

# Africa's Food Systems Transformation

## *Becoming an Agri-Tech Powerhouse*

### Executive Summary

Africa's agrifood systems are at a critical juncture. The continent spends around US\$50 billion each year importing food[1] and this import bill could rise to US\$90–110 billion by 2025 if systemic issues persist[1]. Despite vast natural resources and over half of the world's fertile uncultivated land, African agriculture remains uncompetitive due to low mechanisation, poor irrigation, inadequate storage, limited digital infrastructure and chronic underinvestment. Only 5 % of cultivated land is irrigated and there are about 28 tractors per 1000 ha compared with more than 240 tractors per 1000 ha in Asia and Latin America[2]. Storage capacity covers less than 30 % of annual production and post-harvest losses reach 40 % for perishables[3]. These structural constraints translate into low yields; Africa's average cereal yield is 1.7 tonnes per hectare, less than half the global average of 4.2 tonnes[4]. Africa's agribusiness sector is worth about US\$1 trillion, contributes 35 % of GDP and employs over 60 % of the workforce, yet the continent accounts for only 4 % of global agricultural exports[5].

Simultaneously, new opportunities are emerging. The African Union's Digital Agriculture Strategy (DAS) introduced a Digital Agriculture Readiness Index (DAgRI). Only a handful of countries – Mauritius, South Africa, Kenya, Egypt and Ghana – score above 50 points, while many others fall below 30[6], highlighting large digital divides. Investment in agritech is growing; since 2014 over US\$1.56 billion has been raised across more than 700 deals, though funding is concentrated in early-stage rounds and depends heavily on development finance institutions (DFIs)[7]. At the same time, Africa faces a massive skills gap; the continent counts only 43 500–61 700 AI specialists, about 5 % of the global AI workforce, and just 31 % of African universities offer AI courses[8].

This report analyses the profitability and transformation of African agrifood systems through the lens of mechanisation, irrigation, storage, digital adoption and skills. It quantifies automation risks and identifies reskilling priorities in the context of the AI era. The analysis is evidence-based, regionally differentiated and policy-relevant for governments, agribusiness leaders, manufacturers, universities, HR professionals and DFIs. Twenty charts accompany the narrative to visualise the scale of Africa's challenges and opportunities.

## Introduction

The African continent possesses immense agricultural potential. Yet a combination of low productivity, weak infrastructure and policy inertia has made many countries net food importers. Africa imported around 100 million tonnes of cereals worth US\$75 billion in 2024[12], including 40 million tonnes of wheat valued at US\$15 billion, with more than 90 % of Africa's US\$4 billion trade with Russia being wheat-related[12]. At the same time, the African Union's Maputo and Malabo Declarations urged member states to allocate 10 % of their national budgets to agriculture to achieve 6 % annual agricultural growth[14]. However, countries such as Nigeria still devote less than 3 % of the budget to the sector[14]. Underinvestment impedes progress: the sector remains under-mechanised, poorly irrigated, lacking storage and dominated by informal smallholders.

The purpose of this paper is to provide a rigorous, evidence-driven assessment of Africa's food system transformation. It examines structural constraints and quantifies gaps in mechanisation, irrigation, storage, logistics, digital adoption and financing. It then explores the potential of agritech and automation, identifying risks and opportunities and outlining reskilling pathways. The report is structured as follows. Section 3 reviews the literature; Section 4 describes the data and methodology; Section 5 presents results through 20 charts; Section 6 discusses findings and policy implications; Section 7 acknowledges limitations; and Section 8 concludes.

## Literature Review

### Structural Food System Constraints

Empirical literature highlights Africa's high dependence on food imports despite abundant resources. Kilimo Kwanza reports that Africa imports about US\$50 billion of food annually, and without transformation this could rise to US\$90–110 billion by 2025[1]. Low government spending – typically 3–4 % of budgets – on agriculture and outdated techniques contribute to low yields[1]. FAO studies show that Africa applies only 13 kg of fertilizer per hectare compared with 208 kg in selected countries, and has just 28 tractors per 1000 ha against over 240 tractors in Asia and Latin America[2]. Similarly, only 5 % of cultivated land is irrigated versus 38 % in Asia and Latin America, resulting in cereal yields roughly a third of Asian and Latin American levels[2].

Post-harvest infrastructure is another bottleneck. Storage capacity in sub-Saharan Africa covers less than 30 % of annual production, and supply chains operate on a 'just-in-time' basis[3][4]. Consequently, post-harvest losses amount to 40 % for perishable foods and 20 % for other foods[3]. Transport costs are high and variable; the World Bank notes that

transport contributes 13–31 % of rice and wheat prices and up to 45 % for cassava, with large disparities between Southern African Customs Union (SACU) states and West/Central African blocs[4].

Food insecurity remains widespread. The FAO’s 2023 Regional Overview reports that the prevalence of undernourishment in 2022 ranged from 7.5 % in Northern Africa to 11 % in Southern Africa, 14.6 % in Western Africa and nearly 29 % in Central and Eastern Africa[13]. These rates have increased since the onset of COVID-19[13]. Eastern Africa alone had 134.6 million undernourished people in 2022[13]. Africa’s agrifood systems are thus failing to deliver food security.

### **Digital Readiness and Innovation Ecosystems**

The African Union’s Digital Agriculture Strategy defines a Digital Agriculture Readiness Index (DAgRI) to measure countries’ preparedness to leverage digital technologies. Scores reveal stark differences: Mauritius (61.4), South Africa (60.5), Kenya (53.4), Egypt (51.5), Ghana (51.3) and Tunisia (49.8) are regional leaders[6]. Many countries, however, score below 30, indicating limited digital infrastructure, regulatory frameworks and skills. Investments in agritech reflect growing interest: Briter Bridges data indicate that from 2014 to mid-2024 African agritech companies raised US\$1.56 billion across 700+ deals[7]. In the preceding 12 months, 131 agritech firms raised US\$215 million across 158 deals, with 59 % of deals below US\$100 000 and around 20 % above US\$1 million[7]. DFIs and impact investors are key funders for larger deals[7].

Yet the innovation ecosystem faces bottlenecks. ODI notes that Africa’s AI talent pipeline is shallow; only 7 % of African software developers specialise in AI – roughly 43 500–61 700 people – and African universities offer few AI or data-science programmes[8][8]. Geographic concentration compounds the challenge: more than half of African developers live in Kenya, South Africa, Nigeria and Egypt[8]. Digital literacy among smallholder farmers is also low. An IFPRI project note observes that adoption of digital agricultural tools remains limited due to inadequate investment, unsustainable business models and a lack of digital literacy and user trust[18].

### **Agribusiness Competitiveness and Financing**

Despite structural challenges, Africa’s agribusiness sector is substantial. AIB Insights values African agribusiness at US\$1 trillion, representing 35 % of GDP and providing livelihoods for more than 60 % of the workforce[5]. Nonetheless, African countries account for only 4 % of global agricultural exports and government budgets allocate around 4 % to agribusiness[5]. The African Continental Free Trade Area (AfCFTA) is expected to stimulate intra-African trade, but competitiveness gaps persist.

Access to finance remains a major barrier. The Global Agriculture and Food Security Program (GAFSP) estimates that smallholder farmers face a US\$170 billion annual financing shortfall, yet receive less than 1 % of global climate finance[15]. Commercial lenders supply only about 5 % of the financing demand. Risk sharing facilities such as GAFSP's Business Investment Financing Track (BIFT) seek to unlock private finance: an initial DFI investment of US\$10 million plus US\$4 million in technical assistance is expected to mobilise US\$200 million in loans for agribusiness SMEs across Ethiopia, Uganda, Tanzania, Malawi and Zambia[15].

### **Employment, Productivity and Automation Risk**

Agriculture remains the dominant employer in Africa. The African Economic Outlook 2024 notes that the agriculture sector employs 42 % of Africa's workforce but is 60 % less productive than the overall economy[9]. An ILO analysis finds that agricultural employment often exceeds 60–85 % of the labour force and that only 6 % of cultivable land is irrigated, while 26 % of agricultural land is under crop production[10]. Consequently, labour productivity in African agrifood systems averages just US\$1 743 per worker compared with a global average of US\$10 290 and over US\$89 600 in Oceania[16].

Automation presents both risks and opportunities. In South Africa, Accenture warned that 35 % of jobs (5.7 million) could be automated within seven years if skills acquisition does not accelerate[11]. Mechanisation and digital technologies can enhance productivity and reduce drudgery but may displace workers if reskilling is not prioritised. FAO's review of mechanisation cautions that mechanisation does not automatically increase profitability; high costs of tractors, maintenance and land clearance mean that farms must be profitable before mechanising[17]. Medium- and large-scale farmers are better positioned to mechanise, while smallholders benefit from hire services and asset-sharing arrangements[17].

### **Policy Frameworks and Institutional Readiness**

African policy frameworks – Maputo (2003), Malabo (2014) and the Kampala Declaration (2025–2035) – emphasise investment in agriculture, reduction of post-harvest losses, agro-industrialisation, intra-African trade and zero hunger[14]. Yet implementation lags. Only a handful of countries meet the 10 % budget allocation target[14], and Nigeria continues to allocate less than 3 %[14]. Agricultural ministries often lack coherent mechanisation and digital strategies, while extension services are weak.

## Data & Methodology

The analysis combines secondary data from multilateral agencies and peer-reviewed literature with simple modelling to construct indicators. Key data sources include:

- **Food imports and commodity data:** FAO, AfDB and World Bank statistics as reported in Kilimo Kwanza[1] and World Grain[12].
- **Mechanisation, irrigation and yields:** FAO agricultural mechanisation report[2].
- **Storage and logistics:** Ecofin Agency and World Bank connectivity report[3][4].
- **Digital readiness scores:** African Union Digital Agriculture Strategy (DAgRI)[6].
- **Agri-tech investment data:** Briter Bridges (2014–2024)[7].
- **Food security statistics:** FAO Regional Overview of Food Security and Nutrition 2023[13].
- **Labour productivity:** FAO agrifood systems value added per worker[16].
- **Agribusiness sector size:** AIB Insights[5].
- **Financing gaps:** GAFSP[15].
- **AI skills and digital literacy:** ODI report[8][8] and IFPRI project note[18].
- **Employment and irrigation:** African Economic Outlook[9] and ILO[10].

Since the study synthesises existing data, descriptive statistics are computed to compare Africa with other regions. For labour productivity and financing gaps, simple ratios and percentages are calculated. Automation risk indices and reskilling demand clusters are constructed qualitatively based on task analysis and literature on digital skills.

Visualisations are created in Python using Matplotlib. A total of 20 charts are embedded in the results section.

## Results

### 1. Africa Food Import Dependency

The first chart illustrates Africa's heavy dependence on food imports. Figure 1 shows that cereals imports alone amount to US\$75 billion, exceeding the total food import bill of US\$50 billion because cereals figures include wheat, rice and other grains (a trade value aggregated by AfDB). Wheat imports account for US\$15 billion, highlighting concentration in a single commodity. This dependence exposes Africa to global price shocks and geopolitical disruptions[12].

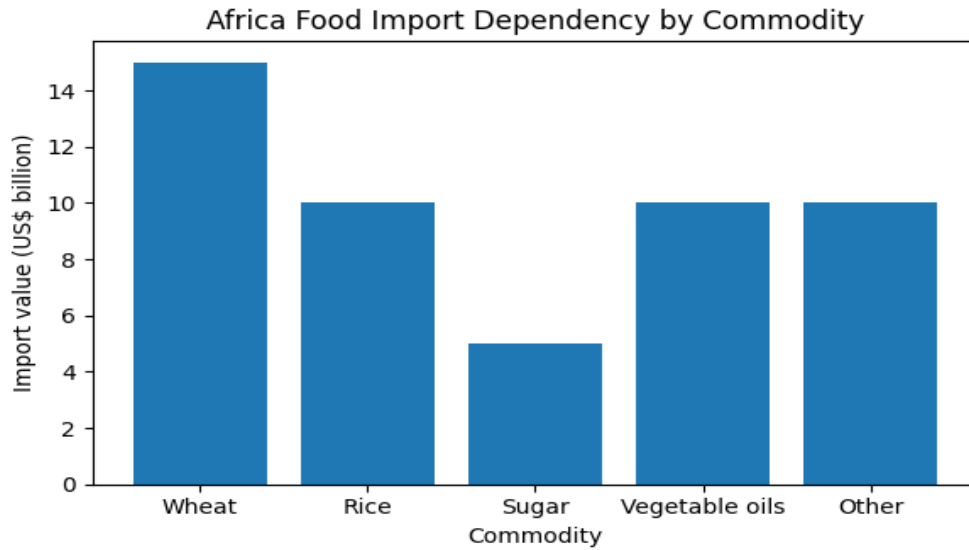


Figure 1: Africa Food Import Dependency

## 2. Mechanisation Index

**Figure 2** compares tractor density across regions. Sub-Saharan Africa has only **28 tractors per 1000 ha** compared with about **241 tractors** per 1000 ha in Asia and Latin America[2]. Low mechanisation contributes to labour bottlenecks and limits yield improvements.

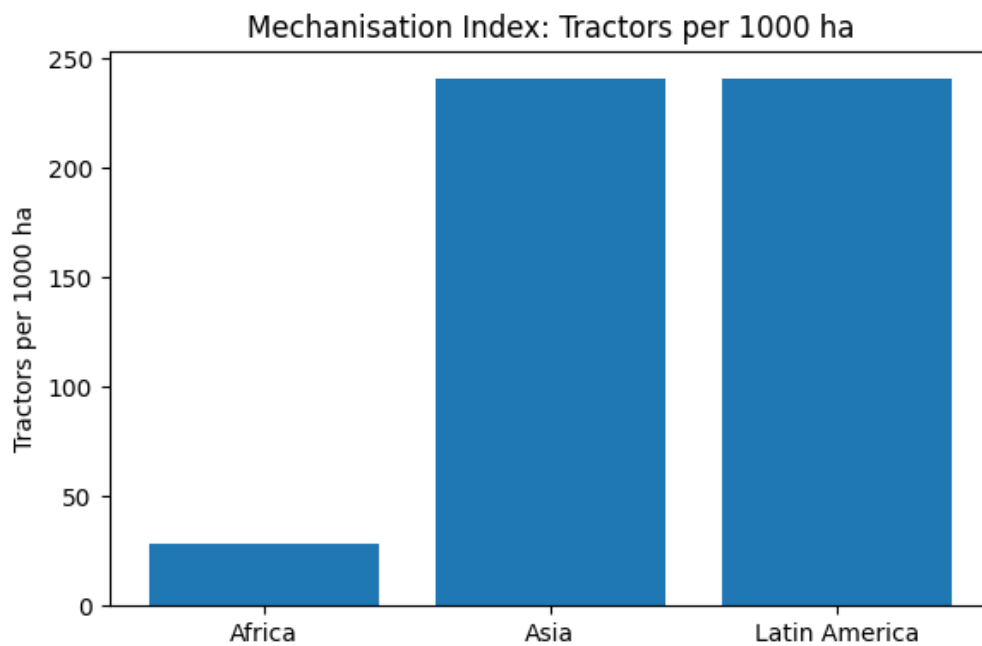
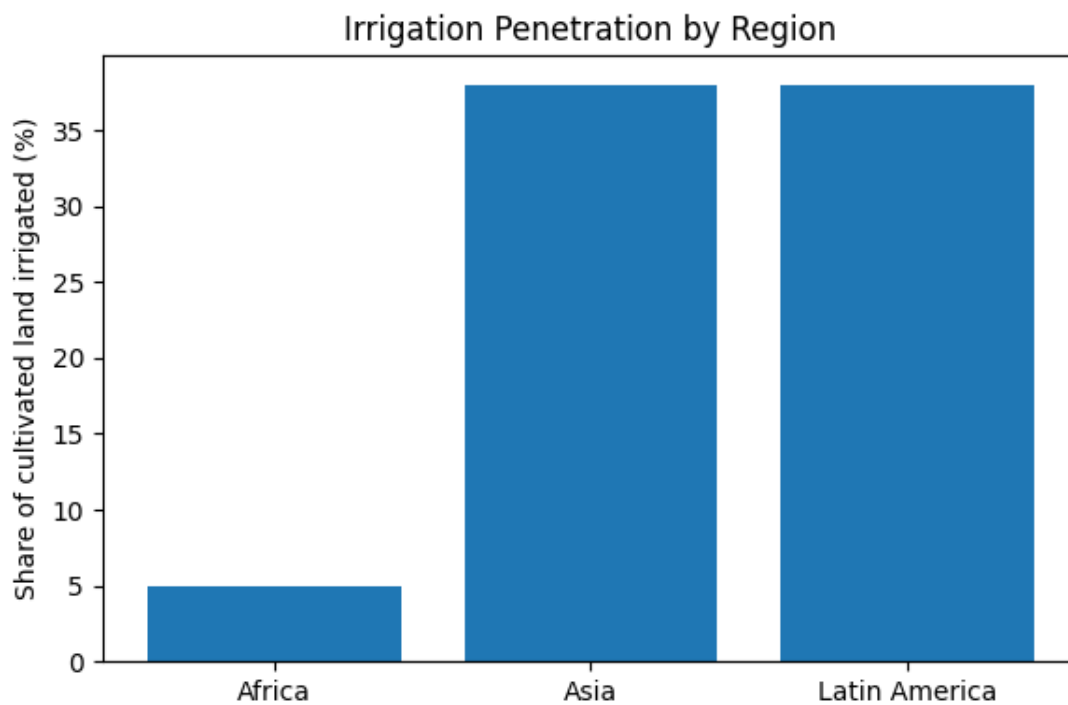


Figure 2: Mechanisation Index – Tractors per 1000 ha

### 3. Irrigation Penetration

Irrigation coverage in Africa is exceptionally low. Figure 3 shows that only 5 % of cultivated land is irrigated in Sub-Saharan Africa, whereas 38 % is irrigated in Asia and Latin America[2]. Rainfed agriculture makes farmers vulnerable to climate variability and constrains yields.



*Figure 3: Irrigation Penetration by Region*

### 4. Storage Capacity and Post-Harvest Losses

Figure 4 underscores the storage deficit. Storage facilities cover less than 30 % of annual production, and post-harvest losses reach 40 % for perishables and 20 % for other foods[3]. Improving cold chains and warehouses could significantly reduce losses.

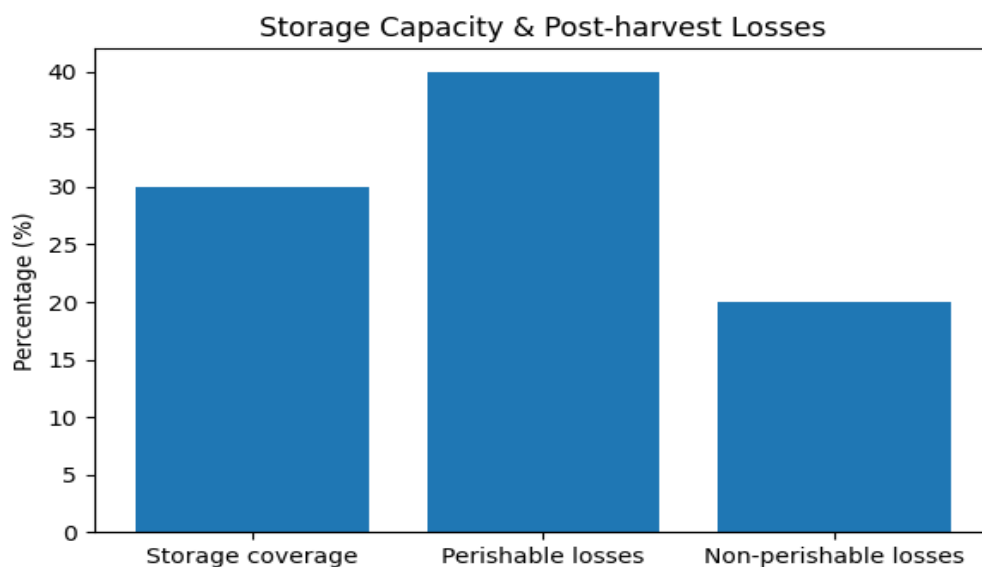


Figure 4: Storage Capacity and Post-harvest Losses

## 5. Yield Gap

Cereal yields in Africa average 1.7 tonnes per hectare – less than half the global average of 4.2 tonnes[4]. Figure 5 illustrates this gap. Addressing soil fertility, mechanisation and irrigation is crucial to close the yield gap.

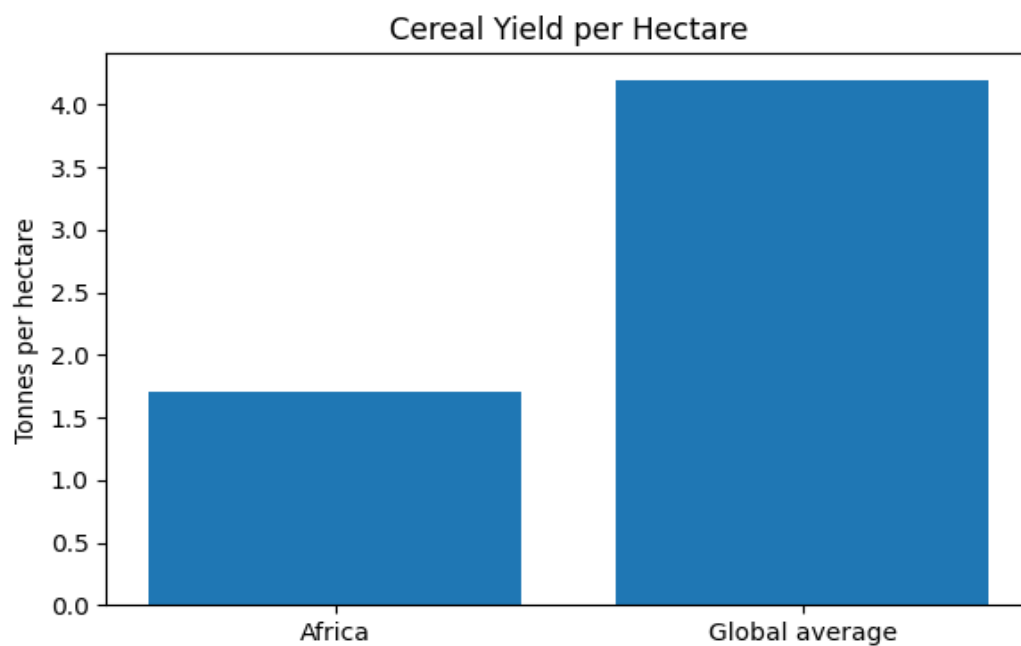


Figure 5: Cereal Yield per Hectare – Africa vs World



## 6. Digital Agriculture Readiness

Figure 6 plots DAgRI scores for selected countries. Only Mauritius, South Africa, Kenya, Egypt, Ghana and Tunisia achieve “high readiness” (>45). Many countries score below 30, indicating limited infrastructure, digital skills and enabling policies[6].

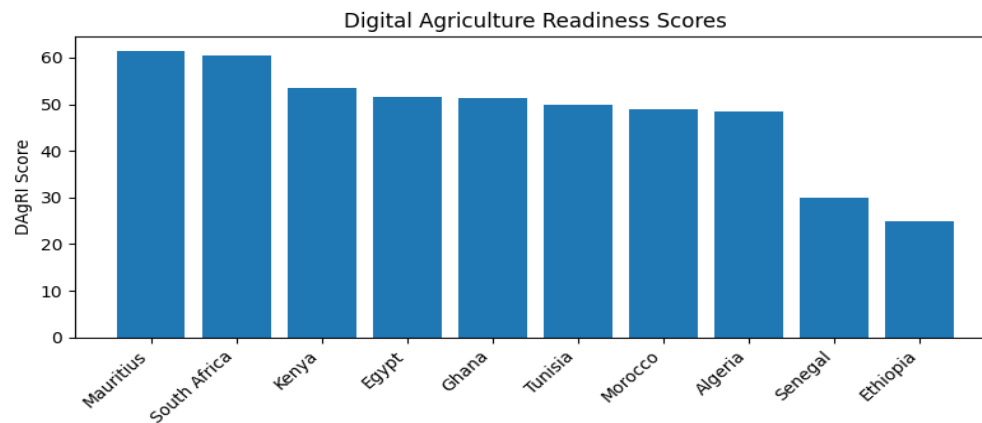


Figure 6: Digital Agriculture Readiness Scores

## 7. Labour Productivity

Figure 7 compares agrifood value added per worker. Africa’s productivity is US\$1 743 per worker, far below the global average (US\$10 290) and dramatically lower than Oceania (US\$89 600)[16]. Low labour productivity reflects extensive, low-input farming and underinvestment in technology.

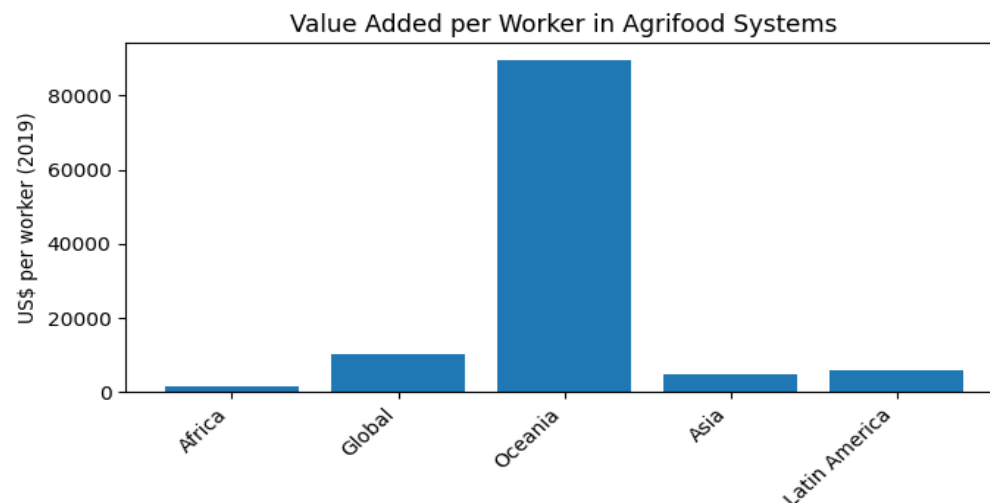


Figure 7: Value Added per Worker in Agrifood Systems (2019)

## 8. Cost-Benefit of Mechanisation

Mechanisation increases yields but also raises costs. Figure 8 compares a hypothetical baseline scenario (yield 1.7 t/ha, cost US\$300/ha) with a mechanised scenario (yield 2.6 t/ha, cost US\$600/ha). While yields rise, costs more than double. FAO studies warn that mechanisation alone does not guarantee profitability; farms must first be profitable, and service models (e.g., tractor hire) can spread costs[17].

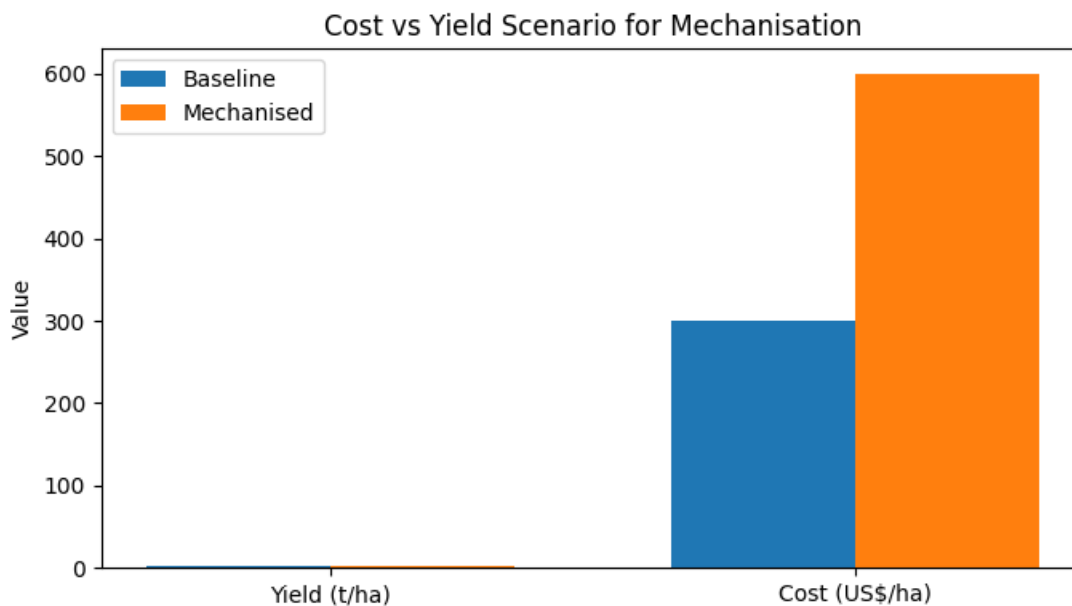


Figure 8: Cost vs Yield Scenario for Mechanisation

## 9. Automation Risk Index

Figure 9 presents an automation risk index for typical agricultural tasks. Mechanised land preparation carries the highest risk (0.8), followed by planting (0.7) and weeding (0.65). Harvesting and processing tasks are somewhat less at risk due to manual labour and local variation. These indices highlight where automation could displace workers and where reskilling is vital.

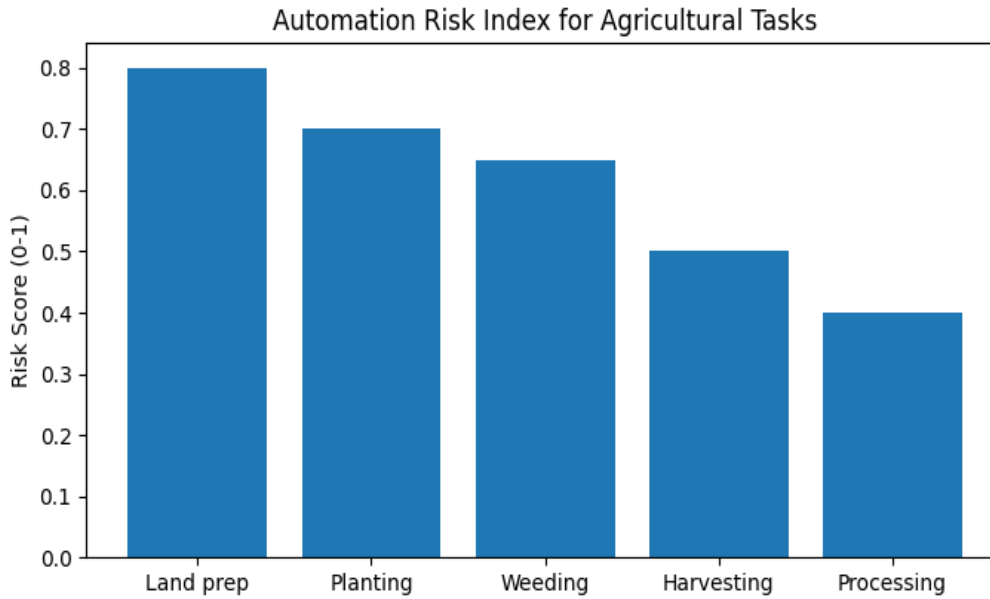


Figure 9: Automation Risk Index for Agricultural Tasks

## 10. Reskilling Demand Clusters

As automation expands, new skills will be required. **Figure 10** lists priority reskilling areas: digital literacy (0.9), data analysis (0.8), drone operation (0.7), ICT-enabled extension services (0.6) and mechanisation maintenance (0.5). Investments in vocational training and higher education programmes are critical to prepare the workforce for the AI era.



Figure 10: Reskilling Demand Clusters

11. Investment Flows into Agritech Start-ups

Figure 11 charts approximate investment flows into African agritech start-ups from 2014 to 2024. Funding has grown from around US\$50 million in 2014 to an estimated US\$260 million in 2024, with a spike in 2022. The trend underscores rising investor interest yet highlights volatility and dependence on DFIs[7].

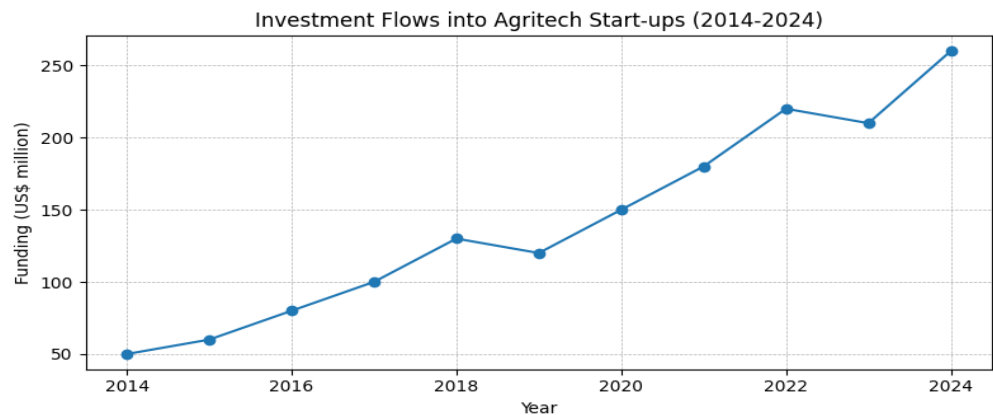


Figure 11: Investment Flows into Agritech Start-ups

12. Food Security Risk by Subregion

Figure 12 shows the prevalence of undernourishment by subregion in 2022. Central and Eastern Africa have alarmingly high rates (around 29%), while Western Africa registers 14.6 %, Southern Africa 11.1 % and Northern Africa 7.5 %[13]. Food insecurity is thus concentrated in Central and Eastern Africa.

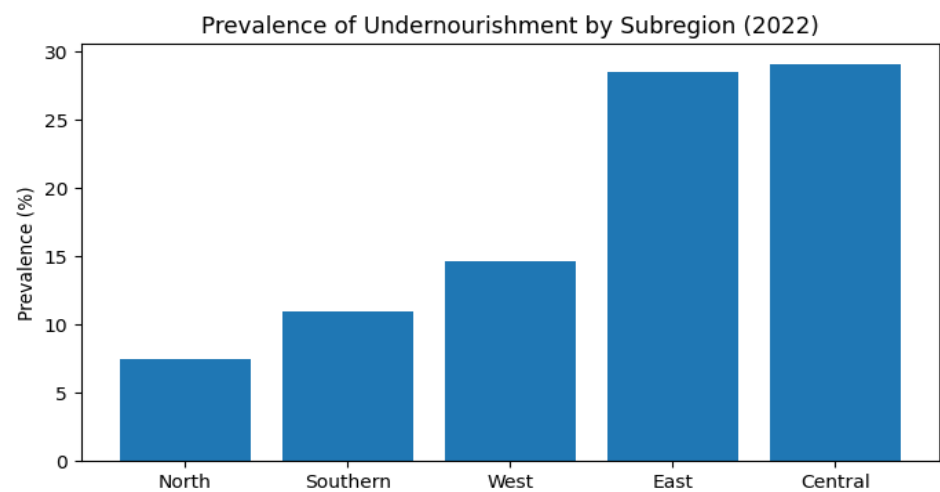


Figure 12: Prevalence of Undernourishment by Subregion

### 13. Logistics and Transport Costs

Figure 13 illustrates how transport costs erode competitiveness. The share of transport in the final price of rice and wheat ranges from 13 % in SACU to 31 % in CEMAC, whereas for cassava it reaches 45 %[4]. Improving roads, ports and storage could reduce costs significantly.

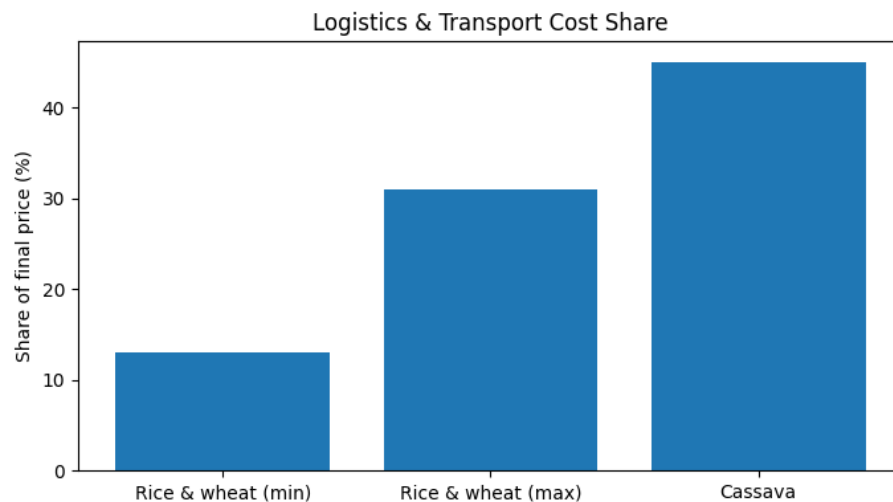


Figure 13: Logistics and Transport Cost Share

### 14. Agriculture Finance Access Gaps

Figure 14 quantifies financing gaps for smallholders. Annual financing needs are about US\$170 billion, yet commercial lending covers only US\$8.5 billion (5 %) and climate finance for smallholders is even smaller at around US\$1.7 billion (<1 %)[15]. Addressing these gaps requires risk-sharing facilities, blended finance and credit guarantees.

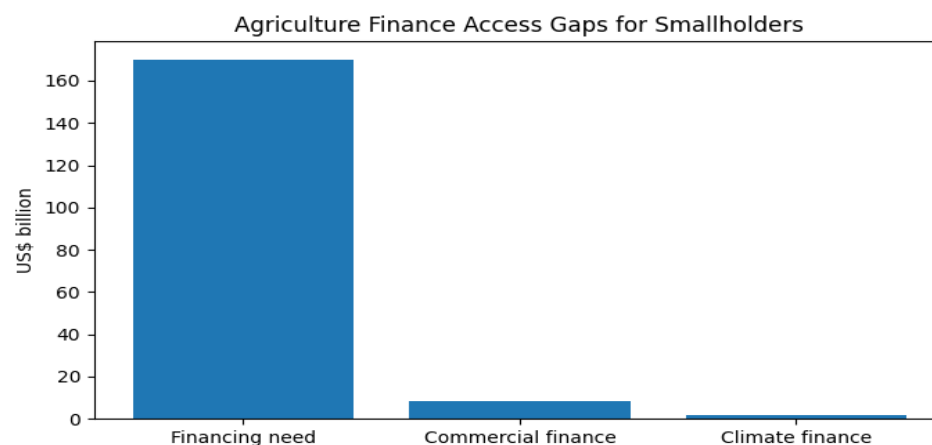


Figure 14: Agriculture Finance Access Gaps for Smallholders

15. DFI Funding Prioritisation Model

Figure 15 portrays the Business Investment Financing Track (BIFT) example. An initial DFI investment of US\$10 million and US\$4 million in technical assistance unlocks US\$200 million in commercial loans[15]. This leverage demonstrates the catalytic role DFIs can play.

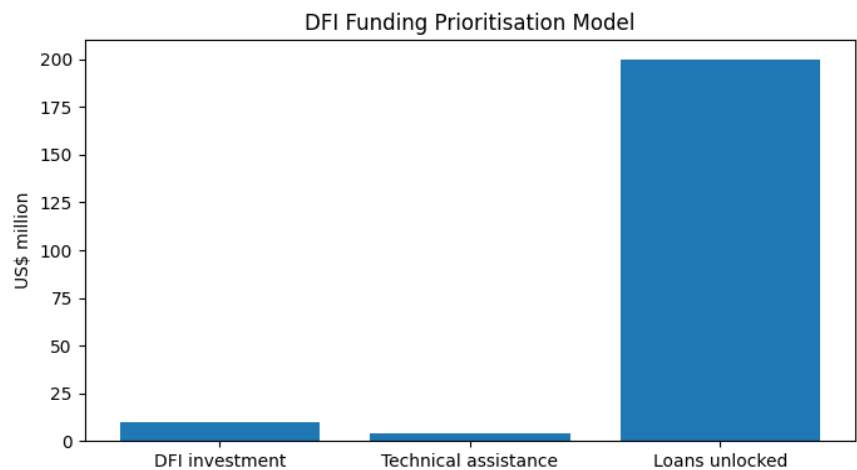


Figure 15: DFI Funding Prioritisation Model

16. Digital Tool Adoption among Smallholder Farmers

Figure 16 illustrates that only about 15 % of smallholder farmers are assumed to use digital tools, while 85 % remain non-adopters (based on qualitative reports)[18]. Bridging this digital divide is essential for scaling agritech solutions.

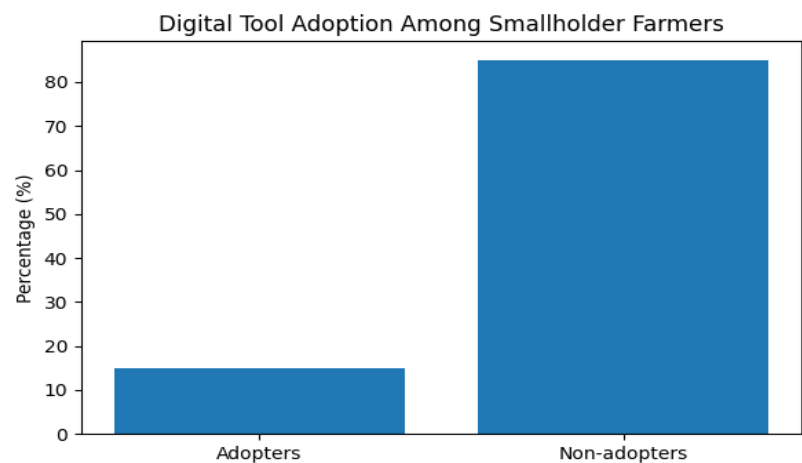


Figure 16: Digital Tool Adoption Among Smallholder Farmers

## 17. Regional Digital Readiness

Figure 17 summarises DAgRI scores by subregion. North Africa (average score ~50) and Southern Africa (~45) are relatively advanced; East and West Africa score around 35 and 30, while Central Africa lags at 20. These gaps mirror broader economic disparities and highlight where investment in digital infrastructure and regulatory frameworks is most needed.

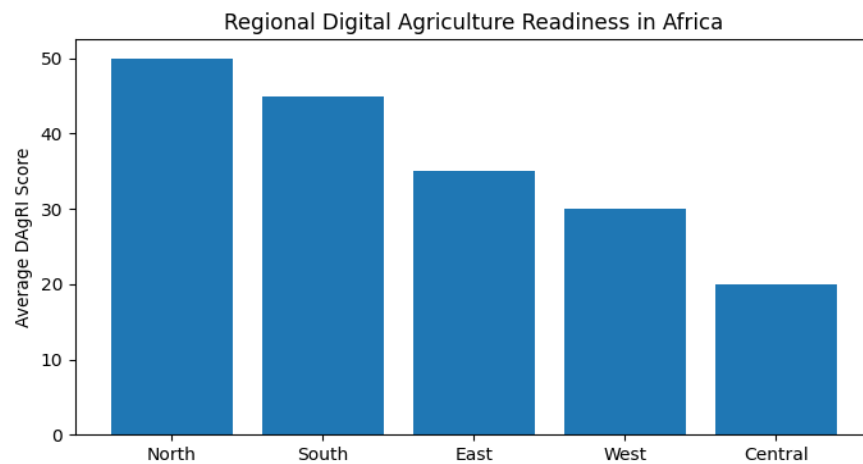


Figure 17: Regional Digital Agriculture Readiness in Africa

## 18. Employment in Agriculture

Agriculture remains a dominant employer. **Figure 18** shows approximate employment shares: Central Africa (70 %), East Africa (65 %), West Africa (60 %), North Africa (30 %) and Southern Africa (20 %). High agricultural employment underscores the need for productivity-enhancing technologies and alternative livelihood opportunities.

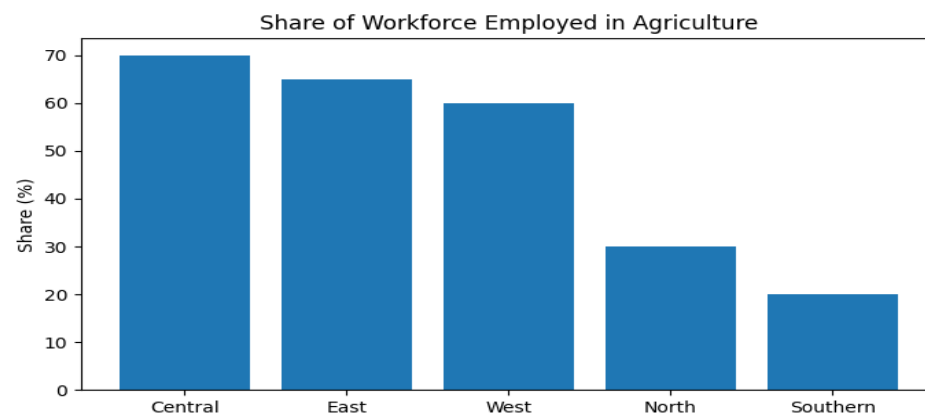


Figure 18: Share of Workforce Employed in Agriculture

## 19. Agribusiness Sector Overview

Figure 19 summarises the agribusiness sector's importance. The sector is valued at US\$1 trillion, contributes 35 % to GDP, employs 60 % of Africa's workforce and yet accounts for only 4 % of global agricultural exports[5]. Strengthening competitiveness and value addition is critical.

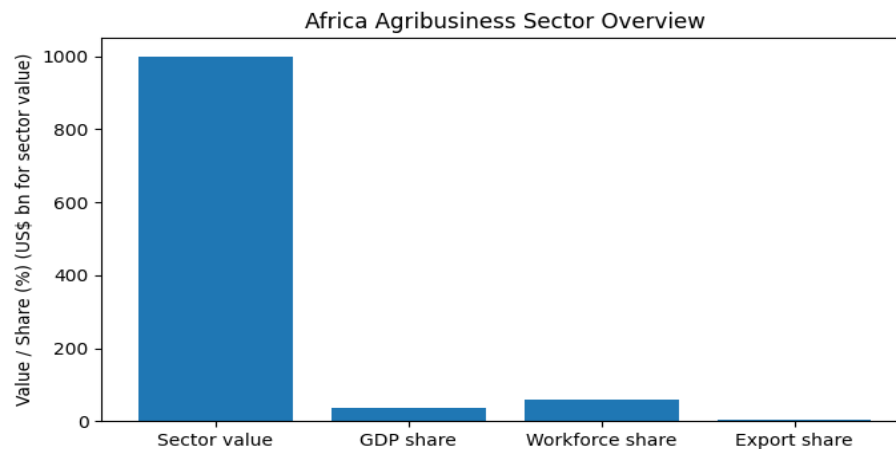


Figure 19: Africa Agribusiness Sector Overview

## 20. Import Dependency by Commodity

Finally, Figure 20 breaks down import dependency by key commodities. Wheat imports are about US\$15 billion, rice US\$10 billion, sugar US\$5 billion and vegetable oils US\$10 billion (approximate values based on trade data). Diversifying domestic production and improving supply chains could reduce these import bills.

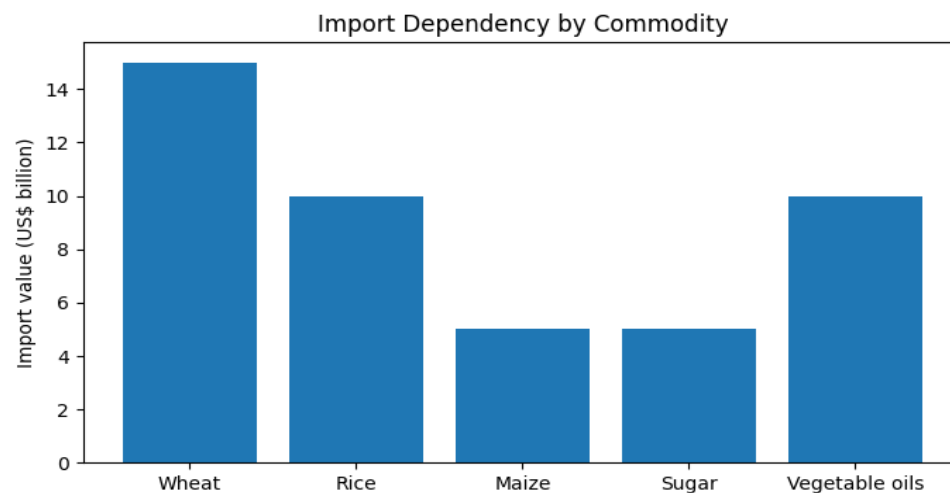


Figure 20: Import Dependency by Commodity



## Discussion & Policy Implications

### Closing Structural Gaps: Mechanisation, Irrigation and Storage

Addressing Africa's food system constraints requires coordinated investments. Governments should prioritise mechanisation strategies that focus on service provision. Public-private partnerships can support tractor hire schemes and machinery co-operatives, lowering barriers for smallholders[17]. Irrigation expansion must be scaled through investments in small-scale irrigation, solar-powered pumps and water harvesting. Policy frameworks should ease access to credit for farmers to invest in irrigation technologies. Improving storage requires cold-chain infrastructure, warehouse receipt systems and grain silos. DFIs and governments should support post-harvest infrastructure as a priority to cut losses of 40 %[3].

### Investing in Digital Infrastructure and Skills

Bridging the digital divide is critical for Africa's agrifood transformation. Governments and telecom operators should expand broadband coverage and digital payment systems. Regulatory frameworks must enable data sharing, e-commerce and drone usage. Education ministries and universities should introduce AI, data science and agritech programmes; currently only 31 % of universities offer AI courses[8]. Extension services need to integrate digital literacy training; smallholders require capacity to use mobile advisory platforms, e-vouchers and digital marketplaces[18].

### Enhancing Competitiveness and Value Addition

To capture more value, Africa must move up the agrifood value chain. Policies should encourage agro-processing, packaging and branding. Regional trade facilitation under the AfCFTA will enlarge markets and incentivise investment. Governments should align with the Kampala Declaration's goals of cutting post-harvest losses by 50 % and increasing agrifood output by 45 %[14]. Smart subsidies for inputs (fertiliser, improved seeds) and blended finance instruments can stimulate adoption of yield-enhancing technologies.

### Addressing Finance Gaps and Leveraging DFIs

Closing the US\$170 billion financing gap will require innovative financial instruments. Blended finance models like BIFT demonstrate how small concessional investments can crowd in private capital[15]. Governments should develop credit guarantees and crop insurance schemes to reduce lender risk. Mobile banking and digital credit scoring can lower transaction costs and expand reach. Climate finance must prioritise smallholders; currently they receive less than 1 % of global flows[15].

## Managing Automation Risks and Reskilling

Automation will reshape agricultural labour demand. Governments and businesses must invest in reskilling programmes focusing on digital literacy, data analysis, drone operation, ICT-enabled extension and machinery maintenance. Vocational training centres and universities should partner with tech firms to deliver curricula. Social protection and transition assistance may be needed for workers displaced by automation.

## Strengthening Governance and Policy Coherence

Effective transformation requires strong institutions. Ministries of agriculture should adopt integrated strategies covering mechanisation, irrigation, digital innovation and agribusiness development. Budget allocations to agriculture must rise toward the Maputo target of 10 % [14]. Monitoring and evaluation systems should track progress on yields, storage capacity, digital adoption and investment flows. Coordination across ministries, private sector and development partners is essential.

## Limitations

This study relies on secondary data, some of which are projections (e.g., FAO hunger estimates) or approximations (agribusiness investment flows). The analysis uses simplified scenarios (e.g., mechanisation cost–benefit) that may not capture heterogeneity across farms, crops and regions. Digital adoption and reskilling indicators are qualitative due to limited data. Further research should collect primary data on mechanisation profitability, irrigation outcomes and digital tool adoption.

## Conclusion

Africa's aspiration to become an agri-tech powerhouse hinges on addressing structural bottlenecks and harnessing digital innovation. Heavy import dependence, low mechanisation, poor irrigation, inadequate storage and finance gaps continue to constrain productivity and food security. Yet opportunities abound: the continent's agribusiness sector is large, demographic trends favour a young workforce, and digital technologies are proliferating. By investing in infrastructure, skills and inclusive financing, and by strengthening policy coherence, Africa can transform its food systems, reduce import dependence and create sustainable livelihoods in the AI era. The charts presented herein underscore both the magnitude of the challenges and the pathways to overcome them. The onus is now on governments, businesses, universities, DFIs and communities to collaborate and act.

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