

Opportunities and Challenges for Sustainable Financing of Agricultural Mechanization in Africa



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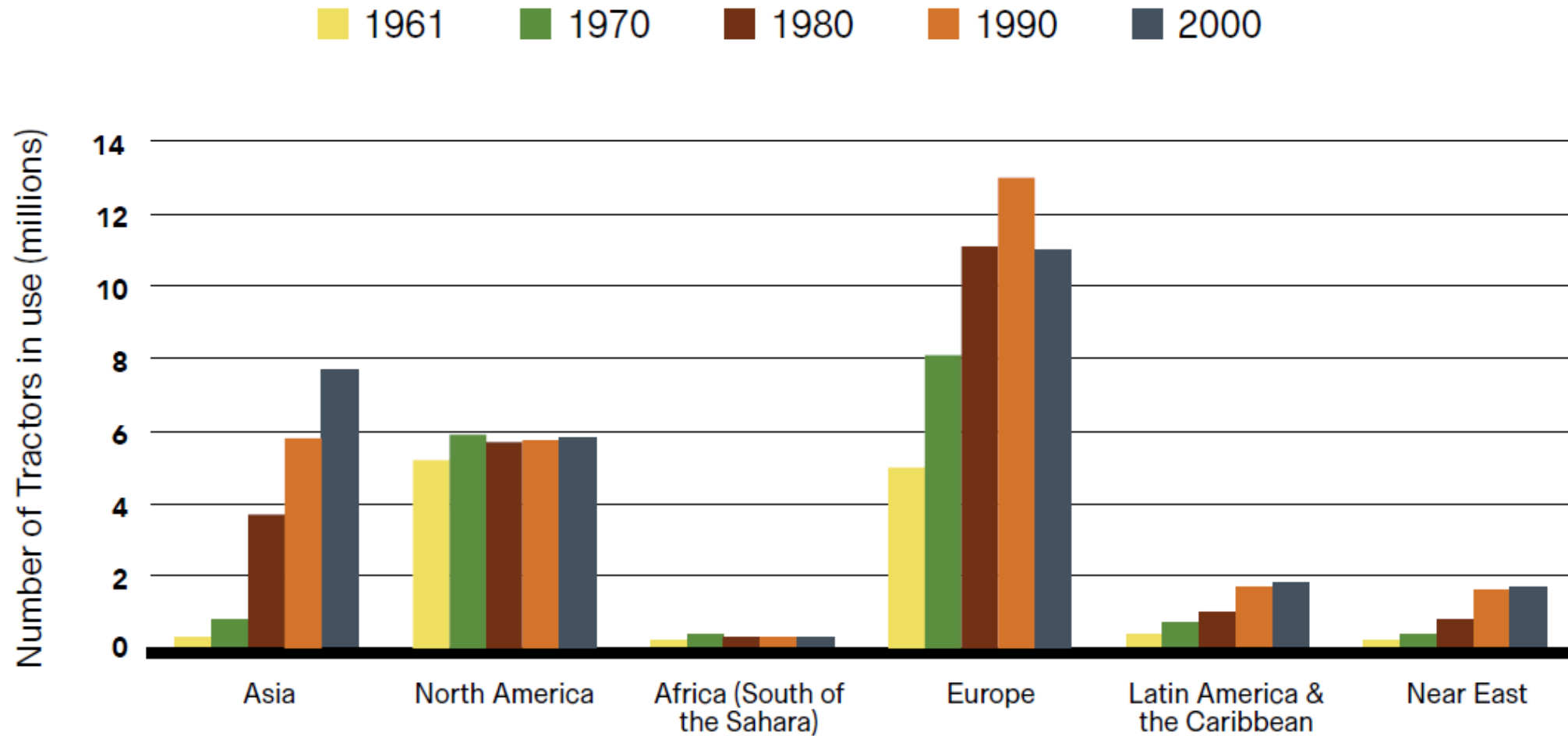
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Africa region lags behind in use of tractors

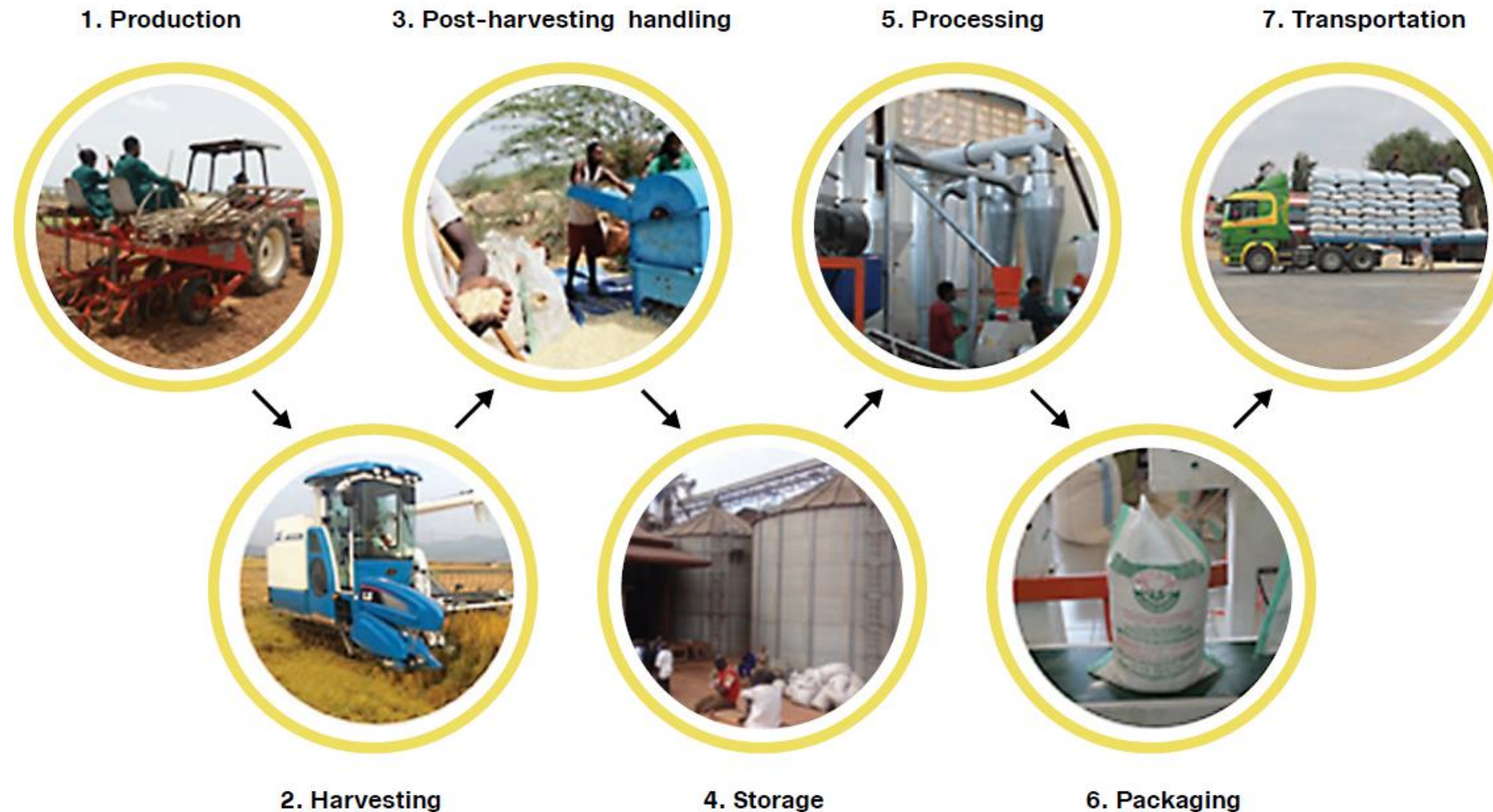
Global tractors in use by region (1961–2000)



Source: FAO, 2008

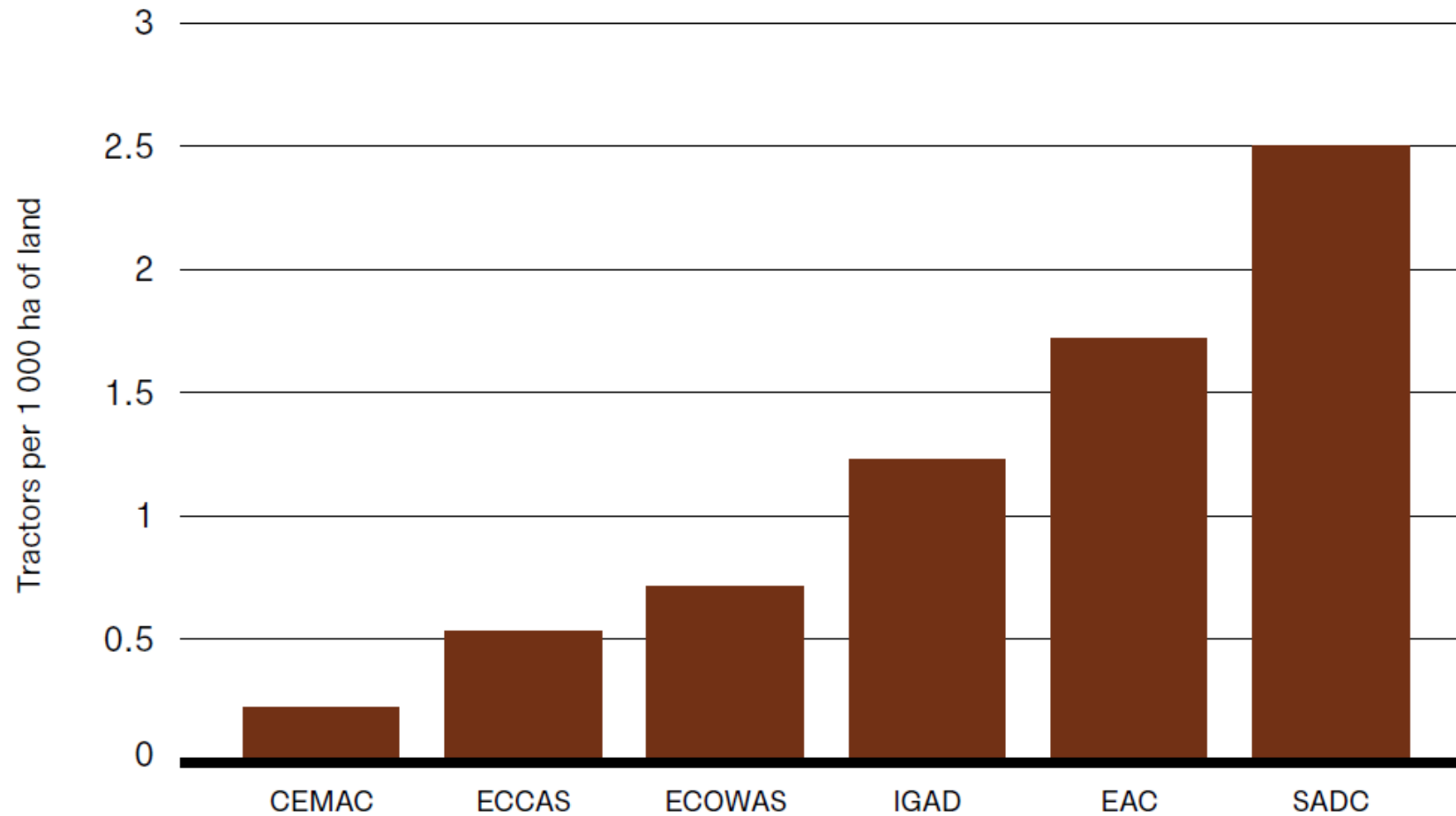
Agricultural mechanization goes beyond use of
tractors

Agricultural mechanization value chain



There are Spatial Variations in Agricultural
Mechanization Across Regions of Africa

Number of tractors per 1000 ha of land in different economic regions of Africa



Source: FAOSTAT and World Bank STAT, 2010.

Spatial Variations of Mechanization Demand: Examples

In **Ethiopia** mechanized commercial agriculture is being vigorously pursued in the Western Highlands, where fertile land is still available.

In **Zimbabwe**, with a tractor density of 35.6 per 100 square kilometers appears quite tractorized relative to other African countries, more than 75 percent of tractor use is concentrated in the commercial farming sector, suggesting limited access to tractors among the majority of smallholder farmers.

In **Ghana**, demand for mechanization can vary between neighboring districts, largely corresponding to population density and market access

In **Kenya**, where mechanization is clustered in the high-potential Rift Valley and Western Lowlands.

In **Nigeria**, adoption of both animal traction and tractors is concentrated in the Central and Northern zones rather than the root-crop-based Southern zones

Tractors and mechanized threshers, mostly through private service providers, cover more than 70 percent of the area in the Bakolori irrigation scheme, the largest scheme in **Nigeria**

Current supply of tractor services in plowing does not appear to be enough to meet existing demand for such services. Nearly half (45 percent) of service providers surveyed in **Ghana** believe they are unable to meet demand, while only about half of them thought that their tractors were being used to full capacity.

Countries with higher overall tractor densities exhibit lower hiring costs on average, with the exception of **Zambia**, where tractors are more widely used on isolated commercial farms (World Bank 2014b).

Such trends are especially observed in **Ghana, Nigeria, and Mozambique**, where stark contrasts in tractor use have been observed across agro-ecological zones and between regions with different economic development levels between the Northern and Southern Regions

Key players and their functions in mechanization supply chains

Three main models of service provision:

1. **Direct government service provision**, which offers plowing services to farmers from public hiring stations, often at subsidized prices;
2. **Specialized private service provision models**, which are ostensibly private enterprises that hire out mechanization services without their own cultivated farms (in Ghana and Nigeria, they have been established through a government credit scheme); and
3. **Private farmer-to-farmer service provision**. The end users of mechanization technology are large, medium, and small farmers, who exhibit distinct usage patterns under different circumstances.

Farmer-to-Farmer Service Provision

In Ghana, 84 percent of medium-scale farmers purchased their tractors using solely personal savings, and only 3.4 percent used any loans for their purchases.

In Ghana, privately hired tractors or power tillers now provide plowing for more than half the areas within three out of the five largest major irrigation schemes.

Tractor owners in **Kaduna and Nasarawa States in Nigeria**, where for privately purchased tractors, 82 percent of total finance was from owners' personal savings, 4 percent from bank loans, and 3 percent from government loans.

Owners who obtained their machines from private **channels earned average profits of \$542 per year**, compared to a loss of \$311 per year for those obtaining power tillers from the government or nongovernmental organizations.

Lessons from past experience on agricultural mechanization in Africa

1. **Presence of a sizeable number of medium-scale farmers and other entrepreneurs** – providing mechanization and other services to the more numerous smallholder farmers.
2. **Entrepreneurial capacity of farmers** and their versatility in adapting to changing markets, technologies and policies (adaptive management).
3. **Opportunities to use tractors and other agricultural machinery in off-farm activities**, such as transport, construction, repair and maintenance of rural infrastructure.
4. **Policies encouraging industrialization** resulting in rising real wages and complementary policies contributing to the private profitability of farming.
5. **Availability of registered land for purchase or leasing by individual farmers** – increasing farm size and subsequent profitability and providing farmers with an opportunity to use their land titledeeds as collateral for credit to buy machinery.

Lessons from past experience on agricultural mechanization in Africa (continued)

6. High levels of effective demand for mechanized equipment – leading to the development of suitable low-cost equipment (tube wells, power tillers, diesel engines) as an alternative to purchasing high-cost and often unsuitable machinery from developed countries.

7. Presence of local entrepreneurs dealing with repairs and manufacturing, and development of machinery supply chains – ensuring availability of repair and maintenance services and spare parts.

8. Business- and enterprise-friendly policies, laws and regulations, as well as physical and institutional infrastructure – encouraging commercial activities and entrepreneurship in farming and input supply, as well as produce handling, processing and marketing.

Principles for Transforming Agricultural Mechanization

1. The farming system must first be transformed to enable the efficient and effective utilization of available technologies.
2. The establishment of commercially sustainable agricultural machinery hire services is high priority in any strategy for sustainable agricultural mechanization
3. It is crucial to identify suitable medium-scale farms and encourage the development of viable commercial farming operations that could also provide mechanization services to small-scale farmers
4. Agricultural Mechanization must go beyond on-farm productivity to include post-harvest systems and the entire food chain
5. Priority areas for different agro-ecologies and farming systems need to be identified in order to ensure focused intervention on mechanization at the country level.
6. Data and digital innovation need to be integrated to build new business models

Innovations Using Digital and Data-driven Business Models for Mechanizations

Uberizing Mechanization: Hello Tractor



Tractor has been reconfigured using ICT, GIS, and Apps and other innovations thus Uberizing many aspects of mechanization.

Customized mechanization services can be delivered at the doorstep of small holders using a technology platform.

Doubling the outreach of existing tractors and mechanization

Cost of land preparation reduced by 40%

Significant increase in agricultural productivity

SunCulture: Solar powered smart irrigation solution



Plug and play, portable irrigation system,
Pay-As-You-Grow platform



Scale: 10,000

Enabling the growth of millions of kg of food



Recommendations

The **public sector** has a crucial role:

1. Financing services of a public goods nature, for example, training, licensing of machine operators, research and development, and rural infrastructure (including last-mile rural road and electricity supply systems).
2. Creating an enabling environment for the private sector to finance mechanization investments by enacting appropriate laws for banking, contracts and leasing regulations.
3. Providing subsidies for the adoption of particular technologies (e.g. CA technologies) – with a clear exit strategy

Institutions and policy

1. Improve rural infrastructure and strengthen agricultural support services to reduce costs and increase profitability, expanding the supply and effective demand for machinery and mechanization services and other input supply and output marketing services.
2. Provide direct support to companies involved in machinery supply and hire services through technical assistance and business advisory services.
3. Reduce or absorb transaction and information costs for the provision of mechanization services to smaller-scale farmers.
4. Remove legal and regulatory constraints against leasing, ensuring that effective procedures are in place for supply and, where necessary, for repossessing assets.

Create an enabling environment to increase the utilization of tractors and other farm equipment

1. Increase 'on-farm' use of tractors and machinery by promoting neighborhood contracting.
2. Review existing regulations on the use of agricultural tractors for 'off-farm' applications such as transport of materials, construction of rural infrastructure (roads, irrigation works, etc.) and land clearing.
3. Intensify agriculture, including livestock production, by increasing irrigation.
4. Facilitate cross-border use of farm equipment.
5. Develop an enabling environment for a demand-driven mechanization process by developing agro-processing industries.

Main policy issues

1. Is it government policy to increase agricultural production, and is increased mechanization seen as an essential means to achieving this?
2. What is to be the role of the public sector in promoting agricultural mechanization?
3. Subsidies – should mechanization and/or the manufacture/importation of machinery be subsidized and, if so, how?
4. Should the pricing of farm products be used as an instrument to increase investment in agriculture and, if so, what mechanisms are needed?
5. Finance – How can farmers best gain access to finance? Should the public sector be involved in financing farmers through, for example, agricultural rural banks or funds?
6. What should be the policy towards donors who wish to use ‘aid in kind’ (e.g. the supply of tractors) as development aid?
7. What is the policy regarding protection of farmers against bad commercial and/or financial practices?
8. What are the land-ownership and registration policies? Can farmers use land as collateral?

World Bank strategic engagement

1. Supporting policies and investments for food system transformation with a strong focus on technology and mechanization including significant result based financing
2. Developing approaches which enable mechanization across the value chain
3. Support agri-entrepreneurship ecosystem integrating data, digitization, technology and mechanization
4. Support incubators and accelerators to create a network of AG tech startups and companies
5. Developing new financing approaches which bundle inputs, markets and mechanization with financial institutions (including digital financing)
6. Develop pay-as-you go financing approaches like solar energy to make mechanization affordable