World Agroforestry Centre

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Policy brief

The drivers shaping change in African farming systems

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Almost half of the African population lives in extreme poverty. Out of these, more than two-thirds live in rural areas and generally make a living by producing rainfed crops, livestock, trees and other agricultural activities. Sub-Saharan Africa's population has increased dramatically over the past 50 years. It is now 850 million and projected to increase to over 2 billion by 2050. The challenge is to produce enough food for this increasing population, and to do so in a sustainable way.

Improving agriculture, particularly smallholder agriculture, is fundamental to improving food security and reducing poverty in sub-Saharan Africa. Appropriate policy tools and interventions are needed based on a clear understanding of the drivers affecting farming systems and how they interact and operate at a local level.

A farming systems framework provides a way to aggregate farm households that have broadly similar resource and livelihood patterns, similar constraints and investment opportunities, and options for managing risk and enhancing productivity. In a new analysis, 14 major farming systems have been classified for Africa, based on spatially explicit agro-ecological and socio-economic variables and expert opinion (Figure 1).

Drivers influencing farming systems and households

Farming systems are highly dynamic and change over time in response to a number of determinants. Seven key drivers analysed below shape the development of farming systems in sub-Sahara Africa. The relative importance of these drivers, how they manifest, and how they interact, differs between farming systems. This needs to be considered in developing science and policy options to improve food security and reduce poverty.

The influence of drivers on household decisions can be direct or indirect. For example, urban demand and international markets influence farmer decisions via local markets. The costs of transportation or storage affect the returns received for produce, and risk levels. Households are vulnerable to natural and economic shocks, both of which are prevalent in African agriculture. The collective effect of decisions across a population of farming system households with similar characteristics will shape change in the farming system. The evolution of farming systems between purely subsistence systems and more specialized market-oriented systems is path dependent. Therefore, the analysis of trends and drivers can help devise appropriate development interventions according to farming systems types.

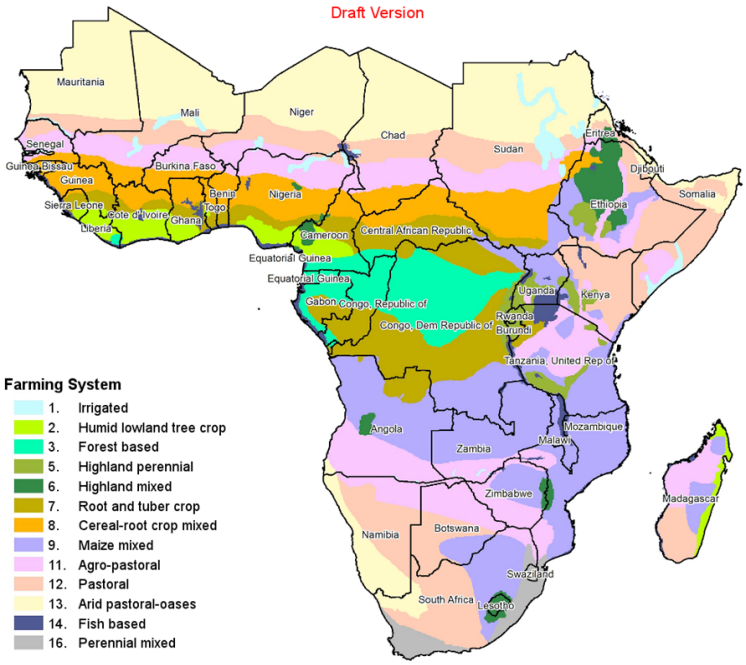


Fig 1. The farming systems of Africa

Note: The Urban and Peri-urban Farming System is not mapped and occurs in all parts of Africa in the centre or fringes of cities. Systems are numbered according to population size in e xtreme poverty

The farming systems classification approach is detailed in Policy Brief 16: 'A farming systems framework for targeting investment in Africa'

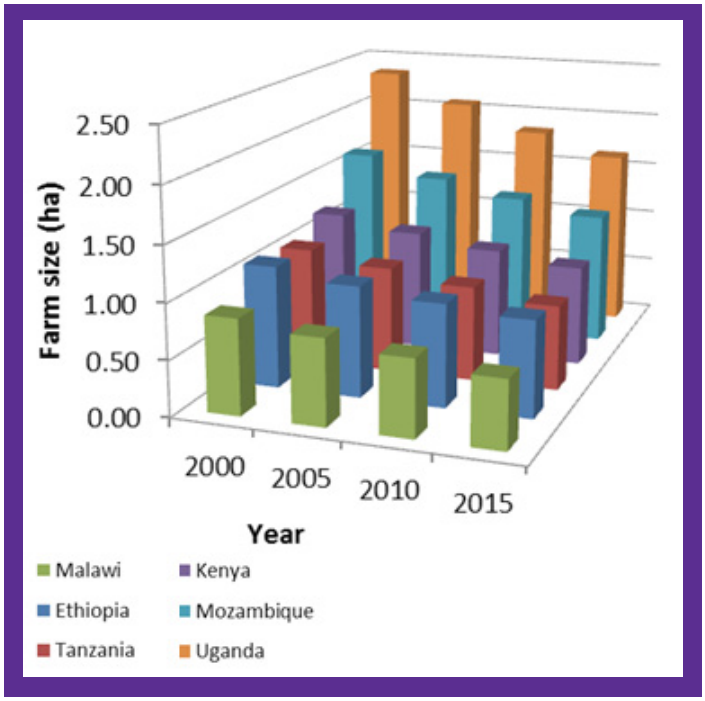
Population

Despite some area expansion, farming systems are reaching limits due to rapid population growth. The result has been reduced farm sizes and fragmentation of farms (Figure 2). As households sought to provide food and maintain income, other changes have occurred including shorter fallows or elimination of fallows, reduced soil fertility, soil degradation. Off-farm work is now a significant and growing component of household income generation in most farming systems. Urban populations have expanded due to rural displacement, creating an expanding demand for rural produce. The Urban and Peri-urban Farming System is an important supplier to these markets.

Close to 75% of the rural poor in sub-Saharan Africa live in five farming systems – the Maize-Mixed, Agropastoral, Highland Perennial, Root and Tuber Crop, and Cereal Root Crop Mixed Farming Systems. These systems have experienced an abrupt closure of the land frontier and declining farm size as a result of high populations, with associated poverty, food insecurity and social change. An exception is the Cereal-Root Crop Mixed Farming System, where there is still opportunity to expand into unused land, if constraints with markets, transport and storage of produce can be ameliorated.

Natural resources and climate

In many systems, variable annual rainfall, poor soil quality and drought create a challenging agro-ecological environment, with variable yield, high risk of crop failure and lack of pasture or fodder for livestock, such as occurs in the Cereal Root Crop Mixed, Pastoral, and Agropastoral Farming Systems. Declining soil fertility has become a major development issue in all farming systems, along with land degradation, and there is evidence of declining biomass productivity on a huge scale in Africa. Most farmers use little or no fertilizer due to cost or inadequate returns. This calls for integrated strategies combining the promotion of better on-farm integration of livestock and fertility-enhancing trees, resource-conserving agriculture, and better access to fertilizers.



Source: Auricht, 2013

Fig 2. Farm size trends in eastern and southern Africa

Deforestation has particularly occurred in the Forest-based, Tree Crop, Root and Tuber and Cereal Root Crop Mixed Farming Systems. However biomass productivity has increased in some parts of West Africa during recent decades, particularly in the Agropastoral and Cereal-Root Crop Mixed Farming Systems, partly due to the widespread adoption of farmer-managed natural regeneration of trees in croplands.

Water management offers great potential for agricultural growth, and for reducing food insecurity and poverty in SSA. Irrigated farming occupies less than one-fifth of the estimated suitable area and this could increase. However large-scale irrigation through public investment has often failed. Smallholder irrigation is widespread and rainwater harvesting technologies are available for vast expansion. Tsetse fly infestation is a major factor limiting the distribution of livestock in some farming systems, for example in the Cereal-Root Crop Mixed Farming System.

Climate change is forecast to have some of its most severe effects in parts of Africa, and the adoption of adaptive farming systems is a key challenge for the future. With increasing population, higher temperatures and rainfall variability, farmlands will be more susceptible to uncertain yields and a lower yield potential.

Energy

For the rural poor in most farming systems, biomass is the main source of fuel. Access to grid electricity is limited but gradually rising. The dominant use of fuel wood and charcoal affects deforestation, nutrient cycling on-farm, labour availability, soil erosion, and the siltation of downstream investments. Acute fuel wood shortages affect the Maize Mixed, Agropastoral, Highland Perennial and Highland Mixed Farming Systems.

Human capital

Education levels of rural people have increased substantially, and communications technology has brought information and knowledge much closer to small farm households. However social constraints and lack of education limit options for pathways out of poverty, such as accessing extension and new technologies, off-farm employment and improving knowledge and capacity of women in agriculture.

Technology and science

The range of technologies and institutional innovations available to small farmers has steadily increased in Africa, even as public research capacity has declined in many countries. Technology and improved varieties have assisted in some systems (e.g. crops in Highland Perennial and disease science in Pastoral) but in most systems, farmers are limited by poor access to inputs and extension services. Across a range of systems, better access to improved crop varieties and better integration of livestock and trees could deliver increased production. Appropriately applied mechanisation could also improve production in some systems (e.g. Cereal-Root Crop Mixed Farming System).

Markets and trade

Even though market access is improving, a common problem across most farming systems is limited farmer access to input, output and credit markets. Farmers will not invest in their farm, or produce a surplus unless there are markets and attractive prices. Many farmers have to travel more than 7 hours to the nearest town of more than 20,000 people, in particular Forest-based, Highland Mixed, Root and Tuber, Maize Mixed, and Pastoral Farming Systems.

Because of the rapid rate of urbanisation, the greatest growth potential in markets is in domestic and regional markets. Currently, poor coordination and weak markets and institutions induce transaction costs and sustain market failure. Improved road networks, supply chain logistics, market institutions, and value-chains (targeting relationships and value-adding of products) could help farmers participate much more actively in trade.

Box 1

The **Highland Perennial Farming System** occurs in moist highland areas with favourable climate and soils and lower incidence of pests and human disease, and was settled early. It has a very high rural population density and the highest rural poverty rate (59%). Rapid population growth has resulted in declining farm size, but with productivity enhanced to some extent by the intensification of farming systems. Good access to markets and supportive agricultural trade policy has allowed intensification and diversification to occur, with diverse activities including tea, coffee, banana (or enset in Ethiopia), maize, beans, sweet potato, cassava, livestock including dairy, and off-farm work. The system is now running up against extreme limits of high population densities, minimum farm sizes, and unsustainable pressure on the natural resource base.

Institutions and policies

Positive developments have taken place in the liberalisation of trade and markets, the strengthening of institutions and policies, the sharing of information and knowledge and in investments in social capital. Despite this, common constraints in most farming systems include land tenure insecurity, poor road infrastructure, limited access to markets, competition from cheap imports, inadequate agricultural research and extension capacity, and lack of education for youth to seek off-farm employment. With rapidly increasing populations, governments have struggled to expand the availability of schooling, health care and other infrastructure. This affects labour availability, capacity and skills, markets and other issues.

Boxes 1 and 2 illustrate the influence of several major drivers in two contrasted farming systems.

Box 2

The **Maize Mixed Farming System** occurs on sub-humid highland and plateaux areas from 800 to 1500m elevation, with a medium season length (191 days average), and has a higher population of rural poor than any other farming system in Africa. Area expansion has underpinned most previous growth in food production in the system. However, this has now reached limits, with agricultural margins pushed into remaining forests. Hunger and poverty are extensive (80% of the poor depend on farming for their main livelihood). Some diversification and intensification has occurred, showing that it is feasible in this system. Off-farm work is a significant contributor to income in most households. The development of road networks in the past few decades has given most of the rural population in this system moderate or good access to input and produce markets. However, a less supportive policy and trade environment relative to the Highland Perennial farming system has made it difficult for smallholder farmers to access seeds, inputs and output markets in order to respond to market price signals. The system has the potential to be the food basket and a driver of agricultural growth and food security in the region.

Source: World Agroforesty Centre

Fig 3. A Malawian farmer in his farm

Interventions

Development interventions will require a deep understanding of the interactions between the drivers at the farming system level in order to identify and build on current successes, and to encourage new and innovative thinking about future pathways and opportunities. Some key interventions required across farming systems are population policy with family planning education; enhanced fertilizer use and integrated soil fertility management; farm system improvement through conservation agriculture, water capture and risk management; better on-farm integration of livestock; improved market institutions and road access; improved crop storage and processing; continued research investment in major food crops, and investment in minor cereals, root crops and pulses (e.g. drought tolerance, yield and production systems); systems analysis and scenario modelling; building women's knowledge, skills and capacity in farming systems; and fundamental investment in building capacity and delivering extension that is grounded in solid understanding of agriculture, farming systems and social context.

Further information on drivers of change and strategic interventions for policy and science in African farming systems can be found in the forthcoming book **Farming systems and food security in sub-Saharan Africa: priorities for science and policy**, which will be co-published by Earthscan, FAO, ICRAF, ACIAR, and the World Bank.

For further information, please contact:

Dr Dennis Garrity (D.Garrity@cgiar.org)

Dr Jean-Marc Boffa (J.M.Boffa@cgiar.org)

This document was prepared by Dr Rosemary Lott.

CGIAR

The World Agroforestry Centre is a member of the CGIAR Consortium

United Nations Avenue, Gigiri, P.O Box 30677-00100 Nairobi, Kenya
Phone: +254 20 7224000, Fax: +254 20 7224001
Via USA phone: (1-650) 833-6645, Fax: (1-650) 833-6646
Email: worldagroforestry@cgiar.org

www.worldagroforestry.org