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Consultative Process for an International Assessment on the Role of Agricultural Science and Technology in Reducing Hunger and Improving Rural Livelihoods

Background/Process:

The World Bank is leading a global consultative process on a proposed international assessment on how agricultural science and technology can help reduce hunger and improve rural livelihoods over the coming decades. An overview of the process and issues to be considered in the proposed assessment will be presented.

Document: An International Assessment on the Future Role of Agricultural Science and Technology in Reducing Hunger and Improving Rural Livelihoods

Comments:

An International Assessment on the Future Role of Agricultural Science and Technology in Reducing Hunger and Improving Rural Livelihoods[1]

Executive Summary

We urgently need an international assessment on the scientific, technical and institutional issues associated with agricultural production, food (systems, safety, quality, security) and enhancing livelihoods in order to improve the quality of the information available for decision makers on these issues at the national and international levels as well as to provide information useful to farmers and consumers. Because assessments must be demand-driven, owned by all stakeholders and targeted to well-defined user audiences, the World Bank is initiating an international consultative process to develop the appropriate authorizing environment for an assessment, and to determine the objectives and value of an international assessment, the key questions to be addressed, the principles, procedures, and timetable to be followed.

The global community confronts an enormous task: stimulating economic growth in rural areas where 75% of the very poor (90% in Africa) currently reside and ensuring the nutritional security of a world population that is growing in size and evolving in consumption patterns without intensifying environmental degradation, social inequity, or adverse consequences for human health.

This challenge is not only great; it is also urgent. Today access to food—sufficient, safe and nutritious food—is the primary problem for nearly 800 million chronically undernourished people. Yet, unless we act now, the next few decades will almost certainly find us unable to produce agricultural products (vegetables, fruits, meat, fish, forest products and commodities) sufficient to meet the demands of growing populations and changing diets.

Meeting these demands will require productivity increases and product diversification to improve the livelihoods of the poor, protect the environment, and ensure broad-based economic growth. It will also require a policy environment in both developed and developing countries that is grounded in equity, that addresses key issues such as trade, IPR and land tenure, and that enhances agricultural productivity while encouraging the sustainable use of natural resources.

Over the next 50 years the global population will increase to 8-10 billion, requiring advances in scientific knowledge across a broad range of agricultural endeavors—developing more productive food and commodity cultivars, improving nutritional quality of crop and livestock products, reducing food and commodity yield losses due to pests and diseases, ensuring healthy livestock, developing sustainable and responsible fisheries and aquaculture

[1] This paper is intended to respond to explicit demands for an assessment (e.g., UN Secretary General Kofi Annan/InterAcademy Council on Food for Africa; New Partnership for African Development) and implicit need (social concerns about technology). We are grateful to the scores of people who have contributed to the development of the paper.

practices, optimizing the use of forests, managing water more efficiently, protecting and improving land productivity, and conserving and managing genetic diversity.

Increasing our knowledge will require a focused and appropriate research agenda supported by renewed public investment in agricultural R&D. In the past century, significant public investments triggered advances in agricultural science and technology that were indispensable to meeting the needs of a rapidly growing population. Today the rate of growth in public investment is declining; and while private sector investments are increasing, the research they support focuses primarily on commodities produced for OECD markets. Given the time required to translate laboratory research into field applications, we must begin now to generate the type and quality of information needed to put agricultural science and technology back on the public agenda.

Assessing the range of possibilities for meeting the demand for agricultural products and improving rural livelihoods is a multisectoral endeavor, requiring attention to a wide array of economic, environmental, ethical and social considerations. Conflicting views on a number of issues - such as the technological potential and public acceptability of modern biotechnology, the adequacy of existing institutions, and the importance of maintaining and improving the science base - underscore the need for a global dialogue. In light of the urgency and complexity of these issues and others, an international assessment is needed now to provide a comprehensive, multidisciplinary look at issues critical to policy formulation.

Experience indicates that open and transparent international assessments can improve the quality of the information for policy formulation, particularly when the issues are complex and the literature on them is extensive and sometimes contradictory. To maximize impact, assessments must be inclusive and sensitive to the concerns of all relevant stakeholders (governments; industry; civil society, including consumers', farmers', health and environmental groups; the scientific community; foundations; international agencies and conventions; and development banks).

While there have been numerous national and international analyses of specific aspects of the proposed assessment (e.g., projected agricultural trends), decision makers need a comprehensive international assessment that recognizes the broader policy and institutional issues surrounding agriculture, and that takes place within an authorizing environment that includes all relevant stakeholders.

Questions that could be addressed by the proposed assessment include:

- What are the underlying causes of nutritional insecurity and resource degradation and how do we overcome barriers to alleviating hunger?
- What kinds of research need to be performed, where and by whom, to develop technologies improve nutritional security and raise incomes? What are the necessary enabling conditions in relation to policies, institutions and markets, to ensure that farmers can adapt technologies?

- What are the research priorities in agricultural S&T, what levels of investment are needed, what are optimal roles for the public and private sector, and what innovative public-private partnerships can be formed?
- What is the balance of investments between technologies to improve food production and food traits (such as vitamin A enhancement and pest resistance) and methods to improve access to food by the poorest through policy reform, institutional strengthening, trade reform?

A successful international assessment requires: (i) high scientific and technical standards, including a rigorous and transparent peer review process; (ii) independence from political influence; (iii) an open transparent process for nominating and selecting experts that ensures geographic and stakeholder balance; (iv) balanced reporting of perspectives, (v) technical accuracy and quantification of what is known and unknown, including key uncertainties; (vi) mechanisms that promote ownership by stakeholders and decrease the risk of political influence on the scientific findings; and (vii) effective outreach and communication of the process and results. It must also be (viii) broad, embracing issues associated with both risk assessment and risk management; (ix) policy-relevant, but not policy prescriptive or policy-driven (x) demand-driven with a well-defined user audience; (xi) owned and authorized by all relevant stakeholders.

During the next year, an authorizing environment for such an assessment will be developed through extensive consultations with all relevant stakeholders. The World Bank in collaboration with other partners will facilitate a series of multi-stakeholder regional meetings, videoconferences and web-based consultations. The consultative process will be used to establish, *inter alia*, the scope, principles and procedures, management and timetable for an assessment; to build an audience, as well as political, institutional and scientific support; and to secure a sound, multi-stakeholder financial base.

The assessment, authorized by all stakeholders, would be designed to cover the agricultural scientific and technical issues deemed important by the stakeholders. As noted earlier, the precise scope and key questions of the assessment will be developed through the consultative process.

Introduction

This paper briefly outlines:

- The challenge: Reducing hunger and improving rural livelihoods in an equitable and environmentally and socially sustainable manner;
- The role of agricultural science and technology in meeting the challenge;
- The need for, and potential benefits of, an international scientific assessment;
- Developing an authorizing environment for an international assessment;
- Elements and schedule of the consultative process;
- Possible processes and budgets for the assessment

The Challenge: Reducing hunger and improving rural livelihoods in an environmentally and socially sustainable manner

Today nearly 800 million people are chronically undernourished in a world where abundant food exists, but where barriers such as low income, trade policies, civil and political instability, low-yielding farming practices and deficits in infrastructure, inputs and information impede access to food in sufficient diversity, quantity and quality for optimum nutrition. Today the key constraint to feeding everyone is poverty. Yet, unless we act now, within the coming decades we will almost certainly find ourselves unable to produce agricultural products (vegetables, fruits, meat, fish, forest products and commodities) sufficient to meet the demand engendered by increased population and dietary transitions.[2]

Seventy-five percent of the very poor, or nearly one billion people, live and work in rural areas and depend on agriculture for their livelihoods. Meeting the demand will require productivity increases and product diversification to ensure broad-based economic growth capable of improving the livelihoods of the poor.[3] Advances in agricultural science and technology drive increased productivity, and will hence be an important factor in improving nutritional security, stimulating economic growth and reducing the number of poor during the coming decades.

Given that 90% of the food consumed in poor countries is produced locally, the economic and physical well-being of poor countries will turn on stabilizing and increasing agricultural productivity via more effective and efficient practices and technologies. As availability of agricultural products comes to rival access to products, knowledge of where to strike the balance between technologies that enhance production (e.g., pest-resistant varieties) and methods that improve access for the poorest (e.g., institution strengthening) will require more and better information about the impact of agricultural technologies on nutritional security, rural livelihoods and the natural resource base.

The increased productivity associated with modern agricultural technologies and practices has engendered both social and ecological costs and benefits. Globally, productivity losses due to soil erosion, nutrient depletion and salinization are 0.1-0.2% per year compared to productivity gains of approximately 2% per year due to improvements in technology and inputs, but productivity losses can be significantly higher with inappropriate management practices in resource-poor areas, such as parts of sub-Saharan Africa.[4] Prior to the onset of modern practices, productivity increased mainly through land expansion. Developed countries now feed over twice as many people on acreage similar to that cultivated fifty years ago, but in areas that have not been able to take advantage of modern practices, expansion has lead to a significant conversion of natural grasslands and forests to agricultural systems with an associated loss of biodiversity at the genetic, species and ecosystem level. In turn,

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[2] See Delgado *et al*., 1999. Livestock to 2020: the next food revolution. *Food, Agriculture and the Environment Discussion Paper 28. Washington, DC: IFPRI*

[3] Typically, a one-dollar increase in agricultural production generates almost two-and-a-half dollars in overall economic growth (CGIAR, 2002, Harvest for growth.)

[4] See Wiebe, 2001. Natural resources, agricultural productivity, and food security. *Issues in Food Security*. USDA, ERS.

loss of biodiversity, land degradation, and present and projected climate change threaten to reduce agricultural productivity - particularly in the areas where the poorest reside, the tropics and sub-tropics. The most affected populations are those in developing countries who are already undernourished and who depend on agriculture for their livelihoods. Our ultimate goal is to feed the world in a way that respects the need to actively conserve our planet's fragile natural resource base (see Box 1) and that improves the livelihoods of the poor.

Box 1 - Environmental concerns

Soil
About 98% of the world's food energy and 93% of all dietary protein come from land (Smil, 2001) yet
- About 25% of the world's agricultural land area is degraded
- Agricultural land degradation is particularly high in the developing world – e.g., Central America (75%), Africa (20%) and Asia (11%) (Scherr, 1999)

Water
In most agro-ecosystems, water is the most limiting growth factor during most years
- The world's largest food producers may well reach limits for water extraction within two generations
- One-third of the world's population lives in areas under moderate to severe water stress
- By 2025, almost two-thirds of the population will live water-scarce regions in developing countries
- Irrigation uses about 70% of the water available for agriculture, industries and households;
- And about 70% of irrigation water is wasted in run-off or inefficient irrigation systems

Climate
Increased climate variability and long-term changes in climate will hamper farmers' adaptive efforts
- Heat waves, heavy precipitation events, floods and droughts are projected to increase
- Rainfall is likely to decrease in water scarce regions
- Productivity is projected to decrease in the tropics and sub-tropics for almost any degree of warming

Biodiversity
About 7,000 plant species have been cultivated and collected for food by humans in last 12,000 years
- Today, only about 15 plant species and 8 animal species supply 90% of our food.
- Agriculture is the largest single cause of habitat conversion on a global basis.
- Climate change, fragmentation and conversion of ecological systems are leading to the loss of wild relatives.

The role of agricultural science and technology in improving rural livelihoods and reducing hunger

Advances in agricultural science and technology have historically played a critical role in alleviating hunger and rural poverty. Agricultural practices in place today came about through increased scientific and technological knowledge that led to mechanization, improvements in cultivars and management practices, and improved plant nutrient and crop protection technologies. These practices resulted in both increased food supplies and higher incomes. For example, US maize yields before 1935 were stagnant, but with the introduction of hybrid maize, as well as the spread of mechanization, yields began to rise; they increased even more as fertilizer use became common after World War II. In most developing countries, the Green Revolution resulted in reduced cereal prices; wheat yields in India quadrupled and rice yields in Indonesia tripled. Many farmers benefited, but not all and Africa was largely by-passed.

In India and China, the incidence of rural poverty declined as agricultural growth and the purchasing power of rural households rose. Agricultural growth can also generate income and employment growth within the non-farm economy. For example, in Asia for each dollar of additional income created in agriculture another $0.50 to $1.00 of additional income is generated in the local non-farm economy (the multipliers are only about one-half as large in Africa and Latin America). In poor countries, even modest growth in agricultural output can significantly stimulate the national economy.[5]

The unprecedented increases in food production by developing countries in the second half of the 20th century were driven by significant public agricultural research expenditures by governments and donors. Between 1961 and 1985, investments in public research in developing countries grew at 6% annually.[6] Today the rate of growth in public investment is declining; and while private sector investments are increasing, the research they support focuses primarily on commodities produced for OECD markets.

Advances and improvements such as enhanced nutritional value of crops, improved pest and disease resistance, vaccine delivery, improved water management and decreased harvest and post-harvest losses, may increase returns and stimulate economic growth, especially in the light of projected environmental changes. Yet, to what extent are they possible, and if they are possible, what are the associated social and ecological costs and what is an acceptable framework for analyzing the risks and costs associated with different technologies and practices given enormous resource disparities? Most importantly, producer and user acceptability of any technological path will be critical to ensure that investments generate the desired returns of reducing hunger, improving rural livelihoods and conserving the natural resource base.

The importance of public acceptability of agricultural technologies is evident in several contemporary contentious debates. One of these concerns the extent to which research should be directed toward environmental issues such as climate change, loss of biodiversity, soil degradation and water pollution versus farm-level technologies for improving crop, fisheries, forestry and livestock production. Popular ideas about resource scarcity are being challenged with data from China and Indonesia, which suggest that soil productivity improves in areas peripheral to cities offsetting soil losses due to urbanization.[7] And biotechnology, which has been around for thousands of years, has recently become a particularly contentious issue with the advent of modern biotechnologies such as transgenics. Proponents of transgenics technology point to successes such as reduced need for pesticides in the production of Bt cotton, and state that adverse human health and environmental consequences can be avoided through risk management and biosafety procedures. Opponents argue that the trials that produced these results are limited in time and space and thus the risk assessments

[5] See Hazell and Haddad, 2001. Agricultural research and poverty reduction. *Food, Agriculture and the Environment Discussion Paper 34, Washington DC: IFPRI*
[6] World Bank, Investment in Research, Topic Brief AKIS.
[7] Lindert, P. 2001. Soil change and agriculture in two developing countries. In: *Agricultural science policy: Changing global agendas*, ed. J.M. Alston, P.G. Pardey, and M.J. Taylor, IFPRI, Johns Hopkins Univ. Press.

underestimate the risk potential, because insufficient information exists to quantify longer-term risks.

Dialogue about issues such as these is critical if policymakers and the public are to get the information they need to make meaningful decisions about how to safely feed the world and improve rural livelihoods. As the UK Deputy Prime Minister, John Prescott, cogently stated: *"Discussions must be pursued on the basis of rational, factual and honest debate – global problems require global solutions and global consensus based on facts, reason and free and open discussion."*

Why do we need an international assessment, why now and the potential benefits of an assessment

International scientific assessments have been the basis of both national and international policy formulation for a number of critical issues, including stratospheric ozone depletion, global climate change and loss of biological diversity. Assessments have proven particularly valuable where the issues are complex and urgent and the available literature is extensive and sometimes conflicting. They guide and stimulate public and private sector research and investment by identifying the key scientific and policy uncertainties in areas of importance to policymakers. An international assessment requires: (i) high scientific and technical standards, including a rigorous and transparent peer review process; (ii) independence from political influence; (iii) an open transparent process for nominating and selecting experts that ensures geographic and stakeholder balance; (iv) balanced reporting of perspectives, (v) technical accuracy and quantification of what is known and unknown, including key uncertainties; (vi) mechanisms that promote ownership by stakeholders and decrease the risk of political influence on the scientific findings; and (vii) effective outreach and communication of the process and results. It must also be (viii) broad, embracing issues associated with both risk assessment and risk management; (ix) policy-relevant, but not policy prescriptive or policy-driven (x) demand-driven with a well-defined user audience; (xi) owned and authorized by all relevant stakeholders.

An international assessment on the role of agricultural science and technology in reducing hunger and improving rural livelihoods is urgently needed. Conflicting views on a number of issues – such as the technological potential and the public acceptability of modern biotechnology, the adequacy of existing institutions, and the importance of maintaining and improving the science base –require better and more relevant information for those charged with making decisions critical to the well-being of the poor. Box 2 contains examples of some of the many unresolved scientific and policy questions associated with the role of agricultural S&T in reducing hunger and stimulating economic growth in rural areas. An international assessment would also:

- produce a peer-reviewed assessment of the key policy-relevant issues for achieving agricultural productivity, nutritional security, and food safety goals in an environmentally and socially sustainable manner, while stimulating economic growth in rural areas and improving the livelihoods of rural communities;
- identify key scientific uncertainties where further research is urgently needed;

- enable the setting of a globally coordinated public and private agricultural research agenda, and identify the optimum roles for private and public goods research;
- identify institutions and practices that lead to sustainable agricultural growth;
- identify necessary enabling conditions (institutions, markets, trade) for enhanced impact of agricultural S&T on the rural poor;
- build local and global physical and human capacity; and
- galvanize public awareness.

Box 2 - A sample of possible questions to be addressed by the proposed assessment

- What are the underlying causes of nutritional insecurity and resource degradation and how do we overcome the barriers to alleviating hunger?
- What kinds of research need to be performed, where and by whom, to develop technologies that improve nutritional security and raise incomes? What are the necessary enabling conditions in relation to policies, institutions, and markets, to ensure that farmers can adopt the resulting knowledge?
- Why has the commitment to agricultural S&T declined at the national and international levels? Is it because there is a belief that the food demand of 8-10 billion people over the next 50 years can be met using current production technologies and practices in an environmentally and socially sustainable manner without any further advances in S&T? Is it disenchantment with scientists and scientific organizations? Or does something else drive the decline?
- What are the research priorities in agricultural S&T; what level of investments are needed, what are optimal roles for the public and private sector, and what innovative public-private partnerships can be formed?
- What is the balance of investments between technologies to improve food production and food traits (such as vitamin A enhancement and pest resistance) and methods to improve access to food by the poorest through policy reform, institutional strengthening and trade issues?
- How can we accelerate the diffusion of technologies and approaches that make more efficient use of the biophysical resources on which agriculture depends?
- How can environmental health workers (sanitation and epidemiologists) work with agricultural scientists to create toxin-free work environments and improve nutrition when endemic disease diminishes the efficacy of fortified foods? How do HIV/AIDS, malaria and other endemic diseases affect agricultural production and rural livelihoods?
- Can we improve the gender balance in access to, and control of productive resources; if so, what will be the benefits?
- Do we need labels or ISO numbers to guarantee the environmental and social friendliness of a product?
- Who bears the risks of new technologies? Is an equitable distribution of risk possible given such enormous differences in North-South resources?

Developing the appropriate authorizing environment for an international assessment

The consultative process will involve all relevant stakeholders, *inter alia*, government representatives, private sector,[8] NGOs,[9] consumer and farmer organizations, the scientific community,[10] foundations, international agencies,[11] regional Banks and the UN

[8] Including industries concerned with processing, organic products, fertilizer, etc.
[9] Including environmental, health, agricultural NGOs, etc.
[10] The Consultative Group on International Agricultural Research (CGIAR), Third World Academy of Sciences (TWAS) and the International Council for Science (ICSU), etc.
[11] FAO, IFAD, UNEP, UNDP, OECD, etc.

Environmental Conventions[12] in creating an appropriate authorizing environment for an assessment. The consultations will focus on six broad objectives:

- Defining the scope, key questions, and the principles and procedures of the assessment;
- Developing the political support of stakeholders;
- Building support among potential users;
- Developing ownership and engagement of institutions and civil society involved in agricultural issues and environment and human health;
- Engaging the leading agricultural, human and animal health and social scientists in the design, preparation and peer-review processes; and
- Establishing a sound multi-stakeholder financial base.

The consultative phase will determine the value of the assessment, how the assessment will inform and facilitate policy dialogues, and how it will build upon previous assessments and other relevant ongoing activities. Current efforts do not take the comprehensive analytical approach that is proposed here, nor do they involve all relevant stakeholders within an appropriate authorizing environment. The proposed assessment will evaluate agricultural systems, including the production, marketing, trade and consumption of biopharmaceuticals, commodities, fiber, and bio-fuels in the context of improving rural livelihoods and reducing hunger. The value of the assessment will be a function of outreach and communication during the assessment process. Hence, it will be important to discuss during the consultative process what institutions and processes are currently in place, or need to be developed, to fully utilize the findings of the proposed assessment.

What is the appropriate authorizing environment? Critical issues include: who are the relevant stakeholders; who are the audiences; and what kind of management and oversight structure (e.g., location of the technical secretariat) would best endow the stakeholders with full ownership of the process and its final products? During the consultations, the value of an intergovernmental vs. a non-governmental process will be discussed in the context of solidifying stakeholder ownership.

What are the principles and procedures? The key to success is an open, objective, transparent and credible process. Hence, all stakeholders must together determine the elements of the principles and procedures— including the nomination/selection process for authors and reviewers, the broad structure of the report and the final approval process. Experience with previous international environmental assessments suggests that:

- the assessment must be policy-relevant but not policy prescriptive;
- the assessment should be broad, embracing both risk assessment and risk management;
- different points of view must be discussed and uncertainties quantified where possible;
- technical accuracy and political ownership are enhanced through wide involvement of experts from all nations, stakeholder groups and scientific disciplines;
- peer-review must be rigorous and designed to ensure scientific integrity;
- mechanisms that promote ownership by stakeholders must be balanced against mechanisms that increase the risk of political influence on the scientific findings; and
- effective outreach and communication of the process and results is essential.

[12] UNCBD, UNCCD, UNFCCC.

What is a likely timetable? After the consultative process, which would develop the authorizing environment, establish the broad scope and the principles and procedures for the assessment, the assessment process, including peer-review and final approval, would take about 2.5 years:

- Six to nine months for detailed design and the nomination and selection of lead authors
- Eighteen months for preparation, multi-stakeholder expert review and approval
- Three months for publication and dissemination

What are the budget implications and funding options?

- a diversity of funding sources would ensure that the assessment process is not perceived as driven by any one set of stakeholders;
- depending on the scope, and the modalities used to conduct and peer-review the assessment, the total cost is likely to be US $10-15 million, comparable to the cost of a comprehensive IPCC assessment report or the Millennium Ecosystem Assessment.

Elements of a consultative process to develop an authorizing environment for an international assessment

The stakeholder consultative process must be open, inclusive and transparent. A steering committee inclusive of individuals from all stakeholder groups with geographical and gender balance, will oversee the process. Key issues to be determined include the appropriate number of consultations, the participants at each consultation, and the time and location of consultations. Outreach will include:

- ***Regional consultations*** in Asia, Africa, Latin America, North America, Europe and Countries with Economies in Transition followed by an international consultation;
- ***Regional videoconferences*** designed to reach groups who are unable to attend the regional meetings; and an
- ***Interactive Website*** where key issues and conclusions from each videoconference and regional meeting will be posted to encourage review and comment on all documents.

Timeline for the consultative process

Present-October 2002

- Preliminary discussions with stakeholders;
- Interactive web site launched; agenda, decision memoranda for November meeting;
- Explore co-financing opportunities for the process; prepare relevant materials.

November 2002 Dublin

- Discussion of broad topic areas; identification of key issues;
- Finalization of the design, governance and schedule for the consultative process, including the composition and terms of reference of the steering committee.

November 2002 - April 2003

- Videoconferences; web site; regional meetings;

May – June 2003

- Development of initial recommendations by steering committee
- Finalization of recommendations through an international multi-stakeholder workshop