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EXTENDED-ABSTRACT

Advancing Sustainable Agricultural Practices in Africa with AI: Interdisciplinary Approaches to Inclusivity and Resilience

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Advancing Sustainable Agricultural Practices in Africa with AI: Interdisciplinary Approaches to Inclusivity and Resilience

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Abstract

Artificial intelligence (AI) is increasingly positioned as a transformative tool in agriculture, yet existing solutions primarily cater to large-scale farms in the Global North, often overlooking the socio-cultural and infrastructural realities of smallholder farmers in Africa. This workshop interrogates how AI can be reimagined to enhance sustainability and resilience in African agriculture by centering farmer agency, cultural knowledge and community and social practice. Building on HCI and CSCW scholarship, we bring together researchers, AI practitioners, NGOs, agronomists, and community stakeholders to explore locally grounded, inclusive, and ethically responsible AI applications. Key themes include trust and skepticism in AI, the role of local languages and epistemologies in model design, strategies for decolonizing AI development and integrating indigenous knowledge and the application of methodologies such as co-design, and participatory AI. The workshop directly aligns with AfriCHI 2025's theme, "Re-centering African Wisdom in HCI," by fostering interdisciplinary dialogue that embeds African perspectives into AI research and practice. We welcome a variety of contributions including papers, case studies and hands-on demonstrations. Outcomes include a collaboratively developed research agenda, and a white paper synthesizing insights from the workshop. By prioritizing African epistemologies and farmer-centered innovation, this workshop aims to shift AI discourse, ensuring that AI-driven agricultural technologies are not only technically robust but also culturally resonant and socially just.

CCS Concepts

• **Human-centered computing**; • **Participatory design**; • **Empirical studies in HCI**; • **Applied computing**; • **Computing in agriculture**;

Keywords

Culturally grounded AI, Indigenous knowledge integration, Smallholder farmer resilience, Decolonizing AI in agriculture

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1 Background

This workshop addresses a pressing challenge: How can smallholder farmers be supported in developing sustainable farming practices amid the escalating uncertainties of rapid climate change? Central to our inquiry is the potential role of artificial intelligence

(AI) in bolstering farmer resilience. Although AI offers transformative potential in agriculture, current solutions are predominantly designed for large, resource-rich farms in the Global North [5, 10, 12]. These systems tend to prioritize efficiency and production over sustainability and resilience, often neglecting the locally specific needs of African farmers, agronomists, and community stakeholders [4, 10, 17]. This challenge is further intensified by ongoing climate stressors, declining extension services, and rapid shifts in the political economy of African agriculture. From the smart farming policies in Kenya, to digital extension initiatives in Nigeria, to climate-resilient agriculture programs in Ethiopia, there is rising momentum to integrate technology in locally relevant ways. Yet many of these efforts are still shaped by top-down models that overlook cultural and linguistic fit.

While AI applications are gaining traction in African agriculture, many existing tools still face limitations when it comes to meeting the contextual realities of smallholder farmers. For example, PlantVillage Nuru, a smartphone-based AI tool that diagnoses crop diseases using computer vision, has shown promising results in offline environments. Yet its effectiveness is often constrained by low smartphone penetration, inconsistent photo quality, and limited integration of indigenous knowledge systems [2, 16]. Similarly, Hello Tractor, often dubbed the "Uber for tractors," connects farmers with tractor owners using AI and IoT-enabled booking. Though it has increased access to mechanization, the model also reveals barriers around affordability, infrastructure, and farmer readiness [13, 21, 22]. Farmer.Chat, a multilingual chatbot developed by Digital Green, uses AI to offer agricultural advice via text, voice, and image inputs. However, field evaluations have identified several usability challenges. For instance, some farmers reported difficulty using the photo-upload feature, experienced latency in receiving answers, and sometimes had to switch between languages (e.g. English and a local language) to navigate the system effectively [7, 23]. These cases underscore the importance of designing AI systems that are not only technically functional but also linguistically appropriate, socially intelligible, and co-created with farming communities. Including such systems in our workshop will allow participants to explore not only what these tools do, but also what they reveal about the frictions and potential of AI in African agricultural practice. While tools such as PlantVillage Nuru, Hello Tractor, and Farmer.Chat are referenced in this background section to illustrate the current state of AI deployment in African agriculture, they are not the focus of the workshop itself. Rather, these cases are intended to surface design tensions and inform discussion around culturally grounded, inclusive, and participatory approaches to AI development.

Recent literature further emphasizes the transformative potential of AI in African agriculture. For instance, Gikunda [11] discusses how AI technologies can enhance precision farming, crop monitoring, and climate-resilient practices, while also highlighting challenges such as technological infrastructure and data accessibility. Similarly, Ayim et al. [3] provides a systematic review of ICT innovations in African agriculture, noting the widespread adoption of mobile-based services and the persistent barriers to their effective use. These insights align with our workshop's focus on integrating African social and cultural realities into AI development, ensuring that technological solutions are both effective and contextually appropriate. By anchoring our inquiry in both tool-specific insights and broader regional literature, this workshop offers a grounded, interdisciplinary foundation for designing inclusive and impactful AI in African agriculture.

Building on established HCI research [6, 9, 10] and emerging discourses on developing AI models by Africans, for Africans, and in Africa [1, 20], our approach seeks to integrate African social and cultural realities—including language, perspectives, and resource sustainability—at every stage of model creation and deployment. By convening researchers, NGOs, practitioners, and community stakeholders, we aim to shift the narrative from technology that merely "deploys" solutions to systems that empower smallholder farmers as innovators and active contributors to knowledge. Importantly, we are committed to engaging diverse voices–from NGOs and local end users to academics from across the continent and beyond–to ensure a comprehensive, locally-grounded dialogue that enriches the design of linguistically and culturally appropriate AI.

2 Objectives

Our workshop is structured around five core objectives:

- Share participatory approaches, co-design methods, and human-centred AI design practices
- Examine how trust, skepticism, and cultural knowledge shape AI adoption in agriculture
- Discuss strategies for integrating African indigenous agricultural epistemologies and ethical frameworks
- Co-develop sustainable AI strategies through interdisciplinary and community-driven approaches
- Address obstacles in AI adoption and illustrate how HCI can contribute to more effective, localized solutions

3 Novelty and Justification

In spite of AI's widespread promotion as a transformative agricultural tool, many current applications fail to fully integrate HCI methodologies and community-centered design principles [8, 14, 15, 18]. While previous research acknowledges the value of HCI in agriculture, a critical gap remains in understanding how trust and cultural adaptation influence AI-driven solutions [9, 12, 19, 23]. To bridge this gap, this workshop will:

- Unite researchers and practitioners committed to designing context-aware and culturally aligned AI systems that support sustainable, resilient agriculture in Africa.
- Share best practices for linking AI research with grassroots agricultural needs, so that emerging tools are usable, trusted, and ethically sound.
- Stimulate dialogue among diverse stakeholders—including HCI experts, AI practitioners, farmers, agripreneurs, and development partners—to foster more inclusive and effective solutions.

4 Proposed Format and Activities

In advance of the workshop, we will share a short participant briefing pack that includes an overview of the workshop goals, curated reading excerpts, and brief summaries of real-world AI tools (e.g., Farmer.Chat, Hello Tractor, PlantVillage Nuru). Participants will

also be invited to reflect on one or two framing questions related to their own experience with agricultural or technological systems. This will ensure a shared foundation for discussion and allow for more contextualized and grounded dialogue during the in-person sessions. This full-day, in-person workshop is designed to maximize interactive engagement through a blend of structured knowledge-sharing, dynamic discussions, and hands-on activities. Sessions are organized around key themes to encourage both critical reflection and collaborative learning.

4.1 *Morning Session*

- Thematic Presentations & Discussions: A series of short paper presentations, position statements, and case studies—highlighting both successes and challenges—will be organized into thematic clusters to prompt sustained discussion.
- Interactive Case Study Discussions: Moderated sessions will allow participants to examine real-world applications of AI in African agricultural contexts, drawing out lessons learned and identifying key challenges.

4.2 *Afternoon Session*

- Breakout Discussions: Focused group discussions will explore essential topics such as trust in AI, cultural integration, sustainability, and ethics, building on insights from the morning sessions.
- Hands-on Demonstrations: Participants will engage directly with AI applications in agriculture through interactive demonstrations that assess usability, adaptability, and overall impact.
- Collaborative Roadmap Development: In a structured session, participants will co-develop an agenda for future interdisciplinary research, policy engagement, and community-driven AI innovation.

5 Relevance to HCI and AfriCHI 2025 Theme

Our workshop directly contributes to AfriCHI 2025's theme, "Re-centering African Wisdom in HCI," by actively challenging conventional, top-down AI deployments and emphasizing the critical role of culturally informed design. Through interdisciplinary collaboration and the inclusion of diverse stakeholders this workshop underscores how integrating indigenous knowledge and local perspectives can transform AI applications in agriculture. This human-centered, ethically robust approach not only aligns with HCI principles but also amplifies African voices, thereby enriching the broader HCI discourse.

Connections to HCI themes include:

- AI & HCI: Designing AI technologies that are user-friendly, trusted, and adapted to African agricultural contexts.
- Ethical & Inclusive AI Design: Tackling issues of bias, accessibility, and the inclusion of diverse voices in AI applications.
- Cultural and Social Considerations: Embedding local knowledge, languages, and traditions into AI to improve usability and adoption.

6 Positionality Statement

As organizers, our diverse backgrounds in Human-Computer Interaction (HCI), AI, digital transformation, ethnographic research, and sustainable development shape our approach to reimagining AI for African agriculture. Coming from academic, industry, and non-profit sectors, we recognize that top-down AI interventions often fail to capture the complexities of smallholder farming, climate resilience, and indigenous knowledge systems. Our positionality compels us to challenge dominant narratives by advocating for co-designed, participatory AI that centers farmers as knowledge holders rather than passive recipients of technology.

Rooted in the values of communal knowledge-sharing, sustainability, and local agency, our work directly aligns with this year's AfriCHI theme, Re-centering African Wisdom in HCI. We draw inspiration from African oral traditions and indigenous knowledge transmission methods to inform AI design, ensuring that technological solutions reflect the storytelling and intergenerational wisdom embedded in African agricultural practices. By working closely with smallholder farmers in Nigeria, Kenya, and Ethiopia, as well as engaging with indigenous farming communities and cooperatives, we ensure that our work is deeply contextualized within lived African realities.

Our engagement is both collaborative and practice-driven, shaped by our work across Microsoft Research Africa, Tallinn University, Brunel University, and Digital Green. With extensive experience in HCI4D, responsible AI, crisis informatics, financial inclusion, and gender equity, we are committed to fostering interdisciplinary, community-led innovation. Fieldwork with farmers in Africa has deepened our commitment to decolonizing AI and co-developing solutions that enhance resilience.

By embedding African epistemologies into our research and design processes, we aim to shift the AI discourse from extractive to generative—one that respects African ways of knowing and empowers communities. Through this workshop, we seek to cultivate a research agenda that is not only technically robust but also socially just, culturally resonant, and contextually grounded in African wisdom.

7 Workshop Outcomes and Next Steps

Participants will leave the workshop with:

- A deeper understanding of how African social, linguistic, and epistemological contexts shape AI adoption in agriculture
- Exposure to participatory, co-design, and decolonial methods for developing AI systems
- Concrete examples of sociotechnical tensions in agricultural AI, drawn from real-world deployments across Africa
- Peer connections and cross-sector insights to inform future research, policy, or community engagement
- A collaboratively defined research agenda for inclusive, context-aware AI design in African settings

8 Plans to Publish Workshop Outcomes

We plan to disseminate the workshop outcomes through HCI/CSCW and AI venues, including workshop proceedings, and special issues. This publication strategy is intended to foster broader engagement

with the research community and stimulate future innovation in inclusive AI for agriculture.

9 Recruitment and Participation Details

- Participants: Minimum of 5 and a maximum of 30.
- Recruitment Strategy: We will target HCI researchers, AI practitioners, NGOs, policymakers, and agricultural stakeholders via academic networks, social media outreach, and direct invitations to key experts.
- Submission Types: Position papers, case studies, interactive demos, or proposed discussion topics.
- Key Dates: Submission deadlines and other key dates will align with AfriCHI 2025 timelines.

10 Call for Participation: Advancing Sustainable Agricultural Practices in Africa with AI: Interdisciplinary Approaches to Inclusivity and Resilience

We invite researchers, practitioners, NGOs, community stakeholders, and African academics to join our half-day, in-person workshop at AfriCHI 2025. This workshop addresses the critical challenge of supporting smallholder farmers in developing sustainable agricultural practices amid the escalating uncertainties of rapid climate change. Central to our inquiry is the exploration of artificial intelligence (AI) as a means to bolster farmer resilience—when designed in a culturally and linguistically appropriate, participatory manner that reflects local contexts.

By centering methodologies such as co-design, participatory approaches, and indigenous knowledge integration, our workshop seeks to reframe AI from a top-down tool into a catalyst for empowerment and local innovation.

We are particularly interested in contributions that revolve around:

- Sharing methodologies for participatory AI in agriculture
- Centering farmer voices in AI system design
- Decolonizing AI to address power imbalances
- Fostering collaboration between academia, industry, and communities
- Exploring adoption challenges in AI-driven agricultural solutions

We welcome submissions in the form of:

- Research or position papers (2-4 pages)
- Case studies or tool demonstrations
- Discussion proposals or interactive design concepts

Submissions should follow AfriCHI 2025 formatting and be submitted via https://forms.office.com/r/Caetee2QQw by Friday, September5, 2025. Accepted contributors will present their work and engage in interactive sessions, including breakout discussions and collaborative problem-solving.

Workshop Date: AfriCHI 2025

Location: Cairo, Egypt

For more details, visit https://www.microsoft.com/en-us/research/event/advancing-sustainable-agricultural-practices-in-africa-with-ai/ or contact .

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