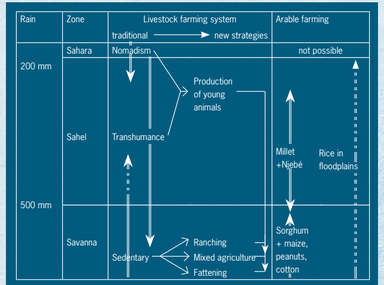
Increasing the productivity base of the poor soils in Africa is essential if the potential of rainfed agriculture is to be realised. This calls for location-specific strategies for soil fertility management. Legume-based systems, capturing nitrogen from the air, provide interesting opportunities to improve soil productivity. In this context, availability and application of phosphorus and other macro and micronutrients require more attention to prevent imbalances in soil nutrient supply and in nutritive value of crop produce.

The major constraints of the nomadic and sedentary animal husbandry systems in sSA could be alleviated by integrating the systems. The traditional semi-nomadic systems could serve as 'delivery room', providing young animals that could be fattened in the savanna. Feedlots would then be located closer to urban centres, where demand for animal products is highest. This would require intensification, including the use of external inputs such as fertilisers, to improve the quality of crop residues and pastures (leguminous forage crops might also be used). 'Savanna-meat', so far underexploited, might even lead to the creation of a new, high-quality niche market.

Biofuels in small-scale enterprises and integrated in complex production systems (e.g. hedgerows) can contribute to diversifying rural income and catalysing rural development.



Integration of nomadic and sedentary systems in sSA to enhance productivity.

The fuels could be used to run irrigation pumps or light vehicles. Large-scale exports of biofuels are controversial and should be investigated judiciously to establish their compatibility with Africa's overall development priorities. Cultivation of legumes like soybeans for food and feed, but also for the rapidly increasing market for edible oils, and other legumes to meet the increasing protein demand, are interesting options that fit agricultural development strategies in Africa.

Social capital, trust and institutions vary widely across sSA, as they have been shaped by historical and current political governance, peace/conflict, culture, economics and other factors. These societal characteristics affect the functioning of institutions that can support or hinder poverty reduction. A pluralism of institutional models – embracing both customary elements and formal rules – is needed to fit the different contexts. Innovative extension approaches, such as farmer field schools that directly involve farmers in field testing and adoption of technologies, and close linkages between policy makers, farmer organisations and research institutions should be established.

Formal land tenure registration systems, particularly individual titling, tend to be expensive, badly tailored to local contexts and inaccessible for poor groups. Flexible land tenure systems have been installed in Ethiopia, Mozambique, Uganda and Niger with both verbal and written evidence accepted for registering land rights. In Mozambique and Niger, collective rights may be registered, building on the principle of collective management of common property resources. These approaches build on positive aspects of socially embedded rules and on group organisation, and show promise when it comes to reaching some of the poorest and most disadvantaged groups.

In embracing diversity, it is important that responsibilities are delegated, and central authorities should engage only in those tasks that cannot be performed effectively at intermediate or local levels. The optimal level of decentralisation is critical for balancing the interests of various groups and will vary from country to country, depending on local governance processes. Support should be extended to decision makers so they can develop the necessary competencies and skills to solve complex problems. Similarly, the many international policies, aid programmes and organisations working in African agriculture need to be coordinated if they are to better fit specific conditions and lower transaction costs.

Policy makers should search for a proper balance between local food markets and the global food system. Integration in international niche markets (flowers, fruit, vegetables) or bulk markets may offer opportunities for specific farmers. For example, it is difficult for farmers to participate in high-value supermarket chains that supply urban populations, due to the high quality requirements and strict compliance criteria. This stimulates vertical integration and is biased towards large-scale production to secure quality and quantity. Nevertheless, small-scale farmers can supply these chains involving farmers, traders, supermarkets and governments. Producer organisations can support farmers in coping with risks, providing technical assistance and information, for example to increase their bargaining power. The decision to produce for specific markets obviously depends on access and technology, but also on risk-mitigating opportunities. In the presence of volatile prices, farmers may rationally decide to limit the production of cash crops and opt for subsistence food crops instead.

Another promising opportunity is expansion of regional trade, as only 9% of agricultural imports in Africa come from farmers located within the region. For regional trade to expand, major infrastructural constraints need to be overcome. Food aid could be replaced by financial aid directed toward developing a market for local purchases. Targeted policies can help kick-start markets. For example, the case of 'infant crop' arguments (offering temporary import restrictions to protect domestic producers, enabling them to gain a competitive edge over time) has been debated. In WTO rounds, African countries should be strongly represented so that they are able to shape their own policies and development paths, which would depart from the "Washington consensus" style recommendations based on liberalisation and deregulation.

Closing remark

Sub-Sahara Africa will continue to face both internal and external challenges. African nations should devote attention to developing specific institutional and managerial skills, knowledge networks and technologies so that they can effectively negotiate and manage these challenges. Africa should be given the opportunity to set its own priorities, rather than being driven by vested national or international interests. In this way it will be able to leapfrog development and avoid increased competition for its scarce resources.

The information of this flyer is based on the report:
Prem Bindraban, Erwin Bulte, Ken Giller, Holger Meinke, Arthur Mol, Pepijn van Oort, Peter Oosterveer, Herman van Keulen & Meike Wollni, 2009. Beyond competition – Pathways for Africa's agricultural development Plant Research International, Wageningen UR, Report 242.

The report can be downloaded from:
www.pri.wur.nl

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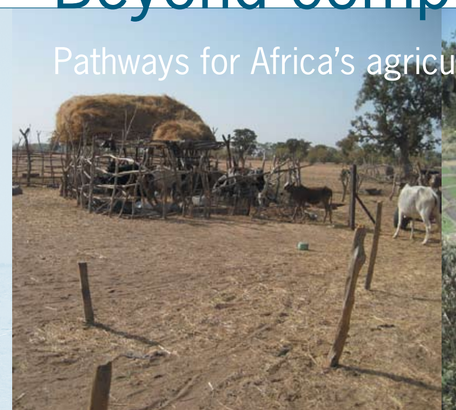
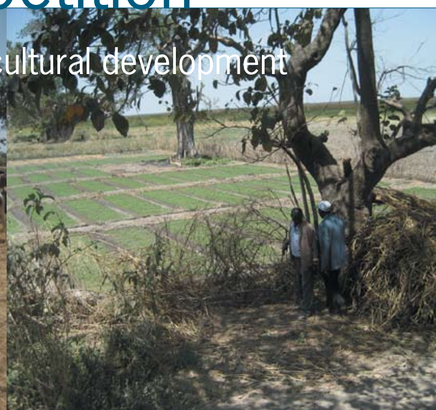
Contact:
dr.ir. P.S. Bindraban, Plant Research International (PRI)
Phone: +31 317 48 08 81 / E-mail: prem.bindraban@wur.nl

Beyond competition

Pathways for Africa's agricultural development





Africa has not undergone a green revolution and much of the continent faces severe poverty and hunger. Development of Africa south of the Sahara is high on the international community's agenda and the crucial role of agriculture in poverty reduction and hunger alleviation is receiving renewed attention. Almost 70% of the population lives in rural areas and is dependent on agriculture. Therefore this sector needs full support, if a serious contribution is to be made to the Millennium Development Goals of halving poverty and hunger by 2015. Food insecurity in sub-Sahara Africa (sSA) has been at alarming levels for decades: one in three people is undernourished. And these 240 million people continue to suffer under the current trend of 'business as usual'.

WAGENINGEN UR
For quality of life

Agricultural productivity

Agriculture serves as a stepping stone towards overall economic growth and improvement of living standards. However, virtually no intensification has taken place in the agricultural sector in sSA, and the increase in food volume has largely been achieved by expanding the area cultivated, in contrast to other continents where per area yield increases have been the main driver of increased food production.

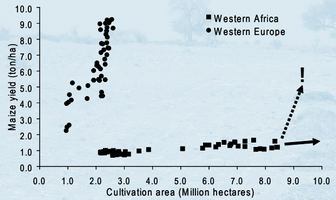


Illustration of the different routes through which the increase in food volumes have been realised. This holds for virtually all crops, even those native to sSa. Dotted arrow indicates desired yield increase strategies to minimize claims on additional land. Source: Based on FAO data.

These different pathways result from differences in the ease of increasing yield. The green revolutions in the OECD countries during the 1950s, and in Asian and Latin American countries in the 1960s and later, occurred in areas with favourable biophysical conditions. In these regions, rainfall is reliable or irrigation is feasible. Productivity on soils with favourable characteristics was further increased through the application of fertilisers, and pest, diseases and weeds were controlled effectively. Hence, production environments were adjusted to the needs of plants and animals, aided by favourable policies that stabilised prices and market conditions and created supportive institutions.

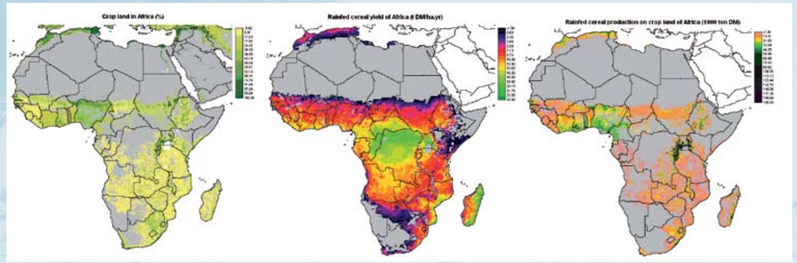
In contrast, yields in sSA remained low. Continuous production without inputs has led to depletion of soil fertility (which is already low and shows highly local variability) and high pressure from pests, diseases and weeds. These factors, combined with erratic rainfall patterns have resulted in very high production risks, including frequent total crop failure and death of animals. This adverse situation is further exacerbated by unfavourable socio-economic conditions, and the absence of hard and soft infrastructure to support a vibrant agricultural sector. These unfavourable conditions are not unique to sSA. They also occur in southern Asia for instance, particularly in production systems where there is limited control over production factors, such as upland rice. Increasing yield is much more cumbersome as location-specific agronomic interventions are required, supported by more effective and diverse market and institutional conditions.

Agricultural development

To increase productivity it is paramount to identify strategies that are most effectively tailored to the socio-economic context of sSA. Any expansion of agricultural land must be carefully planned so that land rights are respected and exploitation of fragile eco-systems is prevented, and biodiversity is maintained, avoiding irreversible environmental damage and increases in carbon emissions.

Land productivity could be doubled or tripled in sSA if rainwater was properly managed, soil nutrients precisely applied, weeds effectively controlled and crops protected from pest and diseases. Yield increase would reduce the need for area expansion, while adverse environmental effects due to intensification could be contained within acceptable limits. However, even such large productivity increases are unlikely to be able to supply the growing population with an adequate diet, making further area expansion of agriculture unavoidable. The increasingly fierce competition for natural resources will be at the expense of biodiversity.

Foreign nations are showing growing interest in Africa's production base as they seek to secure their own growing needs for food, feed, fibre and fuel. These claims pose an additional threat to Africa's food security. Proactive and timely adaptation measures, both technical and institutional, might help rural Africa to capitalise on this increased demand instead of becoming victim to it.

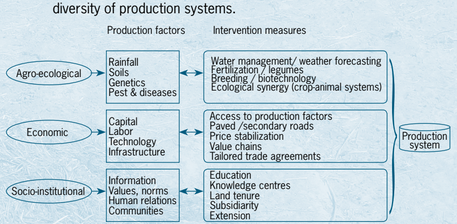


Calculated ecological production potentials based on rainfed agriculture. A. Current distribution of agricultural land (From dark to light green – decreasing fraction of grid is agricultural land). Maximum attainable biomass production under rainfed conditions on the entire continent. Production volumes on current agricultural lands. Source: Conijn et al., 2009.

The diversity challenge

Interaction between the high biophysical variability (spatial and temporal) and diverse economic and poor institutional conditions has resulted in a myriad of production systems that are able to cope with variable production environments. The systems are complex. Ten to fifteen crops are grown simultaneously within the same farming system, often in combination with animal husbandry. This setup provides a multitude of risk management strategies for coping with variability. Yet, such an effective 'safety first' survival strategy is unable to profit from favourable rainfall when it occurs. While inputs, such as fertilisers, could increase long-term average yields, the large variability is regarded as a constraint by risk-adverse farmers. There is, therefore, no one-size-fits-all solution: technologies alone will be ineffective without appropriate institutional and market support.

Even under these circumstances, the basic concept underlying the success of the green revolution still holds: enabling technologies designed to suit local biophysical and social conditions are needed to raise productivity. The challenge in sSA is that a much wider range of these enabling technologies is required, than, for instance, in the rice and wheat-based cropping systems of Asia. Biophysical production factors, along with economic and institutional conditions should be geared towards creating a low-risk investment climate for agriculture. This will require a combination of measures to control larger, systemic risks (e.g. agricultural insurance schemes), while seeking to take advantage of the high diversity of production systems.



Production systems result from the complex interaction of agro-ecological, socio-cultural and economic conditions within a political/institutional environment. Based on Ojiem et al., 2006.

Beyond competition

Current technologies, institutional arrangements and the ways markets function have recently led to a collapse of various global systems, including the financial, industrial and mortgage systems. These developments have serious implications for energy and food systems. Less immediate, but progressively pressing issues include the apparent reduction in oil reserves, increasingly scarce water resources, increased variability and risk in agricultural production due to climate change, deteriorating quality of land, pollution of air and water, and loss of biodiversity. This deterioration of the production base means that a continuation of 'business as usual' is likely to evolve into ever fiercer competition for resources.

Resolving these issues calls for fundamentally new approaches that break with current institutional arrangements, stakeholder interests, market functioning and technological means. Producing biofuels, for instance, does not fundamentally address emerging petrol-related problems, because it does nothing to reduce the continued use of outdated combustion technologies, thereby merely continuing to serve vested interests. Similarly, increasing resource use efficiency in rice may require a shift from traditional flooded rice systems to cultivation methods similar to those used for most other cereal crops. Such fundamental changes are complex and their implementation would require reconciliation between different and possibly conflicting objectives. In light of the diverse production environment in sSA, these new approaches should be flexible, geared towards creating enabling conditions for bottom-up responses, and be designed to maximise learning along the way.

This approach of transformational change creates new opportunities. Africa should benefit from this environment and embrace advanced techniques and technologies which can help to 'leapfrog' development. These are vital for its development, as are advanced organisational skills and diversified market conditions. Mobile phones and cheap, wireless computers eliminate the need for costly grid-wiring. Information, such as seasonal forecasts, early warnings of extreme events or commodity price fluctuations, can be communicated cheaply and quickly. Decentralised energy systems, based for example on solar panels and small, community-based bioreactors, can provide energy in remote areas, thereby freeing up labour currently required for collection of scarce firewood, improving cooking, and reducing the need for fossil fuel. In agriculture, integrated production systems might be preferred over mono-cropping from the perspective of ecological and social sustainability. In these systems, ecological synergies may arise and lead to benefits, such as the creation of refuges in non-productive areas for natural enemies of pests on crops in adjacent production fields. Such synergies may yield valuable insights for enhancing the productivity of complex production systems, which are inherent to most of sSA. We need to evaluate, without ideological prejudice, the potential of advanced bio- and nanotechnology to raise use efficiencies of resources, including land, labour, water, capital and nutrients.

Recommended agricultural pathways for Africa

Embracing the enormous diversity of the production systems in Africa implies that thousands of location-specific successes will have to be achieved. This approach will incur high costs, be knowledge-intensive and require enduring efforts. The resilience of the production systems should be enhanced through ecological synergies, and more emphasis should be given to enhancing the productivity of crops specific to the African diet, like bananas, root crops and small grains, situated within the local production system.

Increasing the productivity of rainfed agriculture is to be given highest priority, as it will continue to make the largest contribution to Africa's own food production. The irrigation potential is limited. Rainfall is generally sufficient to raise current yields two or threefold, but better management of the highly variable amounts of rainwater is imperative. Climate science can now support decision-making at operational level and guide the search for adaptation measures. Resilient cropping systems that make use of drought-tolerant varieties and fertility-raising measures need to be part of these developments.