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## Restless Diplomacies

# AI for poverty reduction in Africa

***The applications of artificial intelligence in sustainable development are revolutionary and are driving change in key sectors for economic growth, social equity, and environmental sustainability. Among these is the fight against poverty – ranked first among the Sustainable Development Goals of the 2030 Agenda – a crucial challenge for the African continent, where a significant portion of the population lives dramatically below the poverty line. Integrating AI into everyday practices for poverty reduction represents an extraordinary opportunity to bridge the gap between technology and local communities. Therefore, making artificial intelligence more accessible can enable communities to use these advanced tools to their advantage. There is an urgent need to foster a culture of innovation and trust. Here are some examples of virtuous processes.***

Artificial intelligence (AI) has emerged as a transformative technology with the potential to address some of the most pressing challenges faced by humanity. Its applications in sustainable development are revolutionary, bringing changes in areas crucial for economic growth, social equity, and environmental sustainability. One such challenge is poverty, one of the Sustainable Development Goals (SDG 1), particularly in Africa, where a significant portion of the population lives below the poverty line (Mienye et al., 2024; Regona et al., 2024). The situation is alarming with around 700 million people, 8.5% of the global population, enduring extreme poverty considering the threshold of 2,15\$ per day (World Bank, 2024). The COVID-19 pandemic exacerbated these conditions, halted progress and increased fragility. Sub-Saharan Africa, home to 16% of the world's population, shockingly accounts for 67% of those in extreme poverty. Projections for 2030 are bleak, as the progress toward poverty reduction has stalled, with people living in poverty experiencing lack of healthcare systems, education, electrification and an increased negative impact of climate change (World Bank, 2024). Whereas other parts of the world like China and India have significantly reduced poverty, Africa may not meet SDG 1 by 2030 given that the continent has not structurally changed to create employment in tertiary industries with enhanced globalization in order to absorb surplus agricultural labor, helping reduce poverty in the rural areas.

### **Brief highlights on poverty in Africa**

Poverty is defined in many ways, but most definitions converge on the inability to meet basic human needs such as food, water, sanitation, clean energy, education, and a means of subsistence. With the development of technology and rising living standards, globally, there was hope that the problem of poverty would be solved around the world. However, the gap between rich and poor people is widening daily due to unequal economic allocations in most nations, causing a large number of people to live below the poverty line despite technological advances. The widening gap is because of economic disparities, historical context, socio-political issues

such a poor governance, environmental and climatic challenges (UN, 2023). More profoundly, instability and conflict exacerbates poverty and hinders accelerated economic growth (Hoogeveen et al., 2024).

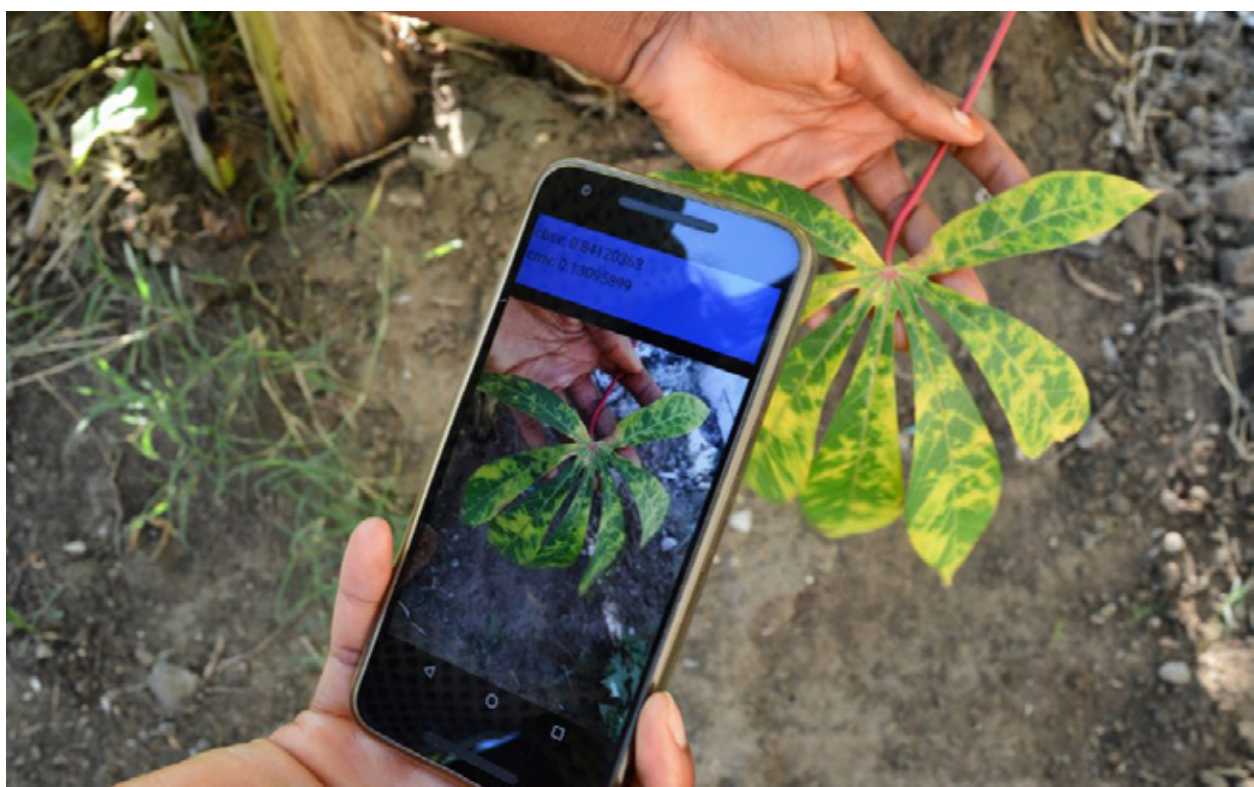
Hoogeveen et al. (2024) show how important stability is for future poverty reduction. Countries that avoided fragility (Benin, Cabo Verde, Gabon, Ghana, Equatorial Guinea, and Senegal) have reduced poverty. Stable countries reduced poverty by 15 to 20% more than fragile countries. Adding that stability extends beyond the ability to preserve peace. Macro-fiscal and debt sustainability are both crucial, as Ghana's recent default on foreign debt demonstrates. Overall, poverty (at \$2.15) has risen from 25% in 2020 to 33% in 2023

Efforts to reduce poverty in Africa requires a **multidimensional approach** that addresses **economic, social, and political dimensions** including promoting inclusive economic growth, enhancing agricultural productivity, supporting SMEs as well as creating an enabling environment for large enterprises to emerge and diversifying the economy, to create sustainable livelihoods for the people (McDermott, 2025). Such multidimensional approach can be pursued through tech-based solutions.

### **AI in Africa: solutions for poverty reduction**

Innovations on AI's applications are underway mostly within the domain of technical people. Its use by ordinary people to eliminate poverty has not been tested widely. We can theoretically posit that it is bound to dramatically change the landscape. Integrating AI into everyday practices for poverty reduction presents a unique opportunity to bridge the gap between technology and the grassroots level. Making AI more accessible can empower communities to utilize these advanced tools for their benefit. This democratization of technology could revolutionize traditional methods of poverty alleviation, fostering a more inclusive approach that leverages the collective intelligence and creativity of the people it aims to serve.

Introducing the application of emerging technologies like AI to the poor in Africa can be a daunting task given the fact that many of the very poor may not have the immediate capacity to use them. However, this can be achieved using the analogy of baby-steps in their early development. Babies learn in steps and once they gain confidence, they move on to another step until they gain their independence. In a similar manner, a team of experts can guide learners – mostly poor farmers in rural areas – through steps such understanding production and consumption data of each commodity to highlight opportunities for exploitation.



Additionally, the team can educate them on understanding the data that affects production, such as soil acidity, alkalinity, and various forms of fertilizer and their impact on pricing and the market. This approach helps shift the poor from guesswork and dependence on exploitative middlemen to developing predictive models and market access. Much like a baby learning to walk, over time, they will come to understand the power of data and monitoring of their assets to achieve desired results. This exercise will give rise to what can be termed the “Baby-Step Theory of Development” (BSTD) where gradual, incremental learning leads to mastery and the effective utilization of AI technology. Just as children progress through sensorimotor, preoperational, concrete operational, and formal operational stages, individuals can start with basic application of AI concepts such as understanding datasets, predictive analytics and resource optimization, and gradually move to more complex applications. This method ensures that learners are not overwhelmed, allowing them to build confidence and competence incrementally.

In the context of introducing AI to the poor, the BSTD posits that incremental learning, facilitated by experts, can enable individuals to progressively understand and harness the power of AI. This theory aligns with the idea that complex skills and knowledge are best acquired through a step-by-step approach, ensuring that learners are not overwhelmed and can build confidence as they progress. In employing the BSTD, AI solutions can be tailored to the specific needs and contexts of African communities, ensuring that the introduction of advanced technologies is both accessible and sustainable.

### **Successful experiences from Africa**

The development of AI and machine learning has given rise to the potential to significantly transform how we approach and solve complex socioeconomic problems. In leveraging vast amounts of data, AI can identify patterns and trends that were previously hidden, allowing for more informed decision-making. Machine learning, a subset of AI, can continuously improve its accuracy and efficiency over time, making it an invaluable asset in tackling issues like poverty. These technologies have progressively transformed from a niche technological innovation to a powerful tool capable of solving complex and multidimensional problems across various sectors (Mienye and Jere, 2024). In recent years, there has been a growing interest in harnessing the capabilities of AI to address pressing challenges in Africa, a continent that is often disproportionately affected by issues such as poverty, climate change, and lack of access to basic services.

Despite the myriad challenges contributing to poverty, AI can potentially offer innovative solutions to bridge the gaps in data collection and analysis, enhance the efficacy of social protection systems, and provide tailored interventions to the most vulnerable populations. In addition, leveraging big data and machine learning algorithms, AI can help identify at-risk communities, predict economic trends, and optimize resource allocation, thus playing a pivotal role in poverty alleviation efforts. The next examples offer a rich experience from the African contexts, which shows the AI applications in combatting poverty.

#### **a. PlantVillage Nuru in the agricultural sector**

One notable example of an AI project showing promise in poverty reduction is the “PlantVillage Nuru” initiative in Kenya. PlantVillage Nuru is an AI-powered application developed by researchers at Penn State University, designed to assist smallholder farmers in diagnosing crop diseases. Using a smartphone camera, farmers can take photos of their crops, and the app uses machine learning algorithms to identify potential diseases and recommend appropriate treatments. This technology helps farmers to increase crop yields, reduce losses, and ultimately improve their livelihoods by providing timely and accurate information. The success of PlantVillage Nuru has been attributed to its user-friendly interface and its ability to operate offline, making it accessible to farmers in remote areas with limited internet connectivity. The project has expanded to other African countries, including Tanzania and Rwanda, demonstrating the

scalability and impact of AI in addressing agricultural challenges faced by smallholder farmers. Through this case study, we see the potential of AI to empower farmers, enhance food security, and contribute to poverty reduction in Africa.

#### **b. JUMO in the financial sector**

Thousands of individuals and businesses across Africa face complex struggles to secure credit for their business, limiting the possibility for them to scale and reach integrate more employees, while also producing more products and services. One of the main reason why African citizens are denied credit is related to the lack of documents to verify their identity, prove employment, or evaluate their credit score. JUMO created a intelligent banking technology, which consists in a platform that makes it simple for banks to provide savings and credit to millions of customers, especially those who are low income and with limited collaterals. In fact, AI can process a big amounts of information, which analyses data on customers to reduce the cost and risk of lending. In this case, the platform makes finance accessible to everyone. Applications such as JUMO are capable of closing the funding gap which is necessary to many informal and formal business to grow and create even more impact on their employees, customers, suppliers, and all the business stakeholders. Ultimately, this is very important to boost the role of many small and medium-sized businesses in Africa to create job opportunities and develop the local economies.

#### **c. Satellite and space technologies**

Another outstanding contribution to poverty reduction can come from new AI technologies offered by satellites. Interestingly, a study by Stanford University applied satellite images in order to collect a significant amount of information on livelihoods conditions. AI, then, plays a crucial role in effectively processing this data, revealing patterns and trends, and offering “a real-time window” into impoverished areas. Major contributions of satellites and AI technologies are for:

**Disaster responses:** satellites can quickly assess the damage, while AI algorithms provide accurate information about affected areas and efficiently manage aid (e.g., drivable roads and debris or flooding, ensuring rapid response and rescues).

**Urban Development:** satellites can guide urban planning and ensure that infrastructure investment is targeted to poor areas such as slums, townships or even rural villages.

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**Agricultural Productivity:** satellite data enable to optimizes agricultural practices and increases yields and food security of farmers living in rural areas.

AI, then, offers a powerful combination that provides African governments, businesses, NGOs and policymakers with innovative solutions and very precise insights that can better contribute to poverty reduction.

## Conclusions

The PlantVillage Nuru initiative stands out for several reasons. Firstly, it empowers smallholder farmers by providing them with advanced AI-powered tools to diagnose crop diseases. This capability significantly enhances their ability to manage their crops effectively and make informed decisions. Secondly, the application's success can be largely attributed to its user-friendly interface and its operational capacity in offline mode. This feature is particularly beneficial for farmers in remote areas with limited internet connectivity, ensuring that vital information remains accessible irrespective of geographical constraints. Originally launched in Kenya, PlantVillage Nuru has successfully expanded to Tanzania and Rwanda, addressing agricultural challenges across various regions, reinforcing its adaptability and impact.

Beyond PlantVillage Nuru, we have seen how AI in Africa presents numerous potentials for poverty reduction across various sectors. In **agriculture**, precision farming, crop monitoring, and pest control harness AI-based technologies to significantly boost agricultural productivity (Goralski & Tan, 2022). Within healthcare, AI-driven diagnostics, telemedicine, and predictive analytics offer substantial improvements in healthcare accessibility and patient outcomes. In the domain of **education**, AI facilitates personalized learning platforms, AI tutors, and efficient educational content delivery, thereby elevating the overall quality of education. **Financial inclusion** is furthered through AI-powered financial services, innovative credit scoring methods, and robust fraud detection systems, which collectively broaden access to crucial financial resources. **Infrastructure and urban development** also benefits from AI, as it optimizes planning, construction, and maintenance processes, ensuring more efficient and sustainable infrastructure growth.

While the implementation of AI solutions for poverty reduction in Africa is fraught with numerous challenges and limitations, the potential benefits far outweigh the obstacles. Addressing the technical, ethical, economic, social, and cultural barriers requires a complex approach and unwavering commitment from all stakeholders. Investing in digital infrastructure and human capital, supporting innovation, ensuring ethical AI use, and fostering collaboration, we can create an environment conducive to leveraging AI for sustainable development.

The path forward demands not only technological advancements but also a **commitment to inclusivity and justice**: ensuring that AI technologies are accessible and beneficial to all segments of society, particularly the most vulnerable, is crucial. As we navigate the complexities of integrating AI into poverty reduction strategies, it is imperative that we prioritize the protection of personal data, mitigate the risks of algorithmic bias, and address the potential socio-economic impacts of automation.

Lastly, innovative funding mechanisms and collaborative efforts between governments, private sector entities, and international organizations are essential to overcoming the financial barriers and scaling AI solutions effectively. In fostering a culture of innovation and trust, we can empower communities to embrace AI technologies and drive meaningful change. Ultimately, the success of AI in poverty reduction hinges on our collective resolve to harness its potential responsibly and equitably. Through concerted efforts and strategic investments, we can unlock the transformative power of AI, paving the way for a brighter and more prosperous future for Africa.

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