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Research Report

African Developments: higher education and research capacities: Africa in the globalising knowledge society

Briefing Paper, No. 13/2010

Provided in Cooperation with:

German Institute of Development and Sustainability (IDOS), Bonn

Suggested Citation: Stamm, Andreas; Knuth, Lidija (2010) : African Developments: higher education and research capacities: Africa in the globalising knowledge society, Briefing Paper, No. 13/2010, Deutsches Institut für Entwicklungspolitik (DIE), Bonn

This Version is available at:

<https://hdl.handle.net/10419/199659>

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African Developments: Higher Education and Research Capacities: Africa in the Globalising Knowledge Society

2010 has been an important year for Africa. It marked the 50th anniversary of independence for 17 African countries and the 10th anniversary of the Millennium Declaration. It has also been around a decade since steps toward creating the AU and NEPAD were taken. In a series of DIE Briefing Papers, researchers from Europe and Africa look into African Developments a decade after the revival of the African Agenda to take stock and identify the challenges facing the continent in the years to come.

Summary

Higher education and domestic research capacities are back on Africa's agenda. Governments have set up ambitious programmes to develop a highly qualified human resource base and build national knowledge and innovation systems. Regional cooperation is increasing. The most ambitious plan is Africa's Science and Technology Consolidated Plan of Action (CPA), which was developed within the framework of the New Partnership for Africa's Development (NEPAD) and endorsed in 2006 by the African Union (AU). The CPA aims at building networks between the innovation systems of African countries and the implementation of flagship programmes in five technology fields.

Initiatives from OECD countries to boost research cooperation with Africa are flourishing. They are mainly driven by actors from the international research community and much less so by development policy and agencies. The latter are still reluctant to accept tertiary education and domestic research capacities as important leverage points and as a catalyst for Africa's development. However, there are good reasons to assume that Africa should build up a solid base of highly trained human resources and institutions that are capable of accessing, processing and

generating knowledge. This will be necessary to enable societies to benefit from global integration, to enhance resilience to global change, to ease the transition towards more sustainable development patterns and to achieve higher levels of good governance and self-determination.

The interest that large parts of the international research community are showing in cooperation with Africa opens up important windows of opportunity for development cooperation to combine efforts and mobilise synergies.

In line with the Paris Agenda and the Accra Agenda for Action, the international community should align support programmes to the CPA and similar programmes, for example in the field of agrarian research.

Research related to agriculture and livestock is relatively better positioned than other fields. Agricultural STI and related higher education may have the potential to promote faster technological catch-up and improve the abilities of African countries to adequately address the urgent challenges of food security and climate change adaptation in a timely fashion. To achieve this, special emphasis should be given to coordinating the relevant existing institutions, which often act largely independently of one another, and to shortening the innovation cycle.

After many years of widespread neglect by the international community, the role that tertiary education and domestic capacities in science, technology and innovation (STI) can play for Africa's development is currently being rediscovered. Germany, Korea, Japan, the United States, and the EU, among others, are significantly scaling up their R&D cooperation with Africa. These efforts are mainly driven by actors from the international research community and much less so by development policy and agencies. The latter are still reluctant to accept tertiary education and domestic research capacities as important leverage points and as a catalyst for Africa's development. There are, however, good reasons to assume that strengthening local capacities to access, process and generate knowledge can have a significant and beneficial impact on the development paths of African countries:

- Export-oriented countries need to endeavour to provide knowledge-intensive products and services, as world markets tend to shift from agrarian and mineral commodities towards more complex goods.
- The transition towards environmentally sustainable growth paths requires the ability to generate and process knowledge of complex and fragile ecosystems and to design low-impact and resilient development strategies.
- Recent studies have found a positive and statistically significant correlation between higher education enrolment rates and governance indicators, including the absence of corruption, rule of law, absence of ethnic tensions and bureaucratic quality.
- Key elements of the Aid Effectiveness Agenda, specifically the alignment of donor contributions with domestic development plans, can only be effective where human resources are available for sound policy designs and implementation.

Higher education and research in Africa: Taking stock

With few exceptions, higher education institutions in most of sub-Saharan Africa were established after World War II and often only after decolonisation. Only 18 out of the 48 countries in sub-Saharan Africa had universities before 1960. While they were often criticised as being the instruments of colonialism, some of these early universities managed to build a solid reputation as centres of excellence comparable to the best in the world, for instance. Makerere University (Uganda), Fourah Bay College in Sierra Leone (with roots reaching back to 1827) or the University of Ibadan (Nigeria), to name but a few.

After achieving independence, many countries considered the founding of local universities as an important element of their post-colonial national development project. The "developmental" universities were established to help nations build their capacity to manage their resources and to replace colonial officials and professionals with highly qualified members from the local majority population.

Until the end of the 1970s, governments gave priority to higher education and university research, leading to relatively high levels of remuneration of faculties and staff and to adequately equipped teaching and research facilities. Things changed for the worse with the economic crisis of

the 1980s and structural adjustment, which focussed on reduced government spending and giving priority to basic education. Resources dwindled in a time when more and more young Africans sought to go to university. Enrolment almost quadrupled from 1975 to 1985 (from 181,000 to 618,000 students), and tripled again in the following decade (1995: 1.75 million students). Also, the number of universities rose sharply, from 52 in 1960 to 143 in 1980 and 331 in 2002, with an increasing percentage of private entities (2002: 34%).

Severely under-resourced universities could not maintain their former quality standards when faced with educating and training a rapidly growing number of students. Budget restrictions stopped investments being made in research infrastructure and staff numbers increasing, thus leading to the disconnect between higher education and research. To date, the share of gross expenditure on R&D of GDP remains extremely low across the whole of Africa (generally below 0.5%).

However, the number of young people seeking access to post-secondary education will further increase in the years to come. Gross enrolment ratios are still not reaching double digits in most African countries (average for sub-Saharan Africa in 2007: 5.9%), while it reaches 35% in Latin America and 25% in East Asia/Pacific. Demographics and continuous progress when it comes to primary and secondary education will continue to boost the number of young people knocking on the doors of already overburdened universities, thus further exacerbating the problem. Denying young people their right to further education and training would most likely result in higher levels of frustration and could be an additional cause of social unrest.

With under-resourced and under-staffed higher education institutions and higher education largely disconnected from R&D activities, sub-Saharan Africa is essentially far from well prepared for the transition towards the globalizing knowledge society.

Agricultural R&D in Africa: prepared to address the challenges of the continent?

As an exception to this bleak picture, STI in the field of agriculture and livestock is doing comparatively well. In many parts of the world, agricultural research, combined with effective extension services, has played an important role in spreading new technologies among farms of all sizes, leading to enhanced food security, increased production, employment and income for smallholders and the landless, while bringing real food prices down.

Also, there is a significant potential in Africa that agricultural STI and related higher education may promote a more rapid technological catch-up and increase economic output.

National agricultural research institutions and some university faculties were established by colonial governments. In the early phase this led to a narrow focus on export crops for European markets and industries. With independence, R&D and extension services were extended to African

smallholders so that they could become part of commercial agriculture and serve the needs of subsistence farmers. Four of the 15 research centres that form the Consultative Group of International Agrarian Research (CGIAR) are located in Africa (see Box 1), other centres have regional offices there. These research institutes have the potential to feed the output of world-class research into the national agrarian innovation systems. In addition, there is the private sector, farmers' organisations, non-governmental organisations and community-based organisations, which are predominantly funded by donors and private sources.

Box 1: CGIAR Centres based in Africa

CGIAR was formed to coordinate international agricultural research with the goal of reducing poverty and achieving food security in developing countries through agricultural research. In Africa, the CGIAR coordinates, amongst other activities, a large number of crop-specific research programmes and has been directly responsible for some achievements, particularly with regard to improving the quality of seed, techniques and tools.

The following CGIAR Centres are based in Africa:

- the International Institute of Tropical Agriculture (IITA) in Ibadan, Nigeria,
- the Africa Rice Center (Africa Rice Center / WARDA) in Cotonou, Benin,
- the World Agroforestry Centre (ICRAF) in Nairobi, Kenya, and
- the International Livestock Research Institute (ILRI) in Kenya and Addis Abeba, Ethiopia.

Hence, the main problem is not the lack of relevant institutions, but the fact that they largely act independently of each other, and thus fail to actually form a coherent system. The main challenge is to adapt the existing institutional set-up to the requirements of an effective agricultural research for development system (AR4D) that generates relevant knowledge and assures its fast uptake by producers. The AR4D concept proposes getting all stakeholders along the commodity chain involved in defining the problem and developing the solution. It proposes the concept of "innovation platforms" as fora where all stakeholders meet to develop innovations. The platform calls for a change in attitudes towards more interaction between the players, ending up in enhanced learning. This situation leads to the generation of innovations that have a good chance of being adopted and thereby also leading to higher incomes and greater impacts on the Millennium Development Goals (MDGs).

Current signs of change

While the overall picture regarding Africa's capacities for keeping in touch with the globalising knowledge society does not seem to be very positive, there are some clear signs of change for the better:

First, since (around) the turn of the century, higher education and STI have been back on Africa's political agenda due to international cooperation efforts and related regional initiatives. Several countries, such as South Africa and Ethiopia, have set up very ambitious plans to strengthen their STI systems.

Second, in the first years of the 21st century, new institutions of pan-African cooperation were established (the AU in 2000; the New Partnership for Africa's Development ([NEPAD] in 2001), and the strengthening of Africa's capacities to generate and apply knowledge has been an important issue on their political agenda. In 2003, the African Ministerial Council for Science and Technology (AMCOST) was established and has since then been hosted by the NEPAD Secretariat.

Third, regional policy instruments have been adopted: Between 2003 and 2005, the AU, NEPAD and AMCOST elaborated Africa's Science and Technology Consolidated Plan of Action (CPA), which was endorsed by the AU in 2006. This very ambitious action plan focuses on:

- building networks between the science systems of African countries, and
- implementing flagship programmes in five technology fields. In each of these programmes the top performing R&D organisations will work in close collaboration with second-tier research centres ("hubs-and-spokes" model).

Four such networks were established in the biosciences during the first phase of the CPA, with the International Livestock Research Centre (Nairobi), the Institute for Agricultural Research (Dakar), the National Research Centre (Cairo) and the Council for Scientific and Industrial Research (Pretoria) serving as hubs for East, West, North and Southern Africa. However, four years after its endorsement by the AU, the Action Plan has not made very much progress. This can be attributed to a lack of political priority in many countries, a lack of financial backing by the international donor and research community, and to limited steering capacities at the NEPAD and AMCOST offices, which are responsible for implementing the plan.

However, positive developments can be pointed out in the agricultural research field: Several regional and continental initiatives, like the Forum for Agricultural Research in Africa (FARA) and the Alliance for a Green Revolution in Africa (AGRA), have been established, and designed to economise on scarce R&D resources by exploiting synergies. In 2003, the AU Summit adopted the NEPAD Comprehensive Africa Agricultural Development Programme (CAADP). The primary CAADP goal is agriculture-led development to eliminate hunger, reduce poverty and food insecurity, and increase exports. To achieve this goal, African governments have agreed to increase public investments in agriculture by a minimum of 10% of their national budget, and to raise agricultural productivity by at least 6% per year. In essence, this would amount to annual investments of some US\$1.6 billion for the period up to 2015. CAADP strongly promotes evidence-based policy-making, thereby creating many docking points between policy and research.

Conclusions and policy recommendations

- STI is back on Africa's political agenda. Its importance for sustained economic growth and sustainable development in agriculture and beyond is being increasingly recognised by national governments and regional initiatives. Currently, the most significant programme is the NEPAD CPA. Endorsed by the AU, it has a high level of multilateral legitimacy. In line with the Paris Agenda and the Accra Agenda for Action, the international community should align support programmes to this ambitious plan to boost regional STI. The deficits when it comes to the plan's implementation should be adequately addressed, for instance by strengthening steering competencies at the NEPAD/AMCOST Secretariat.
 - The increasing interest in STI cooperation between OECD countries and Africa opens avenues for mutual learning by doing and by interacting. It can be assumed, however, that a large number of the requests for STI cooperation "at eye level" will target only a limited number of world-class universities and research centres, for example in Egypt and South Africa, as academic excellence is most likely to be found there. This might result in some STI institutions being overburdened with cooperation requests and many others remaining marginalized. STI policy-makers and agencies could counter this trend by setting up promotional schemes that provide incentives for the integration and strengthening of weaker partners or even make it compulsory, for instance by taking the CPA's "hubs-and-spokes" concept as role model.
- This might require stepping up cooperation with leading academic institutes within Africa at the same time as incorporating cooperation with weaker actors into the promotional schemes.
- Close collaboration between STI policy-makers and development cooperation is crucial. The shortcomings of the STI systems of most African countries are so serious that peer-to-peer cooperation between STI actors should be accompanied by significant investments in physical infrastructure and capacity-building, including the interfaces between public institutions and Africa's private sector. While close harmonisation of the international STI communities based on the self-interests in this field cannot easily be expected, the donor community should consider the possibility of a substantial and well-coordinated programme to boost Africa's STI systems and prepare the continent for the knowledge society.
 - STI in agriculture can and has to play a key role for sustainable development in Africa – all the more so in times of climate change and increasing food insecurity. This requires significantly shortening the innovation cycle. The proposed agricultural research for development system (AR4D) should be supported as a role model, as it helps bring together supply and demand, enhance client orientation of the innovation system and generate ownership of the developed technologies and solutions within the research system, making their implementation more likely.

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