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Implementation of the farming systems approach for African food security

Dennis Garrity, John Dixon, George Mburathi, Timothy Olalekan Williams and Tilahun Amede

Key messages

- The vision is that, by 2030, market-oriented diversified small farms will dominate African agriculture, linked to and supported by value addition and agroprocessing by small- and medium-sized enterprises in value chains that create jobs for young people and women. These farming and food systems will provide rural food and nutrition security and underpin adequate and diversified food supplies to cities.
- Sustainable intensification and diversification will underpin functional farming and food systems with greater resilience to climate and market shocks as well as rural transformation in Africa.
- Knowledge of farming systems (defined broadly to include value chains and local institutions) and farming systems thinking will strengthen decision making through the critical analysis of required policies, institutions, innovations and investments for rural development. Focused knowledge sharing and systems analysis by major farming systems will be enabled by the establishment of multi-stakeholder consultative platforms for important farming systems, supported by existing regional and national bodies.
- Increased capacity in systems analysis at all levels is needed to enable the formulation of effective integrated strategies, implementation and monitoring of impacts. Capacity development will be supported by centres of excellence on farming systems research and development.

Summary

With a growing population, changing demands and strengthening food markets in Africa, it is expected that semi-commercial and commercial diversified small and medium-sized farms will dominate agriculture by 2030. Increasing commercialization has already modified farming systems during the period from 2000 to 2015, along with new technologies, feeder roads and markets which changed crop, livestock and livelihood patterns. The continued evolution of the agricultural sector to 2030 will stimulate rural transformation, with a vibrant rural non-farm economy well linked to farming and urban economies. Progress in African farming and food systems will be largely driven by sustainable intensification and diversification of smallholders. Agribusiness will provide affordable services

to farmers, value addition and access to domestic and export markets. Farming and food systems will be resilient to climatic and market shocks.

A greater understanding of farmer and rural entrepreneurial decision making will contribute significantly to co-designed, inclusive policies and institutions. These will include elements that are customized to specific farming systems. To this end, regional and national multi-stakeholder farming systems platforms are needed to coordinate the analysis, monitoring and evaluation of farming systems structure and function, and to inform policy formulation and investment planning accordingly. The platform teams will integrate the knowledge and views of Ministries, producers and value chain actors, in order to tailor policy formulation, research priorities and rural development investment to specific farming systems.

This vision of farming and rural and food system development will require a massive boost in the capacity to conduct systems analysis and participatory engagement. The use of systems modelling tools enables researchers and policy makers to identify strategies and points of intervention in farms and value chains that result in the greatest returns for the lowest risk. There is a great need for retooling to undertake multidisciplinary analyses of important farming and food systems. Hence building capacity to undertake systems analyses within and across development agencies is a high priority, which should be supported by centres of excellence on farming systems research and development. Successful expansion of systems analysis will require strong commitment and leadership in individual countries and at regional levels.

The vision for farm households, farming systems and food systems in 2030

This book updates the 2001 FAO/World Bank study of farming systems and poverty (Dixon et al. 2001) for Africa, taking into consideration increased population, evolving demands for food, changing climates, strengthening markets, new technologies and other mega-drivers of change. Previous chapters documented a wealth of knowledge on the resources, livelihood patterns, performance, drivers, trends and strategic interventions in African farming systems which can improve food and nutrition security by 2030. Chapter 1 introduced African development challenges, supply and demand for food, poverty reduction, mega-drivers of agricultural and rural development, and the livelihood patterns characterizing various African farming systems. Chapter 2 outlined the sources of information and the methods of data triangulation and analysis. Each of Chapters 3 to 16 characterized a particular farming system and its subsystems, summarized system performance, outlined the influences of the mega-drivers of change and identified priority strategic interventions. The potential advances in farming and food systems were sketched out in Chapter 17, laying the foundation for a discussion in Chapter 18 of key elements of national and regional strategies for improved food and nutrition security.

The farming system concept applied throughout this book embraces the management of plant, animal and other farm production and household consumption, and the function of local institutions associated with value chains, market access, community groups and common property resource management, including forests, grazing lands and water resources for irrigation and livestock. The analysis of farming systems identifies a wide range of interactions between the elements of farms, households and local institutions. Such interactions are frequently synergistic. For example, fertilizer trees generally increase

soil fertility and food crop yields, contract farming can strengthen production and markets, diversification of farm crop and livestock enterprises can improve household diets and reduce malnutrition, and the adoption of conservation agriculture can reduce women's labour requirements. In other circumstances where interactions are competitive, the analysis of trade-offs is important. For example, the consumption of crop residues by livestock might slow the adoption of full conservation agriculture practices, strengthened value chains might weaken traditional local exchange mechanisms, or availability of cheap inorganic fertilizer might reduce applications of compost to crops. The concept of food systems embraces all activities from food production to consumption, and thus overlaps the farming system concept. Food value chains, markets, quality and nutritional outcomes are important aspects. Sustainable farming and food systems ensure improved smallholder incomes and food and nutrition security for consumers (including smallholders) while meeting environmental, economic and social goals. Smallholders, rural communities, consumers and national economies can benefit from farming and food systems analysis which improves policies, institutions, markets and technologies.

This chapter outlines an achievable vision of farming and food systems development, in line with the Malabo Declaration and the Sustainable Development Goals, based on the implementation of the interventions and policies identified in this book. We envisage, by 2030, an African agriculture which will be dominated by market-oriented small- to medium-sized family farms with diversified and semi-commercialized crop, tree, livestock and fish enterprises. Within each broad regional farming system there will be pockets of advanced rural development with leading innovative households who manage integrated farms with novel diversification and substantial off-farm income – from which other farm women and men will learn. Rural youth will play a critical role in the modernization of the farming, non-farm and food systems. Many leading smallholders will have been able to expand cultivated area and herds through leasing, out-grower schemes and other institutional arrangements, and be well connected to local and urban markets. Many farmers in most systems will benefit from the expansion of small-scale irrigation, conservation agriculture-based sustainable intensification and diversification, fodder management and agroforestry tree cover on farms. Modern information technologies will be one driver of change, supported by remote sensing and spatial analysis technology, early warning systems, and knowledge of biotechnologies and biological control and management of pests, weeds and resources. Consumers will benefit from improved food systems, particularly diversified and reliable food supplies to cities.

Because of more effective agricultural services provision, made possible by increased public and private sector investment, leading farm households will be well informed about market, regulatory and technological options. They will invest in their farm resources and benefit from better farm management supplemented by active learning and innovation. They will also benefit from advances in social capital, for example, through rural women and youth groups learning about institutional and technological innovations to improve resources, productivity, market access and resilience to climatic, disease, market or other shocks. Wide availability of food market information will benefit smallholder producers and rural and urban consumers.

Functional and equitable local institutions and policies will enable flow-on benefits to the wider community and rural population. Improved agricultural services and market access will underpin intensification, diversification and increased off-farm income. Through a greater diversity of farm enterprises and increased local income, household

food and nutrition security will be substantially improved in many rural areas and for urban consumers. In addition, greater incentives for sustainable land and water management will be demonstrated through active land restoration programmes. Successful innovation platforms or other forms of multi-stakeholder consultation will bring together local value chain agents, farmers, researchers, extension specialists, NGOs and local development officials. They will actively foster accelerated technological and institutional innovation that better meet farm resource management needs, and facilitate more effective, equitable and productive local common property resource management.

The successful smallholders will be embedded within flourishing farm and non-farm rural economies that will generate enough additional employment to slow migration to megacities. Digitally supported competitive markets will enhance the availability of a wide range of timely and affordable supply of inputs including finances, insurance and information services, and attract investment in transport and value addition for local produce to domestic, African and international markets. In addition, improved rural labour markets will expand opportunities for off-farm employment, link smallholders to rural business and increase growth multipliers between the farm and non-farm economies.

African food systems will have expanded to adequately feed the growing rural and urban populations. Fertility rates are beginning to decline in many African countries, especially in urban areas. These will decline more rapidly, also in rural areas, as girls' education becomes ubiquitous, local health systems improve and economic growth generates opportunities for remunerative occupations. The next few decades are critical until population growth rates slow; thereafter, it will become easier to meet future food and nutrition demands through production and imports. Greater awareness of nutrition and diversification of farming systems are expected to alleviate the threats associated with the double burden of malnutrition.

Continuing urbanization will have generated many African megacities by 2030. Urban food demand will have increased very substantially, and urban consumers will be buying a much greater range of fruits, vegetables, dairy products and other higher-value foodstuffs. This trend will be a major stimulus to farmers and food value chains to provide a more diverse and profitable mix of food surpluses for supply to the cities. Smallholders and food value chains will be more competitive, and expanded subregional trade will drive increased efficiency, for the benefit of both consumers and farmers. However, the majority of smallholders will still consume a significant (although declining) part of their own home-produced food. Consequently, in the absence of perfect market function, farm household food consumption and production decisions will still be integrated. On-farm diversification will not only increase income and reduce vulnerability of livelihoods but will also underpin more diversified rural diets and reduce malnutrition. These changes in the food systems will be a major boost to the evolution of semi-commercial small- and medium-sized family farms.

The foregoing vision of farm households and farming systems development depends on the public and private sector stepping beyond business as usual. Effective implementation of improved and innovative food and nutrition security strategies that ensure more sustainable and resilient intensification and diversification will be absolutely critical. The consequence by 2030 would be substantial growth in average farm household income, a reduced proportion of food-insecure farm households and reduced rural malnutrition. The implementation of these better-targeted food and nutrition strategies will be facilitated by mainstreaming the farming systems framework and by enhancing systems analysis capacity in core agricultural and rural development organizations.

As documented in Chapter 18, the global farming systems framework has served many purposes since 2000 in relation to policy, investment planning, research prioritization and education for African farming and food systems. The update in this book of the status, trends and needs of farming systems in 2015 also adds enormous critical knowledge for much strategy development, planning, implementation, monitoring and evaluation. Chapter 18 also outlined the value of platforms and working groups for major African farming systems to monitor and evaluate trends, constraints, development initiatives, and emerging technological and market opportunities in the particular farming system. The clarification of the contrasting performance, constraints and needs of different farming systems will contribute to resolving the fundamental confusion which arises from averaging resource availabilities, yields, constraints and opportunities within a heterogenous agricultural sector.

Implementation of the farming systems approach and food security strategies

Engaging with stakeholders

There are many stakeholders who determine the pathways for the development of farming and food systems, and they influence the outcomes of any agricultural or food strategy, policy or programme. There is a strong case for the reorientation and harmonization of stakeholder contributions. There are six main sets of stakeholders related to the development of farming and food systems: farm households, farmers groups and communities; rural and urban consumers; agribusinesses; national governments, their agencies and local officials; regional organizations; and development partners and other international investors.

As defined in this book, farming systems are groups of farmers (and communities) with similar livelihood patterns, constraints and development opportunities. The aggregate production and consumption outcomes of a farming system are a function of the decisions of millions of farm households, and careful analysis can anticipate the pathways of change and likely scenarios. The analysis in preceding chapters has shown that the potential of smallholders can be unlocked with access to public and private agricultural services including markets and new technological and institutional innovations. History shows that smallholders respond vigorously to incentives for farm development that are aligned with their own household strategies.

The growth of agribusiness in Africa has been slower than expected in the aftermath of the downsizing of public service provision during structural adjustment. However, there are now signs of agribusiness expansion in some sectors, for example in the marketing of improved maize seed. Also, farmers, farmer groups and communities are increasingly interacting with micro- and small businesses. The farming systems analyses can help to provide businesses with a better understanding of: the pathways for farming systems development, the development of markets for inputs to serve farm intensification and the needs of new enterprises for on-farm diversification. These farming systems analyses can help with optimal location of facilities, for example cold storage chains, fertilizer factories and processing units, and assist with feasibility studies and financing for agribusiness investment.

Alongside market development, national government agencies have a crucial role to play in the development of farming and food systems through the provision of critical public

goods such as technology, infrastructure, market and regulatory information, and the building of human and social capital. The targeting and delivery of these public goods will be facilitated by the further mapping and more detailed characterization of different farming systems at subnational levels. Moreover, the analysis of farm households and food systems provides knowledge on sustainable system options and farmer responses to policy instruments.

There is an important message for national agencies associated with integrated farming systems: interactions between trees, crops and livestock are so prevalent in Africa – they can be observed in the vast majority of farming and pastoralism situations – that farm household and community level interactions must be considered seriously in the design of agricultural development programmes and policies. Failure to understand these interactions and to incorporate this knowledge into programme design is in fact designing for failure. Indeed, this has been the key shortcoming that caused so many of the development failures that have been observed in the past.

Regional and sub-regional bodies can support national agencies with African regional public goods and links to international public goods. There is great scope for these managed spillovers of development options and experience within Africa and for learning from international experience. Better arrangements for regional trade in food between African countries will improve food system efficiency and reduce food wastage. As noted earlier, there is a need to expand the role of international public goods generated by international bodies, and for more active collaboration among these partners that is focused on farming systems as the basis for more successful food systems. Continental political organizations and institutions, if properly briefed, will be effective in reinforcing the efforts of sub-regional organizations for the coordination and scaling-out of the new innovations.

Engagement with stakeholders can occur individually but is often more effective through multi-stakeholder consultative processes such as the innovation platforms described in the previous section. In such innovation platform contexts, stakeholder interests can be aligned and conflicts can be resolved. These institutions can be organized at any level, from communities to farming systems or regions. For example, the farming system working groups discussed in the previous section could also bring together representatives of all six stakeholder groups at national or regional level for joint learning, coordinated implementation and monitoring of farming system developments.

Mainstreaming the farming systems framework into sustainable rural transformation and strengthened food systems

Farming and food systems are dynamic: they are continuously evolving and interacting. Part of the change is visible, but part is the invisible adjustments of internal economic and biological relationships which build up pressure for major change. The pressure points can be identified by careful analysis of the farming systems and the associated changes that are anticipated in coming years. Similarly, analysis can examine food markets and consumption and production trends. The path dependency of the evolution of a farming system is one important reason to classify and analyse current farming systems and their development pathways. In fact, many of the changes in African farming systems which occurred during the period from 2000 to 2015 were signalled in the 2001 FAO/World Bank analysis of farming systems (Dixon et al. 2001).

The African farming systems classification and approach has been incorporated into the Forum for Agricultural Research in Africa's Science Agenda. This update of the status,

trends and needs of farming systems in 2015 adds enormous knowledge for many development strategy, planning, implementation, monitoring and evaluation processes. This idea could be further developed by the establishment of platforms and working groups for major African farming systems, in order to monitor and evaluate trends, constraints, development initiatives and emerging opportunities in the target farming systems. Such platforms not only bring together key stakeholders from the public and private sectors but also would generate valuable knowledge bases in relation to each farming system.

Africa has a long tradition of establishing public initiatives for marginal agricultural sectors, for example the Arid and Semi-arid Lands policy (ASAL) in Kenya. Regional research organizations and the CGIAR recognized different agroecologies for targeting research. However, farming can no longer be differentiated merely by agroecologies because of the huge influence of agricultural services, especially markets. In reality, targeting by agroecological environment largely ignores the importance of socioeconomic factors as determinants of farming systems and the likelihood of innovations fitting the systems. Thus, there will be great value in the establishment of farming systems platforms and working groups at national and regional levels. Essentially these are an institutional innovation which bridges local knowledge with big data, and it strengthens the role of practical, actionable knowledge in public policy and planning. These platforms would be relatively low cost and would coordinate and concentrate studies, establish knowledge banks, monitor innovations and performance and, optionally, coordinate the delivery of critical services where coordination is essential. The sub-regional research, development or policy organizations based in the relevant regions could be mandated to monitor and oversee the quality of the work of the groups, particularly in the formative stages.

Capacity building for farming and food systems in Africa

The analyses in this book illustrate that weak capacity of many local actors hinders positive change, especially in terms of integration and interdisciplinary engagement. Moreover, most scientists and policy makers are well trained in disciplinary skills, but often they lack exposure to and confidence in systems thinking and analysis. Because integrated farming and food systems are dominant in Africa, there is an urgent need to develop systems analysis capacity to complement the disciplinary skill sets within public and private development entities.

The development of systems capacity could be led by regional or national centres of excellence which support universities and training centres in enriching curricula and building staff competencies in systems analysis skills. There is a range of systems methods that could be productively deployed, including soft systems, transdisciplinary analysis, foresight approaches, resource and farming systems modelling and multi-market analyses to assess the resilience of climate-smart agricultural practices. Farming and food systems would be priority themes for the application of systems studies.

Many of the stakeholders mentioned earlier could benefit from capacity building initiatives. The knowledge of staff of government agencies, including extension, could be updated in relation to technologies, systems analysis and participatory methods. Farmer groups could be trained in practices to enhance farmer-to-farmer learning. An appreciation of farming systems by agribusinesses would facilitate targeting of product and market development.

Effective farming and food system strategies

This book has provided an overview of the principal farming systems of Africa and their interplay with mega-trends and drivers. It has highlighted a number of key opportunities for the improvement of farming systems and food policies and institutions. Drawing on these farming system analyses, the following paragraphs highlight critical elements for consideration by policy makers when formulating and implementing agricultural development and food and nutrition security strategies.

The perspectives shaping African public policies have evolved since the 1960s, as illustrated in Chapter 1. Clearly, the policy and institutional settings for improved farming and food systems will differ by country, and there is considerable scope for sharing experiences across countries. With the benefit of hindsight, we find that the gains from past agricultural, trade and economic liberalization in Africa have been less than expected, often patchy or limited and sometimes completely absent, for a variety of reasons. Poorer farmers lost the support once offered by (admittedly inefficient) parastatal marketing boards and government research and extension systems, but have often missed out on new subsidies, markets or production opportunities. The consequence has been continuing impoverishment for many, and growing rural inequalities between farmers who have gained and those who have been marginalized. Against this backdrop, there is a strong argument for deploying a mix of alternative strategies, central to which is overcoming local institutional failures and building social capital. The following paragraphs highlight some aspects of the elements of a regional food and nutrition security strategy that were proposed in Chapter 18.

First, reform is needed to address the institutional failures that are creating inappropriate incentives for poor resource management, production choices and value chain development. Institutions need to encourage synergies and manage conflicts between commodities and strategies – notably for sustainable management of land, water and forests – and encourage on-farm diversification alongside intensification. Labour markets and safety nets for the poor should be co-designed with agricultural programmes. Agricultural programmes should be predominantly area based rather than commodity based because of the links to rural transformation. No country has developed a food and nutrition security strategy without effective incentives for farm production and ongoing innovation.

Second, the key growth potential in agricultural trade and food markets lies in the expanding domestic and regional markets within Africa, where demand in some areas already far exceeds supply. Thus, enhancing these markets is the greatest opportunity to stimulate both the intensification and diversification of farming systems. This will boost rural incomes and food security, reduce urban dependency on food imports and pave the way for Africa to eventually compete as a food exporter on the world market. Such market access requires efficient value chains operated by entrepreneurs, which is a great opportunity for rural youth. On-farm diversification can improve diet diversity and reduce malnutrition, and therefore public agencies could encourage the development of value chains for diversification.

Third, there are huge development dividends from reducing the very large gaps in crop and livestock productivities, often 70–80 per cent of potential productivities. Existing technologies can be deployed to meet much of this productivity gap – with much more effective systems of scaling-up innovations. Each farming system would gain most from scaling up a specific bundle of sustainable technologies – with complementary institutions and markets. For example, crop and livestock producers' needs are quite distinct; root

crop, tree crop and cereal producers also require different technologies, market development and policies to enable effective poverty escape pathways. This will require a massive increase in national budgets for agricultural innovation and rebuilding the capacity for systems-adaptive research, including to address sustainability, diversification, nutritional and resilience goals. This is particularly critical if productivity gains are not going to be reversed due to the bite of climate change. Policy makers need to consider the major opportunity costs of not making these critical investments now.

Fourth, reducing the crop and livestock productivity gap means tackling the decline in soil fertility and land regeneration. A mixed strategy is needed based on integrated soil fertility management practices tailored to farming system conditions. The key water management lesson is the high payoffs from small-scale irrigation, improved soil water management and water harvesting. Before exploiting the huge groundwater reserves which have recently been identified, institutions need to be developed to prevent the groundwater depletion which is evident in the irrigated zones of Asia, the Middle East and the Americas.

Fifth, massive amounts of additional energy are required in African farming: for water lifting devices, farm operations, transportation and processing. In many cases this will require the decentralized production of renewables. The production of bioenergy crops and of local biomass electrical energy is a major potential source of energy as well as additional income for farmers.

Sixth, social capital and inclusive institutions (including women's empowerment) will be a game changer for farming systems and rural transformation by the 2030s. Multi-stakeholder innovation platforms will stimulate accelerated learning, innovation and connections to services and markets. This will require an investment in education and training, and making use of digital communications.

Seventh, rural populations have now reached critical levels in a number of farming systems, with the possible exception of parts of the agropastoral and pastoral systems. In many higher potential systems farm sizes have declined to levels that cannot sustain the minimal production and livelihood needs of farm households with current technologies, practices and markets. Migration to slums simply relocates the problem. Thus, opportunities for the development of rural employment and non-farm rural economies should be actively investigated. Appropriate development of farming systems can stimulate local value adding and can generate non-farm employment and business income through the farm and rural non-farm economic multipliers. There is a potential role for public policy and investment in the promotion of the non-farm rural employment generation, especially for youth, and rural economic growth.

This book has emphasized three scales of knowledge that may help decision makers better cope with the imponderables and the complexity of food and nutrition security. First, there are the larger trends and drivers that are in motion at the continental level, providing a macro-scale back drop and medium- to long-term context for policy and investment choices. Second, there is the level of the farming system, where the drivers play out in unique ways in the local resource and institutional contexts. Finally, there is the farm household itself and how it responds to internal and external forces, including policy interventions, food market changes and new technologies. We argue that a perspective which is deeply cognizant of, and knowledgeable about, all three of these scales and their interactions is fundamental to making and implementing successful decisions about African farming and food systems.

So, what are some key lessons that emerge from the systematic analysis of African farming systems for improved food and nutrition security, considering recent experience and the current possibilities? The positive predictions and forecasts of farming system change that are laid out in this book will depend on many factors, including external (for example, trade, international markets and climate) and internal (knowledge, capacity, institutional alliances, incentives and local stability). The investment in knowledge about important farming systems, and the analytical capacities to apply the farming systems framework and translate the results of farming systems analyses into effective policies and programmes, will generate large dividends. Policy formulation that is tightly grounded in context-specific knowledge of relevant farming systems will generally lead to better food and nutrition security, rural transformation and sustainable development outcomes.