Artificial Intelligence for Agri-Food System Transformation

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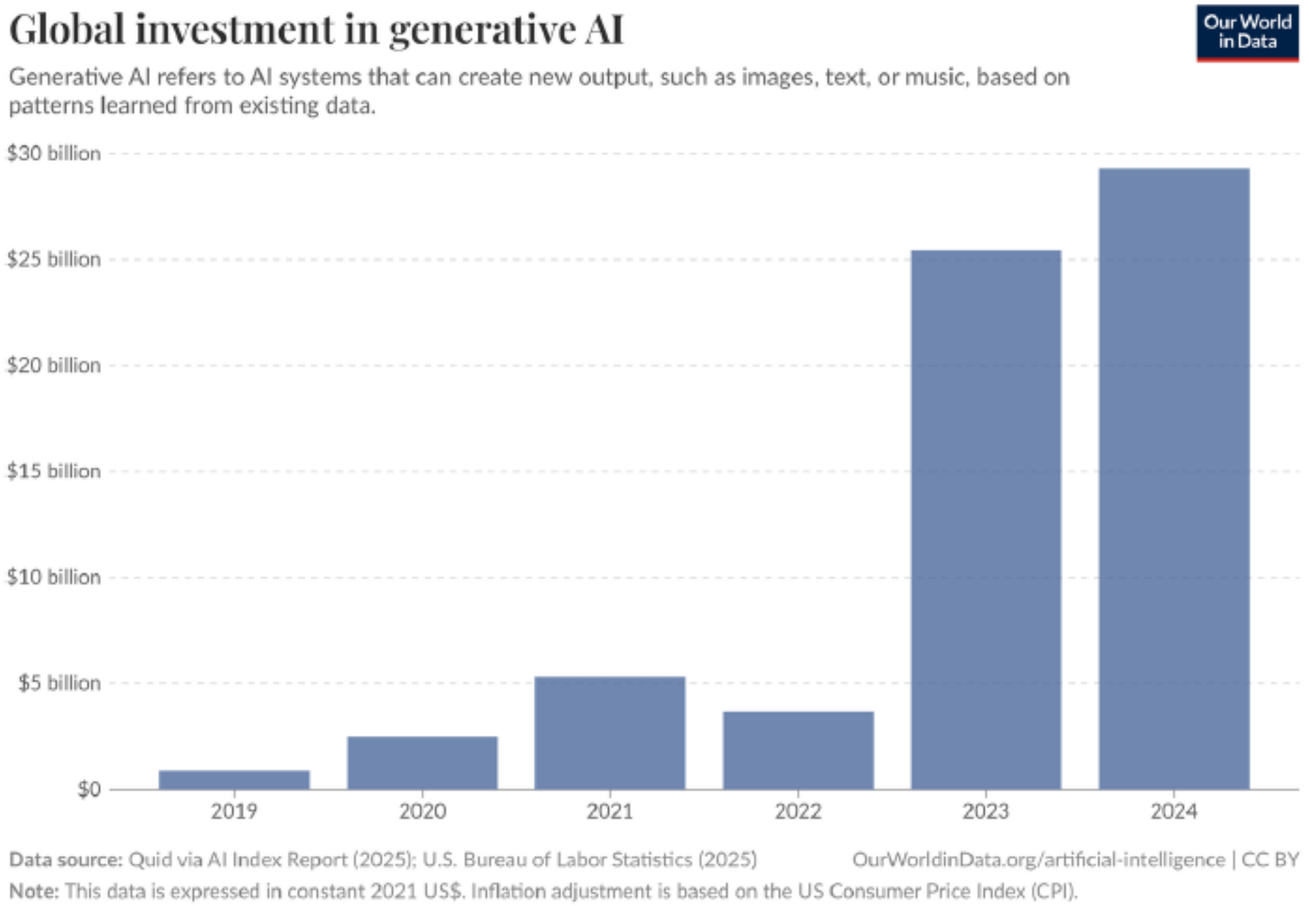
AI-powered Agri-Food System

AI is transforming the agri-food sector, enhancing sustainability, productivity, and food security.

AI in agriculture is expected to grow from $1.5B in 2023 to $10.2B by 2032 (CAGR 24.5%)

Global investment in generative AI has skyrocketed from less than $5 billion in 2019 to over $20 billion in 2023



AI applications in agriculture span the entire value chain

Faster Time to Discovery / Research	Improved Input Targeting / Efficiency	Higher Yields / Better Resource Optimization	Reduced Losses / Improved Quality	Increased Market Efficiency / Reduced Spoilage
R & D	Input Supply	Production	Post Harvest	Distribution & Logistics

Crop & Livestock Discovery

- Phenotyping
- Allele Mining
- Breeding Optimization
- Gene Identification
- Functional Characterization
- Microbiome Optimization

Advisory & Farm Management

- Advisory & ExtensionServices
- Health, Pest, Disease Monitoring
- Precision Agriculture
- Crop Monitoring
- Climate-resilient practices
- Soil Health Management

Inclusive Finance & Risk Mitigation

- Alternate Credit Scoring
- Index based Crop and Synthetic Data Generation

Markets, Distribu-tion & Logistics

- Smart Contracts
- Price Forecasting
- Automated Grading
- Traceability
- Cold Chain & Logistics Optimization

Cross-cutting Applications

- Cold Chain & Logistics Optimization
- Crop Area & Production Prediction
- High-resolution Weather Prediction
- Agro-Ecological Zoning
- Field Boundary Mapping
- Knowledge Discovery

Extension Services: Real-World Impact

AI-powered extension services are already delivering measurable results at scale, dramatically improving the efficiency and reach of agricultural advisory.

Digital Green | NextGen Agroadvisory

- Developed customized 65 fertilizer rates for 277 test sites across three districts in Ethiopia
- Reached 2.2M+ farmers (35% female) with 49% adoption rate since 2012
- Yield increases: 38% improvement using site-specific fertilizer recommendations

$35 → $0.35
Cost per farmer (Conventional vs AI)

$580
Additional income per hectare per season

iSDA | Virtual Agronomist

- Serving over 200,000 plots in seven African countries
- Supporting 17 different crops with personalized advice
- Delivers AI-driven agronomic advice via WhatsApp with instant soil NPK values and sustainable farming practices

1.9x
Yield Increase

4.7x
Profit Growth

Strategic Implication:

AI dramatically extends the reach of agricultural advisory services, reducing cost per farmer while improving outcomes. One extension agent with AI support can deliver personalized recommendations to 1000+ farmers, closing the critical extension gap in developing regions.

Markets, Distribution & Logistics

AI is transforming agricultural markets and supply chains through advanced prediction, optimization, and traceability solutions.

ClimateAi's ClimateLens Platform

- Delivers high-precision 1km-resolution climate forecasts from one week to six months ahead
- Enables agribusinesses to make data-driven decisions through scenario analysis and seasonal forecasts
- Optimizes supply chain planning by predicting harvest timing, yield, and quality across regions

15-25%

Reduction in climate-related losses for agribusinesses

Blockchain-Enabled Traceability

- End-to-end tracking from farm to consumer using AI-verified digital records on immutable ledgers
- AI algorithms verify authenticity and quality parameters through image recognition and sensor data
- QR code scanning provides consumers with complete product journey, building trust and verifying sustainability claims

Strategic Impact:

AI-powered market intelligence and traceability systems are creating more transparent, efficient, and resilient agricultural value chains. By combining climate prediction with blockchain verification, these technologies not only reduce waste and fraud but also connect smallholders to premium markets that value sustainable practices and product origin.

Inclusive Finance & Risk Mitigation

AI is democratizing financial services for smallholder farmers through alternative credit scoring and risk assessment models.

M-Shwari Kenya | Digital Microloans

- Provides digital savings and microloans to previously unbanked rural populations
- AI-powered credit scoring uses alternative data (mobile usage, M-Pesa transactions) to assess creditworthiness
- Particularly benefits sugarcane farmers in regions like Muhoroni subcounty with seasonal financing needs

15M+
Users accessing financial services

72 hrs
Reduced loan processing time

AI-Powered Index Insurance

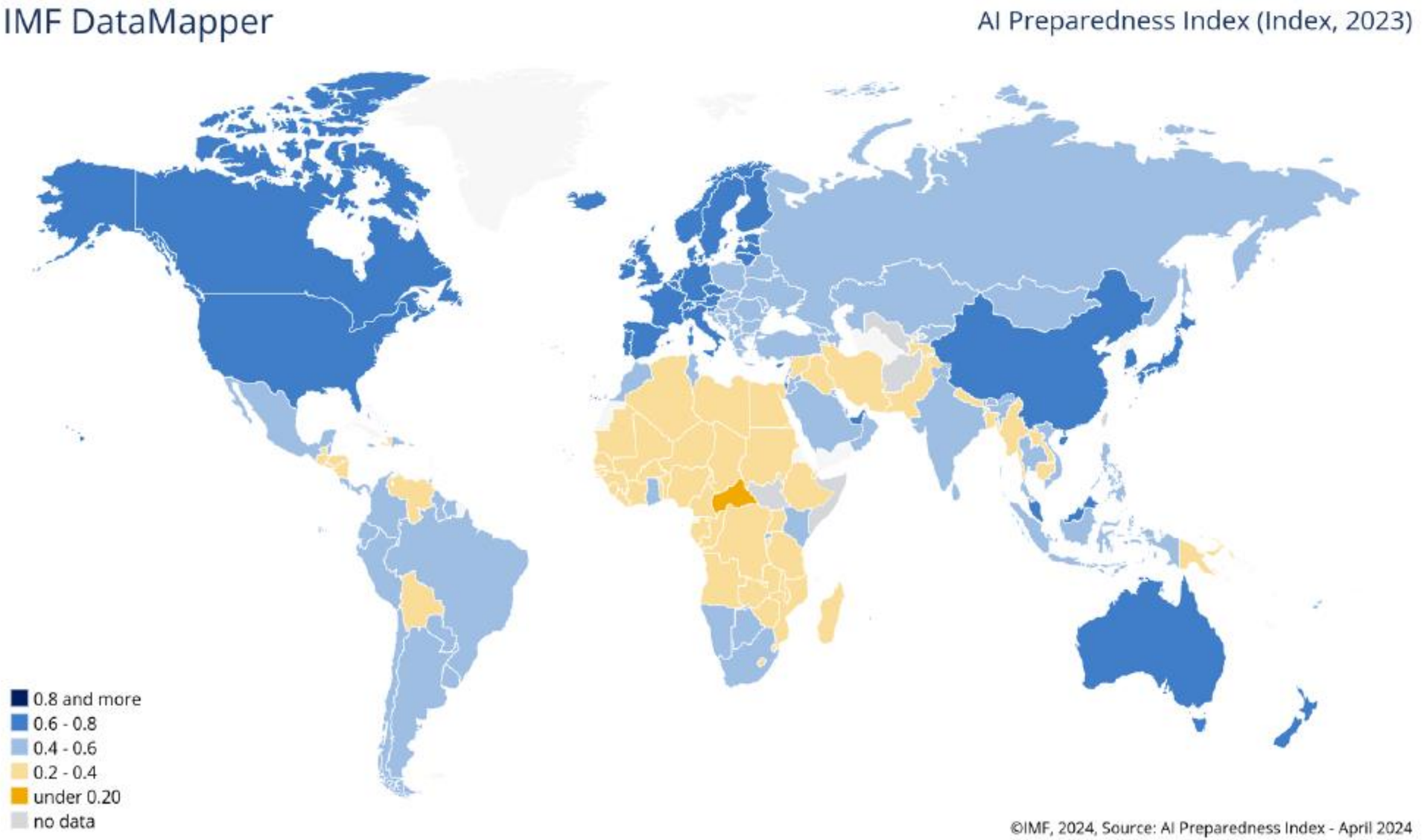
- Uses ML to process satellite imagery, weather station data, and historical yield records
- Automates claims process by detecting weather events (drought, excess rain) without requiring manual field assessment
- Enables affordable premiums as low as $1/month for smallholders while reducing insurer risk

Strategic Implication:

AI enables financial inclusion by overcoming traditional barriers like lack of credit history or collateral. By leveraging alternative data and automating risk assessment, these solutions dramatically reduce costs while expanding access to vital financial services for smallholder farmers.

What’s Holding AI Back?

Digital Divide



Connectivity and Energy Infrastructure

Challenges

- A significant digital divide persists, with rural internet access lagging far behind urban areas.
- Even where network coverage exists, actual usage is low.
- Poor quality of connections limits the use of advanced, data-heavy AI applications.
- Stable electricity remains a core constraint, with over 600 million people in Sub-Saharan Africa lacking access

Opportunities

- Emerging technologies (i.e. satellite internet) enable new connectivity pathways.
- As AI improves, models can run directly on devices without constant connectivity.
- The growth of renewable energy, like large-scale hydro and solar projects, can build the digital infrastructure for AI.

Data Quality and Governance

Challenges

- AI systems are only as good as the data that trains and informs them. In agriculture, most available data—on soil, crops, pests, or climate—originates in high-income regions and lacks local nuance. This creates blind spots and bias in AI outputs when deployed in LMIC contexts.
- Without common standards, AI models struggle to use data from various sources like sensors, satellites, and apps.

Opportunities

- Low- and middle-income countries can build modern, interoperable systems based on open standards, avoiding data silos common in developed systems.

Digital Literacy and Human Capital

Challenges

- A significant skills gap exists. Basic digital literacy, including smartphone competency and data management, has become a foundational requirement for modern agricultural work.
- There is a lack of specialized, cross-disciplinary talent with expertise in data analysis and AI to build and maintain the sophisticated systems the growing agricultural AI market demands.

Opportunities

- The widespread use of smartphones provides a democratic access point for AI tools directly in the field, lowering the barrier to entry.
- AI itself, particularly through natural language interfaces, can make the creation of technology accessible to a broader range of agricultural stakeholders, reducing the need for specialized programming skills.

Creating Enabling Environment

Network Infrastructure - **Bridge urban-rural connectivity gap while leveraging mobile-first and satellite-based opportunities**

Energy Infrastructure - **Power reliable AI systems and innovative policy instruments supporting advances in energy and digitalization**

Data & Policy Governance – **Address governance challenges and manage competing interests with innovative ownership models, open standards and ethical frameworks**

Human Capital Development - **Build digital literacy and specialized expertise through community-based training**

Public-Private Partnerships - **Scale reach and innovation through collaborative frameworks and shared learning models**

Compute – help countries make context-sensitive decisions:

- Use cloud when energy infrastructure is lacking
- Use AI on the edge when network infrastructure is poor
- Fine tune and adapt existing foundational models for local languages

Thank You

To harness AI’s full potential in agriculture, we must prioritize responsible deployment-combining advanced technology with expert oversight, transparent processes, and farmer-centered design. Only then can we deliver on the promise of smarter, safer, and more inclusive agri-advisory for all

What’s Cooking - Digital Agriculture Learning Series
Data-driven Digital Agriculture: Knowledge and Learning Platform