

The Role of Digital Technologies in Promoting African Indigenous Agroecological Knowledge

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Abstract

In a world impacted by globalization and influenced by Westernization, indigenous knowledge is often overlooked and neglected. The neglect of indigenous knowledge has a significant impact on agricultural ecological understanding, commonly referred to as agroecological knowledge. One aspect of indigenous agroecological knowledge that has suffered is African indigenous agroecological knowledge. This paper highlights the importance of African indigenous agroecological knowledge, arguing that it plays a vital role in protecting ecosystems and the environment. Unlike today's mechanized agricultural practices, African indigenous agricultural knowledge is environmentally friendly and inflicts minimal harm to nature. The paper employs qualitative methods to critically analyze, assess, and evaluate these issues, highlighting how digital technologies can aid in the promotion of African indigenous agroecological knowledge. The paper finds that African indigenous agroecological knowledge has been marginalized. The paper concludes that digital technologies should be used to promote African agroecological knowledge.

Keywords: Digital Technologies, Agroecological Knowledge, Indigenous Knowledge, Africa

Introduction

Knowledge is crucial in every area of human endeavour, and is crucial for the advancement of human society and civilization. It is knowledge that has brought humanity to where it is now, whether it is in the scientific, technological, artistic, philosophical, or humanistic domains of life. It is with knowledge that human beings build tools, equipment, appliances, gadgets, etc that are used to create products and services for the welfare of humans. One of the crucial areas where human beings have

created and used knowledge to advance their well-being is in agriculture. With agricultural knowledge, human beings have created food and agro-based products. Agriculture is important for human society. Without agricultural knowledge, human society will be diminished. African indigenous agroecological knowledge has been used for thousands of years to feed African people and promote the sustainability of African societies (Kantiza et al., 2021). Recognise that:

Local communities in Africa have used indigenous knowledge (IK) for centuries in agricultural productivity, preservation of food, and conservation of resources such as water. Using IK, communities have been able to ensure sustainable agriculture productivity and local food security. However, due to a range of intricate and intertwined factors, IK of agricultural practices is rapidly eroding and disappearing. One of the factors is a lack of IK documentation for preservation (Achieng, 2022,p.1).

While agricultural knowledge have advanced human society, agricultural knowledge from indigenous societies such as African traditional societies, which often is rooted in ecological values and beliefs, has also been weakened and threatened by the global world society, especially from colonialism, capitalist globalization, modernization, westernization, and even fanatical forms of religions that sees everything traditional as demonic and evil. There is a right to traditional agroecological knowledge and the development of their knowledge of subsistence (United Nations, 2007). “African farmers face multiple challenges, and agroecology has been proposed as contributing to solutions. However, the viability of agroecological practices for African farmers has been questioned” (Transformative Partnership Platform on Agroecology, 2023, p. 1). To be noted is that: “With the world’s food and agricultural systems increasingly industrialized, homogenized, and privatized, seed epitomizes the struggles involved and is symbolic of the deep injustices that have emerged” (Wynberg, 2024).

Conceptual Clarifications

Concepts requiring explication here are digital technologies, promoting, and African indigenous agroecological knowledge. Digital technology, hereafter DT, refers to electronic devices, tools, resources, and systems that create, store, manage, and can often retrieve data or information; and DT includes communication technology, information technology, and also artificial intelligence (Guest Post, 2023). Computers and computer-mediated forms of communication are a core aspect of DT. It should be realized that DT are involved in almost all aspects of our life today and it converts information to digital format so that the information is processed and also stored for future use; this processing and storing is done through the use of computers, microprocessors, and the internet (Guest Post, 2023). Other examples of digital technologies include: personal computers, tablets, cameras, digital toys, calculators, software, apps, virtual and augmented reality (Johnstone, Kervin, and Wyeth, 2022).

Indigenous knowledge is a geo-spatial, culturally based knowledge that collectively belongs to a people and is both adaptive and holistic (Mistry, 2009). It “...is the collective term to represent the many place-based knowledges accumulated across generations within myriad specific cultural contexts. Despite its millennia-long and continued application by Indigenous peoples to environmental management, non-Indigenous “Western” scientific research and management have only recently considered IK” (Jensen et al., 2021). It can also be seen as:

... a term used to refer to the large body of local knowledge held by indigenous people and includes customs, traditions, traditional ecological knowledge (TEK), group history, spiritual beliefs, cosmology, and traditional language. It is commonly passed down through the

generations orally (via word of mouth), usually from elder to youth. This knowledge is often viewed holistically by indigenous groups with each component being greatly interconnected, forming the foundation of a group's identity and how they are identified by others (Nyayo Discovery, 2025).

What do we mean by African indigenous knowledge? The indigenous here is what is traditional to Africa and has existed in Africa from time immemorial. It is not exogenous to Africa. It is rooted and grounded in the soil and tradition of Africa. African indigenous knowledge comes from the soil, land, earth, and cultures of Africa. It is not foreign knowledge. Indigenous knowledge is also called traditional, local, or native knowledge. This kind of knowledge has evolved with the people for centuries, time-tested, common-sense knowledge that constitutes the cosmovision of the people (Guri, 2016). Indigenous knowledge is often rooted in the spiritual and religious vision of a people.

It is important here to define ecology. It can be understood as: "...the scientific discipline that studies interactions between individual organisms and their environments, including interactions with both conspecifics and members of other species" (Elliot-Graves, 2024, p.1). It is well-established that the term ecology comes from two Greek words, *oikos* (habitation or house) and *logos* (study or discourse) and the term was first used by the German zoologist Ernst Haeckel in 1866 who used the word, *oekologie* to refer to: "the relation of the animal to its organic as well as its inorganic environment, particularly its friendly or hostile relations to those animals or plants with which it comes in contact" (Yadav, 2003, p.1). Ecology studies interactions and interrelationships among all living things, organisms, and everything in existence. Today, the word is often used as a synonym for environment in some discussions. It is the interactions of organisms within their environment, the services they render in the ecosystem, their nutrition, energy, species abundance, and all that affect them to create solutions to save endangered species and mitigate climate change (Michigan Technological University, 2025).

In all societies and cultures, human persons have always interacted with their environments and the organisms and entities in them. African people, for instance, have lived in their different environments and ecologies and studied and related to the environment. They have certain indigenous and traditional ways of living in the environment. It is crucial that their unique lifeways are studied and the viable aspects of them are transmitted to future generations. The indigenous knowledge that they had regarding their environment, which is inclusive of their agricultural knowledge, raises the question of agroecology. Agriculture is here understood to refer to: "...farming. It includes both growing and harvesting crops and raising animals, or livestock. Agriculture provides the food and many raw materials that humans need to survive" (Britannica Kids, 2025, p. 1). It could also be seen as: "Agriculture refers to the practice of cultivating plants, raising animals, and producing food, fiber, and other agricultural products for human use. It is the process of harnessing and modifying the environment to grow crops, rear livestock, and manage natural resources to meet the needs of human populations. Agriculture involves various activities such as land preparation, planting, irrigation, fertilization, pest control, harvesting, and post-harvest processing. It encompasses a wide range of practices, techniques, and technologies used to enhance crop yields, improve animal production, and ensure food security" (Nichepom, 2025).

Agroecology is the application of traditional nature-friendly principles and practices in farming and other agricultural activities, especially in cultivating the land (Ayman, 2023). It is also a bottom-up approach that privileges social and ecological principles, fostering sustainable agricultural praxis with knowledge created from

science, policy, and social movements (Ayman, 2023). “Agroecology is a holistic and integrated approach that simultaneously applies ecological and social concepts and principles to the design and management of sustainable agriculture and food systems. It seeks to optimize the interactions between plants, animals, humans, and the environment ...” (FAO of the UN, 2025, para 1). From another perspective, it can be defined as: “... a body of knowledge, practices and political movements that aims to support transformation of food and agricultural systems to long-term social and environmental sustainability. Agroecology is founded on principles that are implemented in diverse ways dependent on local context” (Transformative Partnership Platform on Agroecology, 2023, p. 1). African indigenous agroecological knowledge (AIAEK) is African indigenous knowledge applied to agriculture.

Challenges confronting the promotion of AIAEK

Agroecology gives a prominent place to the local, local communities and small-scale farmers. This is not to discourage large-scale farmers. But they should operate with ecological principles that do less harm to the Earth. Family farming is one of the most predominant forms of agriculture in Africa. The danger often is to despise small-scale and family farmers as if it is only the large mechanized farming that matters. Many often fail to take into account the fact that mechanized farming is inundated with a lot of environmental challenges, as it contributes a great deal to climate change. Small-scale and family farming does help to foster food security, promote traditional food with a balanced diet, promote agricultural biodiversity, build resilient ecosystems, and mitigate climate change (Ayman, 2023). Ayman rightly notes that these small-scale and family farmers are threatened by large-scale modern corporate industrial farming (2023). Agricultural intensification, together with population explosion, has threatened and endangered agroecosystems and sustainability (Igbatayo, 2003). What industrial modern agriculture in the form of chemicals can do to destroy integrated ecosystems, resulting in the migration or death of birds, can be seen in what is narrated in *Silent Spring*. In this book, it is stated that..

Mining and other extractive industries have devastated the farmland and streams of many farmers and fishermen/women. In a place like Nigeria’s Niger Delta oil spillage and exploration activities have polluted and killed the nutrients in the land. Also, with the advent of the oil industry, some have left their farmlands to work in the oil industry, abandoning their farms.

There is also the challenge coming from urbanization, industrialization, and population explosion. The more urbanization, industrialization, and population explosion are encroaching into the rural places and the African hinterland, the more small communal farms, family farms, etc are endangered and encroached upon. There is also rural-urban migration. As people continue to move out of rural places, more people are leaving rural farms. Not only that they endanger the traditional values they hold dear about the land, but food insecurity also increases.

Insecurity coming from kidnapping, banditry, and herdsmen invading farmers’ land has led to a situation in which many farmers have been killed and died. The more farmers are been killed, the more their knowledge is dying away. It is human beings who carry knowledge, and when this knowledge is documented, it is easy to transmit it to future generations. There is a push in some quarters to relegate African agroecological conservation ethics to the background. This is called ecocolonialism, the disregard for traditional rights and practices for the exploitation of resources, as government and multinational companies desire (Tella, 2015).

The Role of digital technologies in promoting AIAEK

Concerning AIAEK, realize that “it is equally important to publish them in media accessible to those who need them in order to transfer this knowledge to future generations and to popularise them” (Ayman, 2023, p. 5). Digital technologies can help to store AIAEK and make it more accessible to present and future generations. Knowing about earth-friendly practices, traditional methods of storing food and products that use less or no chemicals, etc, need to be kept and stored. Information stored in many forms of digital technologies can easily be retrieved. There is a need for frontal digitalization of African agriculture, including traditional agriculture. “Digitisation refers to everything from delivering farming advice via text messaging to interactive voice response. It also includes smartphone applications that link farmers to multimedia advisory content, farm inputs, and buyers. And it covers the use of drones and satellite systems to inform farmer activities, such as crops and times to plant; and types and amounts of inputs to use” (Abdulai, Duncan and Fraser, 2019, para 2).

We use digital technologies in almost every area of life today. The banking industry, schools, religious organizations, government bodies, etc, all make use of digital technologies. Many services are now automated because of digital technologies. You can go to stores and malls to buy things today without interacting with any human being; all that you need to do is use computer-programmed devices. With digital technology, you can spontaneously communicate with people in any part of the world and also get information from any part of the world. With digital technologies, there are many things that you don’t need to remember or memorise. You just need to type on a Google search or any other search engine, and instantly you can get the answer. Digital technologies are so powerful that they are some of the things that have made our world a global village. But it is only what is first stored there that can normally be retrieved from them.

Africa has found herself in the global village. If she were to ignore DT, it would be to her peril. Africa must share and make its own communication to the global village. It is for Africa to use DT to promote its heritage of AIAEK. There is so much AIAEK in African villages and towns, in African small-scale farming communities and rural places. There is also much knowledge in the hearts and minds of many rural farmers. This knowledge is dying away when these farmers die unless it is retrieved from them and stored. This is where DT comes into play.

DT can also be used to enhance the work of farmers on small and family farms. It can be used to irrigate, clear grass, harvest fruits, gather, and store seeds without using chemical procedures that damage the soil or the seeds and fruits being gathered. Artificial robotic gadgets can be used to transport and transfer seeds and fruits, etc. Many time-saving electronic devices can be used in traditional agriculture. Advocating for traditional agroecology is not a rejection of viable aspects of modern industrial agriculture.

With the challenges often associated with modern industrial agriculture, do we have to abandon it? The issue should not be either or. But rather, how to tap into the good points in each. Ideas can be drawn from the writings of the Dalai Lama, he argued that while growing up in his native Tibet, life was peaceful, calm, and more harmonious, and people enjoyed a tremendous measure of happiness, but with the coming of urbanization and industrialization, that happiness has disappeared. He argued that he is not advocating for a return to traditional society but for a society in which, while enjoying the benefits of a modern industrial society, we are equally able to gain happiness at the same time. While not abandoning modern industrial agriculture, its excessive and negative aspects that destroy the earth can be restrained, while the good aspects are retained. Modern industrial and technological agriculture should not be forced upon people. Principles of valuing and protecting the Earth

gained from traditional societies should be incorporated into modern industrial agriculture. Little community and family farming, rural farming that does little harm to the earth, should be encouraged. Domestic farming in people's backyards and their neighbourhoods should be encouraged. Everything should not be about big, big, big. The small matters also.

Digital technology can also be used in the production of food and the making of agricultural products. DT can be used to promote information about AIAEK. They can be used to market products and services coming from African agroecological farms and systems. The mobile phone or handset, for instance, has become a powerful tool in the hands of many African market women and men, even in rural places. The following debate is ongoing on digital technologies and African indigenous agroecology:

The digitalization of African agriculture has become a battleground between supporters of the conventional Green Revolution and the Agroecology movement. While the Green Revolution proponents see digitization as a technological solution to boost efficiency and productivity, the African social movement views it through the lens of political economy. The movement raises crucial questions: "Who owns the technology? Who controls the data extracted by digital technologies?" These concerns highlight the power imbalances that digitalization can exacerbate, particularly when technology is tied to covert bilateral and multinational agreements. Despite these challenges, the movement also recognizes the potential of digital technologies to engage the next generation in agriculture, eliminate exploitative middlemen, and promote healthy food production and consumption (Afsasite, 2024, para 2).

It is not who made the technology that should matter to us now, but how we can use it to our advantage and benefit. There are many Africans today in the African diaspora. These Africans in the diaspora should use digital technology to advance African indigenous interests. In many big cities in the Western world today, you can see African markets where African products and foods grown in African soil are sold. Many of these stores and markets use digital technologies. African indigenous agricultural principles should be multiplied in the Western and Asian world with the use of digital technologies.

It will not be out of place to note some of the challenges of using digital technologies in Africa. They include: "Limited internet connectivity, low digital literacy, inadequate infrastructure, and affordability issues impede progress" (Churoma et al, 2024). In other parts of the world, digital technologies are used to give farmers real time information about the weather, notify about market prices, offer agricultural extension services, unmanned drones are used to identify weeds and used to save labour, but unfortunately in Africa the use of digital technology is still very low (Churoma, 2024).

Some Elements of AIAEK and Imperatives of Promoting AIAEK

At the heart of AIAEK is the theistic worldview. This pervaded traditional African agriculture. This belief should not be discounted. The land is a gift from the supreme being, the land is alive (even considered a goddess in some African culture such as the Igbo), humans are to farm the land not as owners but in trust to the ancestors, and in the truest sense the land cannot be parceled, the fertility of the land depends on the earth goddess" (Ikeke, 2006). It was expected that people were to farm the land in humility, gratitude to the Almighty, and protect it from harm. Among the Igbo people, the New Yam festival: "...was an occasion of giving thanks to Aní, the

earth goddess and the source of fertility...She was the ultimate judge of morality. And what was more, she was in close communion with the departed fathers of the clan whose bodies had been committed to the earth" (Achebe, 1959). Because of beliefs concerning the land, they were to farm the land without waste or vandalism.

Africa was a land filled with many taboos and religious beliefs to protect the land and agriculture. Forests and trees were an important aspect of AIAK. As important as farming and indeed all of agriculture is, it was believed that there are sacred forests that carry the immanent presence of the divine. Those forests were not to be touched, farmed, or inhabited by human beings. But unfortunately, this is not the notion embedded in modern industrial agriculture. In modern industrial agriculture, rooted in the spirit of rugged capitalism, untouched, unfarmed, and uninhabited land is a waste. It is only useful when it can be farmed, inhabited, or products gotten from it. Forests and trees are simply natural resources needed for human utility. Besides, forests and trees are also streams, water bodies, sacred groves, etc. They are as valuable and even more valuable than cultivated land. African cultural heritage protected fauna and flora from extinction, and there were also innovative irrigation methods, crop mixture, selective hunting of animals, especially game animals, controlled fishing, such as seen in the Argugu fishing festival, and the planting of useful species (Tella, 2015). The Lisabi forests in Degesin village in Ogun State, Nigeria, are protected, and that forests can be found to have different species of plants and animals such as black mamba, cobra, python, antelope, and grass cutter (Tella, 2015).

Now that it has been stated the different ways that digital technologies can be used to promote AIAEK, it is important to state the imperative for this issue. It is a human right to have one's indigenous or traditional knowledge known and also practiced. Indigenous knowledge about agriculture and ecology should not be abandoned for mechanized modern agriculture. Insofar as indigenous agroecological knowledge does not offend against human rights and human dignity, and the demands of gender equity, it should be encouraged. People should not be forced to accept modern agricultural methods and means. Even with modern mechanized agriculture, there is still a place for small-scale community and family farms and gardening. People should be free to make use of traditional means that do little damage to the soil in these places. It is a well-known fact that much of animal and bird farming today is mechanized. A chicken can be reared in 3 weeks for consumption with the use of steroids. This poses health challenges for people. There are still people who prefer to rear birds traditionally in the open in their backyards without chemicals. For health reasons, this should not just be tolerated, it should be encouraged.

The environmental damage done by modern industrial farming should not just be ignored and wished away. AIAEK needs to be preserved. It is an ancestral heritage that should not be discounted. It can be modified and transformed, but not discarded entirely. It has enabled African societies to navigate for centuries and continues to sustain many communities till today. Keep in mind that:

In Cameroon's Batchenga subdivision, indigenous communities possess a wealth of agroecological knowledge passed down through generations. Their finely tuned farming practices account for local conditions, including seasonal variations, specific soil types, and available resources, enhancing agricultural system resilience in the face of climate change. The Batchenga community has also developed sustainable resource management strategies, such as crop diversification, agroforestry, and local seed preservation (Chimi et al., 2025).

It is well attested that AIAEK is sustainable and has helped to mitigate climate change and conserve the environment. The following author argues that: "Such complex farming systems, adapted to local conditions, have helped small farmers to sustainably manage harsh environments and meet their subsistence needs without depending on mechanization, chemical fertilizers and pesticides, or other modern agricultural technologies" (Altieri, 2016, p. 8). This same author argues further that: "Agroecological systems offer promising models for healthy agriculture as they promote biodiversity, thrive without external inputs and sustain year-round yields in the midst of climatic variability" (Altieri, 2016, p. 8). There is no viable reason not to support agroecology. It has helped people, and it has contributed to food security. Note that:

While industrial farming claims to have raised yields, it has done so at great cost, with extensive soil damage, huge biodiversity loss, and negative impacts on food sovereignty. By contrast, agroecology offers a wide range of sustainable benefits far beyond yields. Where conventional agriculture seeks to simplify, agroecology embraces complexity. Where conventional agriculture aims to eliminate biodiversity, agroecology depends on diversity and builds upon it. Where conventional agriculture pollutes and degrades, agroecology regenerates and restores, working with nature, not against her (Farely, 2016, p.10).

AIAEK can help secure food security and sovereignty. The influence of westernization and modernization has often led people to abandon their traditional and native food. Many cannot even name their traditional food and festivals. As people engage in small-scale agroecology, they are likely to grow traditional seeds and crops in their locality.

Conclusion

The paper discussed the role of digital technologies in promoting African indigenous agroecological knowledge. The paper showed that AIAEK is important in environmental preservation and conservation. It was shown that AIAEK refers to the indigenous agricultural practices in Africa that were ecologically friendly. For thousands of years, African peoples have used their indigenous agricultural knowledge to survive in their communities and preserve their environment. Compared to modern mechanized and chemicalized agriculture, the African indigenous agricultural practices were healthier for the people and the environment. AIAEK has been confronted by globalization, Westernization, modernity, and many other forces. The paper argued for the need to bring the good, environmentally friendly aspects of both modern agriculture and indigenous agroecological agriculture into conversation. It was also argued that because of the significance of AIAEK, digital technologies should be used to promote it. If this is done, it will help to create a more harmonious Africa.

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