

AFRICAN TRANSFORMATION REPORT 2017

Agriculture Powering Africa's Economic Transformation

OVERVIEW



ACET

African Center
for Economic
Transformation

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The African Center for Economic Transformation is an economic policy institute supporting Africa's long-term growth through transformation. Our vision is that by 2025 all African countries will drive their own growth and transformation agendas, led by the private sector and supported by capable states with good policies and strong institutions. We work toward that vision through our analysis, advice, and advocacy. Please visit www.acetforafrica.org.

Ghana

Office Location
50 Liberation Road
Ridge Residential Area
Accra, Ghana
Phone: +233 (0)302 210 240

Mailing address

Cantonments
PMB CT 4
Accra, Ghana

United States

1776 K Street, NW
Suite 200
Washington, DC
20006
Phone: +1 202 833 1919

For general inquires, including press, contact info@acetforafrica.org

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Foreword

I am pleased to introduce our second African Transformation Report—*Agriculture Powering Africa's Economic Transformation*. As you might expect, it views agriculture and its challenges through a transformational lens. Rather than view agriculture as an isolated sector, it roots agriculture in the rural economy, and the national economy, so that it can power economic transformation. The target audience thus goes beyond ministries of agriculture and specialists in the agricultural sector to include heads of state and government, ministers of finance and planning, and the broader community of policymakers and experts interested in promoting faster economic transformations.

Given the importance of agriculture for most African countries, other African and international institutions have produced reports on rural transformation. What distinguishes our 2017 report? Four features.

It's practical. It's for African policymakers and practitioners who want a playbook for having agriculture power their economic transformation.

It's logical. It starts with improving land access and tenure, moves next to increasing productivity, next to commercializing farming, then to fueling agro-industry and agribusiness—and finishes with boosting employment, including for women, and balancing intensification with environmental sustainability and climate change.

It's comprehensive. It covers all the basic issues in agriculture, drawing on our research and policy advice, and some of the best work of other institutions. It assembles and synthesizes existing knowledge and adds to that knowledge with case studies and subsector reports to present examples and lessons on how to promote agriculture's transformation.

It's African. Grounded solidly in our understanding of what works and what doesn't work in Africa, our hope is that the report will contribute to advancing the vision for agricultural transformation that African heads of state and government expressed at their 2014 Summit in Malabo, Equatorial Guinea.

K.Y. Amoako
Founding President
ACET

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Preface

Agriculture can lead economic transformation in many countries in Africa—if farm productivity is raised and farming is linked to manufacturing and other sectors of the economy through agroprocessing, other agriculture-based manufacturing, and finance, logistics, and other upstream and downstream services. We refer to this process—of raising productivity on farms and strengthening linkages between farms and the rest of the economy—as agricultural transformation.

The 2014 African Transformation Report—*Growth with Depth*—highlighted the need to convert economic growth driven by commodities and macroeconomic reforms into growth that is structurally grounded and therefore job creating, welfare improving, and sustainable. That report called on African governments to work with the private sector to transform their economies by diversifying production and exports, becoming more competitive globally, boosting productivity across the economy, upgrading production technologies and national technological capabilities, and advancing human well-being through rapid job growth.

The pertinence of these recommendations has been reinforced by the collapse of commodity prices (particularly oil and minerals) since mid-2014 and the consequent slowdown in economic growth in many parts of Africa. As African policymakers respond to this collapse by intensifying efforts toward economic transformation, this second African Transformation Report—*Agriculture Powering Africa's Economic Transformation*—highlights the immense contributions that agriculture can make and offers practical examples, lessons, and recommendations.

Chapter 1 presents a data-rich assessment of the state of agriculture in Africa, its impact on macroeconomic

outcomes, and its performance in the recent past. Chapter 2 discusses land tenure systems, focusing on feasible reforms that could enable the customary tenure systems that prevail in many parts of the continent to better support modern commercial agriculture. Chapter 3 examines how to raise farm productivity by improving farmers' access to knowledge, modern inputs (mainly improved seeds and fertilizer), irrigation, and mechanization. Chapter 4 looks at how to commercialize agriculture and covers risks, markets, and finance (including insurance). Chapter 5 pulls together the themes from chapters 2–4 to focus on the specific goal of growing enough of Africa's key food staples to feed households and support an expanding agroprocessing industry.

Chapter 6 considers how to leverage agriculture to develop manufacturing, particularly agroprocessing and the manufacturing of agricultural inputs. Chapter 7 reflects on the possible employment impacts of agricultural transformation, focusing on employment possibilities for educated youth in farming and in the off-farm segments of agricultural value chains. Chapter 8 considers how to ensure gender equity in agricultural transformation, and chapter 9 proposes ways to ensure that the transformation is environmentally friendly against a backdrop of climate change.

Throughout, the discussion draws attention to the importance of prudent macroeconomic policy to agricultural transformation through the impact of fiscal and monetary policies on interest rates and credit and of exchange rate and trade policies on the reliable availability of fertilizers and on farmers' ability to compete with imports and in export markets.

Yaw Ansu
Chief Economist
ACET

Acknowledgments

Yaw Ansu, ACET's Chief Economist, led the team that prepared this second African Transformation Report, *Agriculture Powering Africa's Economic Transformation*. The team comprised Francis Abebrese, Julius Gatune Karuiki, and Francis Mulangu (ACET staff), as well as Joseph Baah-Dwomoh, Mina Balamoune, Frank Byamugisha, and Hailu Mekkonen (ACET Associates). Suggestions and support from ACET management and other staff are gratefully acknowledged.

The Concept Note for the report benefited from consultations in October 2014 with a number of agricultural organizations and experts based in Rome, including the Food and Agricultural Organization of the United Nations (FAO), the International Fund for Agricultural Development (IFAD), the Purchase for Progress Program of the World Food Organization (WFP), Bioversity International, and Ambassador David Lane (United States Ambassador to the United Nations Agencies for Food and Agriculture). Douglas Gollin (Oxford University) and Shashi Kolavalli (IFPRI, Accra) also reviewed and provided helpful comments on the Concept Note.

The report benefited from background studies by a team of experts. The following studies were conducted under the ACET-JICA collaborative research program, generously funded by JICA: Frank Byamugisha, ACET Associate (Securing Land Tenure and Easing Access to Land); Xinshen Diao, IFPRI, Washington, DC (Agricultural Mechanization and Agricultural Transformation); Fethi Lebdi, Agronomic Institute of Tunisia (Irrigation for Agricultural Transformation); Keijiro Otsuka, National Graduate Institute for Policy Studies—GRIPS—Tokyo (Transforming African Agriculture by Promoting Improved Technology and Management Practices); Mario J. Miranda, Ohio State University, and Francis Mulangu, ACET (Index Insurance for Agricultural Transformation in Africa); and Joseph Baah-Dwomoh, ACET Associate (Integrated Rural Development in Africa, Back to the Future?).

The rest of the background studies were: Patricia Kristjanson, World Agroforestry Institute, ICRAF (Transformation in Africa: The Role of Women); Alexis K. Aning, CEO, CCH Finance House Ltd. Ghana (The Role of Warehouse Receipt Systems in Agricultural Modernization in Africa); Eugenie Maiga, Universite de Koudougou, Burkina Faso, formerly of ACET, and Harounan Kaziang,

Oklahoma State University (The Role of Agricultural Skills Development in Transforming African Agriculture); Ephraim Nkonya, IFPRI, Washington, DC (Agricultural Transformation, Environmental Sustainability, and Climate Change); and Marysue Shore, Global Business Strategies, Washington, DC (What Global Agribusiness Executives Say About Unleashing Africa's Potential).

The Bill & Melinda Gates Foundation generously funded these background studies and other aspects of the report's preparation. In addition, the report relied heavily on an earlier ACET study of 20 agricultural value chains in Burkina Faso, Ghana, Kenya, Tanzania, and Uganda, also funded by the Gates Foundation.

A stakeholders consultation meeting in Kigali in March 2016 helped refine the concept of the report. Participants included Felix Addo-Yobo (the National Development Planning Commission, Ghana), David Sarfo Ameyaw (Head, Strategy, Monitoring & Evaluation, AGRA), Martin Andersson (School of Economics, Lund University), Samuel Asiedu (Dalhousie University of Agriculture, Canada), Kwesi Atta-Krah (Executive Director, Hamidtropics, IITA Ibadan), Ammad Bahalim (GHVisions, Geneva), Grace Bediako (the National Development Planning Commission, Ghana), Aberra Debelo (Ethiopia Country Director, Sasakawa Africa Association), Rachid Doukkali (OCP Policy Center, Morocco), Ibrahima Hathie (Research Director, IPAR Senegal), Francis Juma (Editor, FoodWorld Media, Africa Agriculture and Value Addition magazine), Kiringai Kamau (Agricultural Expert and Transformation Advisor for the Minister of Agriculture in Kenya), Bridget Kezaabu (Food Scientist, Co-founder of Amaraproject), Harrison (Harry) Kiarie (a medium scale commercial farmer in Kenya), Alemayehu Koira Konde (Mastercard Foundation), Augustine Langyintuo (President, African Association of Agricultural Economists), Alexandre Macedo (Country Manager, Yara Rwanda), Victor Manyong (Director, Eastern Africa Hub, Social Science and Agribusiness, IITA), Gerald Masila (Executive Director, Eastern Africa Grain Council), Stephen Muchiri (CEO, Eastern Africa Farmers Federation), Gaudiose Mujawamariya (AfricaRice, Dar Es Salaam), Peter Ngugi (Yara's Commercial Manager in Rwanda), Jane Njuguna (Program Officer, Economist, Monitoring & Evaluation, AGRA), James Nyoro (the Bill & Melinda

Gates Foundation), Emmanuel Nzeyimana (Young Professionals for Agricultural Development Africa), Emily Ongus (Serendi Kenya Ltd.), Idrissa M. Ouedraogo (Directeur, Centre d'Etudes, de Documentation et de Recherche Economiques et Social, Université Ouaga 2, Burkina Faso), John Purchase (CEO, The Agriculture Business Chamber, South Africa), Kenneth Quartey (Managing Director, Sydal Farms, Ghana), Claire Schaffnit-Chatterjee (Researcher, Deutsche Bank), Ishmael Sunga (CEO, Southern African Confederation of Agricultural Unions), Abdou Tenkouano (Executive Director, CORAF/WE-CARD), Isabelle Tsakok (Adjunct Professor of International and Public Affairs, Columbia University), Hennie van der Merwe (CEO, Agri4africa), Marius van Huijstee (CEO, Dutch Agriculture Development and Trading Company), Nicholas Vink (Chair, Department of Agricultural Economics, Stellenbosch University, South Africa), and Anke Weisheit (Director, Research and Innovations, Excel Hort, Uganda).

A panel discussion on agricultural transformation at the launch meeting of ACET's Pan-African Coalition for Transformation (PACT), also held in Kigali in March 2016, provided helpful comments and suggestions. The panelists were: Dina Umali-Deininger (Agriculture Practice Manager for East Africa, the World Bank), Alemayehu Konde Koirra (Program Manager, Economic Opportunities for Youth/Agriculture, the MasterCard Foundation), M.D. Ramesh (President and Regional Head, South and East Africa, OLAM Corporation), Dede Amanor-Wilks (Development Specialist/Consultant; now with ACET),

and Kenneth Quartey (Managing Director, Sydal Farms, Ghana).

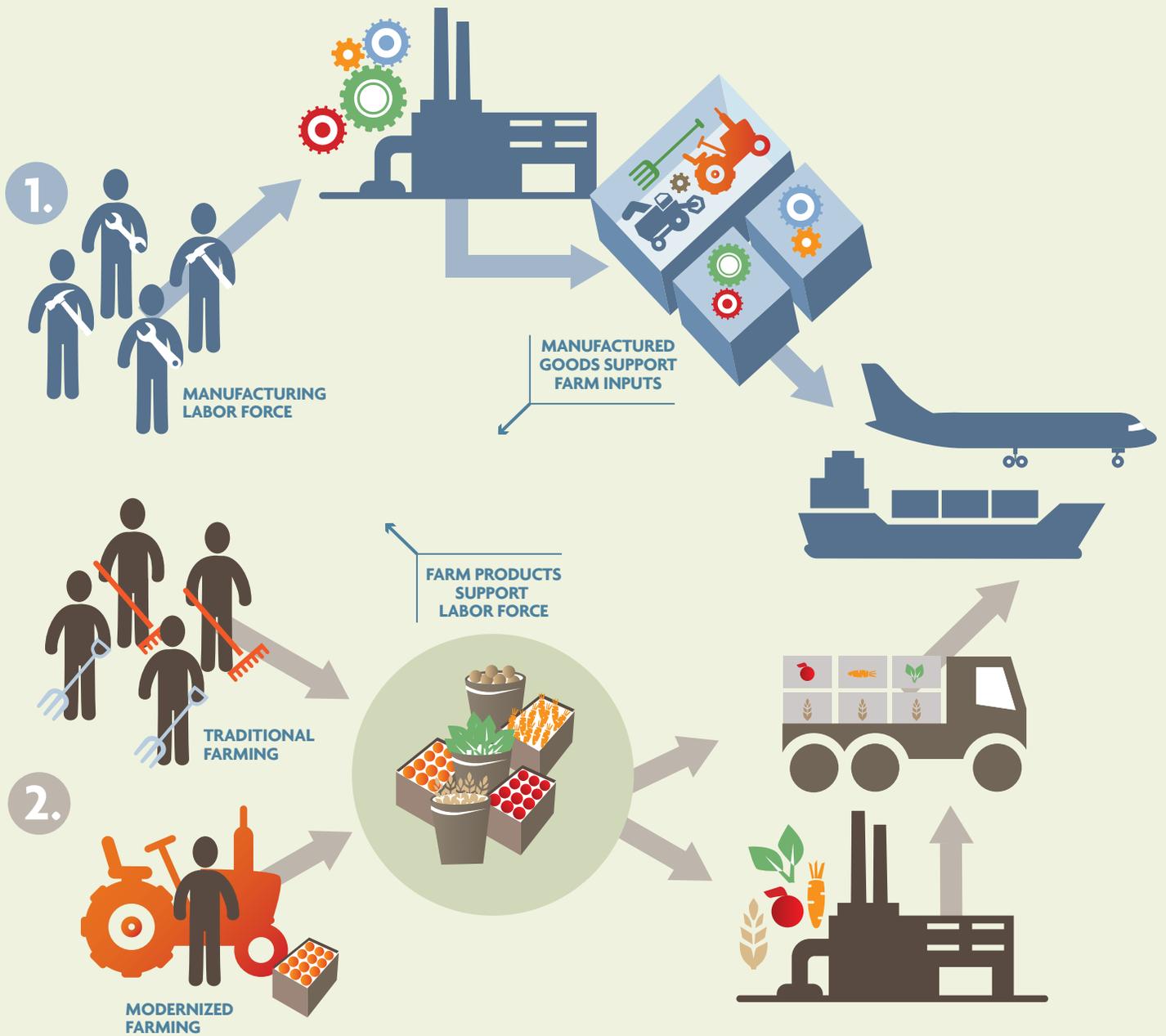
The draft report benefited from comments and suggestions by participants at a review meeting in Nairobi, Kenya in March, 2017. Participating were Benedict Kanu (African Development Bank—AfDB, Abidjan), Jane Njuguna, Emime Ndiokubwayo, Joseph Rusike, and Herbert Ainembabazi (all from the Alliance for Green Revolution in Africa—AGRA—in Nairobi), Rinn Self (the Bill & Melinda Gates Foundation, and a Visiting Fellow at AGRA), William Asiko and Anne Wangalachi (Grow Africa, Johannesburg and Nairobi), and Jane Kabubo-Mariara (University of Nairobi).

Kevin Cleaver was the first to review the full report and, given his long experience in African agriculture, provided very helpful comments. Staff at the World Bank's Global Agriculture Practice and Office of the Africa Region's Chief Economist reviewed the whole report and provided very helpful comments and suggestions, as did Professor Thomas Jayne of Michigan State University, who reviewed a number of chapters.

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A team at Communications Development Incorporated in Washington, DC, designed, edited, and laid out the report—led by Bruce Ross-Larson and including Jonathan Aspin, Joseph Brinley, Joe Caponio, Meta de Coquereumont, Mike Crumplar, Debra Naylor (design), Chris Trott, John Wagley, and Elaine Wilson (layout).

Pursuing two tracks to industrialization



African countries have the opportunity to pursue two tracks to industrialization—one that leverages their relative labor-abundance for labor-intensive and export-oriented light manufacturing, and another track that leverages their advantages in agriculture for globally competitive manufacturing based on agriculture.

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Powering Africa's Economic Transformation

ACET's vision

To create within a generation a modern, competitive, and environmentally sustainable agricultural sector that ensures food security, supports a middle-class lifestyle for a growing number of farmers, and powers Africa's economic transformation

For the most part, agriculture in Africa remains backward and tied to a commodity-exporting economic model that countries are trying to move away from. Yet for many countries, agriculture presents the easiest path to industrialization and economic transformation. Increasing productivity and output in a modern agricultural sector would, beyond improving food security and the balance of payments (through reduced food imports and increased exports), sustain agroprocessing, the manufacturing of agricultural inputs, and a host of services upstream and downstream from farms, creating employment and boosting incomes across the economy.

Many of today's successful economies followed that path to economic transformation. It is even more relevant for Africa today, given its factor endowments and emerging global trends in manufacturing technology, demand patterns, and location decisions of lead firms in global value chains. These global trends are making an industrialization strategy based on exports of labor-intensive manufactures, used so successfully by East Asia, more difficult. But fortunately, African countries can combine that strategy with one based on modernizing agriculture and developing agro-based manufacturing and services. African countries have the opportunity to pursue a dual-track to industrialization—one track that leverages their relative labor-abundance for labor-intensive and export-oriented light manufacturing, and another track that leverages their advantages in agriculture for globally competitive agriculturally based manufacturing. These two tracks are complementary and reinforce each other.

Agricultural transformation can power economic transformation

Many African governments are beginning to look at agriculture through a transformational lens, prioritizing the

sector in economic planning. That new perspective is reflected at the continental level in the African Union's 2003 Maputo Declaration on Food Security and Agriculture in Africa and the 2014 Malabo Declaration on Accelerated Agricultural Growth and Transformation and the associated Comprehensive African Agriculture Development Program (CAADP), and at the country level by some countries' explicit pursuit of agro-based industrialization strategies, particularly Ethiopia.

Agricultural transformation incorporates two main processes: transforming or modernizing farming by boosting productivity and running farms as modern businesses, and strengthening the links between farms and other economic sectors in a mutually beneficial process, whereby farm output supports manufacturing (through agroprocessing), and other sectors support farming by providing modern manufactured inputs and services.

Modernized farming has the following characteristics:

- Higher land, labor, and total factor productivity, achieved through greater use of modern agricultural inputs and scientific approaches to farming.
 - More farmers running their operations as a modern commercial enterprise.
 - Diversification of products from the farming system as a whole, but with specialization on individual farms.
 - Greater resilience against weather variability and climate change.
 - More trade with other sectors of the economy.
- Achieving them will require action on four fronts:
- Assisting the nearly 8 in 10 African farmers who are traditional smallholders, and often uneducated, to acquire the knowledge and inputs to modernize their operations, boost their productivity, become more commercially oriented, raise their incomes, and become more resilient.
 - Attracting and assisting some educated youth to take up farming and operate small and medium-size commercial farms.
 - Encouraging the small number of large commercial farms to develop mutually beneficial links with small and medium-size farms.
 - Removing barriers to women in farming so that the energies and enterprise of all farmers—not half of

For many countries, agriculture presents the easiest path to industrialization and economic transformation

Contributing to economic transformation



them—will be unleashed to accelerate the pace of farm modernization.

A modernized farm sector with strong linkages to other economic sectors will contribute to overall economic transformation by:¹

- Boosting the production of food staples to improve food security and keep living costs low, making it easier to keep wages competitive and support labor-intensive manufacturing (the second track of the dual-track industrialization strategy).
- Supporting agroprocessing with raw agricultural outputs at the scale, quality, and reliability required.
- Supporting other agribusinesses by purchasing their products and services, including businesses manufacturing agricultural machinery, implements, and intermediate inputs and those providing transportation, logistic, and financial services.
- Raising farmers' incomes and expanding markets and jobs throughout the nonfarm segments of agricultural value chains.
- Expanding markets for nonagricultural sectors, such as those producing nonfood or durable consumption items.
- Improving the balance of payments by expanding and diversifying exports and substituting domestic production for food and other agriculture-based imports that can be produced competitively at home.
- Increasing government revenues and personal savings through higher agricultural incomes, which can be converted to national investments for growth.

Opportunities and challenges

Africa is blessed with many natural advantages and rising market opportunities that could be leveraged for agricultural transformation. These include abundant uncultivated arable land, estimated at over half the world's total; a young and growing labor force, projected to be the world's largest by 2050; tropical and subtropical climates, permitting long and multiple growing seasons; and urbanization and a growing middle class, expanding national and intraregional markets for agricultural products.

But Africa faces difficult challenges in leveraging these advantages and opportunities. Although arable land is abundant, it is not readily accessible to those who want to farm, particularly on a commercial basis. Land tenure systems in many parts of the continent do not provide security of tenure or support efficient land rental markets. Large tracts of land are inaccessible because of ongoing conflicts or poor transportation infrastructure (or both, as for example in Democratic Republic of

Congo, the country with the largest expanse of uncultivated arable land).²

The average age of farmers in Africa is estimated by some sources to be as high as 60, and few in the large and growing African youth population are poised to step in to revitalize the ranks of farmers. Youth are not interested in agriculture as it is now practiced in Africa, where the farming technology is still primitive and requires back-breaking manual work. An increasing number of youth are educated, and education systems do not prepare them for farming (and even orient them away from it). And most farming does not provide an income that can support the lifestyle to which educated youth aspire. This lack of interest in farming among African youth is contributing to the aging farming population and farm-labor shortages in some localities, particularly during planting and harvesting seasons.

Nor can African farmers take full advantage of the long growing season because only about 5.4% of agriculture is irrigated. As a consequence, much farming stops in the dry season or crops are devastated by a lack of precipitation. Productivity of land (yields) and of labor (output per worker) is low, because of lack of access to knowledge of modern farming techniques, high-yielding seeds, fertilizers and other inputs, irrigation, and mechanization.

It is also hard to exploit the growing urban and intraregional markets. Roads and other transport infrastructure are inadequate, significant barriers to intraregional trade remain, and many consumers, especially city dwellers, believe that domestically produced foods are inferior to competing imports. Africa's urban areas are increasingly dependent on food imports, now at around US\$68 billion a year for the continent, US\$37 billion for Sub-Saharan Africa. And agroprocessing and other agriculturally related manufacturing are held back by the usual policy, regulatory, and infrastructure constraints that weigh on manufacturing, stifling the opportunity to use agriculture to kick-start industrialization.

By reviewing challenges and proposing solutions, this report aims to convince African policymakers and their development partners of the benefits and feasibility of prioritizing agricultural transformation as the driver of overall economic transformation. The report should also be of value to the private sector, farmers, and educated youth who might consider farming or opportunities in agricultural value chains as profitable and appealing occupations.

Two consistent themes run through the report.

The first is that the institutional environment of African agriculture is changing from one involving mainly farmers and governments, supported by donors, to a

Africa is blessed with many natural advantages and rising market opportunities that could be leveraged for agricultural transformation

Microelectronics now enable more precise irrigation systems

more diverse and dynamic mix involving farmers, governments, donors, the private sector, foundations, and non-governmental organizations. The many actors provide opportunities, but also some challenges. The biggest opportunity is that Africa's fiscally and capacity-constrained governments do not have to do it all—initiate, finance, and implement. They can leverage the finance, knowledge, and capacity of other actors for many tasks while focusing on key public goods or strategic services with high social returns, ignored by others because of low private returns. Governments can also extend the reach of their resources through public–private partnerships. The challenges facing governments in this changed environment include setting standards, disseminating information, and enforcing smart regulations that promote competition and agricultural growth in an environmentally sustainable manner.

The second theme encompasses emerging opportunities for technological leapfrogging, particularly those arising from advances in information and communication technology. This option is vital, considering that many countries' agricultural extension systems have been severely weakened and are unlikely to be revived soon, if at all. Mobile phones, used increasingly by multiple actors in Africa, especially the private sector and nongovernmental organizations, can provide a cheap and practical way to reach farmers. Similarly, satellites, geographic information systems, and advances in data analytics are making detailed soil maps affordable and allow farmers to receive location-specific recommendations for agronomic practices, including customizing fertilizer application to local soil conditions. And microelectronics now enable more precise irrigation systems, smaller and more appropriate machinery, and the use of drones for farm operations at costs that are becoming affordable to African countries. These are just a few of the opportunities for technological leapfrogging, and the list is likely to grow.

Agenda for Africa's agricultural transformation

This section presents the main recommendations for addressing the issues discussed in the report. Together, they constitute a powerful agenda for leveraging the transformation of agriculture for overall economic transformation in Africa.

Securing land tenure and access to land

Agriculture requires access to land. And transforming agriculture requires investments and working capital to raise productivity and run a commercial farm. To make

those investments worthwhile to farmers, they need secure titles to their main farm asset, land. Secure titles also enable them to use their land as security for loans to finance investments and commercial operations. Formalization of land rights to achieve secure titles could also incentivize part-time and low-productivity farmers and elderly land owners to rent out their land and look for more rewarding opportunities off the farm. This process will facilitate land consolidation, make it easier for educated youth interested in farming to acquire land, enable more efficient use of labor, and ultimately increase agricultural productivity.

Most African countries are fortunate in that the model of land ownership that developed on the continent is not one in which land is concentrated in the hands of a small number of large owners and worked by a mass of landless peasants as was previously the case in some other parts of the world. Land in Africa has historically been communally owned, with almost every adult in a village having traditional access rights to some farm land. This system has often been a very effective safety net that has helped avoid destitution in the countryside. The other side of the coin, however, is that under this tenure system individual farmers cannot use land as a personal business asset in which to invest or with which to secure loans. Also, this tenure system makes it difficult to consolidate farming plots into farms that are large enough to make modern commercial farming viable. For example, 60% of farm plots in Ghana are under 1.2 hectares and 85% are under 2 hectares. In Uganda, 58% of farms are smaller than 1 hectare, and in Zambia half the farms are smaller than 2 hectares.

This land tenure system is one of the biggest challenges to modernizing agriculture in Africa. The quandary is how to come up with land tenure systems that facilitate modern commercial agriculture and that also respect the ownership rights of communities and traditional smallholders. Related to this challenge are two issues of equity that require attention as the tenure system changes: ensuring that women have fair and equal access to land, and ensuring that large tracts of communal land are not sold to outside interests in opaque transactions that do not fairly compensate members of the community ("land grabs").

Raising productivity on African farms and modernizing African agriculture will require reform of customary land tenure systems. Easier said than done, but measures can still be taken to improve access to land.

First, secure land rights:

- Improve tenure security over communal lands by organizing and formalizing communal land-owning

- groups, demarcating the boundaries of their land, and registering the land (as Mexico has done successfully).
- Improve tenure security over land that is now individually owned through systematic land titling, using simple low-cost mapping technologies, as Rwanda and Ethiopia have done.
 - Strengthen formal and traditional institutions responsible for resolving land disputes.
 - Enhance and protect the land rights of women through legal and administrative reforms to support gender equality in constitutions, land-related laws, and laws that govern marriage, divorce, and succession, as Rwanda and Ethiopia have done.

Second, ease access to land:

- Develop local land governance institutions to improve the allocation and leasing of communal lands, as Botswana has done.
- Ease restrictions on land rental markets as Ethiopia is doing, following in the footsteps of countries like China and Viet Nam.
- Improve land information systems through re-engineering and computerization as Rwanda, Mauritius, and Uganda have done.
- Bring idle land into use through policy actions including imposing a tax on unused agricultural land to encourage land owners to use, sell, or rent it out; developing transport infrastructure to open up inaccessible agricultural lands; and improving mechanisms for allocating unused state land for productive use.

Third, protect the land rights of local communities from dispossession by large investors and promote principles of responsible agricultural investment:

- To avoid displacing local people, strengthen rural land use planning to identify surplus agricultural land for investors, an approach taken by Mozambique.
- Encourage direct deals between investors and landowners (as Mexico has done) while discouraging expropriation, which often provides too little compensation.
- Promote business models that provide opportunities for smallholders to invest in their land as alternatives to encouraging large farm investments, which require land acquisition and risk dispossessing small landholders.

Boosting productivity on farms

A key to achieving agricultural transformation on the continent is raising productivity levels on African farms. Africa lags behind the rest of the world in both labor and

land productivity in agriculture. Productivity levels in North Africa are comparable to those in Asia and South America, but those in Sub-Saharan Africa are much lower. With higher productivity, farmers can grow enough food not only to feed their households but also to sell surpluses and acquire cash to diversify their diets and satisfy their nonfood needs. As productivity rises and farm households accumulate assets, they become confident enough to release household labor to both value-added agricultural activities and nonagricultural productive activities, further diversifying their economic activities and increasing household income. Higher productivity will also generate surpluses to be used as cheap raw material to support a competitive industrial sector through agroprocessing. And food surpluses can lower food prices and the cost of living, thereby increasing the disposable income of nonfood producers and moderating wage increases, which will enhance the global competitiveness of African countries in labor-intensive manufacturing.

Asia and South America managed to raise yields (land productivity), particularly in wheat, rice, and maize, quite dramatically in the 1960s and 1970s applying “green revolution” technologies. Driving the revolution was a yield-increasing package that included improved seeds, fertilizers, irrigation where needed, some mechanization, and improved farm management techniques based on research and transferred to farmers through agricultural extension. Conditions vary widely across the continent, but where the green revolution package has been adequately available to farmers and tailored to local conditions, it has worked in a number of places in Africa. For example, in the Kpong irrigation area in Ghana’s Volta River region, a combination of irrigation, improved seeds, fertilizer, power tilling, and extension services boosted average dry paddy rice yields to 5.5 tons per hectare, comparable to irrigated rice yields in Asia and much higher than in the rest of Ghana.³ Yields are similar in the Nakhlet Small-Scale Irrigation Scheme on the northern bank of the Senegal River in Mauritania.⁴ And in Senegal and Tanzania, irrigation and improved seeds and better farming practices have pushed yields to 3.7–4.5 tons per hectare, comparable to the average of 4.0 tons in tropical Asia.

Even under rainfed conditions, yields have been significantly improved in some areas in Ghana and in Uganda with improved rice seed varieties and farm practices. Yields in maize have also been high in the highlands of Kenya with the adoption of hybrid varieties, and the application of inorganic fertilizer and manure in a mixed crop-cattle farming system. Maize yields are very high in South Africa, and yields in general are higher in North

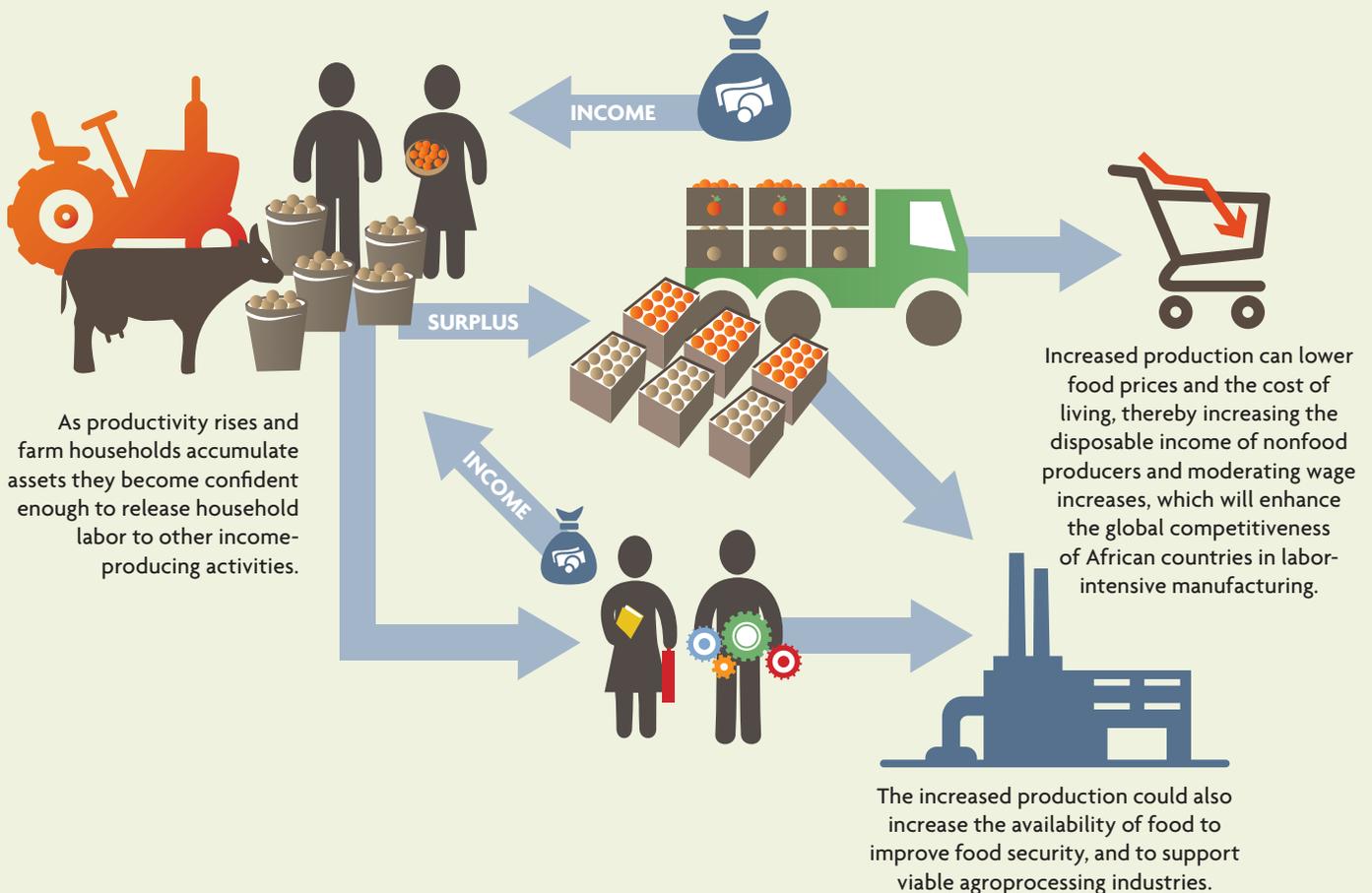
Irrigation, improved seeds, fertilizer, power tilling, and extension services boosted average dry paddy rice yields to 5.5 tons per hectare

Boosting productivity on farms



A key to achieving agricultural transformation on the continent is raising productivity levels on African farms.

With higher productivity, farmers can increase production and incomes and thereby reduce poverty among close to half of the African population that depend on farming.



A key part of the challenge of boosting productivity on African farms lies in making the green revolution package adequately accessible to African farmers and tailored to local conditions.

Africa than in Sub-Saharan Africa, so there is scope for intra-regional learning among African countries in pursuing the green revolution agenda.⁵

So, boosting productivity on African farms lies in making the green revolution package adequately accessible to African farmers and tailored to local conditions—the package of improved seeds, fertilizer, farmer education, irrigation (where needed), and appropriate mechanization.

Improved seed varieties. Numerous varieties of modern seeds have been released in Africa over the past 10 years, but adoption has been slow. One reason is that improved varieties are hybrids, so seeds must be purchased each season. Improved varieties also demand more fertilizer, adding to production costs for financially and credit-constrained smallholder farmers and reducing their incentive to use them. Steps to increase the use of improved seeds include:

- Make improved seed varieties more accessible to smallholder farmers by involving and organizing actors along the value chain—from production to processing and marketing—to support farmers. For example, processors and buyers of produce could provide seeds (and fertilizers) as part of their contract arrangements with farmers.
- Support input dealers or “agrovet” in rural areas. In a number of African countries, input distribution has been transformed from a largely public system to a more liberalized system with private, independent, agro-dealers. One model is AGRA’s Agro-dealer Development Programme (ADDP), which provides training, capital, and credit to build and develop networks of certified agro-dealers to enhance the quality, quantity, and range of seeds offered to hard-to-reach farmers. Programs need to consider the heterogeneity of smallholder farmers that the agro-dealers must serve and the diversity of agro-ecological and business environments in which they must operate.⁶ Support for more enterprising agro-dealers to expand their operations into full-time occupations should be also considered.
- Provide clear policy guidance for importing and handling hybrid seeds.
- Maintain stable, but realistic, exchange rates so that seed and fertilizer importers can manage their imports; and the new international lenders and NGOs that source money in dollars and lend to farmers in local currency can be protected against losses due to large exchange rate fluctuations.
- Support the formation of large, strong, and well-organized farmer-based organizations that can coordinate efficient procurement of inputs and sale of

outputs for members and police sales contracts to prevent violations by members in cases where an off-taker in a contract farming arrangement supplies the improved seeds.

- Keep public policies predictable, so that everyone along the value chain can plan with confidence and reduce their risks.

Increased access to fertilizers. Cost is a major deterrent to optimal use of fertilizer in Africa. Poorly developed agricultural markets, high transport costs, and low and variable output prices persist even as the prices of agricultural inputs rise. Because most crops grown by smallholder farmers are staples and nonexportable, while fertilizer is imported, currency depreciation often raises the price of fertilizer several times above output prices. Consequently, the value-to-cost ratio for fertilizer use declines, creating a disincentive to fertilizer use. Some actions to improve and expand fertilizer use:

- Until more sustainable responses to the high cost of fertilizers are put in place, provide short-term subsidies so that poor smallholders can afford to buy fertilizers. The subsidies must be well-targeted to the poor farmers who need them. In the past, many fertilizer subsidy programs were not well targeted, and public sector programs suffered from late arrival and distribution of fertilizers and sudden changes that made it difficult for farmers to plan and get the maximum benefits from fertilizer use.
- Introduce “smart” fertilizer subsidy programs, which are designed to ensure that the benefits in terms of gains in agricultural productivity and food security exceed the gains from investing the public resources in other areas. To avoid crowding out commercial sellers or undermining investment in fertilizer distribution by suppliers and agro-dealers, the programs should provide subsidies to farmers to enable them to purchase fertilizer from private dealers at market prices, rather than have the government distribute fertilizer to farmers at below market prices.⁷ Nigeria introduced a targeted fertilizer subsidy voucher pilot program in 2009–11 and upgraded it in 2012. In Nigeria’s Kano State, vouchers are key for increasing farmer participation in the private fertilizer market.⁸ Governments should study such smart fertilizer subsidy programs and refine them to reduce the fiscal burden, improve targeting, and strengthen private sector participation. Even with smart fertilizer subsidy programs, close attention must continue to be paid to targeting, fiscal sustainability, and the need to finance other important public services in agriculture.

Boosting productivity on African farms lies in making the green revolution package adequately accessible to African farmers and tailored to local conditions

Returns to irrigation in dryland are high, increasing yields by an estimated 91% and total factor productivity by about 3%

- Accompany programs to promote fertilizer use with soil mapping services, and encourage private fertilizer dealers to supply fertilizer blends that are tailored to local soil conditions. To be fully effective, inorganic fertilizer needs to be applied at the right time, in the right amount, in the right nutrient ratios, and with complementary micronutrients (such as sodium and barium).
- Encourage a broad program of soil fertility management,⁹ including integrated soil fertility management and conservation agriculture, as an important complement to increased use of inorganic fertilizers, to improve soil health and fertility and reduce adverse environmental impacts.

Improved farmer education and farm management.

Farmers' use of optimal agronomic practices strongly affects the productivity increases that can be realized by using improved seeds and fertilizers. Farmers need to know what improved varieties are available and how to cultivate them, including the proper use of fertilizers and other complementary farming practices, which vary by soil type and other agroecological features. Rural advisory services in many African countries are not reaching most farmers, but they are failing particularly to provide information and services to female farmers. Traditional government extension services are no longer adequate as governments cannot afford to provide such services at the quality and scale required to be effective. Other options to supplement government extension services include private sector extension and training programs delivered through contract farming, new forms of public sector extension and training using modern information and communication tools, and peer-to-peer learning schemes, such as farmer field schools. Governments should encourage the following measures, which are already in place in several places in Africa, to supplement the public sector efforts:

- Support the operations of private actors, such as input companies, that combine extension services with input sales as part of their product marketing.
- Increase the use of e-Extension, using mobile phones and other modern communication technologies to reduce the cost of delivering extension services in hard-to-reach places. Collaborate with mobile phone companies and private sector partners to develop and periodically update an e-Extension curriculum tailored to local conditions.
- Create innovative communication and learning approaches to reach farmers. An example is the "Shamba Shape-Up" program in East Africa, which uses

television programming to reach farmers. To increase the range of such "edutainment" to farmers without access to television, the concept can be adapted to radio drama.

- Use farmer-to-farmer learning approaches to increase access to extension services. This approach, which has trained women to provide extension services, has increased the number of women reached in Kenya, Rwanda, Tanzania, and Uganda.¹⁰ Another inexpensive but effective option is farmer field schools, which use field experiments and farmer-to-farmer learning to instill new skills.

More use of irrigation. Irrigation has spatial and temporal productivity benefits. It allows agricultural production on drylands, which make up three-quarters of the agricultural land area in Sub-Saharan Africa.¹¹ Practicing rainfed agriculture in drylands is infeasible or extremely risky. Irrigation makes it possible to reduce production risks.¹² Irrigation also allows dry season production, expanding the temporal availability of vegetables and other crops. Returns to irrigation in dryland are high, increasing yields by an estimated 91% and total factor productivity by about 3%.¹³ Despite these benefits, irrigation's contribution to agricultural output in Africa remains small.¹⁴ In 2006, African countries irrigated just 5.4% of their cultivated land, compared with a global average of around 20% and an Asian average of almost 40%.¹⁵ Geographic coverage is also skewed. A large proportion of irrigated land is concentrated in North Africa, Sudan, Madagascar, and South Africa. In other African countries, the potential for expanding irrigation is enormous, but in Sub-Saharan Africa, outside South Africa, less than 10% of the irrigation potential has been tapped (in North Africa, more than 80%). Steps to increase irrigation include:

- Determine the size and type of irrigation scheme based on an area's agro-ecological conditions and government budget constraints, using the internal rate of return as a guide. Large, multipurpose water supply schemes can serve multiple strategic goals beyond irrigation (providing water for domestic and industrial use, generating hydropower, and providing ecosystem services), but they are expensive to build and difficult to manage. Small-scale irrigation schemes are less expensive and can yield results more quickly. While the internal rate of return is high for most irrigation projects, it varies from 12–18% for large-scale systems and 13–33% for small-scale projects in all subregions of the continent.
- Apply comprehensive approaches to irrigation development and water management. In North Africa,

where irrigation systems are well developed, countries have relied on decennial plans for agricultural water management, with water infrastructure development as the main pillar (big and small dams, shallow and deep wells, and geographical water transfer networks).

- To enhance the quality and responsiveness of irrigation operations and maintenance, which have in many cases been poor, transfer responsibility for operating and managing irrigation works from the public sector to water user associations, which act as intermediaries between farmers and the state owners of irrigation infrastructure. Provide capacity-building support to the associations.

Mechanization to expand cultivated areas and raise yields. Mechanization levels are very low in Sub-Saharan Africa. There are 43 tractors per 100 hectares in South Africa, 35.6 in Zimbabwe, 26.9 in Kenya, 20.7 in Zambia, and around 10 in the rest of Sub-Saharan Africa, compared with 128 in India and 116 in Brazil. The rate is considerably higher in North Africa, reaching as high as 141 per 100 hectares in Tunisia. Expanding mechanization can support agricultural transformation by bringing more land, including land with highly compacted soils, under cultivation and by easing labor constraints that are emerging in some farming systems and that will intensify as the yield-raising package is implemented.

But expansion of agricultural mechanization faces major challenges. In the past, several African governments tried to address the mechanization challenge by importing agricultural machinery to use on state farms or to rent to farmers. These approaches failed because of inefficiencies and poor governance in the state-run agencies and because of the failure to adequately address other fundamental challenges that affect the profitability of farming and consequently farmers' willingness and ability to pay for mechanization services. Recently, some governments have adopted more private sector-friendly approaches, including subsidizing machinery-hiring services and credit guarantee programs for agricultural machinery. Private sector involvement may improve operational efficiency, but all subsidy programs raise concerns about fiscal sustainability and effective targeting that need continuing attention. Beyond subsidies, the following approaches can help address the mechanization challenge:

- *Farmer-to-farmer tractor hiring services.* Programs that help farmers purchase farm machinery to rent out to other farmers, in addition to using it on their own farm, deal with the reality that most farms are

too small to support purchasing a tractor for individual farm use. Such programs help the owner fully utilize the machine—and thus to quickly recover its cost—and expand mechanization access to nearby farmers who lack the capital or credit to purchase their own machines. This approach is being tried in Ghana and Nigeria and deserves broader support.

- *Mechanization services provided by farmer organizations.* Agricultural cooperatives and other farmer groups can jointly own tractors and other mechanized equipment for use by members. Collective ownership can help small farmers overcome the cost and scale constraints of owning a tractor. However, joint ownership of productive assets can give rise to collective action problems such as free riding that can reduce the effectiveness of cooperative tractor ownership. Farmer organizations may need support in setting up mechanisms to minimize these problems.
- *Using smaller tractors and two-wheeled power tillers.* Access to mechanization could also be improved and costs reduced by using smaller but equally suitable machines that are cheaper and require less land to be fully utilized. Two-wheeled power tillers have spread rapidly in much of Asia, as have small four-wheeled 20–40 horsepower tractors in India. But in African countries, the average horsepower is 40–102, even though there is little savings in cost per horsepower for large tractors compared with smaller ones. Where tractors are imported through government and donor-funded programs, trade policy should provide incentives for importing smaller tractors. Preference should be given to bringing in a large number of small tractors rather than a small number of large tractors.
- *Local fabrication of small machines and spare parts.* Governments should support local fabrication of simple agricultural machinery, which is beginning to take place in some African countries, including Ethiopia, Ghana, Kenya, Senegal, Zambia, and Zimbabwe. Engineering departments in universities and polytechnics should be encouraged and supported to design or adapt simple machinery for use under local conditions. Local entrepreneurs, including small and medium-scale enterprises, should receive incentives to produce this machinery. Countries may need to revise tariffs, which now tend to be lower on imports of assembled tractors and higher on imports of the inputs and parts required for local fabrication or assembly. Technical institutes should also be supported to provide cheap outreach courses to mechanics in rural areas to improve their skills in repairs in order to minimize downtime for tractors and other farm machinery.

Collective ownership can help small farmers overcome the cost and scale constraints of owning a tractor

Expanding the use of machines



Commercializing African agriculture

Commercializing agriculture means encouraging and assisting African farmers to transition from farming as a way of life—a primarily subsistence activity, occasionally supplemented by produce sales when there are surpluses—to farming as a business, depending more on markets for acquiring inputs (including finance) and selling outputs. Policies, regulations, and programs must create a conducive environment to enable the business of farming (and agribusiness in general) to be profitable. In particular, macroeconomic, exchange rate, and trade policies, in addition to purely agricultural policies, should aim to reduce the considerable natural and policy risks facing farmers.

Increasing access to land and raising productivity are key prerequisites for transforming African agriculture. Another important prerequisite is a commercial orientation. Running farms as a business requires policies, institutions, and regulations that support the efficient development and functioning of agricultural input and output markets and that reduce and help manage agricultural risks.

Improve macroeconomic and regulatory environments.

In most African countries, commercialized agriculture would constitute the largest private sector activity in the value of output and the number of businessmen and businesswomen. If African farms are to be run as businesses, macroeconomic and regulatory environments have to support business activities:

- Government policies—macroeconomic policies (fiscal and monetary policies that affect the availability and cost of finance), exchange rate and trade policies—and regulations should take into account the need for profitability in agriculture.
- Governments should include and prioritize agriculture in their private sector development strategies.

Strengthen input markets. Beyond the policies, institutions, and programs to increase farmers' access to the "green revolution" package that have already been discussed, a key consideration in improving input markets in Africa is to eliminate fake inputs, which are ubiquitous. Strengthening input markets will require:

- Better resourcing and strengthening of regulatory agencies.
- Incentivizing the emerging franchising and inputs-as-a-service business models that lower costs and improve quality. These include franchising business models (as in Kenya) that self-police through branding and quality control systems and that lower cost

through economies of scale. Incentives could include tax breaks for franchise owners tied to service growth targets and access to subsidized credit to fund franchise growth.

Strengthen output markets. Recommended measures to strengthen output markets include:

- Improve transport infrastructure in the medium to long run. In the short run, increase the availability of cheap "first mile" transport solutions (such as motorized tricycles) by removing import duties and incentivizing local assembly and manufacture through tax breaks.
- Strengthen contract farming to improve the stability of prices, for example, by strengthening contracting laws, developing alternative disputes resolution mechanisms (such as arbitration) for farmers and contract buyers, and routing some government support (such as subsidies on fertilizers) to entities contracting with farmers and providing inputs.
- Improve market intermediation to incentivize stronger, well-capitalized traders able to invest in storage, price stabilization instruments (such as warehouse receipt systems) by:
 - Using public–private partnerships to manage national buffer stocks so that more promising traders can take over running the storage infrastructure that governments built up in some countries.
 - Making special funds at low interest rates available so that traders can borrow to invest in upgrading storage infrastructure.
- Intensify efforts to deepen regional integration, emphasizing the logic of natural markets (along borders of neighboring countries, for example) and establishing special market zones (natural markets) that may be regulated differently until the slower process of regional integration catches up.

Reduce and manage agricultural risks. Once policies and regulations are in place that support the needs of agriculture as a business and minimize uncertainty for farmers and others in agricultural value chains, farmers will still need to deal with the natural risks of agricultural production. For the vast majority of farmers, whose crops depend on rain, the greatest natural production risk is unreliable availability of water. Expanding irrigation will reduce some of the risk, but other policies are also needed to help farmers better manage risk:

- Include education about risk in government extension programs to improve farmers' understanding of risk and knowledge of available risk management tools.

Commercializing agriculture means encouraging and assisting African farmers to transition from farming as a way of life to farming as a business

Becoming more competitive in producing food staples requires a focus on the entire value chain

- Provide incentives for insurers and others to develop and market risk mitigation products. Part of the subsidies received by farmers could be used to purchase insurance (for example, a fertilizer voucher could include a subsidy for insurance).
- Mandate that loans extended to agricultural sector actors include insurance on the loan.

Support programs that assist smallholders in adopting a commercial orientation. In addition to actions to improve the business environment for agriculture, improve agricultural markets, and reduce or better manage risks, specific policies could help smallholders shift to a more commercial orientation:

- Provide training to smallholders on growing for the market—“Grow crops with potential customers in mind” instead of the traditional “look for customers after growing crops.” A good example of such training is the Japan International Cooperation Agency–supported Smallholder Horticulture Empowerment Project in Kenya. Provide training and support for quality certification for export markets.
- Support the development of a symbiotic farming ecosystem that includes a mix of large-scale, medium-scale, and smallholder farmers who support each other through knowledge diffusion and service provision (mechanization, contract farming).
- Route some support for smallholders through medium and large-scale farmers who have contractual relationships with smallholders.

Feeding Africa

The most important goal of transforming agriculture is to enable Africa to feed itself and not depend on imports for products for which natural conditions are conducive to producing domestically. All the policies and reforms for land tenure, farm productivity, and commercialization of agriculture have to find concrete expression in the increased availability of key food items from domestic sources for direct consumption and for supporting an agroprocessing industry. This requires increasing the production of key food staples.

Africa now imports significant portions of its major food staples—at a cost of US\$68 billion annually, US\$37 billion in Sub-Saharan Africa—despite having the potential to produce many of them competitively. By importing food that countries could produce, African countries are forgoing higher incomes and employment, misusing foreign exchange that could finance imports of machinery and technology to advance their economic transformation, and suffering from higher food prices

and food insecurity. Increased domestic supplies of food and lower prices would also moderate wage increases and enable Africa to leverage its relative labor-abundance into global competitiveness in labor-intensive manufacturing and advance its industrialization agenda.

Why are African countries relying more on imports for key food staples? For four main reasons. More people are moving to cities, which means that more people are buying rather than producing their food. Low productivity in the production of food staples combines with the high cost of transporting domestic production from farms to urban areas to put domestically grown food at a competitive cost disadvantage relative to imports. And as people move to cities and their incomes rise, their food preferences shift to include more processed and convenience foods and more dairy and meat products, which the underdeveloped agricultural value chains and processing industries are unable to meet. As a result, the gap between domestic supply and demand is widening, putting upward pressure on prices, threatening to aggravate food insecurity, and increasing food imports.

Becoming more competitive in producing food staples requires a focus on the entire value chain of the key food staples, with the choice of staples depending on country circumstances. That is because it is not enough to increase the production of food staples; challenges in storage, transportation to urban areas, and packaging and branding all have to be addressed.

In addition to the production-side measures presented above, the following measures can improve postharvest handling:

- Incentivize adoption of simple solutions for reducing postharvest losses, such as use of hermetic bags for storage.
- Train extension workers on methods of constructing simple mud silos and create village teams to work with the guidance of extension workers to build these simple but effective storages. This could also be a business opportunity for rural youth. Some of the funds used under youth programs could be directed to this activity.
- Upgrade quality and branding of local products. In many cases, the poor quality and weak branding of local products make them seem inferior to imports, particularly among middle-class urban consumers. (Rice in West Africa is a case in point.) Measures could include:
 - Incorporate quality assurance training and support as part of the extension package for farmers.
 - Provide quality control support, which could be presented as a business opportunity for youths.

For example, youths could be assisted to set up threshing and drying services under youth employment programs.

- Provide incentives to processors (such as rice millers) to install better equipment to improve the quality of their products. One way is to lower import duties on machinery and equipment that improve the quality of final products (for example, “destoners” for milled rice).
- Public education and advertisement programs should promote domestic products that are nutritionally equivalent to imports.

And trade policy can encourage local processing:

- Use differential tariffs to incentivize importers to develop local processing capacity—for example, having higher duties on processed products than on raw products.
- Use mandates to incentivize importers to develop local supply chains—for example, insisting that wheat flour, mainly imported, contain at least a certain percentage of cassava flour (as in Nigeria) or local sorghum flour, which does not lower quality or taste.

Adding value and spurring agro-based industrialization

Beyond increasing agricultural productivity and output and making agriculture profitable, transforming Africa's agriculture requires linking it to a modern agro-industrial sector. Upstream from farms, the demands of a modernized agriculture could support the manufacture of inputs such as fertilizers and other farm chemicals, farm implements, and packaging. Downstream, increased and reliable agricultural outputs can support a vibrant and competitive agroprocessing sector. Expanding agro-industry will contribute to Africa's industrialization, increase employment and incomes, and reciprocally stimulate agricultural growth by creating new output markets and increasing farmers' incomes and enabling them to invest in land and new inputs to further improve productivity.

In most African countries, however, value-added in agro-industry is well below potential. In particular, value added in agroprocessing is less than 40% of agricultural value added in most countries, compared with 80% in Brazil. South Africa is an exception, with value added in agroprocessing reaching 180% of agricultural value added. And most fertilizers and other manufactured agricultural inputs are imported. The challenge of developing agroprocessing and agro-related manufacturing, assuming that farm supply problems are solved, turns on industrial policy and a conducive environment for business. Industrial policy and private sector development

policies should prioritize attracting agribusiness investors (agroprocessors, manufacturers of agricultural inputs, and other service providers in agricultural value chains). Agricultural development policy and industrial development policy must be linked, and ministers of finance, ministers of trade and industry, and heads of investment promotion and export promotion agencies should talk and coordinate more with ministers of agriculture.

Many African countries have good opportunities in agroprocessing, as illustrated by the potential in cotton, cassava, oil palm, and leather products (chapter 6). Opportunities in these and other agricultural products go beyond food production to the manufacture of industrial products to serve domestic and export markets. Today, Africa depends largely on imports for these products. There are four main approaches to spurring agro-based industrialization in Africa:

- Target support to specific product value-chains of high promise, within the overall context of supporting agricultural modernization, to ensure that supplies of produce are available at the scale, quality, and reliability needed by industrial processors.
- Work to attract agribusiness investors into export processing zones and industrial parks, through private sector development and industrial policy that prioritizes the targeted agricultural value chains. This will require close coordination between the ministries of finance and planning, the ministry of trade and industry, the investment and export promoting agencies, and the ministry of agriculture.
- To promote the growth and expansion of local small and medium-size enterprises: support rural artisanal food processors and link them to urban industrial processors as suppliers, building on some of the evolving models, and support local fabricators of simple agricultural machinery and tools.
- Intensify efforts through regional integration to open up wider markets to African processors and input manufacturers on the continent, which can provide some relief from the restrictive standards that discourage African food products from entering developed country markets.

Leveraging agriculture for employment

Agricultural transformation can also be an important part of the solution to growing unemployment, particularly youth unemployment, in Africa. While rising productivity on farms means that fewer people will be needed to produce a given quantity of output or to farm a given area of land, the development of agricultural value chains, including agroprocessing, input

**Transforming
Africa's
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sector**

Agroprocessing, input manufacturing, and agricultural services will open a host of productive employment opportunities

manufacturing, and agricultural services, will open a host of productive employment opportunities in nonfarm sectors. Many of these jobs are likely to be attractive to Africa’s expanding population of educated youth, most of whom shun farming. And some of the educated youth who currently avoid farming might be attracted to it if there were well-designed programs to help them enter and succeed in a modernized and commercially-oriented farming system that would give them access to a middle-class lifestyle (approaching the standard of living of their peers in white-collar jobs).

So, a transformed agriculture—a modernized farming system with strong linkages to other sectors of the economy—can respond to both the general unemployment problem and the specific problem of educated youth unemployment. In the long term, bringing more young people into farming is essential for replacing the aging traditional smallholders who are now the backbone of African agriculture.

Expand jobs in off-farm agricultural value chains. The first part of the agenda for expanding off-farm agro-related jobs is essentially to strengthen selected agricultural value chains and promote agro-industry. The second part—employment—will have to be complemented by two additional actions:

- Support education and training institutions in collaboration with industry to transfer the types of skills needed in the economic activities being targeted.
- Market training and jobs in agro-related economic activities as attractive career options through information and media campaigns featuring national leaders.

Encourage some educated youth to take up farming. The agenda to attract educated young people to take up farming has to focus on the challenges that discourage them from farming. These challenges are the same as the challenges of farming modernization articulated in this report—access to land, to the “green revolution package” of inputs, to finance, and to markets. But the barriers are even higher for youth, who lack the necessary resources and social connections. In addition, youth find current farming practices and rural life unattractive. But the effort to engage youth in agriculture is worthwhile, to take advantage of their generally higher education levels, more commercial orientation, and strong drive, which make them more trainable as modern farmers. Many young Africans already mix livelihoods to earn income. Providing them with financial literacy, business development, and soft skills can help them manage a portfolio of self-employment and

temporary and seasonal work for others in household agricultural production.¹⁶

Initiatives could include “agricultural industrial parks” designed to attract youth to commercial farming. Similar projects were introduced in Africa in the 1960s and 1970s (called integrated agricultural or area development projects), but heavy-handed state control led to their collapse. The agricultural industrial park model proposed here is different. It is a market-oriented business enterprise that receives initial support from the state in collaboration with donors and the private sector in sound public–private partnership arrangements. Democratic Republic of Congo, Mozambique, Tanzania, and other African countries are already developing large agricultural industrial parks or development corridors. These projects aim to attract large agricultural investors, but there is no focus on using them to develop a new class of educated small and medium-scale national commercial farmers. Japan and Brazil are supporting Mozambique in adapting Brazil’s very successful *cerrado* agricultural settlement and development experiment, but it needs a greater emphasis on using the project to support educated national small and medium-scale commercial farmers. The proposed model includes:

- Setting up agricultural industrial parks as pilot schemes, with government, donors, and the private sector coming together in public–private arrangements to provide comprehensive and market-oriented solutions to the problems that youth face in entering farming. Given the costs, and the need to experiment and learn along the way, programs should be geographically focused.
- Acquiring a large track of land, servicing it with infrastructure (roads, water, and electricity), and allocating it according to objective technical criteria to selected young settlers to farm.
- Teaming up with donors to provide focused training on-site in farm production and business management, to educated youth who are interested in farming (to form the pool of candidates from which to select youth settler farmers).
- Incentivizing the private sector—input dealers and lending institutions—to locate near the project site to provide services to settlers (and to adjacent smallholder farmers) on favorable terms.
- Promoting linkages between the project and processors, supermarkets, and other large buyers and exporters.
- Providing dedicated extension agents through a public–private arrangement on the project site for

Providing modern off-farm employment opportunities



a few years to help settlers master the science and business of farming.

- Supporting a strong farmer organization among the farmers.

Once the pilot has demonstrated its effectiveness, it could be replicated in other parts of the country.

Ensuring gender balance in agricultural transformation

Women constitute half the labor force. Putting them on an equal footing with men in driving agricultural transformation and benefiting from it is not only good social policy—It is also good (and essential) economic transformation policy. But women face extensive discrimination in many African countries that limits their access to land, extension services, finance, and markets. These constraints lead to a vicious cycle: without ownership rights, women cannot use their farm plots as collateral for loans to purchase modern inputs, and without good access to modern inputs and extension services, women's productivity is lower than men's, which means that they earn less from their plots, and so are unable to advance. Here are some actions to break this cycle:

- Reform land rights laws to enable women to legally own land, as Ethiopia, Kenya, Rwanda, and Uganda have done. Accompany the formal change in laws with information campaigns to make women aware of their right to own land and facilitate their registration of lands.
- Consider changing laws governing marriage, divorce, and inheritance to remove barriers against women, as Rwanda has done.
- Promote and disseminate simple and cheap labor-saving technologies and inputs in small quantities to address women's limited access to credit and cash.
- Employ more female extension workers.
- Support farmer-to-farmer training approaches that use women as trainers, and encourage farmer field schools with flexible training schedules that accommodate other demands on women's time.
- Use modern information and communication technology, such as mobile phones, text messages, and radio and television programming, to reach more female farmers, and communicate extension messages in ways that make it easier for women with little formal education to access and understand them (such as through pictures and videos).
- Adapt credit products to female clients' needs, such as changing the terms of credit through microfinance institutions, or providing innovative types of savings instruments, such as female-owned *individual* accounts, mobile banking, and branchless banking.

- To help women circumvent credit, educational, and infrastructural barriers, provide bundled services, for example, packaging together loans, savings accounts, and access to inputs such as fertilizers, technology, and extension services.

- Support women farmer organizations to strengthen women's market power in input and output markets.

Harmonizing agricultural intensification, environmental sustainability, and climate change

Raising farm productivity requires intensification—more cropping intensity and increased use of fertilizers and other farm chemicals, irrigation, and mechanization. Improperly done, each of these activities could adversely affect the environment. Farmers will need information on practices that raise productivity in ways that are environmentally sustainable. The impacts of climate change also need to be considered. Research is needed on how climate change is likely to interact with these intensification technologies and approaches and reduce their effectiveness and on what could be done so that farm productivity can continue to rise despite the impacts of climate change. Focusing on these questions and helping farmers deal with them should be key parts of the policy agenda for agricultural transformation.

The intensification of farming, through continuous cropping and increased use of fertilizers, irrigation, and mechanization, that is required for agricultural transformation needs to be made environmentally sustainable and to take into account the potential impacts of climate change. Here some of the actions that are needed:

- Train extension officers to disseminate knowledge about the correct application of fertilizer, to minimize runoff, and encourage mixed crop-livestock production to increase organic fertilizer production.
- Promote small, closed, underground pipe irrigation to reduce water use and evaporation, and support well-run water user organizations to manage irrigation projects.
- Promote the use of small agricultural machinery, such as two-wheeled tillers and small four-wheeled tractors.
- Promote conservation agriculture and climate-smart agriculture.

A partnership for Africa's agricultural transformation

The spearhead of agricultural transformation will be farmers and private agribusiness entrepreneurs. But

Putting women on an equal footing with men is not only good social policy—It is also good economic transformation policy

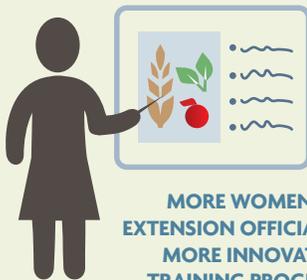
Achieving gender balance in farming



ACCESS TO CHEAP
TECHNOLOGIES
AND INPUTS



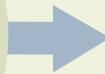
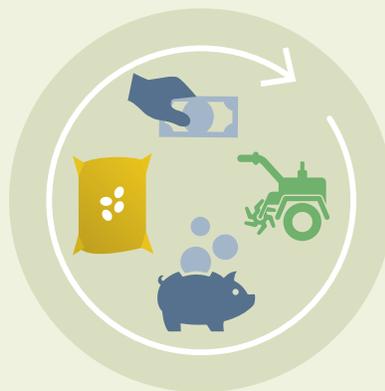
ACCESS TO LAND



MORE WOMEN AS
EXTENSION OFFICIALS AND
MORE INNOVATIVE
TRAINING PROGRAMS
ADDRESSING CONSTRAINTS
FACING WOMEN



ACCESS TO
DIGITAL FINANCE,
MICROFINANCE,
AND BASIC SAVINGS
AND LOANS ACCOUNTS



ACCESS TO
BUNDLED PACKAGES THAT
CAN INCLUDE BOTH FINANCIAL
SERVICES AS WELL AS
AGRICULTURE INPUTS

government has crucial roles to play, mainly supportive but in many cases leading efforts to catalyze innovations. The government's role in advancing agricultural transformation extends beyond the ministry of agriculture to the finance and planning ministries; trade and industry ministries; education, training, science, and technology ministries; and government agencies promoting investments. In effect, a “whole of a government approach” is

required. It can be no less, since agricultural transformation must harness agricultural and industrial policies to drive overall economic transformation. This is an opportunity that many African countries are fortunate to have, and it is time they reached out and seized it—with enthusiasm! And Africa's international development partners need to support African governments, farmers, and entrepreneurs in this transformative agenda.

Notes

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An aerial photograph of a lush green landscape. The terrain is rolling and covered in vibrant green vegetation, likely crops. The fields are divided into numerous irregular plots by thin, dark lines, possibly roads or fences. Scattered throughout the landscape are small clusters of trees and a few small buildings, suggesting a rural or agricultural setting. The overall scene is bright and verdant, with a strong sense of natural beauty and agricultural productivity.

Agricultural transformation incorporates two main processes. The first is transforming or modernizing farming by boosting productivity and running farms as modern businesses. The second is strengthening the links between farms and other economic sectors in a mutually beneficial process, whereby farm output supports manufacturing (through agroprocessing), and other sectors support farming by providing modern manufactured inputs and services.

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