Economic Commission for Africa

Briefing Paper Series

Science and Technology for Sustainable Development

No. 2
January 1998

Economic Commission for Africa

Briefing Paper Series

Science and Technology for Sustainable Development

No. 2
January 1998

For this and other ECA publications, please visit the ECA web site at the following address
http //www un org/Depts/eca/divis/index htm
or Contact

The Director,
Food Security and Sustainable Development (FSSDD)
Economic Commission for Africa
PO Box 3001, Addis Ababa
Ethiopia
Tel 251 1 517200
Fax 251 1 512233
Email ecainfo@un org

CONTENT

Science and technology ... dictate the languages in which we speak and think. Either we use those languages, or we remain mute. J. G. Ballard (b. 1930), English novelist. The Columbia Dictionary of Quotations.

1 Introduction

This Policy Brief is intended to serve as a guide With it, the Food Security and Sustainable Development Division (FSSDD) of ECA can sensitize policy-makers, development planners and stakeholders on the African continent and elsewhere to emerging issues and challenges in science and technology (S&T) that need to be addressed to accelerate socioeconomic development in Africa It is also intended to share ideas on S&T policies with a wider audience engaged in development activities, including scholars, administrators, NGOs and international organizations

The Policy Brief provides information about recent and planned ECA activities and initiatives in science and technology

2 ECA's new vision

Between a third and a half of sub-Saharan Africa is experiencing serious problems of hunger and unsustainability Many of these problems stem from the population–environment–agriculture interaction, or what is called 'the nexus' A growing population requires increases in food production, which put more pressure on the resource base and the environment As more people are pushed into marginal land and as more unsustainable agricultural technologies and practices are used, lower agricultural productivity and more poverty result As poverty usually brings about higher population growth, which puts still more pressure on the environment, whole areas seem to be trapped in a vicious circle of high population growth, low agricultural productivity, and a deteriorating environment Poverty and the inappropriate use of technology are both the cause and the consequence of this vicious circle

On the other hand, countries that have shown remarkable development progress and are in a virtuous circle—a sustainable development path—are those that have been able to use sustainable technology and technological practices extensively In particular, the cross-cutting role of science and technology has been facilitated through institutional and administrative arrangements that have allowed all key stakeholders to participate in formulating and implementing S&T policy This means that the S&T function must not be just another ministry or division, it must be situated so centrally that it reaches and is reached by all stakeholders and is allowed to perform its role of midwife in the development process Therefore, ECA intends to strengthen the cross-cutting aspects of science and technology and give the function a

Members of the Expert Group on Science and Technology

[illegible]	(Botswana)	[illegible]	[illegible]
Dr Akuro [illegible] Mbah	(Cameroon)	Prof [illegible]	[illegible]
Dr Mamadou Diomande	(Cote d'Ivoire)	Eng. [illegible]	[illegible]
Dr [illegible]	(Ethiopia)	Dr [illegible]	[illegible]
Mr [illegible] Yoseph	(Ethiopia)	Prof. [illegible]	[illegible]
Mr [illegible] Tefera	(Ethiopia)	Dr [illegible]	[illegible]
Mr Stephanos [illegible]	(Ethiopia)	Dr [illegible]	[illegible]
Dr Simeon Ehui	(ILRI)	Mr David Anthony [illegible]	[illegible]
Mr Atef W. Ghabrial	(OAU)	Dr [illegible]	[illegible]
Dr [illegible]	(OAU)	Prof Mohamed [illegible]	[illegible]
Dr [illegible] M. N. B. Ayiku	(Ghana)	Prof. C. J. [illegible]	[illegible]
Dr Daniel Adzei Bekoe	(Ghana)	Dr Samuel [illegible]	[illegible]

more central role in the institution

The S&T function within ECA is only a small part of the S&T function within the UN system Science and technology within ECA will endeavour to catalyse the activities of other UN agencies whose mandates have S&T implications for the benefit of ECA Member States In particular, the S&T activities of ILO, UNCTAD, UNDP, UNEP, UNESCO, UNIDO and UNSTD must be catalysed for this purpose

With the target audience being development planners, policy-makers and representatives of stakeholders from the private sector, ECA wishes to achieve these objectives through a number of activities the conduct of studies, the formulation of appropriate policies and strategies, the elaboration of plans of action, advisory services, the organization of executive dialogues and conferences, and backup for ECA-sponsored institutions Achieving synergy between food security and sustainable development will be the goal on the one hand, and applying appropriate science and technology to these nexus issues will be that on the other

As a first step for developing ECA's new vision in science and technology, an Expert Group on Science and Technology in Africa was formed and met on 9–12 February 1998 (See list of experts on page 1)

Members of the Expert Group agreed to form a Network of Science and Technology Policy-Makers and Policy-Making Institutions (ESTNET) with the aim of fostering access to information and greatly enhancing communication The network was officially launched with the participants as its initial members A Steering Committee was also constituted with representative(s) from each subregion and from two major subregional organizations Professor Refaât Chaâbouni (Northern Africa), Dr Samuel Muchena (Southern Africa), Dr Beyene Kebede (Eastern Africa), Dr David Mbah (Central Africa), Dr Banji Oyelaran-Oyeyinka (Western Africa), Dr Ndiaga Mbaye (CORAF), and Dr Ousmane Kane (ARCT)

It has been felt that the achievement of the new vision would be greatly facilitated if ECA could draw on high-level expertise, mainly from Africa but complemented by world-class experts from outside the continent Eight experts have been selected to form an Advisory Board on Science and Technology, which will meet once or twice a year to advise ECA in matters related to S&T policies and management in Africa The board met on 18–19 May in Addis Ababa and looked into priority issues, including identifying issues that were discussed at an Executive Dialogue of Ministers responsible for science and technology, which took place on 18–19 June 1998 in Addis Ababa The members of the advisory board are Professor Daniel Adzei Bekoe, Dr Beyene Kebede, Professor Refaât Chaâbouni, Dr David Anthony Harcourt, Professor Lydia Makhubu, Dr Akuro David Mbah, Dr Ndiaga Mbaye, Dr Omo Ohiokpehai and Dr Banji Oyelaran-Oyeyinka

3 ECA support for science and technology

Until recently, ECA has provided support to Member States in science and technology in the following areas

assisting Member States in formulating and implementing the regional, socioeconomic and intersectoral aspects of S&T policies in Africa,

- bringing the socioeconomic aspects of science and technology to the forefront of policies,
- promoting a better articulation of these policies with the overall development policies of Member States, including better links between sectors, going beyond policies that stress high-level training and public sector research only,
- launching or supporting policy dialogue and initiatives in science and technology in Member States for better S&T management,
- initiating and executing carefully designed and cost-effective science and technology projects to meet the challenges of technological change and globalization, in partnership with the private sector,
- effectively promoting support policies for the technological advancement of Member States and
- participating in collaborative activities with UN headquarters in New York, ECA-sponsored institutions, other UN agencies, and other regional and subregional organizations

Activities in these areas fall under three main categories

- parliamentary services, usually in the form of documentation, servicing of regular conferences, specialized working groups and meetings In 1999, ECA will organize a meeting of the Committee on Natural Resources and Science and Technology,

- operational activities, usually in the form of advisory services through missions to Member States, and group training workshops and seminars,

- published materials, usually non-recurrent publications In 1997, ECA completed a study, 'A Potential of Biotechnology for Food Security in Africa' In 1998, it is conducting a study, 'The Role and Potential of Indigenous Technology for the Promotion of Sustainable Food Security and Development', and in 1999, it will carry out a study, 'A Compendium of Science and Technology Applications to Food Security and Sustainable Development'

4 Why is a Science and Technology policy needed ?

ECA is making its current efforts in science and technology mainly in the following directions

- define the new programme focus, identify FSSDD activities and disseminate this information to a diversified target audience

- support the development of the African Regional Science and Technology Strategy and other regional and subregional activities, which will help identify needs of the Member States and the subregions

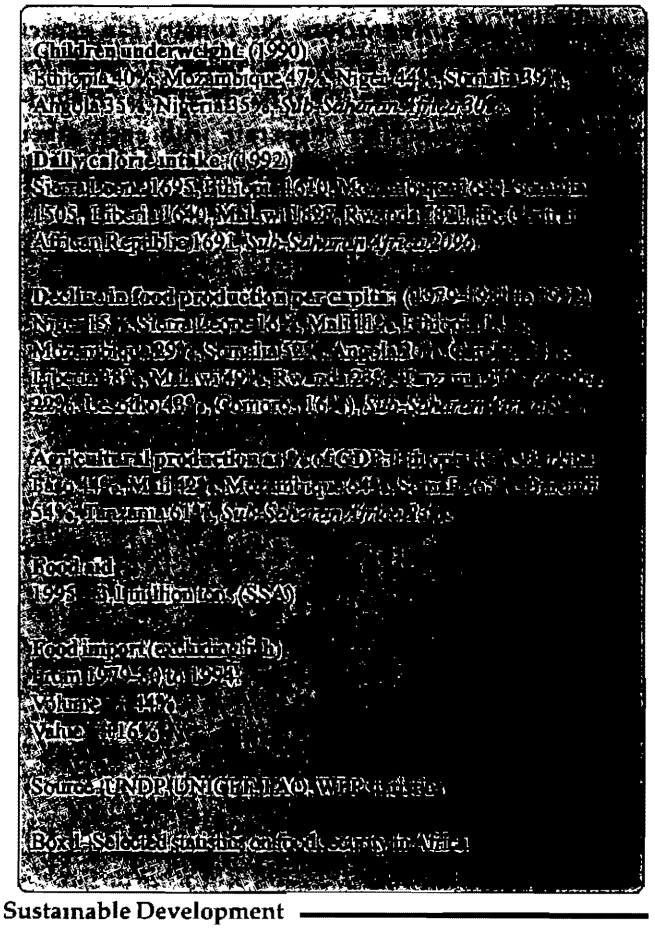
- promote national and subregional programmes falling within the new focus of FSSDD

- facilitate information exchange on programmes and relevant activities through the use of electronic databases and process information from the databases, meetings, conferences, workshops Compendia of best technological practices are being developed These are success cases in Africa and from other parts of the world with similar resource endowments The information to include in the database of achievements for a country will be entered in the following categories

  - the specific, selected commodity
  - storage, processing and preservation
  - infrastructure and support services
  - sustainability
  - women and technology

5 Why an emphasis on food security and sustainable development ?

This policy brief puts emphasis on the problems of food security and sustainable development because they are indeed acute in Africa A precise picture of food insecurity can be drawn from a variety of statistics collected by a number of institutions hunger and undernourishment (such as weight of babies and children, caloric intake), food production, food aid, food import (**see box 1**) Food production per capita has been declining or stagnating in many areas of Africa during the last 30 years Food aid is delivered to more than half of African countries (see box 2) In many areas science and technology can prevent the situation from getting worse or can improve it, particularly in the marginal, dry, semi-arid and semi-humid lands of the Sahel region, the Horn of Africa, and



the drylands of eastern and southern Africa

ECA is convinced that Member States must pay greater attention to science and technology for sustainable food security than they have done so far Many countries have formulated strategies and programmes and have taken action during the last 30 to 40 years to enhance the role and contribution of science and technology in their development Some important results are measurable, including agricultural yield and capacity building But more needs to be done—and be done on many more fronts—if Africa is going to solve the very complex and acute problems related to food security and environmental sustainability and significantly raise its quality and standard of living

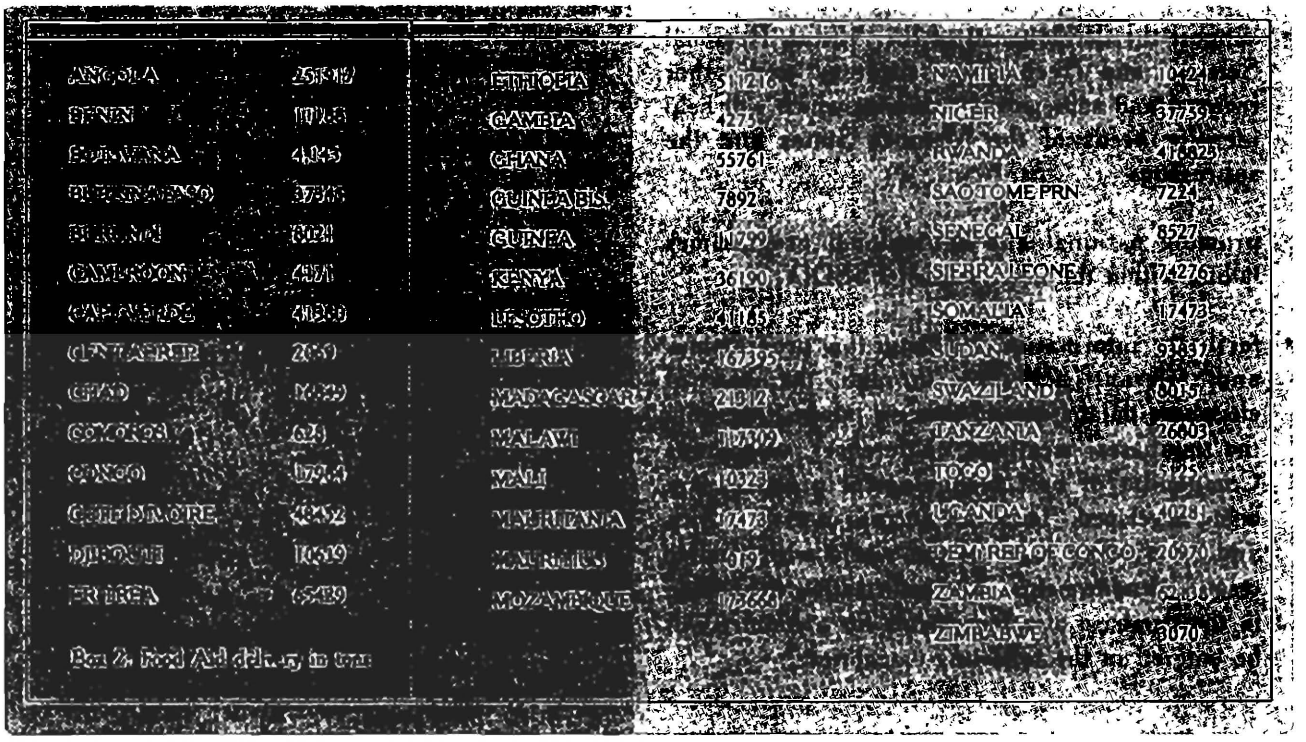
6 Dimensions of integrated management of science and technology

Science and technology policies related to food security and sustainable development have many dimensions—international, regional, economic, cultural, social, political, organizational, institutional, infrastructural

International and regional dimensions for cooperation and integration No country can expect to develop or produce all the technology it needs for progress Even the most scientifically and technologically advanced countries cooperate with each other and design strategies to tap into the vast world reservoir of technological innovation and scientific advances They do this through a wide range of policies, involving brain-gain, alliances, partnerships, twinning of institutions and technology transfer Important for promoting technological exchange processes are policies regarding intellectual property rights Also important are trade policies related to importing technologies critical for food production and processing and for meeting competitive standards for export As no African country except the Republic of South Africa produces more than one-tenth of one per cent of the world technology pool, it is obvious that cooperation must be a major element of any S&T strategy This certainly pertains in areas related to food security and sustainable development

Economic and financial dimensions Most or all economic policies affect the economic environment and the business climate in which technological innovation and transactions take place These policies can be supportive or unsupportive of science and technology for socioeconomic development Unsupportive policies implemented during the 1960s and 1970s are partially responsible for the diminishing food production per capita in a number of African countries (see section below on policy-making capacity)

Cultural and social dimensions Science and technology policies should support technological change



and transformation processes Phenomena connected with such fundamental structures as thought processes, language, values and belief systems can impede or facilitate transformation processes and technological changes, as can attitudes towards nations, the land, institutions of authority and women As an example, science and technology more and more speaks in English, and this has tremendous policy implications for any non-English-speaking country Most industrialized countries have programmes for evolving an S&T culture for their population Children start with science clubs, competitions, prizes, mass media programmes, and so on Science and technology policies should favour basic education for all, they should face the challenges of assuring gender equality and upholding societal values Science and technology strategies also stand to gain from effective population policies that lead to smaller family size and slower population growth Such policies should result in an increase in available resources per capita, which could be invested in basic science and technology

Political dimensions Science and technology on the one hand and democratization processes on the other can be mutually supportive Political liberties are supportive of science and technology and vice versa This is presently exemplified by the reluctance of many developing countries, including some in Africa, to provide full Internet connectivity to their citizens for fear of losing control over the flow of information In addition, political will, commitment and leadership are needed if science and technology are to contribute effectively to development They are needed because, amongst other things, the budget that African governments allocate for science and technology has been and still is often well below what would be required to make a decisive impact on development

Organizational, institutional and infrastructural dimensions How governments should organize themselves to promote science and technology is an important issue In Africa, as in the rest of the world, governments have designed specific structures reflecting their particular situation Some have formed full ministries for science and technology, others have placed science and technology under other ministries such as higher education, vocational training, environment, industry, culture, still others have formed commissions, councils, centres, coordinating committees, and so on Each structure reflects to some extent a particular concept of science and technology and a particular concept of the role of government in science and technology

7 Past experiences, approaches and emerging consensus

For most African countries, development efforts in science and technology from the beginning of the 1960s until now have been made mainly in four directions

Institutional capacity Building institutions for policy-making, promotion and advocacy in science and technology has been a major effort Most African countries now have a central institution regarded as the apex body or focal point for handling policy issues in science and technology and for designing or implementing a number of programmes, projects and activities ECA has helped Member States to build these institutional capacities over the years

Human capacity Building human capacity, including specifically managerial capacity in science and technology, has also been a major effort by most African governments at all levels Schools, technical colleges and universities have been opened, science and technology curricula implemented and tens of thousands of African sent abroad to acquire scientific and technical skills

Research capacity Capacities in research have been strengthened considerably with the opening of over one thousand research centres throughout the continent, half of which are in northern Africa and the Republic of South Africa These efforts have brought forth many interesting and promising results, particularly in food production

Policy-making capacity In the mid 1980s it became evident that although previous efforts had been essential, they were not sufficient for science and technology to make a real contribution to socioeconomic development A new consensus emerged more effort had to be made to put into place an enabling policy environment for the widespread application of technology at all levels of economic activity, including in agroindustry So major efforts were made and are still being made to formulate and implement a wide range of economic policies that have an impact on S&T performance Much effort has been directed at correcting and improving the economic policy environment

emerging consensus

Science and technology to facilitate three critical transitions

- **the transition from low to high productivity agriculture**
- **the transition from high to low population growth**
- **the transition from a poor to a better stewardship of the environment**

Following are examples of recent past policies that were not supportive of science and technology for food security but that have been largely corrected or improved upon during the last 15 years

- policies to maintain higher export agricultural commodity prices than what the market was dictating have encouraged overproduction, pushed down prices, displaced the location of production, and in many instances, through the agency of technology, triggered substitution These factors contributed to the shrinking of market shares in a large number of commodities, thus depriving African farmers of the foreign currency that was needed for acquiring foreign technology

- policies to keep down prices of agricultural goods produced and consumed locally shrank farmers' profit margins and led to underproduction and underinvestment, including investment in agricultural technology, thus leading to low agricultural productivity and creating substantial food shortages

- policies that withheld foreign currency from farmers led to reduced capacity to acquire essential productive agricultural technology, policies that artificially maintained high currency prices had the adverse effect of favouring imports of consumer goods and discouraging exports As a result, they increased the difficulties in making the balance of payments, which constrained the import of needed technologies

- policies of nationalizing agroindustrial enterprises led to undue management interference by politicians and lack of sound competition and incentives, in many cases they contributed to a slowdown or stagnation of industries related to the supply of technologies, agricultural inputs and food processing

- the absence or insufficiency of policies regarding the financing of science and technology for agricultural development and environmental sustainability, from international investment to risk finance, from microfinance to fiscal incentives, has led to a very low rate of investment in science and technology for food security and sustainable development

The emerging consensus is that without a good enabling policy environment the application and utilization of science and technology will be minimal and will have little impact on development More and more, technology is traded like a commodity on the world market, and strategies to acquire and assimilate technologies that are necessary to satisfy basic needs and compete worldwide are of paramount importance Hence major efforts are being carried out to improve the environment and climate for science and technology They must prosper to be able to contribute more decisively to development, particularly to sustainable food security, which remains one of the greatest challenges that African countries will be facing in the years ahead

Member States would like to see the S&T function of ECA strengthened substantially and its human resources increased The S&T capacity of ECA should be enhanced, so that it can better serve its Member States Member States would also like S&T activities to occupy a more central role and not be confined solely to the areas of food security and sustainable development

8 The way forward—policy framework and priorities in science and technology

ECA will focus on a small number of areas for promoting food security and sustainable development through its strategic intervention in science and technology It will assist Member States to focus more directly on three critical transitions (see box 3) that must be occur if Member States are to be food secure in a sustainable way

Progess is aimed in at least four major areas

- improving the context of policy environment by promoting the spread of the best practices Most African countries have made remarkable progress lately in improving policies, but more must still be done in certain areas, including land ownership and regional trade

- advancing and empowering women, who are part of the solution for achieving food security, as they are largely involved at every stage of production and preparation of food, starting with breast feeding This will be done by disseminating information on selected burden- and time-reducing technologies

- accelerating technological innovation in areas where no technologies have been developed to suit the particular technological needs of Africa, improving the effectiveness of research activities by coordinating initiatives better and duplicating efforts less often, by formulating strategic plans with a sharper focus on what is precisely expected, by building better links between researchers and users and a greater partnership with the clients, by depending less upon foreign financing and becoming more involved in the private sector, and by improving the conditions—both material and financial—of the researchers Secondly, much greater importance and support should be given to innovators involved throughout the food production chain Technological change occurs as much from the people working in this chain as from researchers working in laboratories and research stations

- building capacity for the widespread utilization of a wide range of proven technologies and technological practices for making food available in sufficient quality and quantity to feed the population

In this connection, a large number of technologies should be used to a greater extent than is now the case Achieving food security in the wider context necessitates a greater use of technologies that can be broadly grouped into nine categories

- technologies related to population, such as family planning techniques, to keep a balance between population growth and the carrying capacity of the earth

- technologies related to land management, including resource assessment, surveying, soil analysis, remote sensing and GIS

- technologies related to sustainable farming practices—choice of suitable crops, cropping sequences, contour cultivation, strip cropping, terracing, controlled grazing

- technologies related to agricultural inputs, such as biotechnologies and chemical technologies (seeds, fertilizers, vaccines, pesticides, fungicides, in-vitro procedures)

- technologies related to agricultural machinery and implements

- technologies related to food processing and packaging and to food quality standards

- technologies related to infrastructure, including drainage and irrigation technologies, transport technologies, storage technologies

- technologies related to the provision of services, such as microcredit, extension, weather forecast and market data

- technologies that are environmentally friendly, such as for solar cookers and dryers, water purification, biogas digesters, land rehabilitation, recycling, resource substitution, combating desertification, controlling deforestation and soil erosion, technologies that minimize the use of non-renewable resources, technologies compatible with the sustainable use of natural resources