FEED AFRICA
Technology, Infrastructure and Mechanization for Africa's Agricultural Transformation

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Presentation Outline

I. **Imperative of Technology for Africa's Agricultural Transformation**

II. **AfDB's Strategic Response**

III. **Key Initiatives promoting Technologies, Infrastructure and Mechanization**

IV. **Recommendations & Way forward**

V. **Partnerships**

I. Imperative for Technology for Africa's Agricultural Transformation

Importance of Mechanization/technology to Agriculture transformation

- **Production can, substantially, be increased by mechanical technologies[1]**
- **Inputs of labour by farmers/their families can, substantially, be reduced if they have access to a proper selection of tools, machines, & equipment[1]**
- **Adoption of improved mechanical technologies has impact on yields, area cultivated, & related small scale activities (e.g., processing, storage, delivery of irrigation water[1)]**
- **Increase in mechanization & use of improved technologies means more income for farmers; can lead to agricultural transformation in Africa**

1) Source: FAO 2013. Agricultural Mechanization in Sub Saharan Africa: Guidelines for preparing a strategy.

Importance of Mechanization/technology to Agriculture transformation…

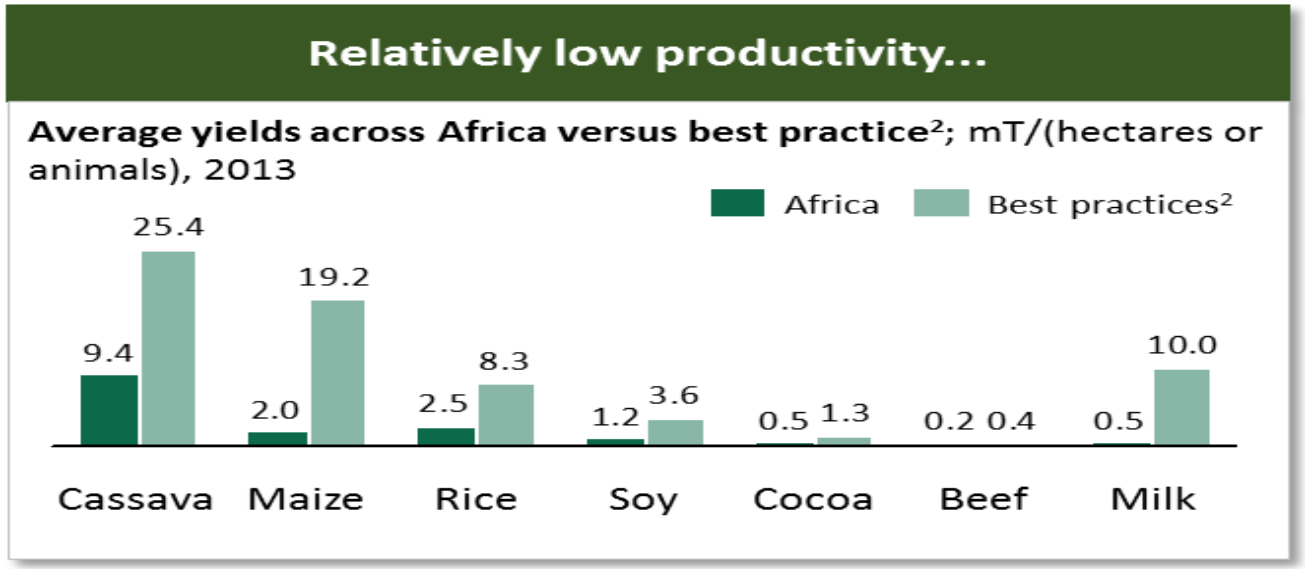
- **Mechanization helps to achieve: low cost, competitiveness, low consumer price, higher volumes of products needed to meet demand (food, feed, raw materials); being driven by urbanization**

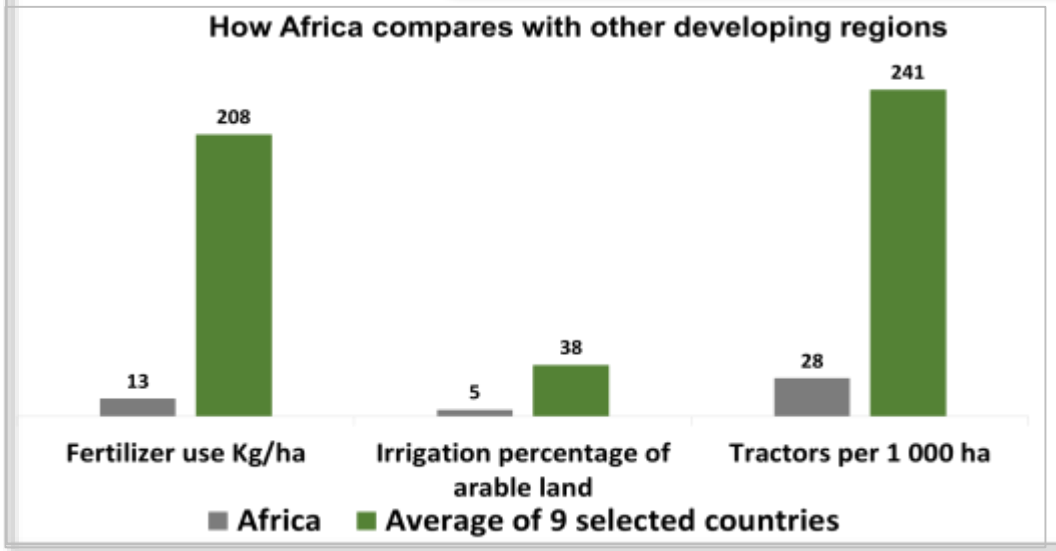
- **Mechanization is critical for large scale up- and out-scaling of improved/ modern technologies & for the new green revolution needed for Africa; can promote demand for industrialization**

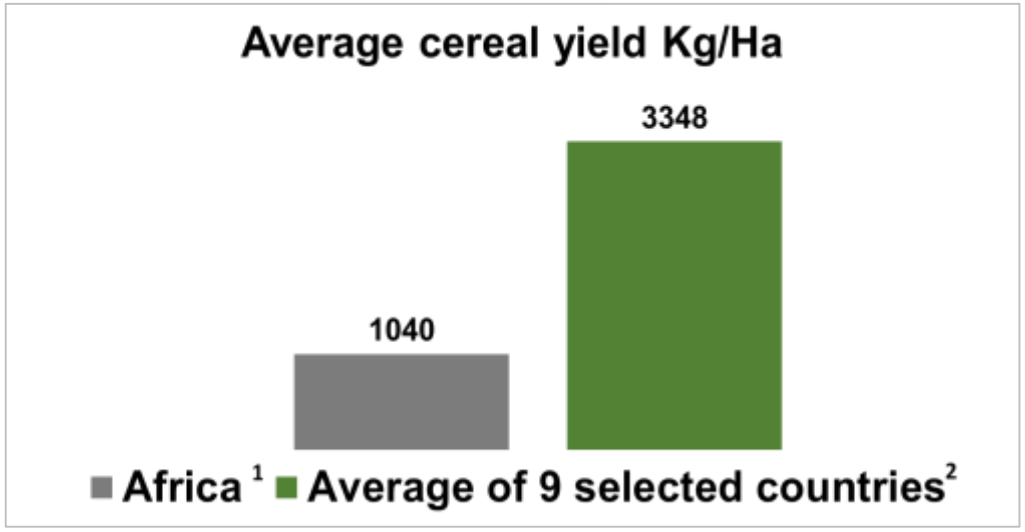
Requirements for successful mechanization in Africa

- **Systems approach along the value chain (to empower farmers)**
- **Environment with good infrastructure (hard/soft); Investments in rural infrastructure are key (Fan et al. 1999)**
- **Different ownership arrangements are important (Diao et al. 2014)**
- **Private sector-led (Diao et al. 2014)**
- **Labor-saving with potential to increase earnings (Takeshima et al. 2013)**

Major reason for low productivity in Africa: Limited use of improved technologies & low mechanization

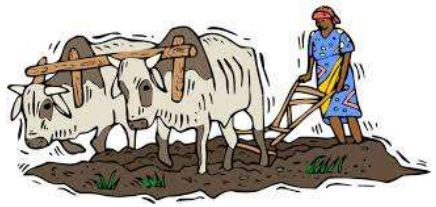






Source: The World Bank (2007) as cited by FAO and UNIDO (2008)
1 Africa less Egypt and Mauritania
2 Bangladesh, Brazil, China, India, Korean Rep., Pakistan, Philippines, Thailand, Viet Nam

Sources of power for land preparation: SSA vs. other regions



	Human muscle power (%)	Draught animal power (%)	Engine power (%)
Sub-Saharan Africa	65	25	10
East Asia	40	40	20
South Asia	30	30	40
Latin America & the Caribbean	25	25	50

Source: FAO 2006

Tractors/100 km2 of arable land: Africa vs. Other Regions

- **Africa: 13**
- **Other developing regions (e.g., South Asia): 129**
- **Global average: 200**
- **Growth rate in numbers of tractors shows that SSA has been uniquely unsuccessful – with growth rate lower than comparable developing regions by a factor of 15 or more**

Source: World Bank and FAO 2013. Agricultural Mechanization in Sub Saharan Africa: Guidelines for preparing a strategy.

Challenges to Agric. Mechanization & Use of Modern Technologies in Africa

- **Disconnect between researchers & farmers:** Technologies produced by researchers are not sufficiently disseminated to reach farmers

- **Limited skills in equipment manufacturing & operation:** Affects the ability to repair and service; properly demonstrate use of new farm equipment/technologies; leads to the problems of sustainability

- **Lack of finance:** Cost of most mechanization technologies are beyond smallholder farmers; calls for access to affordable finance (esp. for youth and women)

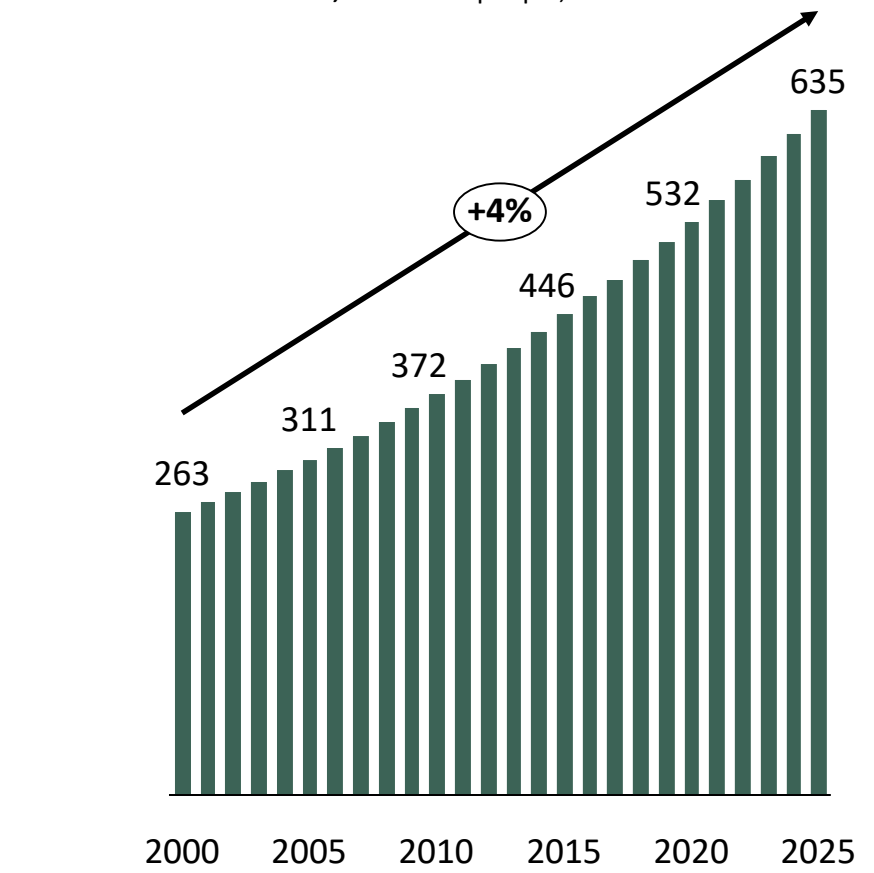
- **Fragmented land holding:** The case in many African countries; poses difficulty in use of agricultural machinery (for smallholder farmers); calls for cooperatives, contract farming (for higher economic efficiency/economies of large-scale)

➔ **See later how some of the challenges are responded to through Enablers**

Urbanization is driving increased demand for food products that are not currently being supplied by African producers

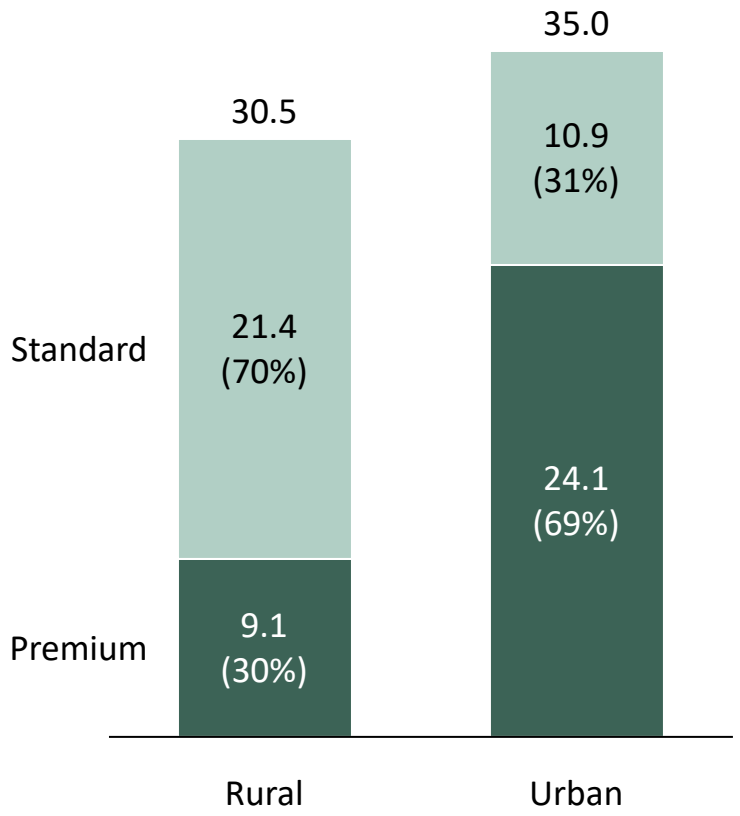
Increasing urbanization across Africa

African urbanization rates; millions of people, 2000-2025



Shifting consumption preferences to 'premium' rice

Per capita rice consumption by grade (Standard vs. Premium) – Nigeria Example - Kg per capita per year (Rural vs. Urban areas)



Source: IFPRI, Policy options for accelerated growth and competitiveness of the domestic rice economy in Nigeria; World Bank; CGIAR, Technologies for African Agricultural Transformation; Africa Rice Center, The New Rice for Africa – a Compendium; World Bank Data; Dalberg analysis

II. AfDB's Strategic Response

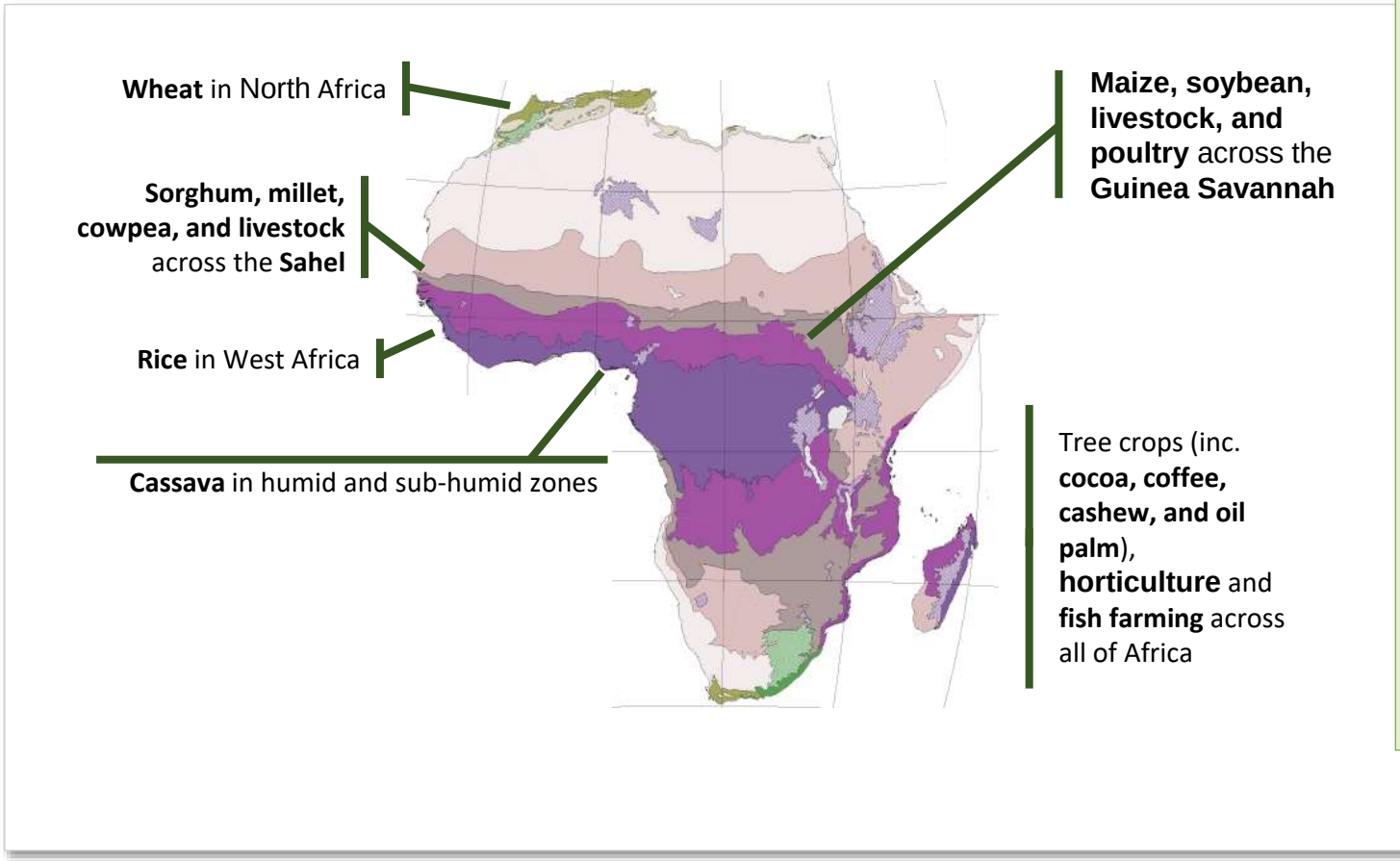
AfDB's "High 5" Priorities

The High 5 for transforming Africa
Le Top 5 pour transformer l'Afrique

1. Power and Light Up Africa
2. Feed Africa*
3. Industrialize Africa
4. Integrate Africa
5. Improve Quality of Life of Africans

FEED Africa will focus on Integrated Commodity Value Chains

The Bank/partners will pursue an agenda to transform a selection of key agricultural commodities & agro-ecological zones



In particular, Feed Africa will take a **commodity-focused integrated approach** – simultaneously addressing multiple bottlenecks across entire **prioritized agricultural commodity value chains** and within related **agro-ecological zones**

Agricultural commodity value chains and agro-ecological zones or regions targeted by the Feed Africa

Responding to the challenges of technology & mechanization: Feed Africa 7 Enablers - Orchestrate, design, scale & replicate transformation

Feed Africa Enablers	AfDB Role	
1 Increased Productivity	Orchestrate/ Design	**TAAT:** Increase investment the dissemination of proven technologies for increased agricultural productivity **Inputs finance/agro-dealer network dev't:** Expand input finance & connect farmers to buyers **Mechanization Program:** Establish facility for on-farm mechanization leasing of farm equipment
	Scale/ Replicate	**Agro-dealer:** Develop agro-dealer supply systems **Innovative farmer extension models:** Support wide-scale deployment
2 Realized Value of Increased Production	Orchestrate/ Design	**Post-Harvest Loss Prevention Facility:** Invest in infrastructure & training to reduce on-farm/post-harvest loss **Warehouse receipts systems (WRS):** Scale WRS as 1st step for commodity exchanges **Agro-processing zones/corridors:** Increase & link production/processing capacity along key corridors
	Scale/ Replicate	**Innovative models to organize/aggregate farmers:** Scale-up & replicate **Agricultural commodity exchanges:** Establish
3 Increased Investment in Hard & Soft Infrastructure	Orchestrate/ Design	**Infrastructure Coordination:** Accelerate & coordinate development of enabling hard infrastructure (energy, water, logistics) **Market infrastructure:** Build market centers and associated service infrastructure **Farmer e-registration:** Launch large scale farmer e-registration systems

Responding to the challenges of technology & mechanization: Feed Africa 7 Enablers - Orchestrate, design, scale & replicate transformation…

Feed Africa Enablers		AfDB Role
4 Expanded Agricultural Finance	Orchestrate/ Design	**Risk-sharing Facility:** Catalyze bank lending to the ag sector through risk-sharing facility **Non-Bank SME Finance & Capacity-Building Fund:** Provide funding & capacity-building to SME funds as well as surrounding ecosystem (e.g. credit bureaus) **Project Finance Facility:** Increase long-term funding to agriculture SMEs **Trade Finance Facility:** Scale up existing soft commodity financing facility **Sovereign Risk Support:** Scale up Africa Risk Capacity (ARC) initiative (sovereign insurance solution to agro-eco. shocks) **Diaspora Bonds:** Create lending products to attract diaspora & institutional capital
	Scale/ Replicate	**Lending rates:** Facilitate lower lending rates to agricultural players through Central Bank funds **Agricultural insurance:** Deepen & broaden agricultural insurance markets
5 Improved Agribusiness Environment	Orchestrate/ Design	**Policy reform matrix:** coordinate establishment of an Africa-wide policy matrix detailing the five groups of key policy change areas required to enable transformation: (i) Land tenure, (ii) Input subsidies, (iii) incentives for local production and processing, (iv) financial sector deepening, (v) Regional integration and trade **Global Program for Improving Agricultural Statistics & Rural Dev't:** Improve statistical systems across African countries by building capacity in ministries and offering technical assistance
	Scale/ Replicate	**Land tenure reform:** Facilitate land tenure reform through the Africa Land Policy Center **Technical advisory to governments:** Provide this to support agriculture development bank set-up / reform **Strengthen capacity of private-sector actors' (e.g. Chambers of Commerce):** To advocate for favorable policies **Development of Agribusiness Environment indices:** Support

Responding to the challenges of technology & mechanization: Feed Africa 7 Enablers - Orchestrate, design, scale & replicate transformation…

Feed Africa Enablers		AfDB Role
6 Increased Inclusivity, Sustainability, Nutrition	Orchestrate/ Design	AFAWA Facility: Establish a facility to promote women-owned MSMEs
	Scale/ Replicate	Women in agricultural research: Increase representation of women in agricultural research, & enhance gender-responsive research, monitoring & evaluation
	Orchestrate/ Design	Youth Jobs for Africa Agricultural Flagship Programs: Establish facilities to increase youth employment and enhance skills in agribusiness (e.g. ENABLE Youth)
	Orchestrate/ Design	Climate Resilience Funding: Provide funds to support climate adaptation & climate smart agriculture practices
	Scale/ Replicate	Nutrition programs: Encourage their scale-up & replication through the Nutrition Trust Fund & other mechanisms)
7 Coordination	Orchestrate/ Design	Partnership: Among key actors from the public sector, private sector and development institutions
	Scale/ Replicate	Pan-African agriculture leadership initiatives (e.g. Leadership 4 Agriculture): Support

III. Key Initiatives promoting technologies, infrastructure and mechanization

Key initiative I: Technologies for African Agriculture Transformation (TAAT)

OBJECTIVE: The CGIAR Technologies for African Agricultural Transformation (TAAT) Clearinghouse led by IITA will raise farmer productivity and incomes by creating a repository of proven agricultural transformation technologies that are tailored for the African context and can be scaled beyond pilots through CGIAR and partner delivery mechanisms

Key components	Problems addressed	Lessons learned from comparable examples
1 Provide funding and strategic support to CGIAR to develop a clearinghouse of technologies in 23 key African value chains 2 FARA collaborates with the TAAT Clearinghouse at IITA to provide capacity building support 3 OCP, AGRA collaborate with TAAT clearinghouse to expand agro-input supply	**Delivery of technologies to end-beneficiaries varies widely across projects and CG centres** • Many recent technologies did not have on-farm trials, were not developed with policy constraints in mind (such as golden rice), and were not delivered through implementation partners that work directly with farmers **CGIAR has developed many high-potential technologies for Africa's ag. transformation, but many farmers have not adopted them** • A 2014 review of improved CGIAR varieties across 20 crops in 30 SSA countries found mean adoption rates of <35% for 14 of the 20 crops, and that the average varietal planted in Africa was developed 14 years ago • For instance, New Rice for Africa (NERICA) rice, a drought-tolerant, high-yield variety developed in the 1990s, has had limited adoption despite over 10 years and > USD $35M spent on dissemination through CGIAR channels	• Brazil's EMBRAPA (Brazilian Agricultural Research Corporation) scales technological innovations and best practices through its Embrapa Management System, via dozens of partnerships with both public institutions and private agribusiness companies • Thailand's National Science and Technology Development Agency (NSTDA) has a dedicated Technology Management Centre (TMC) responsible for technology transfer and commercializing developed innovations; it bridges the lab-to-market gap through applied R&D, IP protection and licensing, spin-offs and join ventures, and contract and joint R&D with private companies.

Source: CGIAR TAAT proposal, February 2016; Independent Review of Integrated Delivery in the CGIAR, 2014; Walker et al. 2014; AfDB 2014; IRIBA 2014; NSTDA 2009.

Some mechanization related proven technologies approved in TAAT for different commodity value chains

PIA	Value chains	Mechanization Technologies approved
Self sufficiency in rice	Rice	• Rice Mechanization (Laser Land Levelling) • Motorized weeders; Axial Flow Thresher • Water Lifting of Water for Rice Irrigation
Enabling cassava as an agro-industrial crop	Cassava	• Mechanization of Cassava Production • Cassava Processing (Village Scale Mechanical • Processing; Mechanical Peeling & Mechanical Drying (Using Pneumatic Dryers) • Cassava Root Waxing (for increased shelf life)
Achieving food security in the Sahel	Sorghum G-nut Cowpea Beef Small ruminant chicken	• Mobile Choppers - Efficient & Optimum Utilization of Crop Residues (Sorghum) • Small & Medium Scale Mechanization (Sorghum) • Improved Storage of Cowpea Using PICs bags (Cowpea)

Some mechanization related proven technologies approved in TAAT for different commodity value chains…

PIA	Value chains	Mechanization Technologies approved
Transforming the savannah zone into Africa's bread basket	Maize* Soybean Yam* Dairy Poultry	• Rural Mechanization (Tillage, Irrigation & Post-harvest processing) (Maize) • Storage/Post harvest Technologies (Maize) • Processing Technologies (Yams) • Post-harvest Technologies (Yams)
Restoring plantations & adding value to cocoa, coffee, oil palm and cashew	Cocoa* Coffee Cashew* Oil palm*	• ICT for Market Price & Market Information System (Cocoa, Cashew, Oil palm) • Oil palm harvesting technologies
Expanding Africa's share of horticultural trade	Vegetable* Banana Potato* Beans*	• Reduced Postharvest Losses (Vegetable) • OFSP Processing Technologies (Potato) • Canning Technology (Beans)
Expanding wheat production in Africa	Wheat	• Mechanizing Irrigated Wheat Production Using the Raised-beds
Self sufficiency in fish production	Fisheries	• Fish Processing - Smoking Kiln

Key initiative II : Mechanization

OBJECTIVE: The African Mechanization Program will raise farmer incomes by allowing farmers to lease mechanized equipment for more efficient production

Key components

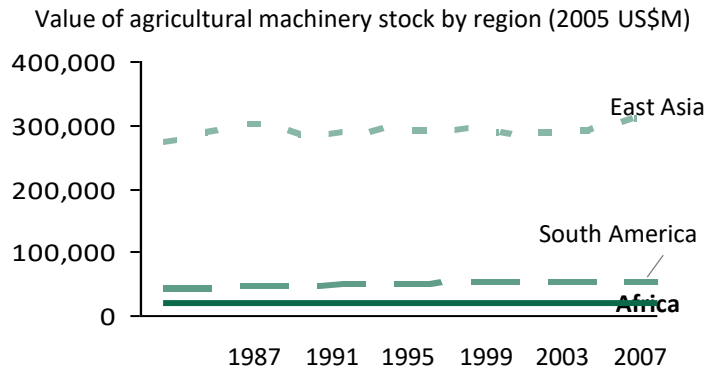
1. Support select RMCs to create **Agricultural Equipment Hiring Enterprises** (AEHEs)
2. Partners (e.g. FAO, UNIDO) work to provide **technical assistance** to AEHEs
3. Provide **concessional debt** to be on-lent for equipment hiring and purchase via commercial banks
4. FAO and other partners collaborate to create a **robust knowledge base and collect data** on mech. access

Problems addressed

Africa is not reaping the potential efficiency benefits of mechanization

- Farmers often lack labor to plant larger fields in time for rains, and thus have lower production
- African farmers have **10 times fewer mechanized implements per farm area than farmers in other developing regions**, and access has not grown as quickly as in other regions

Many African farmers are unable to pay the upfront cost of mechanized equipment

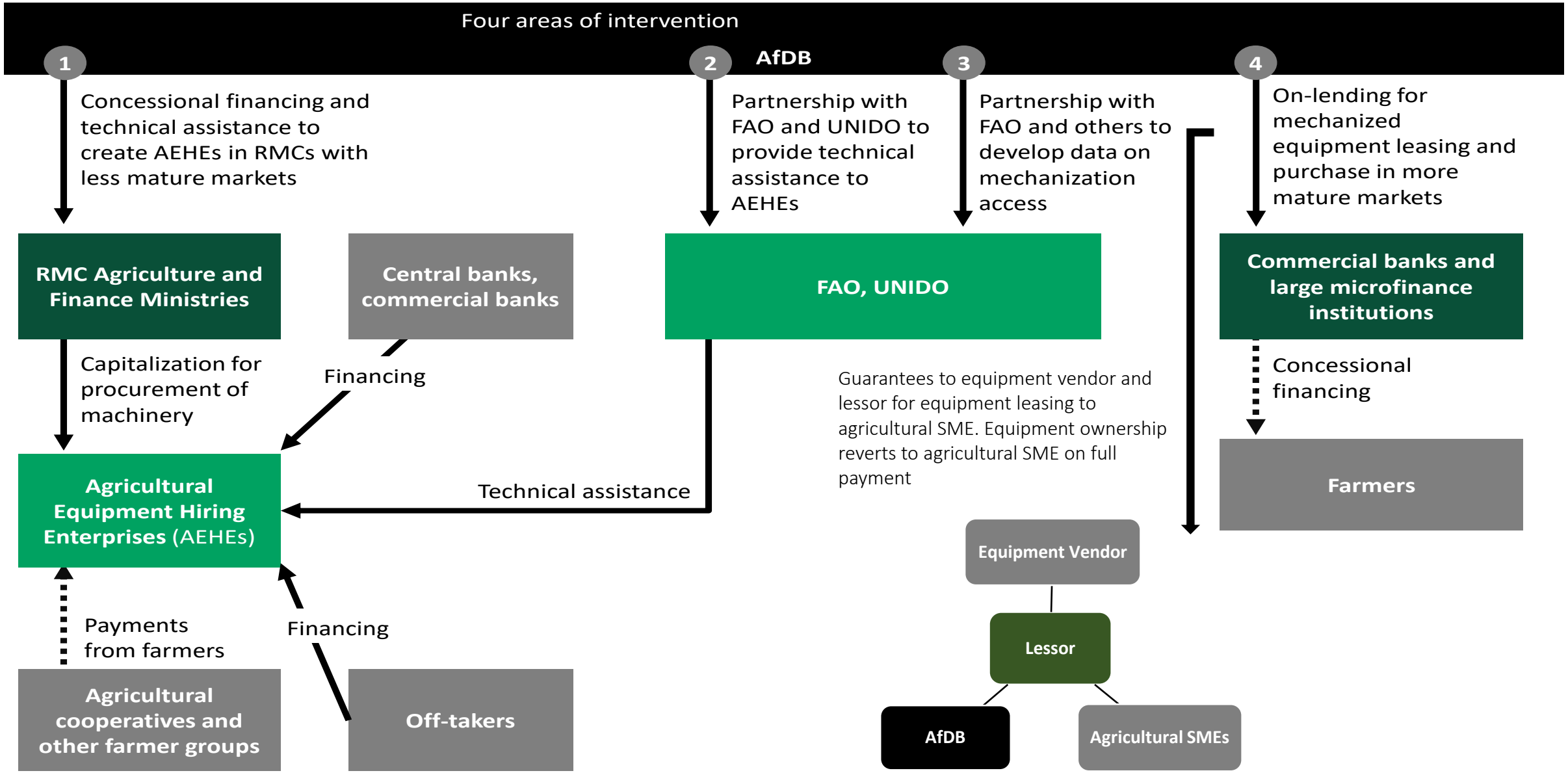


Lessons learned from comparable examples

- **Nigeria's** Agricultural Equipment Hiring Enterprises (AEHEs) experimented with two models: distribution and leasing through the ag. ministry, or through a decentralized SME network; the former requires high government capacity
- BNDES FINAME Agricola's longer-tenure and lower-interest loans are a strong incentive for **Brazilian** farmers to consider leasing equip.
- **John Deere** has distribution networks in E, S, and W Africa; it is launching a first loss guarantee to enable mech. equip. adoption via lower monthly farmer payments
- **Farmers prefer** to be able to eventually own their own assets, such as through Rent-to-Own

Source: FeedAfrica 2015; UNIDO and FAO, 2008; FAOstat, 1985-2007 data.

Potential structure of the mechanization program (less/more mature mkts)



Key initiative III: Post-Harvest Loss Prevention and Processing

<u>OBJECTIVE:</u> The Post-Harvest Loss Prevention and Processing Facility will raise farmer incomes by making post-harvest loss (PHL) technologies more readily available through growth capital investments in suppliers, and on-lending for farmer leasing.

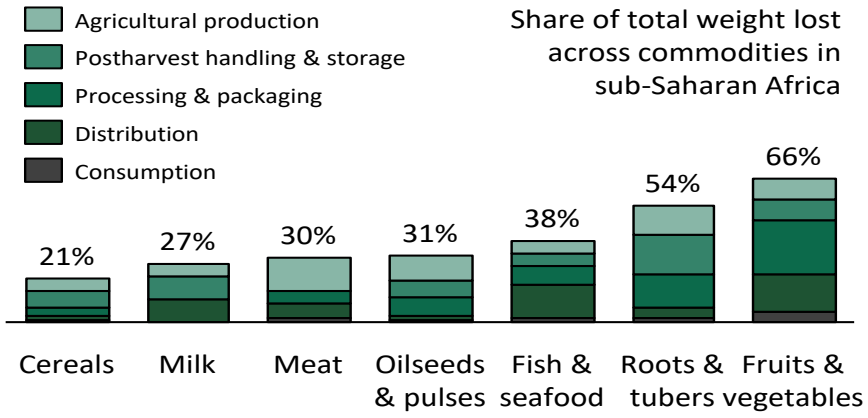
Key components

1. Create a blended finance vehicle to crowd in growth capital investment for PHL technologies
2. Partner with Rockefeller, GAIN, and others to provide technical assistance to investees in conjunction with investments
3. Create an on-lending window to allow agricultural coops and SMEs to lease PHL equipment

Problems addressed

Post-harvest losses (PHL) in Africa are equivalent to the annual caloric requirement of 48M people, and worth USD $4B in lost revenue

- Cereal losses are 21% of production, while fruit, vegetable, root, and tuber losses are >50%, with the greatest losses at handling, storage, processing, and packaging stages
- PHL prevention technologies are typically too expensive for smallholders or are not marketed and sold in remote rural areas



Lessons learned from comparable examples

- Many PHL solutions exist and can be locally manufactured, but are not yet reaching farmers at scale; Mahaseel Agricultural Investment Fund and Anterra Capital are venture and private equity funds providing growth capital to storage and processing companies
- Farmers need to have sufficient incentives, such as market access, to be able to benefit from and pay for PHL technologies; AgResults found that paying farmer aggregators bonuses for higher-quality maize improved uptake

Source: APHLIS; CTA Policy Brief No.7, 2012; Rockefeller Foundation 2014; AgResults Nigeria Year 1 Verification.

Key Initiative IV: Infrastructure

OBJECTIVE: AfDB will catalyze financing for agricultural infrastructure in support of the ATA by providing co-funding and project development assistance to value chain projects.

Key components

1. Invest in **agriculture infrastructure** projects within the Bank's overall infrastructure pipeline (energy, water, transport, logistics, ICT).
2. Provide project **co-financing** facilities for large-ticket agricultural infrastructure PPPs in line with the ATA
3. Build a project development and technical assistance facility that can support nearly-bankable projects to access finance from other FIs

Possible Infrastructure Investment Areas

Hard Infrastructure: The Bank will support the:

- Building of physical markets and enabling structures, including training centers for marketing food safety and quality monitoring and other support services
- Service infrastructure such as warehouses, cold storage units, and feeder roads, irrigation systems,
- Enabling physical infrastructure required in agro-industrial parks and agropoles

Soft Infrastructure:

- **Human capital** and agribusiness **skills** development (e.g. through the ENABLE Youth Program)
- Support the creation of electronic databases to facilitate **large-scale registration of farmers** to link them to financial services, input distribution, e-markets, etc. (though the Farmer e-registration prgramme)

Problems addressed

There is a $48 B gap in overall infrastructure financing across continent

- Despite large infrastructure gap in Africa, project finance in the continent only accounts for 3% of the global figure
- Moreover, 70% of current project finance occurs in four countries (Nigeria, Ghana, South Africa, Angola), highlighting national inequalities in access to finance

More specifically, agriculture-related infrastructure is marginalized in Africa project finance relative to global proportions

- Over 64% of project finance in Africa from 2003 to 2013 went into in **extractive sectors**, far higher than global average of ~27%
- While roads and transportation represented ~22% of global project finance, their allocation in Africa was negligible
- PPPs represented only 1% of Africa project finance

Key Initiative V: Agricultural Risks Sharing & Financing Mechanism for Increased Agriculture Finance

OBJECTIVE: The Agricultural Risks Sharing & Financing Mechanism will achieve increased bank lending to SMEs through de-risking credit activities and attracting new capital to the sector.

Key components	Problems addressed	Lessons Learned
1 **Reduce risks** for Commercial Banks 2 **Leverage** excess liquidity into Agriculture 3 **Build Agricultural Capacity** of Banks 4 Increasing outreach of banks into rural areas 5 and ensure a systematic change in agricultural lending	**Current risk-adjusted returns to capital are too low to justify investment in the sector when other opportunities exist** • Major commercial banks only loan 1-5% of their portfolio to agriculture • Prohibitively expensive interest rates (15-25%) for agriculture reflect high transaction costs, lack of sector expertise, risk exposure • The Bank will support countries with PPF or MIC grants to design and **set up country instruments**. Requests have been received from some coutries (e.g., Uganda, Rwanda, Liberia, Sierra Leone, Rwanda, Kenya, DRC, Cameroon) • A new Department of Agricultural Finance is being set up to create necessary instruments for mobilizing resources for agricultural investment • Instruments will be created for leveraging resources from Sovereign Wealth Funds, Pension Funds, and setting up Diaspora bonds.	Previous risk-sharing initiatives in **Japan**, the **US**, and **India** have produced lessons about: • Structuring of incentives to avoid moral hazard risk by banks or borrowers of originating excessive low-quality loans Successful initiatives such as **NIRSAL** in Nigeria and FIRA in **Mexico** illustrate the importance of: • Partnerships with credible state institutions • Stakeholder inclusion to align credit guarantee offer with private sector needs

Source: Dalberg interviews in Kenya, Senegal, Nigeria (2015); Omidyar Network, "Accelerating Entrepreneurship in Africa Report," 2013; FAO, "Credit guarantee systems for agriculture and rural enterprise development," 2012

IV. Recommendations & Way Forward

Recommendations & Way forward

- **Integration of agricultural mechanization in pan-African policy frameworks**
- **Sustainable mechanization strategies & Business model approach – for meaningful smallholder up-scaling & adoption**
- **Good institutional/organizational arrangements – for increased smallholder mechanization**
- **Private sector led public sector enabled approach – for sustainability**
- **Regional centres of excellence – to promote agricultural mechanization**
- **Field–based capacity building/development for agricultural mechanization**
- **All concerned (farmers ➔ policy makers) must understand & contribute to efforts on mechanization, across the entire farming system, with a value chain perspective (FAO & UNIDO, 2008)**

V. Partnerships

Partnerships – By Flagship Initiative

Flagship	Estimated Cost	Key Partners
Technologies for African Agriculture Transformation (TAAT)	~850 million USD	AfDB, CGIAR, FARA, IITA, IFPRI, World Bank, AFAP, FAO,WFP-PPP, Microfinance actors (e.g. PAMIGA), Equipment manufacturers
Infrastructure	~65-80 billion USD	IFC, IFAD, GSMA, BMGF
Mechanization Program	~6 billion USD	UNIDO, FAO and private sector partners
Post-Harvest Loss Prevention and Processing Facility	~200 million USD	Rockefeller, GAIN, BMGF and Microfinance Institutions.

AfDB will invest USD 24 billion over 10 yrs (USD 2.4 billion per annum). However, USD 32 – 40 billion is required per annum to unlock USD 85 billion of revenue annually. Partnership is imperative

AFRICAN DEVELOPMENT BANK GROUP

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