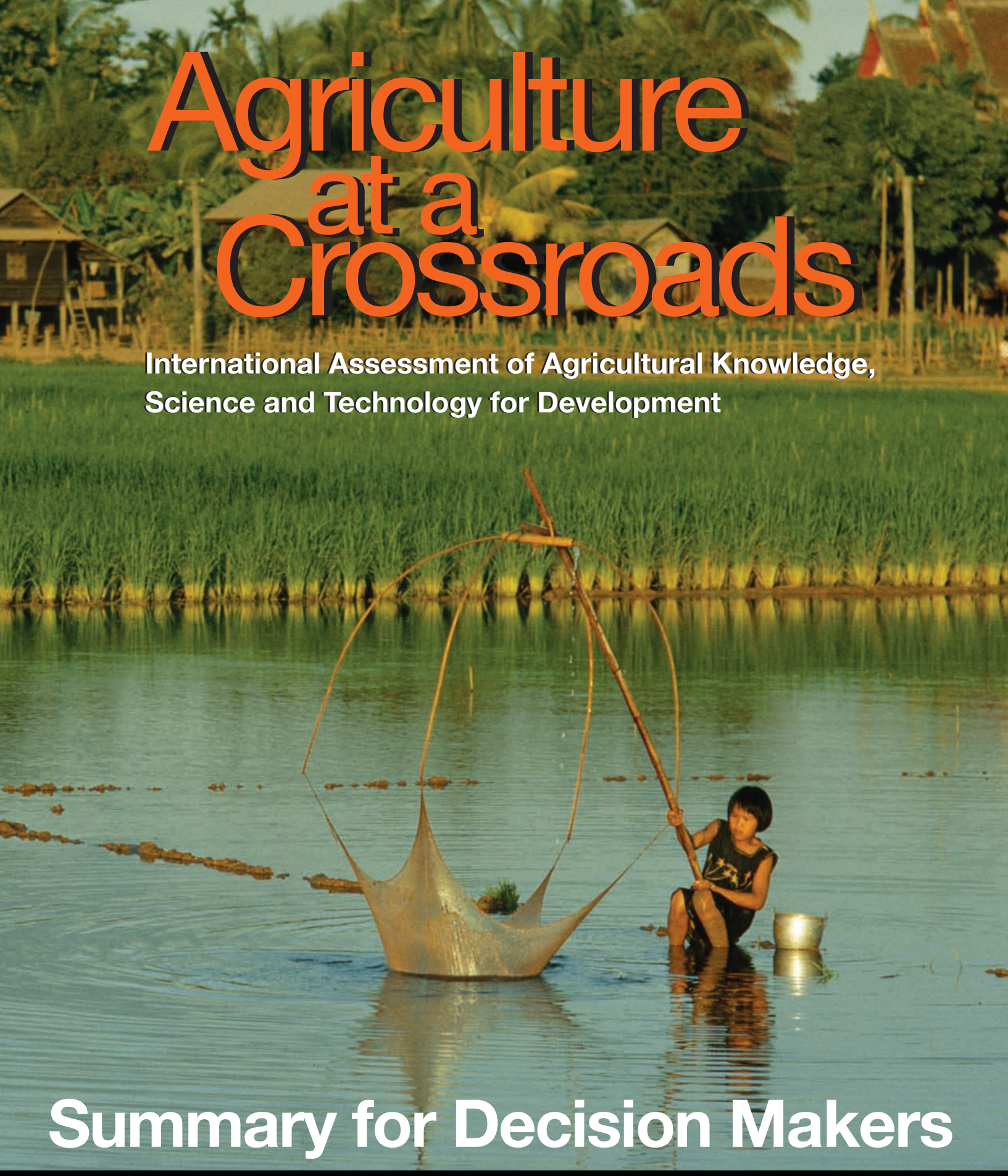

Agriculture at a Crossroads

International Assessment of Agricultural Knowledge, Science and Technology for Development

Summary for Decision Makers

IAASTD

East & South Asia & the Pacific

IAASTD

International Assessment of Agricultural Knowledge, Science and Technology for Development

Summary for Decision Makers of the East and South Asia and the Pacific (ESAP) Report


IAASTD
International Assessment of Agricultural Knowledge, Science and Technology for Development


UNDP
UNEP
UNESCO
THE WORLD BANK
W.H.O. O.M.S.
WHO
GLOBAL ENVIRONMENT FACILITY

IAASTD

International Assessment of Agricultural Knowledge, Science and Technology for Development

Summary for Decision Makers of the East and South Asia and the Pacific (ESAP) Report

This summary was approved in detail by ESAP governments attending the IAASTD Intergovernmental Plenary in Johannesburg, South Africa (7-11 April 2008).

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Contents

Foreword

The objective of the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) was to assess the impacts of past, present and future agricultural knowledge, science and technology on the:

- reduction of hunger and poverty,
- improvement of rural livelihoods and human health, and
- equitable, socially, environmentally and economically sustainable development.

The IAASTD was initiated in 2002 by the World Bank and the Food and Agriculture Organization of the United Nations (FAO) as a global consultative process to determine whether an international assessment of agricultural knowledge, science and technology was needed. Mr. Klaus Töepfer, Executive Director of the United Nations Environment Programme (UNEP) opened the first Intergovernmental Plenary (30 August-3 September 2004) in Nairobi, Kenya, during which participants initiated a detailed scoping, preparation, drafting and peer review process.

The outputs from this assessment are a Global and five Sub-Global reports; a Global and five Sub-Global Summaries for Decision Makers; and a cross-cutting Synthesis Report with an Executive Summary. The Summaries for Decision Makers and the Synthesis Report specifically provide options for action to governments, international agencies, academia, research organizations and other decision makers around the world.

The reports draw on the work of hundreds of experts from all regions of the world who have participated in the preparation and peer review process. As has been customary in many such global assessments, success depended first and foremost on the dedication, enthusiasm and cooperation of these experts in many different but related disciplines. It is the synergy of these interrelated disciplines that permitted IAASTD to create a unique, interdisciplinary regional and global process.

We take this opportunity to express our deep gratitude to the authors and reviewers of all of the reports—their dedication and tireless efforts made the process a success. We thank the Steering Committee for distilling the outputs of the consultative process into recommendations to the Plenary, the IAASTD Bureau for their advisory role during the assessment and the work of those in the extended Secretariat. We would specifically like to thank the cosponsoring organizations of the Global Environment Facility (GEF) and the World Bank for their financial contributions as well as the FAO, UNEP, and the United Nations Educational, Scientific and Cultural Organization (UNESCO) for their continued support of this process through allocation of staff resources.

We acknowledge with gratitude the governments and organizations that contributed to the Multidonor Trust Fund (Australia, Canada, the European Commission, France, Ireland, Sweden, Switzerland, and the United Kingdom) and the United States Trust Fund. We also thank the governments who provided support to Bureau members, authors and reviewers in other ways. In addition, Finland provided direct support to the Secretariat. The IAASTD was especially successful in engaging a large number of experts from developing countries and countries with economies in transition in its work; the Trust Funds enabled financial assistance for their travel to the IAASTD meetings.

We would also like to make special mention of the Regional Organizations who hosted the regional coordinators and staff and provided assistance in management and time to ensure success of this enterprise: the African Center for Technology Studies (ACTS) in Kenya, the Inter-American Institute for Cooperation on Agriculture (IICA) in Costa Rica, the International Center for Agricultural Research in the Dry Areas (ICARDA) in Syria, and the WorldFish Center in Malaysia.

The final Intergovernmental Plenary in Johannesburg, South Africa was opened on 7 April 2008 by Achim Steiner, Executive Director of UNEP. This Plenary saw the acceptance of the Reports and the approval of the Summaries for Decision Makers and the Executive Summary of the Synthesis Report by an overwhelming majority of governments.

Signed:

Co-chairs
Hans H. Herren
Judi Wakhungu

Director
Robert T. Watson

International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD)

East and South Asia and the Pacific (ESAP) Summary for Decision Makers

Writing Team: Shelley Feldman (USA), Dev Nathan (India), Rajeswari Raina (India), Hong Yang (China)

Statement by Governments

All countries present at the final intergovernmental plenary session held in Johannesburg, South Africa in April 2008 welcome the work of the IAASTD and the uniqueness of this independent multistakeholder and multidisciplinary process, and the scale of the challenge of covering a broad range of complex issues. The Governments present recognize that the Global and Sub-Global Reports are the conclusions of studies by a wide range of scientific authors, experts and development specialists and while presenting an overall consensus on the importance of agricultural knowledge, science and technology for development also provide a diversity of views on some issues.

All countries see these Reports as a valuable and important contribution to our understanding on agricultural knowledge, science and technology for development recognizing the need to further deepen our understanding of the challenges ahead. This Assessment is a constructive initiative and important contribution that all governments need to take forward to ensure that agricultural knowledge, science and technology fulfills its potential to meet the development and sustainability goals of the reduction of hunger and poverty, the improvement of rural livelihoods and human health, and facilitating equitable, socially, environmentally and economically sustainable development. In accordance with the above statement, the following governments approve the East and South Asia and Pacific Summary for Decision Makers:

Bangladesh, Bhutan, China (People's Republic of), India, Lao People's Democratic Republic, Maldives, Philippines, Republic of Palau, Solomon Islands, Timor-Leste, Viet Nam (11 countries).

While approving the above statement the following government did not fully approve the East and South Asia and Pacific Summary for Decision Makers and its reservations are entered in Annex A.

Australia (1 country).

Background

In August 2002, the World Bank and the Food and Agriculture Organization (FAO) of the United Nations initiated a global consultative process to determine whether an international assessment of agricultural knowledge, science and technology (AKST) was needed. This was stimulated by discussions at the World Bank with the private sector and nongovernmental organizations (NGOs) on the state of scientific understanding of biotechnology and more specifically transgenics. During 2003, eleven consultations were held, overseen by an international multistakeholder steering committee and involving over 800 participants from all relevant stakeholder groups, e.g., governments, the private sector and civil society. Based on these consultations the steering committee recommended to an Intergovernmental Plenary meeting in Nairobi, Kenya in September 2004 that an international assessment of the role of AKST in reducing hunger and poverty, improving rural livelihoods and facilitating environmentally, socially and economically sustainable development was needed. The concept of an International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) was endorsed as a multithematic, multi-spatial, multi-temporal intergovernmental process with a multistakeholder Bureau cosponsored by the Food and Agriculture Organization of the United Nations (FAO), the Global Environment Facility (GEF), United Nations Development Program (UNDP), United Nations Environment Programme (UNEP), United Nations Education Science and Cultural Organization (UNESCO), the World Bank, and World Health Organization (WHO).

The IAASTD's governance structure is a unique hybrid of the Intergovernmental Panel on Climate Change (IPCC) and the nongovernmental Millennium Ecosystem Assessment (MA). The stakeholder composition of the Bureau was agreed at the Intergovernmental Plenary meeting in Nairobi; it is geographically balanced and multistakeholder with 30 government and 30 civil society representatives (NGOs, producer and consumer groups, private sector entities and international organizations) in order to ensure ownership of the process and findings by a range of stakeholders.

About 400 of the world's experts were selected by the Bureau, following nominations by stakeholder groups, to prepare the IAASTD Report (comprised of a Global and five Sub-Global assessments). These experts worked in their own capacity and did not represent any particular stakeholder group. Additional individuals, organizations and governments were involved in the peer review process.

The IAASTD development and sustainability goals were endorsed at the first Intergovernmental Plenary and are consistent with a subset of the UN Millennium Development Goals (MDGs): the reduction of hunger and poverty, the improvement of rural livelihoods and human health, and facilitating equitable, socially, environmentally and economically sustainable development. Realizing these goals requires acknowledging the multifunctionality of agriculture: the challenge is to simultaneously meet development and sustainability goals while increasing agricultural production.

Meeting these goals has to be placed in the context of a rapidly changing world of urbanization, growing inequities, human migration, globalization, changing dietary preferences, climate change, environmental degradation, a trend toward biofuels and an increasing population. These conditions are affecting local and global food security and putting pressure on productive capacity and ecosystems. Hence there are unprecedented challenges ahead in providing food within a global trading system where there are other competing uses for agricultural and other natural resources. AKST alone cannot solve these problems, which are caused by complex political and social dynamics, but it can make a major contribution to meeting development and sustainability goals. Never before has it been more important for the world to generate and use AKST.

Given the focus on hunger, poverty and livelihoods, the IAASTD pays special attention to the current situation, issues and potential opportunities to redirect the current AKST system to improve the situation for poor rural people, especially small-scale farmers, rural laborers and others with limited resources. It addresses issues critical to formulating policy and provides information for decision makers confronting conflicting views on contentious issues such as the environmental consequences of productivity increases, environmental and human health impacts of transgenic crops, the consequences of bioenergy development on the environment and on the long-term availability and price of food, and the implications of climate change on agricultural production. The Bureau agreed that the scope of the assessment needed to go beyond the narrow confines of science and technology (S&T) and should encompass other types of relevant knowledge (e.g., knowledge held by agricultural producers, consumers and end users) and that it should also include assess the role of institutions, organizations, governance, markets and trade.

The IAASTD is a multidisciplinary and multistakeholder enterprise requiring the use and integration of information, tools and models from different knowledge paradigms including local and traditional knowledge. The IAASTD does not advocate specific policies or practices; it

assessed the major issues facing AKST and points towards a range of AKST options for action that meet development and sustainability goals. It is policy relevant, but not policy prescriptive. It integrates scientific information on a range of topics that are critically interlinked, but often addressed independently, i.e., agriculture, poverty, hunger, human health, natural resources, environment, development and innovation. It will enable decision makers to bring a richer base of knowledge to bear on policy and management decisions on issues previously viewed in isolation. Knowledge gained from historical analysis (typically the past 50 years) and an analysis of some future development alternatives to 2050 form the basis for assessing options for action on science and technology, capacity development, institutions and policies, and investments.

The IAASTD was conducted according to an open, transparent, representative and legitimate process; is evidence-based; presents options rather than recommendations; encompasses risk assessment, management and communication; assesses different local, regional and global perspectives; presents different views, acknowledging that there can be more than one interpretation of the same evidence based on different worldviews, with quantification of uncertainties, where possible; and identifies the key scientific uncertainties and areas on which research could be focused to advance development and sustainability goals.

The IAASTD is composed of a Global assessment and five Sub-Global assessments (Central and West Asia and North Africa – CWANA; East and South Asia and the Pacific – ESAP; Latin America and the Caribbean – LAC; North America and Europe – NAE; Sub-Saharan Africa – SSA). It (1) assesses the generation, access, dissemination and use of public and private sector AKST in relation to the goals using local, traditional and formal knowledge; (2) analyzes existing and emerging technologies, practices, policies and institutions and their impact on the goals; (3) provides information for decision makers in different civil society, private and public organizations on options for improving policies, practices, institutional and organizational arrangements to enable AKST to meet the goals; (4) brings together a range of stakeholders (consumers, governments, international agencies and research organizations, NGOs, private sector, producers, the scientific community) involved in the agricultural sector and rural development to share their experiences, views, understanding and vision for the future; and (5) identifies options for future public and private investments in AKST. In addition, the IAASTD will enhance local and regional capacity to design, implement and utilize similar assessments.

In this assessment agriculture is used to mean agriculture in the widest sense however, as in all assessments, some topics were covered less extensively than others (e.g., livestock, forestry, fisheries, the agricultural sector of small island countries), largely due to the composition of the selected authors.

The IAASTD draft Report was subjected to two rounds of peer review by governments, organizations and individuals. These drafts were placed on an open access Web site and open to comments by anyone. The authors revised the drafts based on numerous peer review comments, with the assistance of review editors who were responsible for ensuring the comments were appropriately taken into account. One of the most difficult issues authors had to address was criticisms that the report was too negative. In a scientific review based on empirical evidence, this is always a difficult comment to respond to, as criteria are needed in order to say whether something is negative or positive. Another difficulty was responding to the conflicting views expressed by reviewers. The difference in views was not surprising given the range of stakeholder interests and perspectives. Thus one of the key findings of the IAASTD is that there are diverse and conflicting interpretations of past and current events, which need to be acknowledged, and respected.

The Global and Sub-Global Summaries for Decision Makers and the Executive Summary of the Synthesis Report were approved at an Intergovernmental Plenary in Johannesburg, South Africa in April 2008. The Synthesis Report integrates the key findings from the Global and Sub-Global assessments, and focuses on eight Bureau-approved topics: bioenergy; biotechnology; climate change; human health; natural resource management; traditional knowledge and community based innovation; trade and markets; and women in agriculture.

The IAASTD builds on and adds value to a number of recent assessments and reports that have provided valuable information relevant to the agricultural sector, but have not specifically focused on the future role of AKST, the institutional dimensions and the multifunctionality of agriculture. These include: FAO State of Food Insecurity in the World (yearly); IFPRI Global Hunger Indices (yearly); InterAcademy Council Report: Realizing the Promise and Potential of African Agriculture (2004); UN Millennium Project Task Force on Hunger (2005); Millennium Ecosystem Assessment (2005); CGIAR Science Council Strategy and Priority Setting Exercise (2006); Comprehensive Assessment of Water Management in Agriculture: Guiding Policy Investments in Water, Food, Livelihoods and Environment (2007); Intergovernmental Panel on Climate Change Reports (2001 and 2007); UNEP Fourth Global Environmental Outlook (2007); World Bank World Development Report: Agriculture for Development (2008); and World Bank Internal Report of Investments in SSA (2007).

Financial support was provided to the IAASTD by the cosponsoring agencies, the governments of Australia, Canada, Finland, France, Ireland, Sweden, Switzerland, Sweden, US and UK, and the European Commission. In addition, many organizations have provided in-kind support. The authors and review editors have given freely of their time, largely without compensation.

The Global and Sub-Global Summaries for Decision Makers and the Synthesis Report are written for a range of stakeholders, i.e., government policy makers, private sector, NGOs, producer and consumer groups, international organizations and the scientific community. There are no recommendations, only options for action. The options for action are not prioritized because different options are actionable by different stakeholders, each of whom have a different set of priorities and responsibilities and operate in different socioeconomic and political circumstances.

East and South Asia and the Pacific Report (ESAP) Summary for Decision Makers

There is nothing more difficult to arrange, more doubtful of success, more dangerous to carry through than initiating change. . . . The innovator makes enemies of all those who prosper under the old order, and only lukewarm support is forthcoming from those who would prosper under the new. Nicolas Machiavelli, *The Prince,* 1513

Governments, private sector, civil society and other major actors in the East and South Asia and the Pacific (ESAP) countries can play key roles in using AKST systems for development, building on their remarkable successes in the last 50 years. Moving beyond their colonial pasts and crises, today the countries of the ESAP region, the key site of the green revolution, are characterized by high levels of food production and rapidly growing centers of manufacturing and services. Notwithstanding these successes, high levels of rural poverty, hunger and malnutrition, gender inequality and social exclusion, environmental degradation and a growing rural-urban divide continue to mar agricultural development processes and outcomes in these countries. Despite dramatic increases in food production, developing countries in ESAP still account for a majority of the world's poor and the highest proportion of the undernourished. Recent price hikes in food items will further aggravate the problem. Though improvements in nutrition are anticipated globally, South Asia is expected to account for over 48% of the malnourished children in the world by 2020 [Chapter 4].

The population of those dependent on agriculture for subsistence and livelihoods is not declining proportionate to the decline in the share of agriculture in the national income in most of ESAP. The size of landholdings is declining and production resources are shrinking. Moreover, the agricultural work force is becoming increasingly feminized and older.

The agricultural sector's development path has led to the erosion and depletion of soil and water resources, the loss of biodiversity, and water and atmospheric pollution that degrades the environment and contributes to global warming. This situation threatens the development of the agricultural and industrial sectors and food security, and demands serious reconsideration in assessing the growth options for the region.

Contexts and Challenges

ESAP is a heterogeneous region with wide variation in agroclimatic zones and biodiversity, levels of economic development, social infrastructure, human well-being and the capacity to respond to disasters and crises. The industrialized and industrializing countries of ESAP have achieved high levels of well-being and are recognized as new centers of manufacturing with the result that ESAP now accounts for a major share of world economic output and economic growth. Agriculture's contribution to the national income and exports in most ESAP countries is declining. While migration into manufacturing, construction and services, whether informal or formal, has reduced the population dependent on agriculture and increased the contribution of remittances to rural income, the share of the population dependent on agriculture continues to be high, even in the rapidly industrializing ESAP countries [Chapters 1, 4].

Most of the region—particularly Bangladesh, Indonesia, China, India, Maldives, the Philippines and Vietnam—is prone to high incidences of natural disasters and has high population pressure on land, along with declining average sizes of agricultural holdings. Some countries, including Australia and New Zealand, however, have lower human to land ratios. The region ranges from some of the most fertile irrigated tracts to dryland agriculture, vulnerable mountain cultivation and coastal ecosystems. It is rich in biodiversity with diverse systems of traditional knowledge that people use to manage their natural resources and production systems. Sixty percent of the ecosystems, however, are degraded or used unsustainably [Chapter 2]. Today, ESAP accounts for the largest numbers of environmentally displaced people in the world, a consequence of natural hazards as well as some planned production enhancing investments, including dams and plantations.

The increasingly female labor force in agriculture often lacks basic services, education and health care. Their limited access to productive assets and essential services further worsens their situation, particularly in South Asia and many parts of Southeast Asia, with high levels of child labor as unpaid family workers [Chapters 2, 3]. More generally, there are high levels of rural poverty in South and Southeast Asia, and in the hill and mountain areas as well as the coastal ecosystems across much of Asia. Historically, the overriding concern in the ESAP region was to produce sufficient food to support its burgeoning population. Although the region as a whole currently produces sufficient food some countries remain in deficit. Many Pacific Island countries are becoming increasingly dependent on food imports. However the main food security concern is to link sufficient production with access by the poor [Chapters 1, 2].

ESAP's growing domestic markets provide a strong base for agriculture. Growing incomes have led to a dietary shift from mainly cereals to animal and milk products, fruits and vegetables. This shift has highlighted issues in the supply

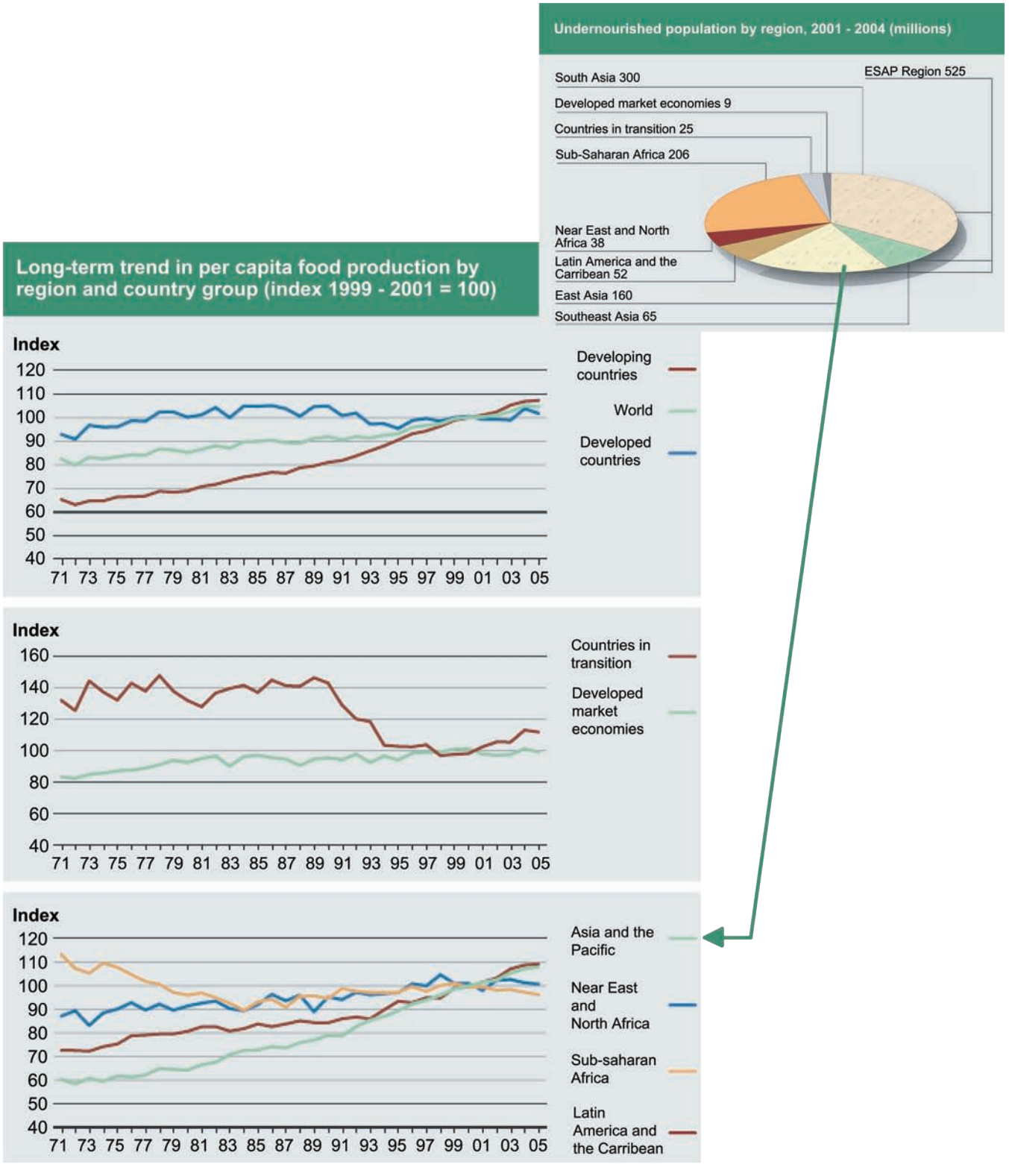

Figure ESAP-SDM-1. *Under-nourishment persists despite growth in food production.* Source: FAO, 2006.

of consistent quality and safe food as well as problems of postharvest care and processing [Chapters 1, 2].

The Green Revolution brought a major change in agriculture based on the extension of irrigation and high-yielding seed varieties responsive to increased doses of nutrients and pesticides and other inputs. Consequently, many countries moved from being importers to exporters of cereals. In fisheries and forestry there has been a shift from the harvesting of wild stocks to cultivated production (aquaculture and plantation forestry) and from extensive livestock farming to mixed farming and intensive commercial livestock production systems.

This input intensive cultivation in various agricultural sub-sectors has led to many of the environmental challenges in the ESAP region. They affect ecosystems, whether forests, arable lands, rangelands (e.g., in China, India and Australia) or wetlands, in terms of their species composition and functioning. Current patterns of agricultural development will increase pollution and environmental degradation including the loss of biodiversity and pose major challenges for agricultural production and poverty reduction [Chapters 2, 4]. Even if corrective mechanisms are put in place through environmental policies, technological and institutional changes, the existing trends of degradation are likely to continue for some years before benefits are realized [Chapter 4]. Notwithstanding the existence of resource-conserving technologies, most of the region is likely to continue to invest in technologies that continue or increase natural resource degradation. With environmental services, both positive and negative, being unpriced in most countries, the latter set of technologies continue to provide higher, short-term returns to farmers. The challenge is for Governments to facilitate environmental costing to enable farmers to respond accordingly in their production and technology decisions.

Natural resources, especially freshwater, coastal waters and arable and forest land, will increasingly be subject to serious pressure from competing sectors [Chapter 4]. Along with continuing increases in agricultural production, intensive agriculture and the tendency to overuse agrochemicals in certain regions and crops will worsen the current degradation of soil and water quality and biodiversity.

Some of the developing countries in the region are paying increasing attention to eco-friendly technologies and policies and investing in natural resource improvement. Pockets of success include diversification into high-value perennials, organic agriculture, agroforestry, renewable energy and community-based NRM projects. The developed countries also invest significantly in environment friendly development. Many governments are parties to the Convention on Biological Diversity and the Cartagena Protocol on Biosafety. More generally, responses range from mandatory assessment of the impact of all programs, technologies, and development interventions on the biological resource base to a ban on all genetically modified crops and organisms. Despite these changes, environmental degradation is likely to increase, along with the worsening impacts of climate change, which will amplify the already existing high incidence of natural disasters in most of ESAP.

ESAP has so far presented a mixed picture with regard to adoption of transgenics. China, Singapore, and India have made significant investments in the state-approved release of transgenic crops, while a number of countries, such as Malaysia and Thailand, are still debating the issue. Japan and many small countries continue their ban on transgenics. There remain significant debates about risks and benefits associated with transgenics (e.g., food safety, human health, environment and socioeconomic). There is a need to develop regulatory and assessment capacities.

Climate change and variability will emerge as major threats to the agricultural sector in most of the ESAP region [Chapter 4]. Projections by the Intergovernmental Panel on Climate Change (IPCC) show that climate change will increase occurrence of natural hazards; increase average air temperatures; change precipitation patterns; increase sea levels with resulting inundation of the coastal areas (low lying islands and deltaic regions are particularly vulnerable); increase soil and water salinity; and provide and new and more favorable environments for pests and diseases. These conditions will have adverse implications for agricultural productivity and livelihoods [Chapter 4]. The frequency and magnitude of these changes in developing countries of ESAP that are already vulnerable to these hazards and dependent on agriculture is of particular concern. Outcomes of these climate related disturbances will certainly be decreases in production and worsening poverty in affected areas, with spillovers.

There are many options available to address these challenges. They pose specific challenges for the different stakeholders (governments, the private sector, and civil society organizations) who work with farmers and the rural poor in different ecosystems in ways that lead to socially and environmentally sustainable outcomes. The options identified and recounted here require that these stakeholders take a keen interest and play a pro-active role in ensuring development. Without this commitment from key decision makers, the downward spiral towards socioeconomic turmoil and ecological degradation may be very rapid and even irreversible. Besides ESAP's own people, the world looks up to ESAP's decision makers to once again reveal the optimism and commitment to action that over the past five decades has kept these massive populations largely famine free [Chapters 2, 3].

Change in Approach to AKST

To meet the goal of environmental sustainability without compromising the social goals of poverty reduction and food security, ESAP countries need to change the content and the practices of AKST. Institutional arrangements and macro-level policies that enable effective linkages of AKST with development stakeholders and goals are also required. This requires a shift from a focus on production enhancing technologies to combining production with environmental concerns. In brief this entails understanding the multiple roles and functions of agriculture. This also entails acknowledging the role of farmers as more than producers of agricultural commodities; they must also be viewed as critical managers of ecosystems.

In a situation of growing competition for water, land and other resources, and increasing environmental challenges, AKST needs technological advances that can increase the efficiency of resource use in diverse environments. Unlike the Green Revolution era that demanded capacities for applied research for crop production, the magnitude and variety of current social, technological, and ecological challenges re-

quires significant investments in the basic sciences as well. The skill base of AKST needs to include social, economic, political and legal knowledge in addition to fundamental scientific knowledge. Institutional reforms within science might include new ways of reporting and evaluating science and technology, new criteria of attribution and causality, and new public/private partnerships, and consultative processes for decision making and learning processes. Increasing regional and international cooperation also are critical in building advanced regional scientific capacity.

Synergies between increased production, improved livelihoods and increased supply of environmental services can help in reducing the costs of meeting environmental sustainability; but it is also likely that, in specific cases, there are tradeoffs between these various goals. The options for actions offered below address agricultural production and productivity, rural poverty, and environmental challenges. While these are presented in this document as discrete actions, they should be read as parts of an integrated approach to using AKST to meet development and sustainability goals.

Options for Action

1. Increasing agricultural production and productivity

With a plateau of productivity in key Green Revolution areas, achieving increases in food and other agricultural production necessitates broadening the base of agricultural growth to include areas of rain fed agriculture and marginal ecosystems. In these areas, the challenges faced by agriculture are only partially constrained by technological possibilities, but more AKST for small scale sustainable agriculture and rainfed or marginal areas is warranted. Institutional changes also are necessary to bring farm households into the cycle of growth and increased productivity. Increasing public investment in irrigation, moisture retention, and infrastructure development, including improvements in market access, depends on a political commitment to neglected regions and crops in national calculations. Growth in these areas also depends on the development of biodiversity intensive farming systems as well as improved technologies for example high yielding varieties for dryland crops, including crops such as oil seeds and pulses that are tolerant to drought, flooding and other characteristics of uncontrolled environments compared to the relatively controlled environment of irrigated agriculture [Chapter 5].

Private sector research, which concentrates on internationally traded crops, is unlikely to find it profitable, at least in the short to medium-term, to invest in the quintessential rainfed crops. Public sector research offers some improved technologies for rainfed crop and livestock production, but some of these have yet to be commercialized and has yet to deliver rural management practices, extension systems and institutional arrangements that can substantially increase production and reduce poverty in the rainfed areas. It may be necessary to substantially increase support for publicly funded research on these crops and regions and to address changes in organizational and institutional arrangements that would create a sustainable cropping system. Focusing only on increasing production and productivity and leaving markets to respond to questions of income distribution and well-being, as has been the general pattern in the ESAP region, may mean that pockets of hunger will persist in the midst of prosperity [Chapter 5].

Advanced information and communication technologies (ICT) will enhance effectiveness of AKST, especially in mountain and remote areas. The increasing knowledge intensive character of agriculture will require information and communication technologies to facilitate rapid dissemination and exchange among farmers, extension workers, researchers and policy makers. AKST effectiveness may be accomplished through context specific, flexible and interrelated decision tools that include e-extension, e-learning modules, and market information systems accessible through mobile technologies and Internet kiosks now used among producers in various countries, such as Bangladesh, China, India and the Philippines [Chapters 4, 5].

There are possible advantages and risks attributable to new technologies such as biotechnology, nanotechnology and precision agriculture. In the case of GM crops there is contradictory evidence of advantages and disadvantages (for example, the claimed reductions or increases in herbicide and pesticide use) [Chapter 2]. However, while the region will continue to invest in biotechnology, more public sector attention will be necessary to focus on poverty-relevant applications of biotechnology that reduce costs, such as that offered by marker-aided selection in plant breeding, animal production systems for vaccines and essential drugs, and other veterinary and environmental applications.

There are possibilities for building competitive advantage in high-value commodities. With higher incomes there is an increase in the share of high value and high quality products, including animal and milk products, in food consumption. ESAP itself is a growing regional market that can offer opportunities for agricultural producers in ESAP who could be encouraged by preferential tariff reductions and special access for least developed countries (LDCs) and small island economies [Chapters 3, 5]. While integrated crop-livestock systems and access to common property resources for herders and pastoralists may become crucial for poverty alleviation, there may be increasing investments in high-technology animal production systems.

A large part of higher value markets, however, are increasingly organized in retail chains. This can marginalize small-scale producers but also provide opportunities for upgrading small-scale production through value-added activities. The share of agricultural incomes can be increased, provided small-scale producers can be organized in cooperatives or producer groups, acquire the necessary capital and technology, develop management skills and overcome problems in dealing with scale requirements, including certification [Chapter 3]. Many small island countries face unique challenges with respect to increasing agricultural production and productivity due to their geographic isolation, small population sizes, limited land area and high transportation and production costs.

The expansion of domestic markets for processed foods and beverages along with growth in agricultural trade has led to increasing awareness of food safety and quality in the region. Despite the acceptance of international food safety regulations such as Hazard Analysis and Critical Control Point (HACCP), with the exception of a few countries,

Major Challenges in the ESAP Region

1. Productivity and quality of agricultural and food systems
   - Increase food production through the enhanced productivity of resource use
   - Build competitive advantage in high value subsectors
   - Improve food quality and safety
   - Broaden the base of growth in rain fed agriculture and marginal ecosystems
   - Change the price equations of production and technology decisions
   - Improve animal disease control
   - Mitigate risk and enhance risk taking capacity
   - Enhance the availability of affordable inputs and credit
2. Rural employment, livelihoods and poverty
   - Reduce high levels of rural poverty
   - Enhance non-farm employment opportunities
   - Reduce gender inequality and social exclusion
   - Develop rural social safety nets
   - Enhance access to and development of markets
3. Environment, science and technology
   - Integrate environmental concerns (for example climate change) into agricultural development and natural resource management (NRM) decisions
   - Reverse the loss of traditional and indigenous knowledge
   - Build capacities in frontier science
   - Build effective systems for the generation, assessment and utilization of science and technology
   - Linking research and extension services

many governments in ESAP have not taken adequate actions to address safety and quality. Responding to emerging human and livestock health issues, such as avian influenza and foot and mouth disease, will need stringent monitoring and biosecurity and biosafety mechanisms within countries and across the region. But in many countries of ESAP water and sanitation remain a major concern and governments may consider ensuring potable water as a basic input to ensuring food safety and health.

2. Reducing rural poverty and enhancing well-being

Increased production and productivity are not goals in themselves, but rather means to achieve the goal of enhanced human well-being. Experience of the last half century shows that production efforts need to be supplemented by other measures (such as access for poor people to land, capital, technology and management skills) in order to increase people's ability to secure improvements in well-being. Complementary policies and interventions that can secure the goal of increased human well-being in rural areas of ESAP are outlined below.

While increased food supply and availability have reduced hunger, and improved human health and nutrition, some parts of ESAP have been adversely affected by some agricultural practices such as use of contaminated water (e.g., heavy metals), and overuse and inappropriate use of chemical fertilizer and pesticides. While indigenous and traditional knowledge have much to offer to nutrition and human health, political and social responses will be critical to enable partnerships with formal AKST necessary to achieve development and sustainability goals.[1]

Increase investment in public goods and reduce resource-use distorting individual subsidies. Subsidies have played a historic role in enabling ESAP countries to develop cereal production. There are pressures for these subsidies to continue to support livelihood of poor farmers and to maintain self-sufficiency in the cereal production of developing countries. With the opening of trade regimes and increasing environmental awareness there is pressure to reduce subsidies that lead to overuse of scarce resources and to increase investment in public goods, including in infrastructure (irrigation and roads), research and knowledge. Incentives may be extended for adoption of environment friendly technologies.

To the extent that subsidies are used, they are more effective when they are aimed at bringing about desired changes, rather than used to support uncompetitive livelihoods. Many countries have favored conservation-oriented policies focused on forests and rangelands. The shift to plantation forestry in Asia in order to protect existing natural forests offers valuable lessons for policy makers. These policy shifts when coupled with institutional support can increase incentives for afforestation and enhance forest-based livelihood options [Chapters 3, 5].

In ESAP agricultural exports account for a small and declining share of exports, which today are dominated by manufactures and services. However, agricultural exports continue to grow and are critical for the largely small-scale producers they support. In addition to trade in conventional (grain, tea, coffee) and new (fruits, vegetables) agricultural commodities, there is considerable scope for developing organic and fair trade markets where social, sustainable and ethical objectives can overlap. For a number of agricultural exports, market instruments that shift some risk to marketers and financiers can be of use in addressing problems of fluctuations and secular declines in price. It also is possible to diversify output, move up the value chain through processing activities and develop alternative crop uses without compromising food security. International trade negotiations to reduce developed country tariffs for processed products, and capacities to reduce the costs of compliance for millions of small-scale producers also can trigger quality improvements in domestic markets [Chapter 3].

Enable rural populations in noncompetitive sectors to shift to non-farm livelihoods. One of the most problematic areas of public policy is that of managing changes in livelihoods. With the increased openness of trade regimes, uneven world markets have led to critical noncompetitive subsectors in the LDCs and developing countries, while in developed countries, such as Japan and South Korea, high standards of living have made many aspects of agriculture unviable.

[1] The Republic of Palau.

Governments of these countries and others in Asia have made the transition from small-scale agriculture to non-farm employment a priority. Yet, given the poor educational levels and training among rural populations, particularly women, the transition has not met the needs of most agricultural producers for alternative decent livelihoods [Chapter 3].

Even as ICTs reduce the cost of acquiring information, investment in general skills development is still required to assist people in shifting towards or adapting to different livelihoods, particularly those in the non-farm sector. Importantly, there is the need to fashion public policy, provide opportunities for adequate non-farm income and build a climate of public opinion to support this strategy to enable once agricultural producers and their children to value the opportunities afforded by new livelihoods such as skilled work in manufacturing or rural industry [Chapter 3].

Producers in the LDCs and small island economies often are unable to compete with either developed country enterprises (given their technological capacity) or with large developing country producers (who able to utilize economies of scale in activities such as processing and marketing). These economies also have limited fiscal capacity to provide the support allowed under WTO regulations. Besides eliminating developed country subsidies, there is a case for providing technical and capacity-building support to producers in such LDCs along with special access rights in regional and global trade. For many small island economies, non-agricultural livelihoods such as tourism, as well as migration, provide the few options available for increasing rural incomes [Chapter 3].

The current difficulty of ESAP food deficit countries in buying rice in international markets shows the limits to the utilization of trade opportunities for national food availability. Along with the promotion of local production, the ESAP countries can consider using their considerable foreign exchange reserves to set up a regionally managed system of emergency food stocks. Such regionally managed food security stocks can also be of use in meeting emergency needs resulting from the frequent natural disasters in the region.

Establish rural safety nets and safeguards for small farmers. Increasing market openness can make livelihoods vulnerable and in the absence of social safety nets force the burden of adjustment for economic downturns to fall on the poorest, particularly women. This burden was evident during the 1990s Asian financial crisis when government interventions were concentrated in urban areas, even as return migrations and reductions in remittances pushed much of the burden of the crisis on the rural economy.

In cases where the reduction of import tariffs have resulted in import surges or increased volumes of heavily subsidized imports, which can have negative effects on small farmers, developing countries should be able to take effective measures to ameliorate the impact on their small-scale agricultural sectors.

In the face of volatile international markets, comprehensive safety net measures and social protection systems can help to secure the well-being of the most vulnerable in situations of risk and uncertainty. The experiences of the Asian financial crisis, the tsunami, frequent floods, glacial outbursts, cyclones and droughts, and abnormal price hikes of essentials in many parts of ESAP have built a consciousness among policy makers and the general public that some of the gains of high growth can and should be used to build safety nets for the poor [Chapter 3].

Ensure gender equity and social inclusion. The feminization of agriculture in most of the ESAP region means that women comprise a majority of the continuing rural poor. But, despite the opportunities gained from growing markets, the benefits that accrue to women depend on their level of knowledge and access to assets and resources. To increase their productivity and share of income they require gender sensitive technology, access to market and capital and secure property rights [Chapter 5]. Moreover it is critical that women be recognized for their role in both paid and unpaid work and as repositories of traditional skills and knowledge.

Religious minorities, low castes and indigenous or tribal people, too, are subject to forms of exclusion. Landless and other poor workers, both seasonal and rural and urban longer-term migrants, face discrimination in access to public services, most crucially in education and health care. Markets are unable to overcome these exclusions, even though it is recognized that the performance of the agricultural economy can be enhanced through the equitable participation of all groups [Chapter 5]. A number of countries in ESAP (e.g., Bangladesh, India) have taken affirmative action in the spheres of education, employment, access to credit and land, etc. to overcome exclusion. These can be taken up more generally in the region.

3. Options to address environmental sustainability

Diverse AKST capacities focusing on new institutional arrangements are required if we are to respond to the changing demands of sustainable production and ecological or biodiversity conservation. Technological and institutional changes are essential to address environmental challenges of the degradation and loss of forest land, and competing demands and degradation of soil and water systems. While AKST has thus far primarily confined itself to production increasing technology generation, it now will need to address environmental sustainability along with productivity enhancing technologies.

Arresting the loss of forests and grasslands. China, India, Cambodia and Vietnam, among others, are currently experimenting with plantation systems to reduce extraction from natural forests [Chapter 4]. In order to reverse the declines in grassland and forest cover, options for action include granting favorable property rights to communities, agroforestry, private forestry and payment for ecosystem services.

Degradation and competing uses of land. Rapid urbanization and industrialization in the region leads to competition for productive land resources. In addition, there are problems of increasing land degradation, declining soil fertility, increasing toxicity and salinity/alkalinity. Projects to reclaim degraded lands for arable purposes will only make a small contribution to future growth in food production. Along

with increases in productivity there is also a need for systems of compensation, payments and other rewards that might increase the supply of environmental public goods linked to particular forms of land use. These can be coupled with stringent environmental regulations that will ensure the most productive and effective use of limited resources [Chapter 5].

Over-exploitation of water. Agricultural production will be increasingly constrained by the declining availability and degradation of water [Chapters 2, 4] with major implications for food production. By the year 2020 per capita water availability is estimated to decline to between 15 and 35% of that available in 1950 [Chapter 4]. These challenges can be effectively addressed by incorporating community-based watershed management and water sharing arrangements, developing alternative irrigation and drainage systems and establishing appropriate charges for the use of water in cultivation (which also promotes cultivation of less-water using crops).

Priorities, especially in water-constrained economies, such as Australia, India and China, will be to increase water use efficiency in irrigated farming, generate and enable adoption of crops tolerant to water stress, and invest in recharging renewable water sources (groundwater) and their sustainable management. In the least developed and developing ESAP countries, it may be necessary to invest in and plan for multisectoral uses of water including urban water demands.

Degradation of the ecosystem. It is predicted that by the year 2020 nitrogen pollution from food production (fertilizer use and domestic animal waste) and consumption systems will increase by 1.3-1.6 times in East Asian countries from 2002 levels. ESAP continues to invest in production-enhancing technologies that degrade natural resource despite the availability of resource conserving technologies, practices and institutions. They also have yet to offer policies and programs, or encourage participatory institutional arrangements that enable the utilization of these new environment-friendly production technologies [Chapter 4].

Though the genetic engineering of crops and livestock has been promoted as a technological solution to reduce environmental impact (e.g., pollution due to pesticides and herbicides, crop damage from pests and biological generation of pharmaceutical products), in the ESAP region these technologies raise concerns about democratic decision-making and public choice, where decision-making in agricultural science has to be increasingly conscious of the ecological, social and ethical criteria that influence technological choices [Chapters 4, 5].

The environmental technology business in Asia is slated to grow at a rapid pace with national strategies and regional cooperation. It is important to engage both the public and private sector in building capacity to assess, develop and utilize these environmental technologies for agricultural and rural applications. Government support may be necessary to develop markets for various alternative practices such as "green chemistry," biodynamic farming, integrated pest management, organic agriculture and diversified agroecological production systems [Chapters 4, 5].

Mitigation and adaptation to climate change. Agricultural production in ESAP will be threatened by climate change and variability. ESAP is divided into two groups of countries with regard to greenhouse gas (GHG) emissions: the developed countries such as Australia and Japan with high per capita emissions and the developing countries with low per capita emissions. Among developing countries it is necessary to further specify the large economies of China and India whose emissions are still very low per capita but are substantial contributors to current global emissions due to their demographic and economic size.[2] Through emissions from rice cultivation, livestock and deforestation, agriculture in ESAP contributes substantially to GHG emissions.

To mitigate the effects of climate change, AKST development to reduce emissions from agriculture is needed. In order to adapt to climate change, AKST development is required to meet cultivation challenges, such as drought, long inundation, salinity and high temperatures. As water availability will be highly variable over time and space, AKST development also is necessary for conserving water and increasing irrigation efficiency. Pathogens spread due to climate change and new animal diseases will need to be dealt with in order to protect livestock production. The growing demand for biofuels is increasing competition for land leading to conversion of natural forest into plantations, but development of second generation biofuels technology could enable utilization of current poor and marginal lands in an environmentally and socially sustainable manner.

The development of AKST to mitigate and adapt to climate change requires substantial investments in research organizations. For farmers to adopt these technologies targeted financial support will be needed. Payments can be provided to farmers to enable them to switch to technologies that emit less GHGs, or farmers given monetary credits for reductions in GHG emissions. In this way ESAP can contribute to the development of the global carbon market.

Carbon markets are also required to bring about changes in the use of forests. Current payments for afforestation and reforestation can be extended to "avoided deforestation" in the post-2012 era. Since the opportunity costs of not using forests extractively are high in terms of the foregone livelihoods of some of the poorest people of the world (who depend on forests for livelihoods), a system of international payments (through market or non-market methods) would combine equity with reductions in global carbon emissions.

The required technology development, technology transfers and the financing of incentives (either payments or carbon credits) for farmers to adopt GHG emission-reducing technologies all require various types of funding. While carbon markets can provide some of these funds, there may be need for substantial international funding for such transformations. As agreed under the Rio principle of "common but differentiated responsibilities" the developed countries should hold major responsibility for financing these transformations.

It is certain that ESAP will have substantial numbers of "climate change refugees" from low lying and small island

[2] India.

countries, coastal areas and even those with low rainfall. The developed countries may be best placed to finance the required rehabilitation of those whose livelihoods are destroyed by climate change.

Conserving biodiversity. To enhance local involvement and incentives to conserve agricultural biodiversity, governments, the corporate sector and civil society organizations (CSOs) may establish learning platforms which will serve as active repositories of indigenous practices of seed storage, cultivation, and conservation. For the private sector this also may encourage investment in conservation given the increasing importance of bio-prospecting and patenting for industrial and pharmaceutical applications. Alternative cultivation systems, such as ecological agriculture and ecotourism around the theme of genetic wealth, could also increase incentives to conserve biodiversity. Other interventions such as the establishment of biological corridors within a nation would contribute to preserving biodiversity.

Institutional and organizational change. For AKST, further attention to NRM technologies will be constrained by the fact that many resource-conserving technologies remain unused for want of appropriate policy and institutional arrangements [Chapter 4]. The institutional and organizational changes summarized below point to the changes that are required for effective options for action.

There often is a tradeoff between rewarding the development of knowledge through intellectual property rights (IPR) and consequently inhibiting its spread and utilization. Countries may consider regional and bilateral cooperation and the formulation of national IPR systems and providing argumentation for adjusting IPR within the WTO trade rules to meet the needs of small scale farmers and development.

ESAP is a leader in "Open Source Biological Software"[3] which offers a rapidly expanding resource to meet the needs of ESAP's scientific community and industry. Though only a few groups, often limited to closely networked stakeholders, have the capacity to share or utilize this open source data base, institutional alternatives such as these will undoubtedly prove useful for spreading the use of environmental technologies and monitoring systems. Their effectiveness can be enhanced with the evolution of norms for sharing knowledge and information. Governments will have to decide whether IPRs, Open Source Biological Software or a flexible combination of the two will be the most effective tools for knowledge creation and utilization [Chapter 4].

While local and traditional knowledge systems will become mainstream in parts of some ESAP countries, they are likely to decline in other areas of indigenous, mountain and small island communities where many biodiversity hotspots are located, largely in response to domestic and international markets [Chapters 4, 5]. In order for these communities to meet development and sustainability goals, they will need to be multifunctional in their approach to the development of AKST in ESAP. There is an increasing need for investment and new rules for accreditation and access mechanisms in non-formal education, traditional health care, organic agriculture and integrated pest management (IPM). These are options to acknowledge, revive and provide opportunities for economic growth to repositories/practitioners of traditional knowledge.

Institutional arrangements include community-based user committees able to respond to demands for improved NRM with secure user and management rights. The success of these initiatives will depend on both public and private stakeholders (corporations and individual households). Environmental protocols in ESAP also face the problem of a lack of compliance that may demand institutional responses to ensure the monitoring and evaluation of compliance mechanisms. Moreover, institutional alternatives to trade-distorting and environmentally damaging subsidies need to be a continued focus of monitoring and evaluation systems [Chapters 3, 4, 5].

Crucially it is farmers and farm households who make production decisions, responding to market-based price incentives. The various measures detailed above to institute charges for resource use (e.g., water), payments for positive environmental products (e.g., improved water quality) and charges for negative environmental products (e.g., methane emissions) would all enable the internalization of what are now externalities. Changing the incentives of the price system through appropriate rewards and charges can help farmers shift to environment-friendly technologies. Setting this up, however, in relatively open economies is a matter of international negotiations and agreements [Chapters 3, 5].

ESAP offers several institutional alternatives for community-based land management and for the rehabilitation of degraded land and water bodies. These examples reveal that if rights over competing water use are to be equitably resolved there is need for coherent administrative functions and policies and resolution mechanisms that establish and strengthen inter-ministerial coordination, multistakeholder consultations/management, and multi-sectoral dialogue. The effective design of national and regional water policies and appropriate technologies for basin-wide management is also required [Chapters 4, 5].

Given increasing conflicts over natural resources and environmental insecurity evident in disputes over fishing rights and water sharing, ESAP countries also need to enhance conflict resolution systems and regional cooperation, such as those started with avian influenza, to manage priority conservation programs and monitor pest and disease incidence, as well as monitor development and compliance mechanisms [Chapters 4, 5].

In Asia, CSOs and NGOs are increasingly being involved in the policy arena to ensure green development and a sustainable growth pattern. CSOs will also play an increasingly strategic role in the campaign for the right to food and human rights for marginalized and tribal people for whom the pressures for survival are likely to increase under growing environmental and economic pressure. Consequently there is a likelihood that demands to invest in building local capacities for sustainable agricultural and food systems to feed the resource poor people of Asia will also increase [Chapters 4, 5].

When working in isolation existing national, regional and international research institutes, educational, training,

[3] Over one million life science patents and appropriate software exist to make this resource transparent and accessible to users.

ICT and R&D organizations are unable to address the multiple functions of environmentally sustainable agriculture. AKST organizations, therefore, need to increase the involvement of farming communities, enhance research and civil society partnerships, strengthen infrastructure and community resources and widen the participation of non-research stakeholders. Policies and the organization of research also need to consider integrating skills that are currently compartmentalized into laboratory-based science, fieldwork-based extension and hierarchical policy making.

In sum, meeting current and future challenges in ESAP requires recognizing the multiple functions and roles of agriculture. Key demands on AKST are conserving resources without degrading the environment and increasing agricultural production. This includes developing AKST that is able to mitigate and adapt to climate change. The implementation of global, regional and national decisions able to bring about shifts in the utilization of AKST is ultimately the work of myriad farmers, women and men, and farm communities as contributors and end users. Their knowledge of the interactions of the ecosystems they manage, and the opportunities offered to them in terms of improved agricultural and non-farm livelihoods are critical factors in the success of AKST in meeting the challenges of developing environmentally sustainable production that simultaneously contributes to sustainable livelihoods and communities.

Annex A

Reservations by Governments

Reservations on SDM

Australia: Australia recognizes the IAASTD initiative and reports as a timely and important multistakeholder and multidisciplinary exercise designed to assess and enhance the role of AKST in meeting the global development challenges. The wide range of observations and views presented however, are such that Australia cannot agree with all assertions and options in the report. The report is therefore noted as a useful contribution which will be used for considering the future priorities and scope of AKST in securing economic growth and the alleviation of hunger and poverty.

Reservations on Individual Passages

1. The Republic of Palau would like to note that in many small Pacific Island countries human health and nutrition has been adversely affected due to changes in food consumption patterns from traditional local foods to imported foods. These changes have resulted in significant increases in obesity as well diet-related diseases such as diabetes and hyper-tension. This was not discussed in the underlying report.
2. The Government of India does not agree with the word "substantial" at its share in global emission is too low (less than 4%). The statement proposed is "But among developing countries it is necessary to further specify that large economies of China and India whose per capita emissions are still very low and will grow to meet their social and development needs."

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Steering Committee

The Steering Committee was established to oversee the consultative process and recommend whether an international assessment was needed, and if so, what was the goal, the scope, the expected outputs and outcomes, governance and management structure, location of the Secretariat and funding strategy.

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"Although considered by many to be a success story, the benefits of productivity increases in world agriculture are unevenly spread. Often the poorest of the poor have gained little or nothing; and 850 million people are still hungry or malnourished with an additional 4 million more joining their ranks annually. We are putting food that appears cheap on our tables; but it is food that is not always healthy and that costs us dearly in terms of water, soil and the biological diversity on which all our futures depend."

—Professor Bob Watson, director, IAASTD

The International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) , on which *Agriculture at the Crossroads* is based, was a three-year collaborative effort begun in 2005 that assessed our capacity to meet development and sustainability goals of:

- Reducing hunger and poverty
- Improving nutrition, health and rural livelihoods
- Facilitating social and environmental sustainability

Governed by a multi-stakeholder bureau comprised of 30 representatives from government and 30 from civil society, the process brought together 110 governments and 400 experts, representing non-governmental organizations (NGOs), the private sector, producers, consumers, the scientific community, multilateral environment agreements (MEAs), and multiple international agencies involved in the agricultural and rural development sectors.

In addition to assessing existing conditions and knowledge, the IAASTD uses a simple set of model projections to look at the future, based on knowledge from past events and existing trends such as population growth, rural/urban food and poverty dynamics, loss of agricultural land, water availability, and climate change effects.

This set of volumes comprises the findings of the IAASTD. It consists of a *Global Report*, a brief *Synthesis Report*, and 5 subglobal reports. Taken as a whole, the IAASTD reports are an indispensable reference for anyone working in the field of agriculture and rural development, whether at the level of basic research, policy, or practice.

IAASTD
International Assessment of Agricultural Knowledge, Science and Technology for Development

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