Biosciences in Africa's economic transformation

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African countries are currently among the fastest growing economies in the world. Much of this is linked to China's commodity demand, which is expected to decline in coming years as China's growth slows down.

External stimuli, however, have tended to mask endogenous sources of growth which are driven by investments in agriculture. Such endogenous growth will rely heavily on Africa's investment in the life sciences, with genetics serving both as foundational field and as source of metaphors on how to understand the world.

The continent's renewed interest in fostering agricultural development has come at a critical moment when the impacts of climate change are becoming

Africa's economic transformation is starting in the new age of biology

more discernible and the need to rethink Africa's agricultural strategies accordingly is more pressing.

African agriculture will need to intensify the use of science and technology more than would have been the case without the threats of climate change. Investments in science and technology will be required along the entire agricultural value chain from resource intelligence through production, marketing, storage and ecological rehabilitation.

Science, technology and economy

Agriculture will continue to play a significant role in Africa's economic transformation. This is for two main reasons. First, agriculture accounts for 32 per cent of Africa's GDP and for nearly 65 per cent of employment. In effect, it will not be possible to promote prosperity in Africa without significant focus on agricultural transformation.

Second, so far much of the discussion on the role of science and technology in economic growth has tended to focus on high-tech, urban-based industries. The application of science and technology to Africa's economic transformation will need to focus on agriculture which is still the base upon which much of the growth and employment are founded. This does not mean that technological innovation will have to start in the agricultural sector. Given Africa's economic structure new technologies will quickly find agricultural applications irrespective of their origins. The mobile money revolution that started in Kenya is a good example. Mobile phones first took root in urban areas and spread to rural areas. But it was the need to find a low-cost way of enabling rural women to repay micro-loans that inspired the creation of the mobile money (M-Pesa) revolution that has now gone global.

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Technologies that focus on the needs of women are likely to have the widest adoption rates and impact. This is mainly because of the dominant role that women play in African economies. It is also for this reason that efforts to advance science, technology and engineering education in Africa need to specifically focus on women. Analogues of the mobile money revolution are already being piloted in health, education and energy in rural Africa.

The century of Africa

Mobile communication will create a wide range of innovative ventures for Africa. But the technological transformation of rural Africa will require foundational investments in basic infrastructure such as energy, transportation, water supply and irrigation. It is easy to use a mobile phone to find out where to get the best price for one's produce. But one has to move the produce there, which requires a reliable transportation network. It is estimated that it will take nearly US$93 billion a year over the next decade to meet Africa's infrastructure needs.

Nearly 60 per cent of the world's available arable land is in Africa. Part of this land is being leased out to hedge funds with little agricultural know-how. Careful design and implementation of this critical agricultural asset will allow Africa to feed itself as well as to export food to the rest of the world. Doing so in a smart way will require using emerging technologies that maximise sustainable intensification.

The century of biology

Timing defines nations. South Asian economies embarked on their growth path at the dawn of the microelectronics revolution. Africa's economic transformation

is starting in the new age of biology – both as a field of scientific endeavour and as a metaphor on how we view the world. The world of genetics captures both phenomena and will most likely offer Africa its opportunity to become an important player in the global knowledge ecology.

There are already indications of this. Young African scientists, many of them women, are making significant contributions to medical and agricultural research using genetics and foundational knowledge. They are designing new diagnostics for human and animal diseases and developing new crop varieties that tolerate drought, resist pests and outcompete weeds.

Governing the future

Africa has so far suffered greatly from a lack of high-level leadership that appreciates the importance of innovation in development. Efforts to graft Western democracy on to Africa have had mixed results, with too much focus on elections and too little attention paid to building democratic institutions such as party platforms, think-tanks and succession mechanisms within parties.

Africa appears to be undergoing a rapid jump from autocracy to technocracy without really having built what one can honestly call democracies. In 2005 Namibia's founding President Sam Nujoma stepped down as head of state and registered as a Masters student in geology at the University of Namibia where he was also Chancellor. He graduated in 2009.

In the past only a handful of African presidents had any training in the sciences. Today Angola, Egypt, Eritrea, Ethiopia, Nigeria, Senegal, Somalia and Tunisia have engineers or medics as heads of state. The appeal to technocracy might just be a way to go around the ethnic patronage that underpins much of Africa's corruption, nepotism and misgovernment.

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But there is more to this seemingly accidentally rising technocracy in Africa. These are leaders who will readily appreciate the importance of science and technology in economic transformation. Many of them have risen to positions of leadership because their followers value their pragmatism. Their technical training has prepared them to understand the evolutionary character of economies.

This is indeed the century of biology, with genetics serving as its disciplinary and metaphorical paradigm. It is going to be African leaders who are either trained in the scientific, technological and engineering fields or leaders who appreciate the dynamics of change through time that will turn this vision into reality.

Further reading

Juma C. (2011) *The New Harvest: Agricultural Innovation in Africa.* Oxford, UK: Oxford University Press.

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