LEAPFROGGING DEVELOPMENT

Unlocking Africa's Potential in Global Value Chains with Artificial Intelligence

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OVERVIEW AND CONTEXT

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Eniola Harrison

Chair Africa Program,
Global Policy Center
IE University

Varaidzo A. Mureriwa

Health & Public Sector
Managing Director
Accenture Africa

Artificial Intelligence (AI) presents a pivotal opportunity for Africa to fundamentally reposition its role in global agricultural value chains. By integrating AI technologies, African nations can transition from being primarily producers of raw commodities to becoming key players in high-value processed goods. This shift is critical for capturing significantly more value on the continent, fostering sustainable economic development and creating skilled employment for future generations. The agricultural sector, which already employs approximately 60% of Africa's workforce, stands to gain the most.

To unlock this potential, however, a concerted and strategic effort is essential. It has never been more critical for the public and private sectors to collaborate with regional economic blocs, to create a harmonised, continent-wide enabling environment that diminishes trade barriers and fosters innovation. This requires focusing on developing supportive policies, investing in digital infrastructure and human capital and promoting an ecosystem where AI solutions can flourish and scale.

While progress need not be contingent on a uniform pan-African consensus, individual country sovereignty and localised strategies are vital for delivering tangible benefits. However, these national initiatives should be viewed as scalable models for regional transformation.

The widespread adoption of AI-enabled solutions in Africa's agricultural sector also has profound implications for its engagement with major trading blocs particularly the G20 and the European Union (EU). AI acts as a powerful equaliser in trade equity and a facilitator of market access:

Meeting international standards
AI-enabled traceability, quality assurance and compliance tools help African producers meet increasingly stringent international standards (e.g., EU Green Deal regulations), levelling the playing field with more established partners.

Boosting bargaining power
By democratising access to data and digital infrastructure, AI helps to bridge gaps in bargaining power. This empowers African nations to not just be compliant, but to negotiate better trade terms, capture higher value segments and reduce their dependency on raw commodity exports.

Ultimately, by leveraging AI within a region-wide collaborative framework, African agriculture can foster a new era of verifiable quality and efficiency, making it a pivotal partner in securing resilient and sustainable global food systems.

Authors

Beatrice Grace Aluoch Obado
Adjunct Professor of International Relations and Sustainable Development
IE University

Theodore Lechterman
UNESCO Chairholder in AI Ethics and Governance
IE University

Satish Nrusimhadevara
Technology Growth
Managing Director
Accenture Africa

Mayuri Naik
Research Lead
Accenture Africa

Coordinated by

Eniola Harrison
Chair Africa Program
Global Policy Center
IE University

Varaidzo A. Mureriwa
Health & Public Sector
Managing Director
Accenture Africa

Edited by

James Velasquez
Accenture, USA

Regina F. Maruca
Accenture, USA

Acknowledgements

Bill Evans Gbafore
Research Assistant
IE University

Patrice Juah
Gurus and Griots Fellow
Africa Program, Global Policy Center
IE University

Gugu Nyanda
Health & Public Sector
ManagingDirector
Accenture Africa

Charles Matthews
Marketing and Communications
Accenture Africa

Arlene Lehman
Accenture Africa

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ABSTRACT

This report examines how artificial intelligence can help African economies move up global value chains by targeting three anchor crops—cocoa, coffee and sugarcane—across West, East and Southern Africa.

Using comparative case studies in Ghana and Côte d'Ivoire (cocoa), Ethiopia and Kenya (coffee) and Mozambique and South Africa (sugarcane), it maps where AI is already creating value and what is needed to scale impact. The authors assess applications in traceability and compliance, quality grading, climate adaptation, logistics optimisation, customs automation and trade finance, with a focus on meeting tightening market standards such as the EU Deforestation Regulation.

The analysis further highlights binding constraints, including limited rural connectivity, fragmented data, weak midstream coordination and risks of exclusion for women, youth and smallholder farmers. It illustrates how AI-enabled solutions, when paired with cooperative-led models, interoperable standards and rights-respecting data governance, can help overcome these barriers. Policy recommendations centre on regional harmonisation through AfCFTA and regional economic communities, investment in digital infrastructure and skills and financing mechanisms that convert verified digital records into working capital.
Done well, AI can shift Africa's role from raw-commodity supplier to competitive, value-adding participant in global agriculture.

METHODOLOGY

This study explored how artificial intelligence can help reposition Africa within global agricultural value chains by analysing its role across three key export crops: cocoa, coffee and sugarcane.

To do so, researchers developed two country-level case studies for each crop and structured their analysis around common themes such as trade and logistics, value chain structure, AI's role across the value chain and inclusion. This thematic approach enables comparison of how similar challenges are being addressed in different contexts. It also highlights where AI is already being applied along the value chain, from production and grading to traceability and logistics.

The selected countries are not exhaustive but represent key examples within each region. To provide additional perspective, researchers drew on experiences in other emerging markets, such as Latin America and Southeast Asia. The study uses ECOWAS (Economic Community of West African States), COMESA (Common Market for Eastern and Southern Africa) and SADC (Southern African Development Community) as regional policy anchors to explore how progress across regions and crops differs and how coordination at that level can support digital and AI adoption.

Note that researchers exclusively drew on data from secondary sources, including academic literature, policy documents and project analyses. While that approach offered a broad perspective, limitations include the absence of fieldwork, reliance on early-stage pilots, uneven documentation across crops and limited, disaggregated data on smallholders.

Ultimately, however, the methodology supports a broader understanding of how inclusive and coordinated strategies can shape Africa's digital agricultural future.

PREFACE

HARNESSING AI FOR AFRICA'S DEVELOPMENT

Theodore Lechterman

The 2022 release and subsequent mainstreaming of OpenAI's ChatGPT set off a race by firms and countries to capitalise on opportunities created by artificial intelligence.[1] Experts remain split on the potential for generative AI (gen AI) to live up to its hype, with many insisting that the technology's known limitations—such as hallucination, bias, contextual ignorance and environmental costs—cannot feasibly be overcome.[2] Yet gen AI has spurred subsequent developments in AI research. Its proliferation has also raised awareness about earlier breakthroughs in predictive AI that have quietly been revolutionising industries and transforming the global economy.[3]

Current developments in AI are based on machine learning, where algorithms are trained to make predictions and take actions without explicit programming by humans. When carefully developed, deployed and governed, these methods can enable a variety of gains: propelling economic growth; reducing human biases in decision-making; saving humans from dangerous, stultifying or undignified tasks; accelerating scientific discovery and making essential services more accessible.

Various AI ethicists express enthusiasm for the opportunities AI may create for developing regions like Africa, for example, through precision-based agriculture, widening access to education and health care, detecting and mitigating environmental risks, facilitating language translation and cultural preservation and empowering citizens to hold governments accountable.[4]

At the same time, many barriers remain for Africa to capitalise on these opportunities and share equitably in the global AI economy while mitigating the many risks AI creates and amplifies.

To date, the US, China and the EU have dominated breakthroughs in AI research, development, deployment and governance.[5] Meanwhile, Africa's primary role in the global AI value chain has been limited to contributing natural resources and underpaid labour. US-based AI labs, for example, have subcontracted data validation and content moderation to workers in Uganda, Kenya and Madagascar, paid meagrely under conditions of precarious employment and psychological trauma.[6]

Estimates suggest that Africa holds 30% of the rare earth minerals needed for AI chip development but captures only 10% of the global revenue currently generated from mining these minerals.[7] While some hope that Africa might better leverage this opportunity, such ambitions must contend with Africa's long and tragic history of natural resource exploitation, through which Africa's abundant resource wealth has often been siphoned off by elites at expense of the region's populations and development.[8] Embracing Africa's limited role as a provider of menial labour and raw materials would also reinforce the area's historical position in global value chains (GVCs), where it has often served as a source of natural resources with minimal autonomy or value addition. This position places Africa at a significant risk of further marginalisation amidst the rapid global shift toward AI-driven economies.[9]

Although the region contains several corridors of innovation that could help it climb the AI value ladder, it faces constant risk of brain drain, bottlenecks blocking innovation scaling and diffusion and structural inequalities that prevent the gains from innovation from being widely shared. If current trends hold, AI superpowers such as the US, China and the EU, which occupy dominant positions in the global AI value chain, are likely to continue reaping the benefits of AI at near-exponential rates, widening gaps with African countries.

In principle, Africa could achieve AI sovereignty and one day become a competitive AI superpower in the image of the US or China. It could invest in recruiting and maintaining top researchers, incentivising the creation of AI laboratories, semiconductor manufacturing centres, data centres and more—all with the aim of creating locally-controlled frontier AI models for internal deployment and foreign export. As desirable as this path might seem, however, its near-term prospects are dim given more limited access to the chips, talent, capital and infrastructure that AI development requires; challenges of regional coordination; and the considerable jump that existing superpowers have on establishing market share.

Yet Africa has a chance to redefine what it means to be an AI superpower by charting its own path. Africa can cultivate a meaningful role in the global AI value chain, combine foreign imports with local control, innovate with promising use cases and chart a purposeful course forward that deliberately eschews breakneck disruption in favour of responsible integration.

By identifying its distinctive niches in the global AI economy and use cases for leapfrogging over development hurdles, Africa can unlock the power of AI to strategically empower Africans.

The region's decision-makers must also overcome several known challenges. Africa's AI transformation must contend with previous findings about Africa's digital transformation challenges, including inadequate digital infrastructure, a skills deficit, insufficient policy frameworks and fragmented data management systems.[10] AI development and deployment require electricity, broadband internet and data centres—resources that yet are unavailable or unreliable in many parts of the region. It requires an expert workforce and AI literacy from regulators and users—challenging in Africa due to gaps in education and brain drain. It requires good governance to establish and enforce rules and coordinate activities—while many African countries struggle with government instability and corruption. Procuring AI models that accurately reflect the conditions in their areas of deployment is a further challenge in the region, where high-performance models are imported from abroad and trained on non-Africa data without particular regard for African values or interests.[11] Any African AI strategy must also contend with the raft of ethical challenges that AI creates or reinforces, including bias, opacity, accountability gaps, safety risks, privacy and copyright violations, environmental damage and potential job loss.[12]

Multilateral governance bodies such as the G20 and UNESCO, regional economic communities (ECOWAS, COMESA, SADC) and the African Continental Free Trade Area (AfCFTA) have an opportunity to establish common standards and best practices for AI development, deployment and governance that uphold human rights and sustainable development goals while reflecting diverse regional needs.

This report, offered in support of these efforts, explores how Africa can strategically utilise AI and digital transformation to reposition itself within global value chains, targeting improved integration and competitiveness through the regional economic communities and AfCFTA.

Finally, the report's authors recognise that their shorthand reference to Africa and discussion of common features, interests and challenges appear to treat the region as a single, collective entity.

They stress the importance of widespread recognition that "Africa" is not a monolith but a region rich in diversity of many kinds, and recognise, furthermore, that any strategy adopted must be owned by and accountable to stakeholders to be legitimately implemented. In that spirit, with this paper, they seek to advance the conversation and promote purposeful action.

EXECUTIVE POLICY SUMMARY

FOUR THEMES FOR AI DEVELOPMENT IN AFRICA

Across the case studies covered in this report, several critical themes emerged for Africa's AI future: trade and logistics; value chain structure; AI's potential within the value chain; and inclusion for women, youth and smallholders in African agriculture.

Each of these areas calls for action from leaders at all levels—from global to local. We have prepared a set of recommended actions for these leaders to help them develop effective AI adoption plans that position Africa more competitively within global value chains.

Trade and logistics

AI offers strong potential to enhance the efficiency and transparency of Africa's trade and logistics systems. Applied in routing, customs, finance and last-mile delivery, it can lower costs, strengthen compliance and expand market access when supported by coherent policy, infrastructure and data frameworks.

RECOMMENDATIONS

Global institutions
Strengthen coherence between continental and global policy frameworks—such as the AU–EU Partnership and the Joint Vision for 2030—to harmonise approaches across Africa, strengthen AI infrastructure and human skills capacity and mobilise sustainable investment in strategic value chains to enable countries to fully harness the potential of AI.

Regional bodies
Create unified, harmonised regulatory frameworks across countries to support integration of AI in trade and logistics while ensuring compliance of data privacy, security and ethical AI practices.

Governments
Adopt comprehensive AI policy frameworks for trade and logistics that balance enabling innovation with managing risks and promoting inclusivity; invest in digital literacy, digital skills and training programs to equip the workforce to be competitive.

Cooperatives and traders
Facilitate market access and distribution of goods; act as an aggregator for small players and thus bridge the gaps in supply chain caused by infrastructure limitations.

Donors and technology partners
Enable investments, innovation and modernisation required to unlock the potential of the continent.

Academia and research institutions
Serve as thought leaders, knowledge hubs and capacity builders required to create a modern and integrated trade and logistics environment in Africa.

Value chain structure

AI demonstrates clear potential to strengthen resilience, improve compliance and increase value capture. If scaled inclusively, AI tools can move producers beyond raw exports, enabling greater participation in higher-value segments of the global economy.

RECOMMENDATIONS

Global institutions
Finance interoperable AI frameworks for traceability and compliance, invest in open-source data governance and ensure AI adoption aligns with ethical, inclusive and climate-smart trade standards.

Regional bodies
Develop harmonised AI and data standards, embed them in trade protocols and promote cross-border cooperative learning exchanges.

Governments
Decentralise data governance, expand rural digital infrastructure and support interoperability between public and private platforms.

Cooperatives and traders
Pilot AI applications for grading, fermentation management and compliance tracking; invest in member training for digital literacy.

Donors and technology partners
Support farmer-led digital platforms, fund rural connectivity and co-design AI tools with local user input.

Academia and research institutions
Examine socio-technical dynamics of AI adoption, including governance models, equity implications and climate resilience impacts.

AI across the value chain

AI-enabled tools can deliver benefits across the value chain through production, grading, traceability and more. If scaled inclusively, tools can raise export quality, reduce rejection risks and unlock finance for smallholders.

RECOMMENDATIONS

Global institutions
Expand funding for compliance-linked AI tools that also support climate adaptation and smallholder certification systems; provide transitional financing and technical assistance to ensure compliance with the EU Deforestation Regulation and recognise local realities in countries such as Ethiopia and Kenya.

Regional bodies
Harmonise digital traceability and certification across borders; integrate AI into customs and trade systems; support multilingual access and language localisation; enable AI-driven export finance through regional digital platforms and support digital extension tools for cooperatives.

Governments
Develop national digital standards, integrate TRACE with customs systems and expand logistics digitalisation.

Cooperatives and unions
Pool resources for shared AI tools, adopt cooperative-level grading and traceability pilots and train youth as digital intermediaries.

Donors and technology partners
Support open-source platforms, fund rural connectivity and co-design AI tools with women and smallholders.

Academia and research institutions
Track socio-economic impacts of AI adoption, study data governance models and co-create farmer-focused training content.

Inclusion of women, youth and smallholder farmers

Without deliberate strategies, AI risks deepening rather than reducing inequality. If designed inclusively, AI adoption can place the empowerment of women, youth, smallholders and persons with disabilities at the centre of Africa's agricultural transformation.

RECOMMENDATIONS

Global institutions
Mobilise financing for inclusive AI in agriculture, promote open-source AI tools and encourage South-South cooperation on gender-responsive digitalisation; support inclusive AI-enabled traceability and certification, ensuring women- and youth-led cooperatives can comply with EU sustainability standards.

Regional bodies
Harmonise AI standards, embed gender-disaggregated monitoring and facilitate cross-value chain learning between sugar, cocoa and coffee.

Governments
Expand connectivity and affordability, subsidise inclusive AI advisory services and use AI-generated data as collateral to improve women's and youth's access to finance.

Donors and technology partners
Co-fund inclusive AI pilots with multilingual, offline and disability-accessible design; reduce costs through blended finance and scale tools for women-led cooperatives.

Academia and research institutions
Produce gender-disaggregated evidence on AI adoption; assess impacts on productivity and equity and develop participatory design frameworks that include women, youth and persons with disabilities.

INTRODUCTION

THE ECONOMIC POWER AND POTENTIAL OF COCOA, COFFEE AND SUGAR IN AFRICA

Beatrice Grace Aluoch Obado
Mayuri Naik
Satish Nrusimhadevara

Agriculture remains the backbone of many African economies, contributing not only to GDP but also to employment, foreign exchange and integration into global trade. Two major frameworks underpin Africa's agricultural trade: the European Union–African Union partnership and the African Continental Free Trade Area (AfCFTA). The EU remains a critical trading partner, with EU-27 exports to Africa totalling €166.1 billion in 2024 and imports reaching €188.5 billion.[13] Meanwhile, AfCFTA has expanded intra-African trade, which rose by 7.2% in 2023 to reach USD 192 billion, or 15% of the continent's total trade.[14] Simulations suggest AfCFTA could raise Africa's income by 7% by 2035,[15] and by 2045, intra-African trade could increase by 35%, with agrifood trade rising 54% in that timeframe.[16]

Among the most critical crops are cocoa, coffee and sugarcane. These commodities not only underpin foreign exchange but also drive broader economic performance (see box, "Cocoa, coffee, sugarcane, and economic growth in Africa").

Yet the structure of Africa's agricultural value chains has many of the same development and growth constraints it has had since the colonial era: fragmented coordination, offshore value capture and limited local control over pricing and market access. More than 80% of Africa's agricultural exports remain unprocessed, reflecting missed opportunities for rural industrialisation and broader economic transformation.[16]

Coffee, cocoa, sugarcane and economic growth in Africa

Sub-Saharan African economies have averaged annual growth of 3.2% over the past decade, despite shocks such as the COVID-19 pandemic and climate volatility. In fact, agricultural exports contributed to rapid GDP growth in countries such as Ethiopia (10.3%), Ghana (8.5%) and the Democratic Republic of Congo (7.6%), outpacing Ireland (7.2%), the fastest-growing EU economy at the time.[17]

In 2023, Ghana and Côte d'Ivoire together accounted for approximately 50% of the USD 8 billion worth of cocoa exported globally, while Ethiopia and Uganda contributed around 5% of the USD 38 billion global coffee exports. Countries such as South Africa, Eswatini and Morocco, meanwhile, remain pivotal exporters of sugarcane, supplying essential ingredients for the international food and beverage industry.[18]

Artificial intelligence (AI) technologies could help the region mitigate these issues, driving broad economic gains. The questions are where and how to deploy AI tools most effectively to spur growth and overcome challenges (see box, "AI in agribusiness: opportunities and challenges").

Across the case studies covered in this report, several critical themes emerged for Africa's AI future: **trade and logistics**, **value chain structure**, **AI's potential within the value chain**, and **inclusion for women, youth and smallholders in African agriculture**.

An examination of the state of agribusiness across African industries identified unique challenges in the logistics landscape. These included infrastructural gaps, high operational costs, delays and fragmented supply chains.

A look at the cocoa industry provided a critical lens for Africa's structural position in the global economy: Ghana and Côte d'Ivoire dominate global production, yet capture only a small share of total value, which continues to accrue primarily in processing, branding and retail abroad. By understanding how the cocoa industry in these countries functions, we can see how AI-driven tools such as traceability systems, certification mechanisms and improved logistics could enable value chains to capture more—while also exposing the persistent challenges of export dependency.

The coffee industries in Kenya and Ethiopia, meanwhile, show how digital applications can be integrated across multiple nodes of production and trade. From precision farming and pest management to digital quality grading and price forecasting, AI demonstrates real potential to improve competitiveness. At the same time, the case of coffee underscores enduring constraints, including weak infrastructure, gaps in governance and unequal access for smallholders.

Finally, through the sugarcane industries in Mozambique and South Africa, we examine the critical need for inclusion. Women, youth and smallholder farmers form the backbone of production across cocoa, coffee, sugar and other commodities. Still, they continue to face systemic barriers to technology, finance and markets. Any successful plan for AI adoption must treat inclusion as a guiding principle rather than a peripheral concern, ensuring that digital transformation does not reinforce existing inequalities.

The countries considered in each of the crop-specific sections of this report also participate in regional blocs that are deeply relevant for AI implementation. Regional blocs matter because no single African country can meet the scale, compliance and data requirements of modern GVCs alone. Through shared standards, digital interoperability and collective market power, ECOWAS, COMESA and SADC transform fragmented national value chains into regional production networks capable of competing and negotiating in global markets.

To harness AI's potential, leaders across Africa must address structural constraints and strengthen digital readiness under AfCFTA. Investments in rural broadband, digital registries and interoperable platforms are essential for scaling AI applications and ensuring traceable exports. When integrated effectively, for example, AI-supported customs screening and certification systems can reduce clearance times, increasing competitiveness in global trade.[19]

Policy frameworks must also shift AI from isolated pilots to coordinated national and regional strategies. A continental AI-agriculture task force under AfCFTA could harmonise traceability standards, foster cross-border collaboration and ensure AI adoption is embedded as a public good.[20] Without such systemic integration, Africa risks exclusion from premium markets, rising compliance penalties and continued underpricing of its exports.

Cocoa, coffee and sugarcane remain pillars of Africa's agricultural economy, underpinning GDP growth, rural employment and foreign exchange earnings. However, their value is constrained by continued reliance on raw commodity exports. AI offers a critical opportunity to overcome these structural limitations by enabling traceability, enhancing quality assurance, supporting climate adaptation and driving value addition.

For AI to move from pilot to scale, investment in digital infrastructure, governance and regional integration is essential.

If aligned with AfCFTA and international compliance standards, AI can help Africa transition from commodity dependency to competitive, value-led agribusiness, thereby embedding equity, resilience and sustainability in its agricultural trade systems.

AI in agribusiness: Opportunities and challenges

Among the key opportunities for AI in agribusiness, we found:

01
Traceability and compliance

In Ghana and Côte d'Ivoire, satellite monitoring and QR-coded tracking systems have been introduced to verify plantation health, detect deforestation and ensure transparent supply chains. These technologies are crucial for compliance with the EU Deforestation Regulation, which requires verifiable traceability for imports. [21, 22]

02
Climate adaptation and quality assurance

Ethiopia and Uganda are using machine learning models for yield prediction and climate risk forecasting, while computer vision systems are applied to coffee bean grading.[23] These tools reduce post-harvest losses, improve sorting precision and enable farmers to supply premium markets with strict quality standards.

03
Value capture

AI also offers potential to address Africa's low levels of value addition. For instance, AI-enabled grading and certification systems could allow African cocoa and coffee to access premium markets, where buyers demand climate-compliant and traceable products.

Yet despite promising pilots, AI use in African agriculture faces structural and systemic bottlenecks:

Fragmented pilots
Most AI interventions are donor-driven pilots that lack institutional anchoring. Without coordinated national strategies, they fail to achieve scale or sustainability.[20]

Weak infrastructure
Rural broadband access remains limited across much of Africa, undermining the ability to deploy AI tools in farming communities. Energy shortages compound these barriers, particularly in off-grid areas.[20]

Low private sector participation
AI adoption requires investment and private-sector involvement, yet agribusiness ecosystems remain underfunded. Weak private-sector incentives limit integration of AI into broader value chains.

Governance and policy gaps
Institutional readiness varies significantly by country. Ghana ranks 47th in the 2023 Oxford Insights AI Readiness Index, while Uganda ranks 74th. Ghana's higher readiness reflects investments in digital land registration and e-certification systems, whereas Uganda lags in digitizing export systems.[24] These gaps highlight the uneven landscape of digital preparedness across Africa.

Section

01

TRADE AND LOGISTICS ACROSS THE CONTINENT

Satish Nrusimhadevara

The African continent—home to over 50 countries, a GDP of USD 3.4 trillion and a population of 1.3 billion people—has an expansive business potential in trade fuelled by rapid urbanisation, a growing middle class, adoption of new technologies and improvements in transport and logistics infrastructure.

While the potential is immense, the continent faces unique challenges in its trade logistics landscape, including infrastructural gaps, high operational costs, delays and fragmented supply chains.

Artificial intelligence is a good tool to overcome these challenges as it presents unprecedented opportunities to enhance efficiency, transparency and competitiveness. AI-driven innovations such as predictive analytics, real-time tracking, automated processes and intelligent decision-making systems present powerful tools to address these challenges effectively. The African continent can leverage this transformative force of AI in the global trade and logistics sector to drive economic growth and regional integration. The adoption of AI is expected to increase Africa's GDP by USD 1.5 trillion by 2030, with small and medium enterprises (SMEs) increasing their revenues by 15–20%.[25]

AI's potential to optimise supply chain management, improve inventory control, streamline customs procedures and facilitate smoother trade financing processes can significantly reduce trade costs, enhance the reliability of goods movement and expand market access for businesses—including SMEs and informal traders who often face barriers in accessing global markets.

To harness the full potential of AI in the trade and logistics ecosystem, the continent must navigate challenges such as digital infrastructure deficits, data quality and governance concerns, skill gaps and policy frameworks that enable and promote responsible and inclusive AI adoption.

CHALLENGES

Underdeveloped infrastructure
Major ports in Africa like Cape Town and Durban experience severe port congestion, causing vessel delays of up to 10 days, disrupting shipment schedules and increasing costs.

Fragmented logistics networks
Route complexities in serving Africa and lack of allocation of larger shipping vessels create added difficulties for shippers.

Bureaucratic customs processes
Complex and time-consuming customs procedures, inconsistent regulatory frameworks and high landing fees create barriers for trade.

Unpredictable demand
Unpredictability in global trade flows—for example, changing geopolitical situations, demand spikes due to ecommerce or tariffs—create challenges to African trade.

These challenges contribute to an increase in costs and cause delays in shipments and reach to the market, thus causing significant losses to sellers. It is estimated that the lack of last-mile delivery systems amounts to 30–40% post-harvest agricultural losses in rural areas of Africa.[26]

The promise of AI, from routing to last-mile delivery

African industries face persistent challenges in areas such as transport efficiency, regulatory compliance, access to trade finance and last-mile delivery, all of which constrain growth and integration into global value chains. Emerging AI applications provide targeted responses to these issues, offering solutions that range from optimised routing and scheduling to enhanced compliance, expanded financial inclusion and improved distribution systems.

Routing and scheduling

By leveraging AI-driven tools, transportation costs and delays can be substantially reduced through enhanced routing and scheduling. These tools may also help with real-time tracking of goods in transit, thus improving visibility and mitigating risk.

For example, studies by Accenture and the South African Journal of Economic and Management Sciences report that AI technology could boost productivity in the South African logistics sector by up to 30%, helping companies reduce costs, optimise processes and increase customer satisfaction.[27] This broadly reflects the positive impact of AI on supply chain management, particularly in demand forecasting and logistics efficiency through efficient port operations, enhanced cargo handling and predictive maintenance.

Compliance and fraud detection

AI helps process unstructured data, like customs documents, to improve compliance and efficiency. Document inspection is a big process, one that is time-consuming and error-prone. AI can aid in inspecting documents, identifying errors and reducing delays. Customs and border control authorities can further help with compliance in trade and logistics by automating and streamlining clearance processes.

The Regional Electronic Cargo Tracking System (RECTS) used in the East African Community in Kenya, Uganda, Rwanda and the Democratic Republic of Congo is a prominent case study of AI in border control for trade and logistics in Africa. RECTS combines GPS tracking with AI technologies such as neural networks and machine learning algorithms to track cargo position and analyse transit data, allowing it to detect transit violations such as route deviations or tampering with electronic seals. This, in turn, reduces cargo theft, diversions and government revenue leakage, while increasing efficiency and security.[29]

Case study

DP World supply chain optimisation in Africa

Using AI to optimise supply chains, DP World (a leading global logistics supplier) achieved savings of approximately 20% over five years. Specifically, the company achieved these gains by enabling enhanced scheduling, optimisation from planning through fulfilment, predictive analytics, automation and blockchain integration for greater visibility and sustainability.

The initiative of embedding AI along with digital twins helped DP World improve supply chain synchronisation and reduce operational costs. This case highlights how AI and digital transformation are making African supply chains more customer-centric, resilient and cost-effective.[28]

Case study

Twiga Foods reduces post-harvest losses

Kenya's Twiga Foods adopted AI to transform their logistics operations for fresh produce distribution in urban African markets. By deploying data-driven algorithms, Twiga Foods was able to optimise their logistics networks—collection centres, cold storage, packhouses and a large distribution centre—and delivery routes to connect farmers to markets efficiently, reducing post-harvest losses from the traditional 30-40% down to 4%.[30]

Border controls also involve real-time monitoring, detection and tracking of illegal crossings and illicit trade activities along its extensive borders. South Africa uses AI-driven border security technology programmes involving drones with AI-enhanced cameras. By leveraging these AI-driven technology and smart border initiatives, South Africa has been able to build efficiencies in customs clearance, reduce delays and enable better-targeted inspections, thereby benefiting intra-African trade and logistics.[31]

Finally, AI can assist in navigating complex trade regulations and compliance requirements by providing real-time analysis and predictive risk assessment to detect fraudulent activities and ensure adherence to export and import rules. Additionally, AI improves supply chain transparency and traceability, enabling better enforcement of regulatory standards across logistics networks.[32,33]

Trade finance

Availability of money to trade can be an important bottleneck: Africa faces a significant challenge in this regard as there are many unbanked citizens and SMEs can't access funds. The current gap in trade finance in Africa is estimated to be around USD 90 billion, impacting SMEs especially. By leveraging AI, countries can close this gap by streamlining transaction processes, improving credit evaluations through alternative data and enabling faster and more transparent trade finance solutions.

Afreximbank is a great example of digital transformation in trade finance with its Africa Trade Gateway (ATG) ecosystem. By leveraging AI, the bank has improved supply chain prediction and risk analysis to better serve their corporate and sovereign trade clients. AI-driven tools further contribute to real-time compliance monitoring, fraud detection and improving liquidity solutions like supply chain finance receivables and loans.[34]

Last mile delivery

While there is a need to transform trade routes overall, it is imperative that the last mile delivery of goods is seamless. With poor infrastructure, high delivery costs and complex urban and rural environments, Africa faces challenges in last mile delivery. By employing AI, however, companies can revolutionise the last mile delivery. The key innovations in last mile delivery include AI-powered route optimisation tools and predictive analytics. These technologies can reduce delivery times, fuel consumption and operational expenses by dynamically scheduling deliveries, even taking into account real-time traffic and weather.

Companies such as Kobo360 in Nigeria use real-time tracking and data analytics to improve freight efficiency, while Pargo in South Africa has implemented community-based pickup points and locker systems to overcome delivery challenges in townships and informal settlements.[35]

The market for last mile delivery is expected to grow to USD 8.93 billion with a CAGR of 8.2% by 2031 in Africa—a significant opportunity for increasing trade and uplifting the population of Africa.[35]

RECOMMENDATIONS

Global institutions (G20, EU, AU)
Strengthen coherence between continental and global policy frameworks—such as the AU–EU Partnership and the Joint Vision for 2030—to harmonise approaches across Africa, strengthen AI infrastructure and human skills capacity and mobilise sustainable investment in strategic value chains to enable countries to fully harness the potential of AI.

Regional bodies (ECOWAS, EAC, COMESA, SADC)
Create unified, harmonised regulatory frameworks across countries to support integration of AI in trade and logistics while ensuring compliance of data privacy, security and ethical AI practices.

Governments
Adopt comprehensive AI policy frameworks for trade and logistics that balance enabling innovation with managing risks and promoting inclusivity; invest in digital literacy, digital skills and training programmes to equip the workforce to be competitive.

Cooperatives and traders
Facilitate market access and distribution of goods; act as an aggregator for small players and thus bridge the gaps in supply chain caused by infrastructure limitations.

Donors and technology partners
Enable investments, innovation and modernisation required to unlock the potential of the continent.

Academia and research institutions
Serve as thought leaders, knowledge hubs and capacity builders required to create a modern and integrated trade and logistics environment in Africa.

REFLECTION

AI technologies bring significant promise for addressing Africa's long-standing trade and logistics constraints. Examples such as AI-enabled cargo tracking, fintech innovations in trade finance and community-based delivery systems show how digital technologies can help reduce costs, increase transparency and expand access to global markets. What's more, these benefits extend beyond large corporations and into more marginalised groups that face higher barriers integrating into regional and international value chains.

Realising this potential, however, will depend on more than technological innovation alone. Adequate infrastructure, harmonised policies, responsible data governance and investment in digital skills are necessary to ensure that AI adoption is both effective and inclusive. Done well, leaders across the continent can apply AI technologies to revolutionise trade and logistics, fostering sustainable development, competitiveness and inclusive growth.

Section

02

VALUE CHAIN STRUCTURE: COCOA IN WEST AFRICA

Beatrice Grace Aluoch Obado

Region:
West Africa

Focus Value Chain:
Cocoa

Theme:
Value Chain Structure

Countries:
Ghana, Côte d'Ivoire

Regional Body:
Economic Community of West African States (ECOWAS)

The structure of Africa's agricultural value chains has deep historical roots. Colonial-era commodity systems shaped extractive trade flows, centralised governance and minimal domestic processing. While these structures have evolved, many of their features persist today: fragmented coordination, offshore value capture and limited local control over pricing or market access. More than 80% of Africa's agricultural exports remain unprocessed, reflecting missed opportunities for rural industrialisation and broader economic transformation.[14]

Cocoa is central to Ghana and Côte d'Ivoire's economies, but they face structural limits (see box, "Cocoa Sector Snapshot, Ghana and Côte d'Ivoire"). In 2024, Ghana produced just about 429,323 metric tonnes (MT) by June, roughly 55%[36] of its typical seasonal output, due to smuggling, disease and weather shocks. Together, the two countries still account for nearly two-thirds of global cocoa production.[37] Yet export composition shows limited value addition: Ghana's grinding capacity of about 505,000 MT is underutilised, with only about 210,000 MT processed in 2024/2025.[38] Côte d'Ivoire still exports around 72% of its cocoa as whole beans, while Ghana exports 68%.[39] This means most of the value capture continues to take place offshore through chocolate manufacturing, branding and retail. These bottlenecks—shortfalls in output, under-utilised processing capacity and dependence on raw materials—illustrate why structural transformation in the cocoa chain remains elusive.

Cocoa sector snapshot

Ghana and Côte d'Ivoire

In Ghana, the cocoa sector employs about 800,000 farmers across 10 of 16 regions. The Ghana Cocoa Board (COCOBOD) stabilises prices, distributes inputs and enforces quality standards, but its centralized model limits cooperative autonomy and slows private sector innovation. In Côte d'Ivoire, cocoa supports the livelihood of about six million people, including about one million smallholder farmers. Oversight by the Conseil du Café-Cacao (CCC) allows greater private participation but suffers from weaker midstream coordination and under-resourced cooperatives.[38,40]

Both countries now face acute pressures: in early 2024, Ivorian arrivals dropped 34% year-on-year to 1.05 million tonnes, while Ghana's graded and sealed purchases fell 35% to 351,000 tonnes. Ghana also lost an estimated 160,000 tonnes to smuggling in the 2023/24 season, while excessive rainfall, reduced sunlight and fungal diseases such as black pod further depressed yields.[41,42] These combined vulnerabilities highlight how institutional constraints and external shocks continue to strain the resilience of West Africa's cocoa sector.

CHALLENGES

Upstream
Productivity remains constrained by limited access to improved seedlings, mechanisation and climate-resilient practices.

Midstream
Processing capacity is underutilised and traceability fragmented, leaving most value addition outside the region.

Downstream
Exporters and international buyers dominate certificate and price premiums, excluding most farmers from higher margins.

Systemic pressures
Illicit cross-border flows and recurrent climate shocks further erode revenues and undermine long-term resilience.

New market requirements, particularly from the EU, US and UK, are tightening rules on deforestation, labour standards and traceability. At the same time, climate projections show rising temperatures and changing rainfall patterns could reduce suitable cocoa-growing areas by up to one-third by 2050.[43,44]

AI and other digital tools could play a role in mitigating these challenges. Predictive pest alerts, automated quality grading and blockchain-enabled traceability can make supply chains more transparent and resilient. AI applications such as digital grading, automated fermentation monitoring or AI-powered certification, however, are still at the pilot stage. Most traceability platforms focus on basic farmer registration rather than full chain-of-custody or compliance tracking. Technology alone cannot fix deeply entrenched structural constraints. Institutional reform, cooperative empowerment and inclusive digital governance remain essential.

Distinctions

Ghana and Côte d'Ivoire

In Ghana, COCOBOD's centralised model has maintained price stability and quality but limits the space for private AI innovation. Farmerline's AI-powered extension services, for example, face integration challenges due to limited interoperability with state systems.

In Côte d'Ivoire, liberalisation has opened opportunities for private investment and experimentation with traceability, but the absence of standardised digital protocols and cooperative strengthening means many farmers struggle to meet EU deforestation compliance. This limits their ability to access differentiated, premium-paying markets.[45,46]

From raw materials to raw data: unlocking new value

The potential for farmers to benefit from both their crops and the data they generate is becoming clearer. In Ghana, Farmerline uses AI-powered voice services to deliver market prices and weather updates in local languages.[47] In Côte d'Ivoire, pilot blockchain systems link farm-level GPS data to exporter records to prepare for EU deforestation compliance.[43] Similar initiatives elsewhere in Africa, such as SMS price alerts in Kenya or AI pest alerts in Rwanda, demonstrate that small digital interventions can improve bargaining power and reduce information gaps. Recent innovations, such as carbon-tracking pilots and SME-led digital branding, are enabling some to access AfCFTA markets and international buyers. Yet many of these initiatives remain in pilot stages and their broader impact still requires independent verification.

However, as Adeniran and Pilling (2024)[48] note, deploying AI into unequal systems without safeguards can deepen exclusion. Farmers may lose control over the data they generate, and benefits often accrue to better-resourced intermediaries rather than producers themselves.

Cocoa and the compliance imperative

Global market shifts are intensifying pressure on cocoa producers. The EU Deforestation Regulation, along with US and UK labour and environmental standards, now require farm-level traceability, deforestation-free certification and labour transparency. Meeting these standards demands integrated, data-rich platforms capable of linking farm GPS coordinates with supply chain records in near real time.

Both Ghana and Côte d'Ivoire have initiated national traceability systems and signed onto the Cocoa & Forests Initiative. Yet most current tools focus on registration and static record keeping. AI-enabled systems such as satellite-based deforestation monitoring, automated compliance scoring and predictive risk mapping remain underdeveloped and underfunded. The AI-enabled systems could help mitigate the compounded risks of smuggling, climate shocks and yield variability but these remain underdeveloped and underfunded.

Lessons from Latin America and Southeast Asia

Structural readiness matters

Comparative experience shows that digital tools deliver the most value when integrated into strong institutional and cooperative systems. In Latin America, AI and computer vision tools are being piloted to assist cocoa farmers with early detection of pest and diseases. A 2025 systematic review of AI applications in cocoa farming found that these technologies can reduce crop losses when deployed effectively in the right agronomic and institutional context.[49, 50]

Blockchain-based coffee traceability in Colombia, for example, has raised export premiums by as much as 20% by streamlining certification processes.[51]

Additionally, in Colombia and Ecuador predictive AI has significantly improved cocoa disease detection, enabling rapid identification of diseases such as swollen shoot via advanced image analysis, reaching up to 99.1% accuracy and reducing detection times substantially. Providing early warning signs to farmers can help reduce losses.[52]

Early implementation studies show that such systems enhance traceability and could help producers capture greater value across the supply chain.[51] In Southeast Asia, Vietnam's cocoa sector uses cooperative-led data platforms to integrate climate monitoring with quality grading, creating more consistent export lots.[53,54]

These successes rest on three pillars: robust cooperative networks, public investment in R&D and platforms tailored to local needs. In regions lacking these, adoption remains donor-dependent, uneven and vulnerable to platform capture or data privacy risks.[55]

Comparative lens: Value chain structure

The cocoa sector in Ghana and Côte d'Ivoire exemplifies Africa's persistent structural imbalance in global agricultural trade. While the region produces more than half of the world's cocoa, much of the value from processing, branding and marketing is captured abroad. Similar governance and coordination challenges appear in coffee and sugarcane value chains. In coffee (Kenya and Ethiopia), cooperatives lead wet-milling and auction systems but remain constrained by volatile prices and external certification demands, while sugarcane (Mozambique and South Africa) is dominated by vertically integrated mills that retain most of the domestic value. Across all three commodities, limited midstream capacity and weak institutional linkages constrain Africa's potential to capture higher value and drive industrial transformation.[56]

RECOMMENDATIONS

Global institutions (EU, G20, innovation bodies)
Finance interoperable AI frameworks for traceability and compliance, invest in open-source data governance and ensure AI adoption aligns with ethical, inclusive and climate-smart trade standards.

Regional bodies (ECOWAS)
Develop harmonised AI and data standards, embed them in trade protocols and promote cross-border cooperative learning exchanges.

Governments (COCOBOD, CCC)
Decentralise data governance, expand rural digital infrastructure and support interoperability between public and private platforms.

Cooperatives and traders
Pilot AI applications for grading, fermentation management and compliance tracking; invest in member training for digital literacy.

Donors and technology partners
Support farmer-led digital platforms, fund rural connectivity and co-design AI tools with local user input.

Academia and research institutions
Examine socio-technical dynamics of AI adoption in cocoa, including governance models, equity implications and climate resilience impacts.

REFLECTION

The cocoa sectors of Ghana and Côte d'Ivoire reveal both the endurance of structural inequalities and the scope of transformation. AI can enhance productivity, quality and compliance, but its impact depends on reforms that strengthen cooperative governance and farmer agency. Without such reforms, digital tools risk reinforcing extractive patterns. With coordinated investment in infrastructure, skills and inclusive design, ECOWAS can reposition West Africa cocoa not only to withstand stricter global standards, but also to shape the future of sustainable and technologically advanced trade.

AI demonstrates clear potential to strengthen resilience, improve compliance and increase value capture in West Africa's cocoa sector. Predictive pest alerts and climate-adaptive models can help farmers safeguard yields. Digital grading and fermentation monitoring can enhance bean quality and consistency, positioning Ghana and Côte d'Ivoire to secure premium markets. Blockchain-enabled traceability offers pathways to meet EU deforestation and labour standards while improving transparency. Verified digital records could also underpin new forms of finance, reducing dependence on informal credit. If scaled inclusively, these tools can move producers beyond raw exports, enabling greater participation in higher-value segments of the global cocoa economy.

Section

03

AI ACROSS THE VALUE CHAIN: COFFEE IN EAST AFRICA

Beatrice Grace Aluoch Obado

Region:
East Africa

Focus Value Chain:
Coffee

Theme:
AI across the value chain

Countries:
Ethiopia, Kenya

Regional Body:
Common Market for Eastern and Southern Africa (COMESA)

Kenya and Ethiopia are central to the global Arabica coffee supply (see box, "Coffee sector snapshot, Ethiopia and Kenya"). Arabica coffee is indigenous to Ethiopia's southwest highlands, making the country Africa's largest producer and one of the world's top five producers of the variety.[57] Kenya's premium reputation is anchored in its auction system operated by the Nairobi Coffee Exchange (NCE).[58]

"This is about justice and dignity... keeping smallholders at the centre and ensuring investment is green, inclusive, and aligned with the SDGs."

Qu Dongyu
Director-General, FAO
remarks, July 2025

Both countries are under mounting pressure from climate stress (which threatens Arabica suitability), rising labour costs, rural out-migration, limited access to affordable finance and increasingly strict traceability and deforestation regulations in key markets such as the European Union. The commission's implementation pages confirm geolocation traceability requirements for operators. Climate models suggest that Ethiopia could lose up to 60% of optimal Arabica-growing areas by 2050 under high-emission scenarios, as projected in climate models by Davis et al. (2012),[59] with Kenya facing similar risks in its lower-altitude production zones.[43] Synthesis work also finds Arabica especially climate-sensitive (systematic review).

Coffee sector snapshot

Ethiopia and Kenya

Coffee accounts for roughly one-third of Ethiopia's export earnings and supports over 15 million people, with more than 90% of production coming from smallholder farmers operating on plots smaller than two hectares.[60] Kenya's auction system continues to secure quality premiums despite a decade-long decline in national output (Nairobi Coffee Exchange).[58]

In both countries, AI adoption is emerging not through sweeping reform but through targeted experiments, including mobile-based advisory services, blockchain-enabled traceability platforms and cooperative-led grading pilots. These early innovations respond to structural constraints in information flows, infrastructure and compliance with trade standards.

Climate change affects more than yield: it can shift flavour profiles, disrupt flowering cycles and increase vulnerability to pests such as coffee berry borer and leaf rust. This undermines market premiums and export stability.

The urgency for climate-informed innovation is clear. AI tools, from predictive pest alerts to adaptive planting calendars, can help farmers select climate-resilient varieties, optimise timing of interventions and improve overall decision-making. These tools align directly with Ethiopia's Climate Resilient Green Economy strategy and Kenya's Climate-Smart Agriculture Implementation Framework.

CHALLENGES

Infrastructure
Patchy mobile connectivity, low smartphone ownership, weak symptoms/logistics integration.

Cost
AI-powered sorting machines priced at over USD 20,000 remain unaffordable for individual farmers.[61,62]

Inclusion
Women in rural East Africa are 37% less likely than men to own smartphones, while unemployed youth remain underutilised despite higher digital literacy.[63]

Governance
Traceability pilots risk being donor-driven without embedding farmer data rights and cooperative governance.[48]

Logistics
Delays at Ethiopia's Commodity Exchange and Djibouti Port increase costs, while AI-enabled logistics and customs automation remain limited.[64]

Production, grading and traceability: the path to smarter and more resilient value chains

Coffee took centuries to cross borders amid bans and moral panic—while today, AI innovation can take just months. For Ethiopia and Kenya, this speed is a chance to set rules early, anchor benefits locally and keep smallholders central.

Production

Currently, most Ethiopian coffee farmers receive no formal extension services.[65] Pilots using computer vision and mobile advisory for disease identification have emerged, while broader climate-smart agronomy guidance is being aligned to

national strategies. Still, adoption remains uneven. Women in rural East Africa are 37% less likely than men to own a smartphone, and youth unemployment remains high despite higher digital literacy levels.[63]

Programmes that train young people to act as digital intermediaries within cooperatives and initiatives that ensure women have equal access to devices and advisory services are critical. These measures accelerate adoption, create rural employment, reduce youth migration and enable more inclusive decision-making in cooperative governance.

Grading

A significant portion of value is lost during the grading stage. Cooperative-level optical AI sorting pilots report faster, more consistent defect removal for export lots. The cost, however, is prohibitive for individual farmers, with AI-powered sorting machines priced at over USD 20,000.[62] Pooling ownership at the cooperative level reduces unit costs relative to individual farmers; such ownership allows for shared equipment and training, reducing barriers to adoption.[61] National scaling of such technology could increase Ethiopia's share of export-grade beans significantly, potentially adding USD 25 to 40 million annually to export revenues.[66]

Traceability

Coffee exports from both Ethiopia and Kenya increasingly face global compliance requirements—notably the EU Deforestation Regulation and similar frameworks—that require proof of legal, deforestation-free production with full geolocation traceability.[67]

In Ethiopia, the government and partners have introduced TRACE, a blockchain-backed platform that records GPS coordinates, harvest data and cooperative processing histories.[61] In Jimma, some cooperatives are already using TRACE to monitor rainfall, pest outbreaks and input use alongside compliance records.

Lessons from Latin America

Traceability and ownership

Cooperatives in Honduras use AI and QR codes to track farm-level data, while blockchain systems in Colombia have shortened export certification timelines. Donor-supported infrastructure has also enabled rural digital systems.

Challenges remain, however, as digital tools are often donor-driven rather than farmer-led—while local governance and data ownership are rarely embedded.

AI systems must be co-designed with cooperatives and embed local data governance.[68,69]

Kenya is pursuing complementary approaches, including county-level geo-registries in the central highlands and QR-coded tagging systems that track coffee lots from wet mills to the Nairobi Coffee Exchange.[70] These systems aim to integrate trace data with quality certification and payment processes.

Comparable traceability innovations are also underway in sugarcane cooperatives in Mozambique and Eswatini[71] as well as in cocoa-producing regions of Ghana and Côte d'Ivoire.[72] Persistent barriers include inconsistent mobile connectivity, low smartphone ownership and reliance on intermediaries for digital registration, raising questions about long-term sustainability and farmer data rights.[48]

Even with upstream advances, however, logistics bottlenecks persist. In Ethiopia, delays at the Commodity Exchange, customs inefficiencies and manual documentation at Djibouti Port increase costs and reduce flexibility.[64] TRACE includes features to streamline export paperwork, but uptake is limited due to weak integration with public systems. AI-enabled logistics solutions, such as shipment tracking and customs automation, remain largely absent.

Comparative lens: AI across the value chain

AI in East Africa's coffee sector remains in its infancy, with pilot projects testing applications such as digital grading, traceability and yield prediction. These initiatives, often led by cooperatives or partnerships, indicate growing interest in digital transformation but highlight uneven readiness due to gaps in connectivity, affordability and technical skills. Similar experiments in cocoa (Ghana and Côte d'Ivoire) use GPS mapping and digital traceability to support compliance with sustainability standards, while sugarcane mills in South Africa have adopted limited automation and analytics for efficiency and energy management. These experiences show that AI's benefits depend less on technology itself and more on an enabling ecosystem—governance, infrastructure and data frameworks—that supports its equitable use.[74]

Digital applications across the coffee value chain

Many pilot projects have shown initial promise. For example:

- Blockchain-enabled digital payments in Ethiopia's coffee sector demonstrate the potential for secure, real-time farmer compensation and full traceability.
- Cooperative-level AI grading results in greater export consistency and quality.
- TRACE integrates GPS and compliance data (but remains only partly connected to customs and export systems).

At the same time, scaling is constrained by low digital literacy, inadequate rural connectivity and fragmented governance.[73] Addressing these barriers is essential for ensuring that traceability benefits are inclusive and sustainable.

RECOMMENDATIONS

Global institutions (EU, G20)
Expand funding for compliance-linked AI tools that also support climate adaptation and smallholder certification systems; provide transitional financing and technical assistance to ensure compliance with the EU Deforestation Regulation and recognise local realities in Ethiopia and Kenya.

Regional bodies (COMESA, EAC*)

- **COMESA:** Harmonise digital traceability and certification across borders, integrate AI into customs and trade systems, support multilingual access and enable AI-driven export finance through regional digital platforms.
- **EAC:** Align agronomic standards and traceability protocols; support language localisation and digital extension tools for cooperatives.

Governments (MoA Ethiopia, ECX, Kenya's Ministry of Agriculture)
Develop national digital standards, integrate TRACE with customs systems and expand logistics digitalisation.

Cooperatives and unions
Pool resources for shared AI tools, adopt cooperative-level grading and traceability pilots and train youth as digital intermediaries.

Donors and technology partners
Support open-source platforms, fund rural connectivity and co-design AI tools with women and smallholders.

Academia and research institutions
Track socio-economic impacts of AI adoption, study data governance models and co-create farmer-focused training content.

REFLECTION

AI in Ethiopia and Kenya's coffee sectors illustrates both opportunity and vulnerability. Early pilots in disease detection, grading and blockchain traceability demonstrate potential to improve quality, compliance and climate resilience. If scaled inclusively, these tools could raise export quality, reduce rejection risks and unlock finance for smallholders. Yet without investments in digital infrastructure, skills and cooperative governance, these tools risk entrenching existing inequalities. Coordinated action that combines Ethiopia's production scale with Kenya's quality systems can safeguard East Africa's Arabica share in premium markets. Ultimately, inclusive and climate-smart adoption will determine whether AI strengthens smallholder agency or reinforces external actors.

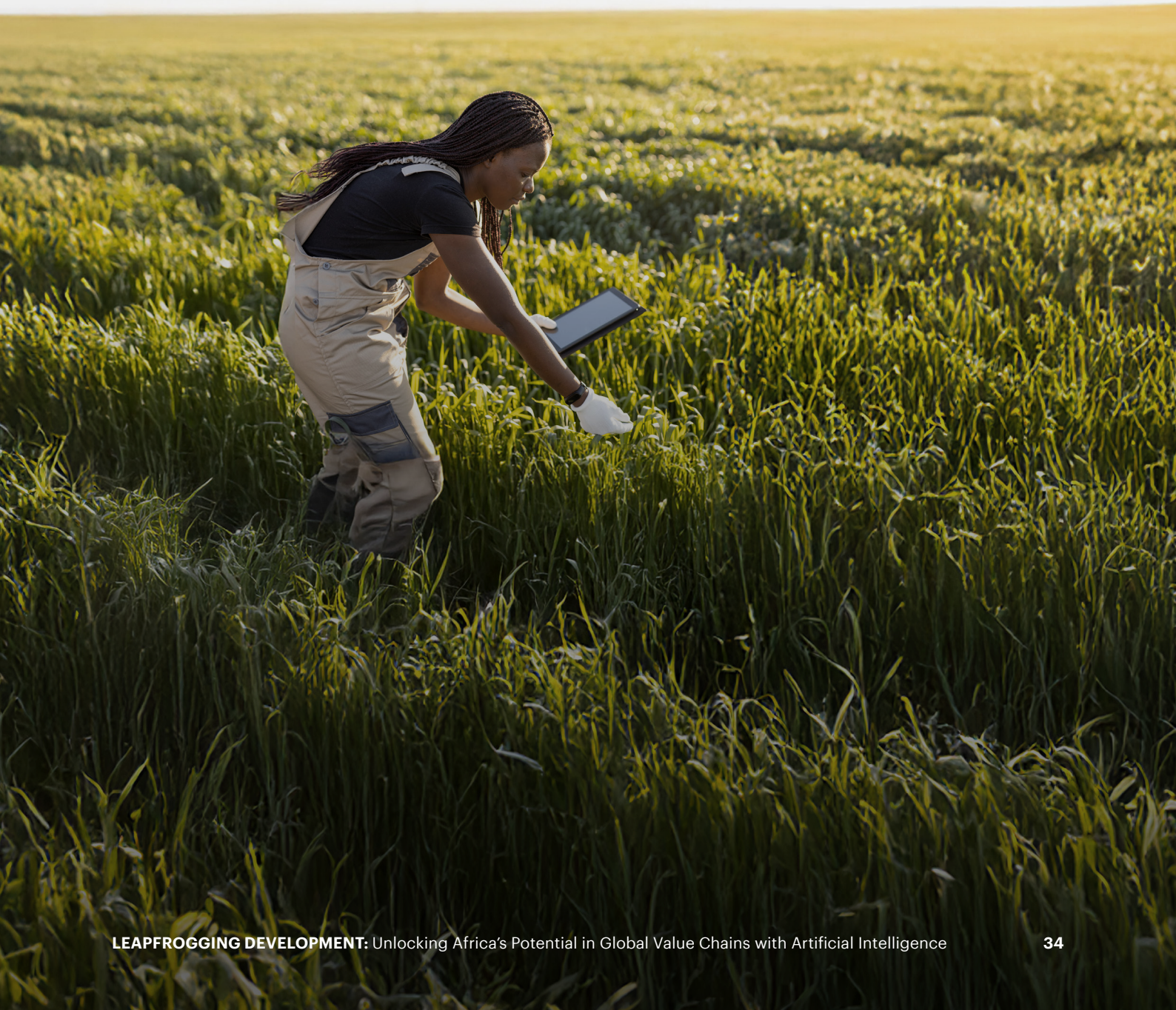
* The East African Community does not include Ethiopia as a member state, yet it is a significant body for both the coffee industry as well as the region.

Section

04

INCLUSION OF WOMEN, YOUTH, AND SMALLHOLDERS: SUGARCANE IN MOZAMBIQUE AND SOUTH AFRICA

Beatrice Grace Aluoch Obado



Region:
Southern Africa

Focus Value Chain:
Sugarcane

Theme: Inclusion

Countries:
Mozambique, South Africa

Regional Body:
Southern African Development Community (SADC)

Sugarcane is a strategic crop in Mozambique and South Africa, sustaining hundreds of thousands of rural jobs, generating export earnings and supporting downstream industries such as ethanol and food processing. Its development, however, reflects a dualistic legacy: large estates dominate production and processing, while smallholder growers, especially youth and women, remain on the margins with limited bargaining power, financial access and participation in higher value segments.

The sector's future is shaped by two interlinked forces. On the one hand, digital technologies such as precision irrigation, satellite monitoring and AI-based traceability are increasingly deployed in commercial estates. On the other hand, most smallholders lack connectivity, literacy and financial means to engage with these tools, deepening inequalities in access and benefit.[75]

For women, these disparities are particularly more pronounced (see box, "Inclusion for women in South Africa, Mozambique and around the globe"). They shoulder a disproportionate share of field labour in sugarcane production—such as planting, weeding and harvesting—yet remain underrepresented in cooperative governance and excluded from key decisions on marketing and technology adoptions.[76]

Their restricted access to land titles and formal credit further constrains participation in the higher segments of the value chain. Unless digital platforms are intentionally designed to address these barriers, the rapid expansion of AI in agriculture risks entrenching structural inequalities rather than reducing them.[77]

Inclusion for women in South Africa, Mozambique and around the globe

In South Africa, one study found that gender was a positive factor influencing smallholder sugarcane farmers' access to credit and ICT, though structural barriers limited income gains from this access.[78]

Global parallels show similar dynamics. In India, cooperative-led digital cane systems improved payment transparency but did not resolve women's underrepresentation in governance, and AI-driven tools have often boosted efficiency in large estates while excluding smallholders due to cost and connectivity gaps.[79] In Brazil, AI-driven harvest monitoring boosted efficiency in estates but excluded smallholders due to cost and connectivity gaps.[68]

A World Bank pilot in Mozambique, however, demonstrated that when women are given tailored capacity-building, they adopt sustainability and digital practices at higher rates.[15] Similarly, in Colombia and Honduras, youth- and women-led digital platforms have achieved high uptake when embedded in inclusive governance structure.[80,81]

Consider an example in South Africa's Limpopo province: satellite-based irrigation forecasting was introduced under a national agri-tech initiative to optimise water use, yet uptake among women- and youth-led cooperatives was low, hindered by weak connectivity, high data costs and limited digital literacy. These barriers meant the tool's potential to improve yields and water efficiency went largely unrealised.

In contrast, a 2024 pilot by the Southern Africa AgriTech Network[71] in southern Mozambique achieved strong adoption. The mobile application, designed for traceability and certification, was deployed through women-led sugarcane cooperatives. Adoption was driven by subsidised training, multilingual content and local facilitation, demonstrating that inclusive delivery design is as critical as the technology itself.

Climate stress also amplifies the risk of marginalisation. Mozambique's coastal sugar belt faces recurrent cyclones, while South Africa's interior provinces increasingly suffer droughts.[68] Meanwhile, global buyers are tightening sustainability and traceability requirements, making digital readiness essential for retaining export access. AI could help farmers adapt, monitor compliance and improve yield, but without deliberate inclusion strategies, it is likely to reinforce existing structural exclusions.

Gender, youth and disability inclusion: Persistent gaps

Women account for a significant share of the sugarcane labour force in southern Mozambique but face lower smartphone ownership, limited financial access and language mismatches that restrict engagement with AI tools.[82] Rural women across Africa are about 25% less likely to own smartphones than men, limiting their participation in mobile-based services.[63] Women in agri-processing are also at high risk of job displacement as automation spreads.[76]

Youth farmers, while generally more digitally literate, often have limited agency in technology design. Interviews from Limpopo revealed strong interest in AI tools but frustration over top-down design processes, inadequate training and lack of opportunities to influence features.

Persons with disabilities remain the least included group. Most agricultural AI tools require visual or touch-screen interaction, excluding those with visual or motor impairments. Few platforms in the region provide audio-based guidance, voice commands or simplified navigation, representing both an inclusion gap and an untapped innovation opportunity.

CHALLENGES

Digital divide
Rural smallholders face weak connectivity, high data costs and limited access.

Gender exclusion
Women provide much labour in sugarcane but remain excluded from leadership, training and credit systems, which limits their ability to benefit from digitalisation.

Youth marginalisation
Despite being early adopters of technology, young farmers in Southern Africa often lack influence in cooperative governance and digital platform design, reducing their ability to shape AI tools to their needs.

Disability gap
Most agricultural tools rely on visual or touchscreen interaction, excluding persons with visual or motor impairments. Few African agri-tech platforms integrate audio-enabled or accessible design features.[83]

Market compliance pressure
Global buyers are tightening sustainability and traceability requirements. Meeting demands requires digital systems that many women- and youth-led cooperatives cannot currently access, risking exclusion from premium markets.[84]

Opportunities for inclusion in policy, finance, compliance and beyond

Inclusive AI adoption in Southern Africa's sugarcane sector presents a chance to address long-standing inequities while strengthening productivity and market resilience. For women, AI-enabled traceability can open access to certification and premium export markets, while digital records can substitute for collateral, improving credit access and bargaining power. Youth, often eager adopters of technology, could benefit if platforms were co-designed with them, fostering innovation in irrigation, climate forecasting and processing.

For smallholders, who remain at the margins of commercial estates, the use of AI-based advisory tools to improve yields and reduce certification costs could enable fuller participation in regional and global markets. And for persons with disabilities—typically excluded from agri-tech—the use of voice-enabled and simplified AI applications provide opportunities for integration, turning an overlooked group into active participants in advisory and compliance systems.

If intentionally designed, AI has the potential not only to enhance efficiency but also to reposition sugarcane as a model for inclusive and climate-smart digital transformation.

Role of SADC and regional policy

The Southern African Development Community's (SADC) Regional Agricultural Policy commits to fostering innovation, youth entrepreneurship and market integration. However, gender, youth and disability-specific indicators are largely absent from digital agriculture initiatives, and programmes often prioritise commercial farming over inclusive smallholder engagement.

SADC could reposition itself by harmonising digital agriculture standards across member states, creating incentives for inclusive AI adoption and facilitating regional knowledge exchange. Insights from Latin America suggest that strong cooperative networks, multilingual platforms and shared ownership models improve both equity and scalability.

Traceability and compliance for market access

Global buyers increasingly require verifiable, sustainability-certified sugar. For Mozambique and South Africa, meeting these requirements is essential for retaining and expanding access to premium export markets.

In Mozambique, the SAATN[71] mobile app logs plot-level GPS coordinates, harvest dates and processing records, aligning with sustainability certification schemes. Offline functionality ensures that data can be collected without continuous network access, then uploaded when connectivity is available. In South Africa, private sector-led traceability tools are emerging but remain concentrated in commercial estates. Integrating inclusive traceability into mill-level reporting systems could expand participation to smallholders and reduce compliance costs.

Lessons from other value chains show that blockchain and QR-coded systems, when paired with multilingual interfaces and cooperative governance, can significantly speed up certification processes and strengthen smallholder bargaining power.[85,61]

Comparative lens: Inclusion across value chains

The sugarcane industry in Southern Africa highlights enduring inclusion gaps in agricultural digitalisation. Women perform significant roles in cultivation yet remain underrepresented in leadership and training. Youth often drive innovation, but face limited access to finance and ownership opportunities, while persons with disabilities are rarely included in platform design or extension programmes. Parallel challenges persist in cocoa, where women lack secure land rights and cooperative representation, and in coffee, where smallholders struggle with digital literacy and certification barriers. Without deliberate design for accessibility and representation, digital agriculture risks replicating existing inequalities rather than resolving them.[86]

Across all three value chains, inclusion gaps are multidimensional. Without deliberate action, AI risks reinforcing existing inequalities.

RECOMMENDATIONS

Global institutions (G20, EU, AU)
Strengthen coherence between continental and global policy frameworks such as the AU–EU Partnership and the Joint Vision for 2030 to harmonise approaches across Africa, enhance institutional capacity and mobilise sustainable investment in strategic value chains.

Regional bodies (SADC)
Promote the harmonised use of AI across the sugarcane value chain by developing shared regional standards for data management, ethical practices and system interoperability. This should be complemented by gender-disaggregated monitoring systems and initiatives that encourage knowledge exchange between the sugar, cocoa and coffee sectors.

Governments (Mozambique, South Africa)
Expand connectivity and affordability, subsidise inclusive AI advisory services and use AI-generated data as collateral to improve women's and youth's access to finance.

Donors and technology partners
Co-fund inclusive AI pilots with multilingual, offline and disability-accessible design; reduce costs through blended finance and scale tools for women-led cooperatives.

Academia and research institutions
Produce gender-disaggregated evidence on AI adoption; assess impacts on productivity and equity and develop participatory design frameworks that include women, youth and persons with disabilities.

REFLECTION

The experience of Mozambique and South Africa's sugarcane value chains illustrates both the promise and the risks of AI-enabled agriculture. Mozambique's gender-responsive pilots show that when tools are designed with multilingual content, offline functionality and cooperative leadership, women and smallholders adopt them readily. South Africa's irrigation initiative, by contrast, highlights how exclusionary design, high costs and weak consultation can prevent women, youth and marginalised groups from benefiting. Lessons from cocoa and coffee reinforce this pattern: across value chains, women contribute the most labour, youth show strong interest in technology, smallholders struggle with compliance costs and persons with disabilities remain largely excluded.

Without deliberate strategies, AI risks deepening rather than reducing inequality. Yet if designed inclusively, AI can reposition sugarcane as more than an export crop: it can become a platform for climate adaptation and market access, while placing empowerment of women, youth, smallholders and persons with disabilities at the centre of Africa's agricultural transformation.

CONCLUSION

SEIZING THE AI OPPORTUNITY FOR AFRICAN AGRIBUSINESS

Beatrice Grace Aluoch Obado
Mayuri Naik
Satish Nrusimhadevara

Africa has expansive trade potential, powered by rapid urbanisation, a growing middle class, accelerating technology adoption and ongoing improvements in transport and logistics infrastructure. Artificial intelligence offers additional leverage at continental scale: estimates suggest AI adoption could lift Africa's GDP by about USD 1.5 trillion by 2030, with SMEs increasing revenues by 15–20%.[25]

Strategically integrating AI within Africa's regional economic frameworks can drive substantial gains in food security, employment and regional stability. These opportunities are especially significant for young populations and rural areas, where AI-enabled transformation can activate value chains and create dignified work. [87] The critical task ahead is to turn structural gaps into opportunities—reframing challenges in infrastructure, governance and inclusion as entry points for innovation.

AI-driven interventions can enable African economies to ascend global value chains by improving productivity, reducing transaction costs and enhancing product quality. This repositioning has the potential to reshape how African countries participate in global markets, fostering more sustainable and competitive growth.[88] By embedding AI into agricultural trade, Africa can shift from dependency on raw exports toward value-added participation.

For young people, this transformation means not only better livelihoods but also a chance to design and manage the digital platforms that will increasingly govern trade.

As value shifts from physical commodities to digital records, control over agricultural data becomes as strategic as control over land. Farmers now generate geolocation, yield and compliance data that feed AI systems, yet often retain no rights over how this data is used or monetised. Without frameworks for data ownership and cooperative governance, AI risks reproducing historic inequalities, where producers supply raw inputs while value is captured elsewhere. Embedding digital tools in fair data policies is therefore essential for farmer agency and value retention.

Realising AI's potential will require deliberate policies that go beyond pilots. Building robust digital infrastructure, harmonising regulatory frameworks under AfCFTA and embedding safeguards for data governance and ethical AI are essential. Investment in digital literacy and workforce training must match investment in technology itself. A continental approach—through AfCFTA and the regional economic communities—can harmonise traceability standards, foster cross-border collaboration and ensure AI is adopted as a public good rather than a donor-dependent experiment.[20]

When integrated effectively, AI-supported customs screening and certification systems can reduce clearance times, lowering trade costs and enhancing Africa's competitiveness in global markets.[89] Likewise, coordinated digital readiness strategies can open premium markets that demand sustainability and traceability, preventing exclusion from high-value trade opportunities.

Cocoa, coffee and sugarcane remain pillars of Africa's agricultural economy, underpinning GDP growth, rural employment and foreign exchange earnings. Yet their value is still constrained by a reliance on raw commodity exports and persistent structural weaknesses. AI offers a path to overcome these limits by enabling traceability, improving quality assurance, supporting climate adaptation and unlocking new forms of value capture.

The promise, however, will not materialise automatically. Without investment in infrastructure, inclusion and governance, AI could reinforce existing inequalities rather than reduce them. To move from pilot projects to sustainable systems, African governments, regional bodies, cooperatives and development partners must align on coordinated strategies that build digital readiness and integrate AI into broader development frameworks.

If pursued with deliberate inclusion and regional coordination, AI adoption can help Africa reposition itself in global value chains—not as a supplier of raw commodities, but as a competitive, value-driven participant.

This transformation would not only strengthen resilience and sustainability but also ensure that farmers, cooperatives and young entrepreneurs capture a fairer share of the benefits of digital agriculture.

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