



Harnessing Science and Technology for Sustainable Development in Africa

This paper is the 5th Annual Peter Doherty Distinguished Lecture presented by K.Y. Amoako, Executive Secretary of ECA, at the International Livestock Research Institute (ILRI), Addis Ababa, 10 April 2003.

During this lecture, Mr. Amoako conveyed his idea of sustainable development and why it has declined in Africa over the last 30 years. He argued that sustainability is a direct function of institutional development, human and physical capital accumulation as well as productivity. He indicated a few of the most critical challenges Africa must address to achieve sustainable development and a better life for its citizens, also adding that these technologies, formidable as they are, are not panaceas of some kind. There are no panaceas for Africa, and he showed that Africa could do much more to address many of her problems with existing and conventional technologies.

Mr. Amoako elaborated on the concept of sustainable development. From his vantage point as a development economist, sustainable development is easy to explain but substantially more difficult to realize. It is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It is a pattern of development that ensures a steady enhancement of well-being over time. It requires structural changes that lead to enduring widespread improvements in the quality of life of a society.

Application of traditional and new technologies can help respond to the challenges of sustainable development

Sustainable development requires a systematic, carefully coordinated, interconnected series of policies and strategies that will improve people's lives in a progressive, irreversible, palpable manner.



K.Y. Amoako, Executive Secretary of ECA

In his lecture, Mr. Amoako outlined some of the daunting challenges that confront Africa. In his view, technology holds many of the potential answers to Africa's problems. It seems that the situation in Africa today calls for nothing less than a new technological regime. He further considers that such a response is urgently required if Africa has any chance at all to meet the basic Millennium Development Goals (MDGs) of reducing poverty, hunger, illiteracy, diseases, and lack of access to water and sanitation. It is also required to meet the challenges of globalization, productivity and international competitiveness. In today's globalized economic environment, African countries must improve their competitiveness not just by relying on their low labour costs, but also by improving their technological levels. In short, harnessing science and technology is the key to facilitating the transition to sustainable development.

It is hardly breaking news that, as Africa settles into the 21st century, science and technology has become pervasive in all sectors of human enterprise. It shapes the way we grow our food and eat it, the way we dress, the way we

Editorial Note

ESTNET has been officially launched earlier this year and thousands of science and technology policy-makers, promoters, analysts and managers have visited the site to get information on science and technology policies and institutions in Africa. The first issue of the Newsletter was about the website, the databases and the network. This issue provides some information on a number of documents that have been recently added to the ESTNET databases and that can be accessed at the ESTNET website (<http://www.uneca.org/estnet>). These are:

- A lecture by the ECA Executive Secretary, K.Y. Amoako, on 'Harnessing Science and Technology for Sustainable Development' delivered at the International Livestock Research Institute (ILRI) in April 2003;
- An ECA-commissioned paper on 'Making Science and Technology Work for the Poor and for Sustainable Development in Africa';
- An ECA-commissioned paper on 'Science and Technology for Food Security and Sustainable Development';
- An ECA-commissioned paper on 'Towards a Green Revolution in Africa: Harnessing Science and Technology for Sustainable Modernization of Agriculture and Rural Transformation';
- Highlights of an 'Ad Hoc Expert Group Meeting on Science and Technology for Sustainable Development: Towards a Green Revolution in Africa', which took place in Addis Ababa from 10-12 June 2003; and
- Biotechnology for Sustainable Development in Africa. ■

Making Science and Technology Work for the Poor and for Sustainable Development in Africa

This paper highlights the fact that, although science has a universal character, it is supported or constrained by practices which are influenced by local customs and values. In Africa, these behaviors and practices are deeply rooted in traditional beliefs and superstitions that are not easily displaced by science or by modern approaches based on new knowledge. Policies for science and technology for sustainable development, therefore, need to take into account the nature of the local environment, in order to effectively deliver the benefits of science to society. Herein lies the challenge for African nations and their governments.

There are several reasons why a focus on science and technology to benefit the poor in Africa is both appropriate and timely. Most important among them is that the number of people living below the poverty threshold in sub-Saharan Africa is still growing, from 242 million to 300 million during the 1990s. Secondly, science and technology is the most important, readily available means for empowering the poor. African countries need the capacity to explore the socio-economic implications of new technologies, especially to be able to predict their impact on society, to identify emerging opportunities, and serve as an early-warning system to forecast technological threats.

New approaches are needed in order to shift the direction of scientific development from its current programmes that are elitist and conservative, to new initiatives that are inclusive and populist, and which would be of more direct benefit to the poor.

The rapid growth and unprecedented influence of new technologies, especially the information and communication technologies (ICTs) including the Internet, is raising global awareness of the power of technology as a whole. It is now compelling for African countries to invest in these or risk widening the gap between them and the rest of the world. It is this realization that should bring

science and technology, and the strategies for making them work for development, to the top of the African agenda. The key issue should be the empowerment of individuals and groups, to be able to use scientific knowledge and technological know-how to address such pressing problems as prevention and treatment of HIV/AIDS and other public health crises, food security and nutrition, high unemployment, drought, and water supply.

Initiatives in public understanding and utilization of science would consist of finding the means to deliver scientific information to lay people in a manner that makes it attractive and enjoyable, as well as training scientists on how to communicate their messages effectively. Several instruments are available, particularly through formal and informal education:

- (a) Media presentations by experts and practitioners to interpret the scientific and technical aspects of such issues of concern as farming methods, community healthcare to the general public;
- (b) Broadcasts of relevant science and technology messages about daily living, highlighting the implications of science and technology to matters of daily routine; and
- (c) Exhibitions, fairs, and science competitions, all of which present opportunities for the public to see, ask questions about products and processes.

These initiatives must seek to answer questions on how technology could be used to facilitate development, the role of the private sector and the non-governmental sector, what technologies should be promoted, and what type of educational structure and curricula would facilitate the achievement of national objectives. The strategies of delivery would include:

- A restructuring of science education;

Towards a Green Revolution in Africa:

Harnessing Science and Technology for Sustainable Modernization of African Agriculture and Rural Transformation (SMART/AGRIC)

This paper proposes the launch of a Green Revolution Initiative in Africa (GRI). On 21 February 2003, UN Secretary General Kofi Annan urged African countries and their global partners to promote a "Green Revolution" in Africa, to help the continent move towards self-sufficiency in food, reduction of hunger, and eradication of poverty. This call to action is therefore a major UN policy imperative and a challenge for all key players and stakeholders.

The paper argues that a Green Revolution in Africa can be triggered by mass adoption of improved high-yielding varieties of popular African food crops and by mass adoption of scientific methods of agriculture and farming systems, including better management of biological, chemical, mechanical and hydrological parameters.

The widespread application of appropriate Green Revolution technologies in Africa can lead to the elimination of hunger and mass poverty, and the transformation of rural economies.

ECA has undertaken some research and reflection on the promise of a Green Revolution in Africa. It has pondered questions like: What does a Green Revolution mean for Africa? Has Africa missed the GR? Is it possible for the continent to catch up? What are the key challenges and opportunities, options and necessary actions for a way forward?

Preliminary findings clearly indicate that Africa did not miss the Green Revolution – it is merely delayed. Furthermore, a Green Revolution is the only known method for sustainable modernization of agriculture, poverty and hunger eradication, and rural transformation. It is a step that cannot be missed on the way to development. All major societies on all continents – including a few limited examples in Africa - underwent a Green Revolution in the 50 years from 1930s-1980s, starting

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Science and Technology for Food Security and Sustainable Development

This document discusses the challenges that Africa faces in the area of food security and sustainable development. It identifies the technology and the policies that need to be promoted, drawing on lessons from Asia, Latin America, and some successes from Africa.

The Green Revolution, which took place in Asia in the 1960s, is a major global scientific and technological achievement towards increased food production. Improved crop varieties, irrigation, pesticides and mineral fertilizers were introduced, which contributed to substantial improvement in food production. With this technological advancement in agriculture it was possible to develop varieties, which have contributed to higher food production and improved the returns to costly resources used by poor farmers. As a result, increased productivity has decreased food costs, in

general, and thus improved food security, particularly for vulnerable sections of society.

Irrigation, drainage and efficient rainwater harvesting to cope with rising water scarcity are critical in ensuring adequate food production and food security. There is high potential in Africa for increasing food productivity through better control of water and increasing the use of plant nutrients. The concern should be reducing irrigation costs to enable smallholder farmers to manage farms in a manner that minimizes resource degradation, water logging and salinity.

A wide range of improved crop- and resource-management technologies must be emphasized, which have improved environmental and resource sustainability. In this regard, it is possible to bring less-favourable lands under cultivation by introducing new plant varieties

(e.g. drought-tolerant crop varieties), which in turn also contributes to higher food production. This practice reduces the conversion of forest, grasslands and swamplands for cultivation of food crops.

Without advancement in agricultural technology, India would have cultivated nearly 60 million hectares of additional land to produce the quantity of wheat currently consumed.

Scientific and technological advancement goes hand in hand with investment in institutional infrastructure and continued research activities to raise food production and productivity. In China, for example, infrastructural investment continued alongside remarkable efforts and achievements in the area of seed improvement. Consequently, the combination of a decentralized research system and successful extension ser-

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vices replaced the traditional varieties of rice and wheat with modern dwarf varieties by 80 percent at the end of 1970s. The Chinese experience, especially the post-1978 reforms, demonstrates the importance of incentives and a conducive institutional framework in maximizing the effects of agricultural infrastructure, and of successful research on, and dissemination of, new technologies.

Post-harvest technologies that encompass efficient crop handling, storage, processing, transportation, marketing and utilization also need to be promoted. These kinds of technology reduce food losses, add value to crops, facilitate efficient trade, generate employment and new products for the market and provide diversification of food. ■

Ad Hoc Expert Group meeting on Science and Technology for Sustainable Development: Towards a Green Revolution in Africa

The meeting was held in the United Nations Conference Centre (UNCC), Addis Ababa, Ethiopia, from 10-12 June 2003 and was attended by experts in science and technology policies of various African countries, the United States, India, and from various international and regional institutions, including the African Union (AU), the International Livestock Research Centre (ILRI), Harvest Biotech Foundation International, the Common Market of Eastern and Southern Africa (COMESA), Sasakawa Global 2000, the West Africa Rice Development Association (WARDA) and the United Nations Development Programme (UNDP). The meeting was also attended by staff of the Sustainable Development Division (SDD) and other Divisions of ECA.

The main objectives of the meeting were to:

- Review emerging critical issues and ECA activities in science and technology for sustainable development in Africa;

- Discuss science, technology and innovation policy in Africa;
- Reflect on the potential, readiness and prospects of Africa to embark on a Green Revolution; and
- Provide ECA with feedback, recommendations and advice on the way forward.



Josué Dioné, Director, Sustainable Development Div.

The meeting unanimously endorsed the need for Africa to have a Green Revolution Initiative. African governments must consider agriculture modernization as a top priority for achieving socio-economic development and poverty reduction. To this effect, the experts elaborated a road map comprised of short- and medium-/long-term strategies / recommendations to trigger a Green Revolution in Africa. ■

Making Science & Technology work

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- A focus on the utility of scientific culture;
- The use of familiar materials and processes; and
- Teaching through indigenous science and technology practices, including in indigenous languages.

Understanding of science and technology is an essential pre-requisite for making wise choices in the acquisition and utilization of knowledge resources, which are to be fully deployed towards human development and welfare. Attempts to bring the benefits of science to society require a certain threshold of capacity to understand science and its implications, and to recognize the daily opportunities to make science work for people. ■

Biotechnology for Sustainable Development in Africa

This policy-oriented document explores the promises and challenges of biotechnology for sustainable development in Africa. Biotechnology is one of the leading technologies of the 21st century.

Africa must seize the opportunities to harness both conventional green revolution as well as emerging gene revolution technologies to make significant headways to sustainable agricultural development and food security. Biotechnology should be viewed as part of comprehensive, sustainable agricultural development, poverty reduction and food security strategy, and not as a technological "quick fix" for Africa's hunger and poverty problems.

Modern biotechnology should be considered in complementarity with conventional green revolution technologies in boosting food and agricultural production.

Biotechnology is highly applicable and holds great promise in several important sectors:

- Food, agriculture, natural resources and environment where its applica-

tion ranges from crop and animal improvement, through soil fertility and land protection, crop and livestock protection, post

- harvest technologies, biofertilization.
- In health, it can help produce vaccines, diagnostics and medicines for the major diseases, such as malaria, TB and HIV/AIDS; and also for diseases of animals and crops.
- In industry and energy, biotechnological procedures enhance industries dealing with plant and animal oils, carbohydrates, proteins, textiles, leather, wood, fermented products, biogas, plant alcohol, insulin and hormones.

The expected benefits of biotechnology can only be realized if a number of key challenges are addressed, including the extent to which the technologies are relevant to Africa, are pro-poor and mitigate bio-safety and related risks. The challenge is to ensure that poor farmers in Africa gain from biotechnology, as the current focus of biotechnology research is on crops grown and disease strains

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that are prevalent in developed rather than developing countries.

Major constraints to the use of biotechnology are the potential or perceived risks associated with its application. These include genetic erosion, production of 'superweeds', antibiotic resistance, allergy reactions and bioterrorism.

Other constraints include inappropriate approaches to GMO research, lack of institutional and human resource capacity, and lack of investment. Other constraints include lack of policy decision and/or frameworks related to biotechnology, poor management of controversies, inadequate infrastructure, disarticulation of the National System of Innovation, poor regional integration and cooperation and poor awareness on the advantages associated with biotechnology. ■

Towards a Green Revolution ...

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with Europe and North America, then South Asia and Latin America, and most recently China. Localized African examples include yield-enhancing experiments in North Africa on wheat; in Kenya by colonial settlers on maize; in Zimbabwe (1980s) by African small-holder farmers with maize; and in West Africa on cassava and rice. ECA finds that Africa is now poised at the threshold of triggering a GR. It is now a question of how, not when, the African Green Revolution shall be designed, triggered and sustained.

While a GR was taking place in other continents, Africa was also undertaking agricultural development programmes and experiments using various models, including commodity-based systems, integrated rural development projects,

state farms from USSR, communal farms from China and land settlement schemes from Israel. The major weakness of those approaches was that they failed to design for the complex African subsistence farming systems and diverse agro-ecological zones (there are at least 7 major agro-ecological zones in sub-Saharan Africa alone). Many initiatives also failed to include key improved commodity technologies and lacked the necessary socio-economic components like irrigation facilities, land reforms, credit and policy support for purchased farm inputs such as seeds, fertilizers and farm tools. Many were capital intensive, dependent on foreign funding and foreign staffing, leaving the African farmer with little participation in the planning, implementation, learning and ownership of the process. Most collapsed after donor withdrawal with little sustainable

impact on the ground. Besides, there was political neglect of the importance of science and technology for agricultural modernization.

However, apart from these examples, there are other initiatives that suggest the possibility of a Green Revolution in Africa. These include successful diffusion of improved technologies of maize, cotton, rice, sorghum and groundnuts in a few countries. There are also successful irrigation projects and instances of redesigned traditional farming systems. The adoption of national plans for modernization of agriculture and agriculture-led industrialization strategies in a few countries, the renewed international interest in African agriculture and the advent of NEPAD with its Comprehensive Africa Agricultural Development Programme are also encouraging signs. ■

Harnessing Science and Technology...

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travel, the way we learn and work, the way we communicate, and the way we make war and peace. In the last century alone, science and technology generated more knowledge than in all the epochs of human existence put together. Hundreds of millions of people have already enjoyed the fruits of this explosion in enhanced health, education, life expectancy, reduced maternal mortality, labour saving, and entertainment. ■

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