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## Women's Use of Indigenous Knowledge for Environmental Security and Sustainable Development in Southwest Nigeria

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# Women's Use of Indigenous Knowledge for Environmental Security and Sustainable Development in Southwest Nigeria

## **Abstract**

Indigenous women are important part of a community's social capital. This study examined women's use of Indigenous knowledge (IK) for environmental security and sustainable development in southwest Nigeria. Qualitative data was collected using in-depth interviews conducted among 80 purposively selected rural Yoruba women. The data were analysed using descriptive tools such as frequencies, percentages, and content analysis. The findings reveal an extensive wealth of IK used in agriculture, food processing and preservation, family health care, and child care. The findings also suggest that paying attention to IK will help to incorporate culture as part of rural development and sustainable development in Nigeria, leading to more successful outcomes using place-based knowledge. Indigenous women can, and should, contribute to the design and implementation of sustainable development initiatives because of their extensive IK.

## **Keywords**

women, Indigenous knowledge, environmental security, sustainable development, southwest Nigeria.

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## Women's Use of Indigenous Knowledge for Environmental Security and Sustainable Development in Southwest Nigeria

Historically, African rural communities have been greatly endowed with Indigenous knowledge (IK) regarding how to carry out activities to ensure survival and over time notable progress in development has been made using this knowledge. Many Indigenous people believe that there is a holistic interconnection among all things on the planet: animals, plants, natural forces, human beings, and the supernatural life. Indigenous modes of traditional farming, fishing, pastoralism and herding, foraging, and forestry are based on long-established knowledge and practices that help ensure ongoing agricultural diversity and the preservation of valuable landscape and seascape features, livelihoods, and food security (Food and Agriculture Organization of the United Nations [FAO], 2009). The fact that humans depend on the environment for their existence and sustenance means that life is shaped by the environment and this underscores the need for protection from all forms of environmental degradation, especially those brought about by the activities of humans. In light of the significance of the environment for human survival, many environmental issues have received global attention, and communities across the world have undertaken efforts to make the world a better place for human habitation. Indeed, this is likely because the state of the environment continuously affects the health of those who depend upon its provisions.

Development planners and policy makers are beginning to recognise the need to understand existing knowledge systems and decision-making processes as they focus their attention on small-scale agricultural producers. However, traditional livelihoods and Indigenous plant varieties, landraces, and animal breeds are increasingly endangered by large-scale commercialization of agriculture, changing population dynamics, land-use or cover changes, and the impacts of global climate change. Ill-informed climate change-related strategies, policies, and interventions could exacerbate underlying vulnerabilities to the impacts of climate change. Research on local communities' experiences with climate change in sub-Saharan Africa show that unpredictable and severe weather phenomena such as floods, droughts, and desertification have affected food security, access to water, livestock and wildlife management, and community cohesion (Raufu, Kibirige, & Singh, 2015).

A critical look at these issues shows that environmental security, IK, and sustainable development are very closely linked. IK is an important asset with regard to the social capital of local people, particularly insofar as it often constitutes the main resource for their livelihoods (Nnadi, Chikaire, & Ezudike, 2013). In Nigeria, however, the efficacy of IK in enhancing sustainable development has not been effectively incorporated into most development projects. Since Nigeria's independence in 1960, communities and other stakeholders have implemented many different development initiatives; many of which have not achieved or recorded much in the way of notable successes due to their failure to include IK (Olatokun & Ayanbode, 2009).

IK's potential ability to improve agricultural production can be gauged by the traditional agricultural sector,<sup>1</sup> which accounts for the largest proportion of the economy in Tanzania (Mushi, 2008). For

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<sup>1</sup> The traditional agricultural sector is characterized by multipurpose units geared to subsistence production using simple technologies, with a division of labour based on sex and age. The soil and plants are often treated with noxious, laboratory-produced products to prevent disease or pests from blighting the plants.

instance, some farmers have planned their agricultural production by using IK to ensure both food security and sustainable agricultural production (Asogwa, Okoye, & Oni, 2017). By storing and preserving food, households ensure that they secure food without jeopardizing future access to it or consumption of it (Kamwendo & Kamwendo, 2014), thereby translating into resource access, entitlement, and security. In this way, IK represents a valuable source of local solutions to issues of food insecurity, particularly in terms of the ability of rural populations to access food during seasonal shortages or major stress periods such as droughts.

IK is also part of the healthcare systems in many Indigenous communities. According to Eyong (2007), more than 80% of the world's population uses traditional healthcare services. This claim is supported by Soewu and Ayodele (2009), who have found that traditional healthcare is often combined with conventional healthcare systems. In some communities, traditional healing approaches are the main ways through which to address various health and well-being problems. This indicates that IK can positively address and impact the health of people in many communities.

Another area in which IK plays an important role is the conservation of water. Cheserek (2005) has noted that, in order to protect water bodies from contamination, Indigenous communities follow certain taboos. These taboos include not washing in or near the river or stream, not allowing lactating mothers to come to water points, and prohibiting the throwing objects into water bodies. These taboos are intended to assist the efforts of communities to protect and conserve water, which is a very important resource. The success of development projects and initiatives in some communities has depended solely upon grassroots participation of local people—which is a result of understanding and harnessing of their IK.

Rural women are pivotal to development in African countries as they play diverse roles in development projects and initiatives. They contribute to wage activities, engage in the marketing and distribution of foodstuffs, and ensure the survival of both the family and social unit. Specifically, their domestic activities make vital contributions to the maintenance of local economies. For example, Yoruba women possess an enormous amount of knowledge about food production and processing, medicine, childrearing, and other survival skills. It is therefore important that Indigenous women, as custodians of knowledge about both biodiversity and land use and management, are recognised and encouraged to use their knowledge to enhance sustainable development.

The abysmal failure of non-traditional agricultural techniques in Africa has made it critically necessary for Africa's agricultural policies to revert to its age-old Indigenous agricultural technologies. Olukoya (2006), in his study with the Ikale-Yoruba people, has argued that the utilisation of the Ikale's IK system enabled Ikale farmers to become the undisputed regional experts in food crop production in southwestern Yoruba land during the period under review. He further argued that modern approaches to agricultural development in Africa will continue to fail unless they take into consideration Africa's homegrown innovative farming techniques and IK systems. In essence, Yoruba IK finds application and relevance in all spheres of human activity and forms the basis of development. A careful reading of Yoruba intellectual traditions reveals the extent and ramifications of Yoruba knowledge, which, if properly studied, would reveal an uncommon commitment to inquiry, research, investigation, and the functional application of knowledge to solving human problems.

## The Problem

The most serious problems facing the world today include water and food supply crises, extreme volatility in energy and food prices, rising greenhouse gas emissions, large income disparities, chronic fiscal imbalances, and terrorism (UNU-IHDP & UNEP, 2012). These challenges stem from environmental mismanagement or inequality—or, indeed, from both. Indigenous Peoples inhabit some of the world's most challenging, vulnerable, and biodiverse environments—many of which depend mainly on the use of natural resources for subsistence—which suggests that Indigenous Peoples should play a crucial role in the sustainable management of these lands and waters, as well as the natural resources and species that share these environments with Indigenous communities. Unfortunately, however, the voices of Indigenous women are seldom heard when discussing, planning, and implementing sustainable development and environmental conservation projects. Often, potential solutions are masked or hidden because they come from women, whose voices are either not heard or not included in decision-making processes.

Ignoring Indigenous women in the planning and execution of sustainable development initiatives not only violates these women's right to participation, but also forecloses the inclusion of that valuable, sometimes even critical, contributions regarding opportunities for better planning and implementation. Women have taken a great interest in environmental resource management and have generated a wealth of IK (Denton, 2002). In Yoruba communities, men and women often have different needs and different priorities when it comes to resource use and management. They have different degrees of access to and control over natural resources (in accordance with customary laws and practices of their distinct communities). They use the environment in different ways, they may use different resources or the same resources in different ways, and they have different knowledge the ways in which the environment and natural resources suffer as a result of environmental degradation following unsustainable resource extraction and destructive infrastructure projects.

Yoruba women, through their roles as farmers and collectors of water and firewood, have a close connection with their local environments and often suffer most directly from environmental problems. Their direct contact with their environment has produced their deep knowledge about it. They have served as agriculturalists, water resources managers, traditional scientists, and more. With this in mind, the underlying premise of this study is that Indigenous Yoruba women are an important part of their community's social capital, which enables them to the design and implementation of sustainable development initiatives.

With their gender-specific knowledge, skills, social relations, and networks, Indigenous Yoruba women can make critical contributions to designing viable, practical solutions to the challenges posed by environmental change and unsustainable development (Ibnouf, 2013). They can:

- Help conserve the diversity of native and domesticated plant varieties that are necessary for maintaining resilience in agriculture and ensuring food security (Nnadi et al., 2013);
- Enhance existing knowledge about agricultural and seed conservation, medicinal plants, and healing practices that can be integrated into community health programs (Aluko, 2016; Asia Indigenous People's Pact [AIPP], 2012; Borokini, Ighere, Clement, Ajiboye, & Alowonle, 2013); and

- Propose alternative land-use practices or income sources to reduce pressure on endangered species and resources that are critical for local livelihoods (AIPP, 2012).

It is against this backdrop that this article examines the link between Yoruba women's use of IK for environmental security and sustainable development in southwest Nigeria. Since Indigenous Peoples around the world have developed close connections with the lands, waters, and environments in which they live and work, it has become clear that their IK can be a valuable resource for addressing resource management and environmental security. Often, environmental degradation has serious negative consequences—droughts can cause food shortages and the spread of infectious diseases, for example. Indigenous women possess special knowledge about how to ensure the survival of the family in these situations; their domestic activities contribute to the maintenance of local economies to enhance sustainable development. This study aims to highlight Indigenous women's potential and emphasize their innovation through their use of IK for environmental security and sustainable development.

### **Conceptual Issues**

#### **Indigenous Knowledge (IK)**

In this article, IK refers to traditional knowledge associated with African cultures. It is largely inherent in the community, and it is not associated with any form of formal learning or training; rather, it is transmitted or taught through oral tradition and is deeply rooted in African culture (Ugboma, 2014). African cultural heritage consists of different cultural values, IK, and heritage materials. IK resides in the heads and on the lips of its custodians, passed down through generations through oral tradition. Even in an increasingly digital age, oral tradition remains an important means of preserving and transmitting IK.

In this study, IK represents a possible alternative path for progress among the world's rural poor. As Escobar (1995) has stated, "the remaking of development must start by examining local constructions, to the extent that they are the life and history of the people, that is, the conditions for and of change" (p. 98). Such an approach to "remaking development" (Escobar, 1995, p. 98) can be supported by careful ethnographic work that seeks to tease out the complex interrelationships between communities and places (Herbert, 2000). Importantly, this approach implies a change that comes from within communities themselves by demonstrating confidence in and deployments of IK, among other things, as factors that can bring about economic and social progress. In this way, the rural poor would have a voice in discussions about progress that materially affect them, and outsiders would listen seriously to them, learn from them, and respect their realities and priorities (Chambers, 1983).

#### **Environmental Security**

The relationship between the natural environment and the security of humans has been the object of much research and the subject of many publications in recent decades, but it has only recently become an important focus of international environmental policy. Even though there is no universally agreed upon definition or concept of environmental security, it is evident that the Cold War meaning of "security"—which invokes the spectres of militaries and nuclear fallouts—no longer dominates international discussion of what the word security implies for policymaking. Today, security possesses a broader meaning, one that includes economic stability, population growth, sustainable natural resource

use, and environmental protection. This understanding of security generally puts more emphasis on the security of people and their overall well-being and needs than it does on the security of nation states.

Environmental security is central to national security insofar as it comprises the dynamics of and interconnections between natural resource bases, the social fabric of a state, and the economic engines of local and regional stability (Myers, 2002). To the extent that humankind neglects to maintain the life-supporting ecosystems that generate water, food, medicine, and clean air, current and future generations will be confronted with increasingly severe instances of environmentally induced change (Floyd, 2007). Examples of emerging environmental change include the depletion and pollution of fresh water supplies; the depletion of fisheries; the degradation and disappearance of biodiversity; the degradation and loss of agricultural lands, food, and health and safety, as well as stratospheric ozone depletion and global warming. Indeed, our ability (or lack thereof) to make innovative institutional arrangements and/or technological advances to manage these environmental security challenges will immediately impact global security.

Though the concept of environmental security is not easy to define, this article approaches it in relation to environmental changes. In the light of degradation and loss of agricultural lands, food, and health and safety, how Indigenous women are able to use the knowledge they are endowed with to protect their environment from the dangers caused by natural or human processes in order to support health, livelihoods, and food production is of critical importance.

### **Sustainable Development**

The term sustainable development has been defined as “development that meets the needs and aspirations of the current generations without compromising the ability to meet those of future generations” (Nigerian Institute of Social and Economic Research [NISER], 2009, p. 13). Generally, sustainable development balances the conservation of natural resources with the needs of development. For this article, sustainable development refers to developments that improve the quality of human life from within the capacities and limits of supporting ecosystems.

As noted by Harris (2000), the need to achieve environmental sustainability is rooted in recognition of the fact that (a) the benefits of development have been distributed unevenly, and (b) development has negatively impacted both the environment and social structures. It has been recognized, for example, that many traditional societies have been devastated by forest depletion, water system disruption, and overfishing; similarly, urban centres in many developing countries have suffered and continue to suffer from extreme pollution, inadequate transportation, poor water quality, and lack of infrastructure. Mead (1974) has referenced this negative trend, stating:

We are living beyond our means. As a people, we have developed a life-style that is draining the earth of its priceless and irreplaceable resources without regard for the future of our children and people all around the world.

The fear is that, if the trend of environmental degradation and resource depletion continues, the achieved benefits of development may be eroded. There may also be a collapse of ecosystems that will jeopardize present and future development.

## **Importance of Indigenous Knowledge in Attaining Environmental Security and Sustainable Development**

While IK practices rely on vibrant, reliable principles of interaction between humans and their environments (Shaw, Takeuchi, & Sharma, 2009), the policy context for its use in the management of environmental issues still remains undefined; this is due largely to the ongoing privileging of scientific and technology-based forms knowledge. In the last decade, the global explosion in population, accelerated urbanization, and income growth have become unsustainable. Together, they have generated growing, often competing, demands for food, natural resources (such as soil and water), and productive land (Ayeni & Olorunfemi, 2014). In this context, IK seems like an attractive solution; however, its inclusion in policymaking on sustainable agricultural production and environmental security is only possible through social change—ideally through non-violent mass movements—that is mobilized through organizations that ensure IK is employed from start to finish—from goal setting, to strategizing, to developing, to sustaining change.

It is, however, difficult to change or redirect human behaviours, attitudes, and perceptions toward change—accepting ideas that can actually effect change is even more difficult. Many factors other than people's attitudes, perceptions, and participation in sustainable development affect their understanding of their immediate environment, and environmental security issues are best influenced through people's longstanding, collective knowledge. Meanwhile, in order for younger generations to become champions of IK in policymaking, the desire for change has to be fostered by present day traditional environmentalist through day-to-day research battles that showcase the relevance of IK in sustainable development.

The most urgent environmental security issues are related to the scarcity of resources like water and land (UN-IHDP & UNEP, 2012). Considering the mismatch between existing global management capacity and threats to environmental resources, there is a need for environmental policy reform. Sustainability, integrated protection of the environment, and development are closely linked. In Africa, environmental insecurity has become the major threat to national economies, posing significant problems for the continent's growing population. It has become a global issue of critical importance that is increasingly acknowledged as one of the main challenges to sustainable development (Ayeni & Olorunfemi, 2014). Specifically, Nigeria has faced, and will continue to face, many significant challenges associated with environmental insecurity. In all parts of Nigeria, there exist ethno-religious conflicts and these, according to Ibrahim and Igbuzor (2002), have emerged because of new and particularistic forms of political consciousness and identity often structured around ethno-religious identities. Control over scarce resources, power, land, chieftaincy, local government, councils, markets, and sharia, among other trivial issues, have resulted in large-scale killings and violence amongst groups in Nigeria (Adagba, Ugwu & Eme, 2012). In addition, the porosity of the Nigerian borders has led to an influx of migrants from neighbouring countries such as the Republic of Niger, Chad, and the Republic of Benin (Adeola & Oluyemi, 2012). These migrants, who are mostly young men, are some of the perpetrators of crime in the country.

Although Nigeria has a strong and diverse economy relative to other countries in sub-Saharan Africa, significant portions of its population and economy are tied to environment-sensitive activities, such as agriculture. The fact that communities have survived despite the country's rapid growth suggests that



the IK held by some tribes, ethnic groups, and clans—particularly in the rural areas—is used as mechanisms for coping and adapting to these changes (Federal Government of Nigeria, 2012; Society for Water and Sanitation [NEWSAN], 2013).

Indigenous Peoples' IK, which helped them cope with past environmental extremes (e.g., flood, drought, and water stress), can potentially guide current and future responses to environmental threats. For instance, millions of traditional farmers and Indigenous communities use their IK to ensure food and livelihood security in a wide range of ecosystems, including fragile and harsh ones. Traditional practices are embedded cultural traditions and bio-cultural dynamics, and they can regenerate local food systems while increasing socio-environmental sustainability and resilience. These practices can be applied in innovative ways to help tackle current environmental problems. Through their on-farm or in situ conservation and management of resources, farmers, pastoralists, herders, fishers, foresters, foragers, mountain people, and other communities following traditional lifestyles maintain high levels of genetic and biological diversity for food and agriculture. This creates an important basis for the food security of present and future generations worldwide. The application of traditional knowledge in such areas as ecosystem and landscape management, water management, soil conservation, biological control of pests and diseases, ecological agriculture and livestock practices, and plant and animal breeding often enhances food security and prevents or alleviates poverty.

### **Yoruba Indigenous Knowledge (IK) Systems**

Yoruba IK Systems cover all aspects of human life, including how to manage the natural environment. These systems have been a matter of survival for the people who generated them; they are cumulative, representing generations of experience, careful observation, and trial-and-error experiments (Ajala, 2009).

For centuries, Yoruba IK has guided people on how to sustainably utilize their natural resources and deal with environmental conservation and natural disaster management. This knowledge has been handed down orally from generation to generation, and it is closely interwoven with the people's cultural values (Makinde, 2016). For instance, IK is used in soil classification, with factors like soil colour and texture functioning as key common factors in Indigenous soil knowledge. Farmers are aware of the link between soil texture and the differential deposition of river sediments, as well as the "feel" of soils and their moisture content (Makinde & Shorunke, 2013). They use this knowledge to enhance crop production using practices such as shift cultivation, mixed cropping, intercropping, and transhumance. Some of these innovations are particular to certain environments and cannot be replicated elsewhere. Often, conservation measures are intuitive hazard-prevention measures. For example, conservation of Indigenous trees and vegetation along riverbanks serves both to protect water catchments and reduce flooding and soil erosion.

The use of IK for conservation tends to affect all aspects of the environment. For instance, in many communities, certain forests are designated as shrines and are effectively considered protected areas. These protected forests have multiple functions because they also influence other elements of the environment, such as biodiversity, forest conservation, and land use and management. As such, they serve as important frontiers for the regeneration of flora and reproduction of fauna. Conservation practices are vital to Indigenous communities as they ensure the sustainability of natural resources so as

to guarantee their availability for future generations (Makinde & Shorunke, 2013). Moreover, maintaining the delicate balance of the ecosystem ensures that other practices that rely on the environment, such as weather prediction and traditional medical practices, will continue to flourish.

### **Women's Contributions to Indigenous Knowledge**

Indigenous women are not only excluded from public decision making, but they are often invisible as knowledge makers—especially in mainstream science, which has undervalued their knowledge. However, as producers, custodians, and consumers of traditional knowledge, women have been recognized in major international agreements (e.g., the United Nations Declaration on the Rights of Indigenous Peoples [UNDRIP], 2007). Their contributions have been noted as crucial to biodiversity management, the sustenance of family and community, and the development of new knowledge (FAO, 2005).

Women produce 80% of the food in Africa, 60% of the food in Asia, and 40% of the food in Latin America (FAO, 2005). Due to their work providing food, water, fuel, medicines, fodder, and other necessities to their families, rural women have wide and diverse knowledge about the uses of local resources. However, the loss of biodiversity increases the women's burden as they perform their daily chores. For example, water scarcity and contamination and deforestation has made many women's water- and fuel-gathering tasks more taxing and time consuming (Gibb, 2007). Rural women have a lot at stake in ensuring the health of local ecosystems now and in the future, and they play a key role in the preservation of biodiversity.

The demand from global markets for cheaply produced agricultural products has intensified the expansion of commercial agriculture into rural areas in developing countries. This expansion has threatened the biodiversity of local ecosystems as monocropping, the introduction of alien species, and the clearing of forests has intensified. It has also resulted in a division of labour in many communities: Men tend to be more involved with raising commercial crops and women tend to be involved with raising crops for personal consumption. Because of this, women tend to have more specialized knowledge of wild plants than men (Gibb, 2007). However, the increased centrality of money in these rural economies has further lowered women's status—they do not earn cash like the men do. This further degrades women's economic contributions to local economies. This partly explains why many projects aimed at assisting farmers deal only with men—it is their commercial, moneymaking contributions that matter. This approach not only excludes women from participating in the planning and decision-making stages of development projects, but it also excludes them from reaping any resultant benefits. In this way, gender-blind development work can reinforce gendered inequality.

### **Theoretical Perspectives**

The idea that development that is responsive to the needs of people in the developing world should come from within their own communities is not new. Gegeo (1998), Foucault (1980, 1988), Amin (1976, 1989), Freire (1970, 1984), and Nyerere (1990) have all argued that development that is dictated from outside, rather than anchored within, the knowledge base of a target population will not be fully concerned with local needs. While it is true that globalizing forces may be realized in uniquely local forms (Cvetkovich & Kellner, 1997; Keesing, 1992; Wilson & Dissanayake, 1996), it is also true that Western-oriented development in developing countries has been haunted by the ghost of

underdevelopment. It is for this reason that this article includes African feminist perspectives in order to analyse Indigenous women's knowledge related to environmental security and sustainable development.

Modernization is the imposition of a dominant political, economic, and socio-cultural system on Indigenous Peoples. It has dire consequences for Indigenous Peoples since it is based on massive resource exploitation, market-driven production, and unfair trade and competition without regard for cultural diversities, local economies, and the sustainable resource management systems of Indigenous Peoples. Modernization often results in systematic and large-scale displacement of Indigenous Peoples, the destruction of their resources and livelihoods, and the weakening of their socio-cultural systems. Traditional religious beliefs and cultural traits, according to the theory, usually become less important as modernization takes hold.

Following the loss of access to resources, Indigenous women often become more economically dependent on men, which further weakens their social status. At the same time, the burden to take care of and provide for children continues to rest disproportionately on their shoulders. Their role to ensure food security is often seriously threatened, while increased resource scarcity, environmental hazards, and disasters make them vulnerable to serious reproductive health conditions. As Indigenous women are forced to seek other sources of livelihood, they become more vulnerable to sexual and other forms of violence. Large numbers of Indigenous women and girls work in domestic households. Domestic work is outside of the regulatory framework for employers, which leaves women and girls isolated and vulnerable to physical and sexual abuse by employers.

In light of this, African feminists have emphasized the need for an approach that is anchored in a retrieval, revitalization, or restoration of African Indigeness (Wane, 2005). Such an approach requires that African people reposition their cultural resource knowledge and use the power of collective responsibility to tackle social issues. Although much of its content is ancient, IK has proven its usefulness in addressing modern issues. It is based on cognitive understandings and interpretations of the social, physical, and spiritual worlds and encompasses concepts, beliefs, and perceptions of local peoples and their natural human-built environments (Dei, 1999).

A commonly held societal view is that ordinary African women lack power and agency due to their lack of "appropriate" knowledge or disadvantaged economic and political positions. This view is often justified as the result of low levels of education, poverty, and the unequal distribution of resources. The lack of acknowledgement and support for women's traditional knowledge systems and their contributions to development are presented as natural and inevitable consequences of a busy, dynamic world. A number of African scholars, many of whom are women, have challenged this assumption and opposed the global onslaught of imposed modernization (Aidoo, 1998; Mama, 1997; Nwapa, 1966, 1970; Ogundipe-Leslie, 1994; Wa Thiongo, 1985). Indeed, generations of African women writers have built careers on intimately interrogating the micro- and macro-effects of both modernization and the resistance strategies undertaken within their communities. These voices of de-Westernization deplored the lack of women's voices in the public discourse (Sadaawi, 1997, see pp. 143-208). However, within the confines of patriarchal culture and an approach to nationalism that limits women's agency, women's voices are fewer and further between. Yet, African women are the guardians of traditional knowledge and are often leaders in resistance struggles. Despite the efforts of the Western world to disrupt Indigenous practices, women's role as traditional teachers has never ceased. They have continued their

work in different ways so as to break the silence and speak their truths, as they know them. The transformation of traditional society gave way to years marked by fierce battles between tradition and modernity, which included conflicts about women's participation in environmental security and sustainable development (Swai, 2011). Indeed, women battled for their very lives and for their continued existence as integral members of the community.

## Methods

### Objectives of the Study

The main objective of the study is to examine the rural women's use of Indigenous knowledge for environmental security and sustainable development in southwestern part of Nigeria.

It asks the following research questions:

- a. What IK exists among Yoruba women in rural Nigeria?
- b. What IK do Yoruba women use to protect their environment from threats like climate change?
- c. How is IK used as part of sustainable agricultural development in their communities?

### Study Area: Southwest of Nigeria

The Yoruba people, who occupy the southwest of Nigeria, are a highly researched ethnic group in Africa. Their rich cultural heritage is manifest in their history, society, and philosophy (Olajubu, 2008). The Yoruba make up about 93% of the inhabitants of southwestern Nigeria—as of 2006, 39.8 million of the 46 million people living in this area were Yoruba (National Population Commission [NPC], 2006). Based on the average Nigerian annual population increase of approximately 3 percent (Federal Office of Statistics, 2009), the Yoruba population had likely grown to about 40.9 million by 2009. Southwestern Nigeria has six states: Ekiti, Lagos, Ogun, Ondo, Osun, and Oyo; of these, two states, Oyo and Ogun, were chosen for the study.

**Oyo state—Ibadan.** Oyo state has 33 local government areas (LGAs) that are made up of rural, rural-urban, and urban communities; it is known as the “pace-setter state.”<sup>2</sup> Ibadan is the capital of Oyo state. The principal inhabitants of the state are the Yoruba people, and their main Indigenous occupations are subsistence farming and trading (Onibokun & Faniran, 1995). This study was carried out in the Ido LGA, formerly known as Akinyele West LGA. Its headquarters were at Ido town due to its many rural communities and large population of rural women with appreciable use of IK. The LGA has a population of about 55, 893 and occupies a landmass of 865.49 km<sup>2</sup>, with about 57% of the land used for agricultural purposes (NPC, 2006). It is bordered by Akinyele, Oluyole, and Ibarapa, which are LGAs of Oyo state, and Odeda LGA of Ogun state. The inhabitants are predominantly farmers and farming accounts for 63% of the LGA's total economic status. The LGA consists of about 78 settlements, which are distributed into 10 wards (Oladeebo, Oyeleye, & Oladejo, 2013).

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<sup>2</sup> The nickname of Oyo State.

**Ogun state—Abeokuta.** Ogun state has 20 LGAs that are made up of rural, rural–urban, and urban communities; it is known as the “gateway state”<sup>3</sup> because of its strategic position as the road, rail, air, and sea link to the rest of the country. Abeokuta is the largest city and state capital of Ogun state. Abeokuta means “under the stone,” and the city lies below the Olumo Rock, which is home to several caves and shrines. The town depends on the Oyan River Dam for its water supply, though it is not always dependable (Kayode-Adedeji, 2010). Odeda LGA was chosen for this study based on (a) its nearness to Ido LGA of Oyo state, and (b) the large number of rural communities and large population of rural women with appreciable use of IK.

### Data Collection Procedure

The research presented in this article is the result of an exploratory study, owing to the size of the population, respondents’ levels of literacy, respondents’ locations, and time and financial constraints. The study employed a qualitative methodology, using direct interaction with participants through interviews to gather information. The participants of the study included women farmers (subsistence farmers) located in the rural communities of both Ido LGA in Oyo state and Odeda LGA in Ogun state. The participants were selected based on population density, the accessibility of their locations, the available financial resources for the study, and the fact that their locations supported farming, which is the main occupation in the study area.

A multistage sampling technique was employed in the sample selection. First, in order to select a sample that was representative of the population within a limited geographic area, a cluster sampling technique was used to select women at both LGAs. Second, a purposive sampling technique was used to select four villages from each LGA (eight villages altogether) in order to get information from rural women. Overall, 80 respondents (10 per village) were purposively selected for the study (see Table 1). An in-depth interview guide was used to explore the women’s use of IK for environmental security and sustainable development in their communities. The interviews were conducted in the Yoruba language and later transcribed. The qualitative data collected were analysed by manual content analysis and descriptive statistics, such as frequencies. Content analysis is a systematic, replicable technique for compressing text into content categories based on explicit rules of coding and identifying themes or patterns.

### Research Instrument: In-Depth Interview Guide

The aim of the in-depth, semi-structured interview was to explore rural women’s use of IK for environmental security and sustainable development in southwestern Nigeria. The main interview questions fell into four categories:

1. *Background information:* Respondents were asked about the location of their community, and their occupation, literacy level, and level of education.
2. *Types of existing IK:* Respondents were asked to describe the types of IK that exist among rural women of the Yoruba ethnic nationality in Nigeria.

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<sup>3</sup> The nickname of Ogun State.

3. *Use of IK:* Respondents were asked to describe what IK women use to secure their environment, areas of life in which rural women use IK, and rural women's adaptation strategies to climate variability and change.
4. *Role of IK in sustainable development:* Respondents were asked to describe the role of IK in sustainable development—particularly in terms of the availability of food, cultural promotion, health provision, childcare, and poverty reduction—and in what ways IK has increased women's level of economic empowerment.

## Results and Discussion

### Background Information

Table 1 shows the number of women from each rural community who participated in the study. Table 2 lists the demographic characteristics of participants by their occupation, literacy level, and level of education. Farming is by far the most common occupation (53.75%), followed by food processing and sales, herb making and selling, petty-trading, hairdressing, and tailoring. There was a high level of illiteracy among participants: 65.0% of respondents could neither read nor write, and 23.75% could only read. Of the 80 participants, only 9 (11.25%) could read and write. Relatively low literacy rates may explain why so many work as farmers. Overall, only 35.0% participants could read, with 78.57% only able to read in the Yoruba language and only 21.43% able to read both Yoruba and English. In terms of participants' level of education, the majority (68.75%) had no formal education. Only 10 (12.50%) completed secondary school education, while 18.75% completed primary education (which contributes to a low level of literacy). These findings suggest that the socioeconomic conditions (both in terms of location and literacy) of Indigenous women in rural areas influence their choice of occupation.

### Types and Use of Indigenous Knowledge

Table 3 shows the types of IK that participants used; many participants mentioned that IK had been available and used in different aspects of their lives. Most noted that they inherited IK from their parents or relatives, explaining that the knowledge was transferred to them verbally through taboos and the telling of folktales. Most women employed IK for their farming activities, food storage and processing, family health, saving and lending practices, and cultural preservation.

The women use IK specifically created from African modes of thought that is an alternative to Western means of enhancing sustainability. Traditionally, they practiced non-tillage farming techniques by using Indigenous soil preparation and planting materials for their farms. This means that they clear the land, which is done either by hand or by burning, and then raise crops with minimum disturbance to the soil (insofar as the soil is not tilled). Holes for planting are made with sticks that are large enough for the planting material. In the case of cocoyam ("*koko*;" *Colocasia esculenta*), the apex of the shoot is placed in the hole and its base is covered with soil. For cocoyam, there are no significant differences in yield between tillage and non-tillage treatments. However, weed infestation is greater with tillage treatments, and non-tillage treatments come with the benefit of soil conservation and lower labour inputs.

**Table 1. Location of Rural Communities**

Site Number	State	LGA	Name of Community	Number of Respondents	Percentage (%)
1.	Oyo	Ido	Odebode	10	12.5
			Akufo	10	12.5
			Araromi	10	12.5
			Aderoju	10	12.5
2.	Ogun	Odeda	Anigilaje	10	12.5
			Ojoo	10	12.5
			Eweje	10	12.5
			Ijemo-Fadipe	10	12.5
<b>Total</b>				<b>80</b>	<b>100.0</b>

*Note.* Source: Fieldwork, 2014.

**Table 2. Demographic Characteristics of Respondents**

Variables	Frequency	Percentage (%)
<b>Occupation:</b>		
Farming	43	53.75
Food processing and sales	18	22.50
Herb making and selling Petty trading	9	11.25
Hair dressing	5	6.25
Tailoring	3	3.75
	2	2.50
<b>Literacy level:</b>		
Can neither read nor write	52	65.0
Can only read	19	23.75
Able to read and write	9	11.25
<b>Level of Education:</b>		
No formal education	55	68.75
SSCE	10	12.50
Primary education	15	18.75
<b>Total</b>	<b>80</b>	<b>100.0</b>

*Note.* Source: Fieldwork, 2014.

**Table 3. Types and Uses of Indigenous Knowledge Among Yoruba Women**

Indigenous Knowledge	Purpose
Farming practices	Non-tillage Slashing and burning Mulching Use of organic manure Use of locally made pesticides Use of ash for seed treatment
Food processing and preservation	Sun drying Pounding with locally made mortar Roasting and frying food Grinding with stone Early harvesting with hand Use of sacks Burying in moistened soil Mixture of red pepper Wood ash application Placing under fire
Family health	Child care: depressed fontanel (“ <i>oro agogo</i> ”), navel pain (“ <i>ejinrin were</i> ”) Curing multiple diseases, such as skin disease, chicken pox, inflammation, malaria fever, etc. (“ <i>dongoyaro</i> ”)

*Note.* Source: Fieldwork, 2014.

Farmers indicated that cocoyam should be planted with the arrival of the rainy season, as planting in the dry season might negatively affect the cocoyam due to a lack of moisture. Among the women, 87% planted cocoyam tubers (“*isu*”) and cassava (“*ege*”) with planting sticks, and their crops sustained their families. Any extra crops were sold for income. Normally, the women work the digging sticks into the soil, levering in three or four directions to make the right-sized hole. The apex of the shoot is then placed into the hole and the stick is used to press the soil against the shoot.

The women’s use of inorganic fertilizer was limited, as were biocides that pollute the environment, mainly because they lacked the financial ability to purchase them. Instead, most of the women noted that they used organic manure from animals. Farm practices like crop rotation systems and planting cover crops greatly enhance the uses of organic manure, and leftover plant materials are used to feed livestock such as goats, sheep, and poultry. These animals are also food sources and income sources for families. These practices show that the women appreciated the usefulness of conserving and protecting their farms and materials to enhance their livelihoods. Another practice was the women’s pest control method of mixing ash with kerosene and spreading it over vegetables infected with aphids. On



homestead plots, women also noted that they often hung banana leaf threads over garden eggs (“*igba*,” *Solanum melongena*) to prevent bird attacks.

On food processing and preservation, women used sun drying to preserve most of their food, from *elubo* to *gari*, melon, and peppers. Women also smoked and used charcoal (“*eedu*”) to preserve their food, citing charcoal’s inhibiting effect on microorganisms (Olatokun & Ayanbode, 2009). One respondent noted, for example:

One method is to immerse fresh products, for example vegetables, in salted boiling water for a few minutes and then dry them under the sun for about three days. These are then stored in a safe, dry place. This method is also used to dry edible insects such as locusts and caterpillars. Another method is to directly spread the food under the sun. Food crops like sorghum, pearl millet, beans, and groundnuts are usually kept drying under the sun before storage in traditional underground store or pits to increase their shelf life. Other food is first salted if there is danger of decaying during the drying process, as is the case with meats and tomatoes and afterwards stored in dry place at room temperature. Dried tomatoes are then soaked in warm water to be turned into tomatoes sauce. (Respondent 31)

Through such practices, these women have contributed to increased food safety for their households by using locally made, traditional pesticides that are not environmental pollutants. Traditional pesticides, such as citrus lemon leaves and neem (“*dongoyaro*,” *Azadirachta indica*), were also mentioned as pest controlling agents.

The women also referenced various methods through which they had adapted to climate variability and change. These methods depended on the resources they were exposed to, their levels of education, and their distinct forms of IK. Specifically, this article considers the women’s use of alternative energy sources for cooking, as participants noted using maize, guinea corn stalk, and cow dung in place of firewood for their cooking. These women indicated that the smoke from these materials affected the aroma of the food and that the fires using these fuels required constant attention, which takes much of the women’s time along with that of female children, who are considered a suitable assistant. However, time spent in cooking food by women under scarcity of firewood was not considered in this study. The materials used by women for cooking are biodegradable and could be used in the production of biogas.

Regarding family health, some participants, who are herb sellers, referenced IK about plants and their medicinal properties. This indicated that they use herbs for both preventive medicine and as an alternative means by which to treat diseases. Noting that their diagnostic method is mainly biological examination, participants explained that they used their sensory organs to examine afflicted individuals, even though they lack medical, scientific knowledge. In the short time the researcher spent with the women, the following Indigenous practices were used to treat the different ailments. For treating depressed fontanel in newborn babies (popularly known as “*Oka Ori*”), the participants noted that a major symptom is babies’ incessant, unprompted crying. The *Euphorbia kamerunica* plant (popularly known as “*oro agogo*”) is often prescribed, and the root of the plant is often used to cure the ailment. One respondent explained:

For newborn baby medications, all you need to do is just boil “*aidan*” [*Tetrapleura tetraptera* bark], “*oko eran*” [*Boscia angustifolia* bark], “*iyeye*” [*Spondias mombin* bark or hog plum],

“*alubosa elewe*” [*Allium ascalonicum* bulb or leafed onion], and “*eru*” [*Xylopiya aethiopica* seeds or Ethiopian pepper] with water and give [to] the baby. (Respondent No. 35)

Similarly, one participant noted that to treat babies’ navel pain, they would:

Boil leaves of “*ejinrin-were*” [*Momordica charantia* or bitter gourd], “*osan wewe*” [*Citrus aurantifolia* root or lime fruit], and “*erawonka*” [*Xylopiya quintasii* leaves] with water and administer [it] to the child. (Respondent No. 47)

To treat multiple diseases or ailments, many women used neem (*Azadiracha indica*). One respondent explained:

To treat wounds and sore[s], a paste of “*dongoyaro*” is applied. Even smearing honey is a common practice for recovery from burning and wounds. (Respondent 12)

Overall, respondents reported that economic viability and compatibility with socioeconomic and cultural conditions are the indicators that demonstrate the appropriateness of Indigenous health and environmental management practices in this setting. Therefore, it is necessary to incorporate local Indigenous practices into mainstream research in order to ensure outcomes are appropriate within the setting.

### **Role of Indigenous Knowledge in Sustainable Development in the Communities**

Respondents emphasized that farming activities done with IK are less expensive and result in more crop production and, thus, more food. IK and practices in food processing and preserving can be considered an ideal method of dealing with the practical circumstances surrounding household survival, and women offer many traditional food products that support food supply, and food quality and safety. These food products contribute to improving food access and availability by meeting household needs in an undesirable climate and undesirable socioeconomic conditions. Women are able to use locally available raw agricultural materials that are processed into food products at relatively low cost, resulting in food with a higher nutritive value compared to the raw material, a better taste, and a longer shelf life.

In addition, IK methods of preventing and treating diseases have increased both infants’ and adults’ chances of survival. Indeed, the provision of health-related services further confirms the role Indigenous women play in family care. Malaria and measles are the major diseases that affect infants in rural areas; according to IK, if the right herbs are used at the right time, infant mortality from these diseases can be reduced.

When women are financially empowered through the sale of farm products, herbs for medicinal use, and other trading activities then they have the means to purchase other necessities for themselves and their families. However, it is evident from the women’s accounts that income generated is generally only enough for family sustenance. In the words of one of the respondents:

There is a little reduction in poverty since we are able to feed ourselves and sponsor our children’s education. One major measurement of poverty is inability to afford three square meals, and this we have. (Respondent 62)

## Conclusions

IK is crucial to community sustainability and development. It can provide convenient, effective alternatives to Western knowhow and gives additional options to local people in carrying out their daily activities. Traditionally, the Yoruba practice non-tillage farming techniques, using Indigenous soil preparation and planting materials. Women, more so than men, have generated significant IK surrounding family health, food processing, and methods of food preservation. IK and practices related to food processing and preservation can be regarded as optimum methods of addressing the practical circumstances surrounding survival of households. As they became part of rural livelihoods, traditional methods of processing and preserving food products were modernized and adapted.

Lessons can be drawn from the specific Indigenous practices discussed in this article. For effective responses to climate change, women need to be supported in taking their place as active participants in developing and designing beneficial adaptation strategies. For example, when firewood is scarce, women spend a significant amount of time finding materials with which to cook food. A common practice is to burn rice husks indiscriminately, increasing pollution and carbon dioxide (CO<sub>2</sub>) in the atmosphere. Alternatively, energy saving stoves could be developed from local materials like clay and briquettes produced from rice husk in rice growing communities to serve as firewood. If briquettes and energy saving stoves were developed and distributed, this would reduce the time women and girls spend collecting firewood, which would in turn provide opportunities for girls to go to school and allow women to engage in other activities. It is possible to empower women in their communities while pursuing and developing biodiversity work. The challenge, however, is ensuring that this is done in a way that includes women's voices from project planning, to decision-making, to determining methods, and measuring outcomes.

## Policy Recommendations

- a. The efficient utilization of local resources plays a key role in enhancing the capacity of peoples in rural areas to adapt to changes in climate and socioeconomic conditions. Efficiently using local resources ensures the availability of Indigenous food sources for rural communities with high rates of poverty and limited access to outside resources. IK and practices related food processing and preservation can provide valuable lessons to policymakers. Insufficient attention has been given to IK as part of environmentally sustainable practices and household food production; however, integrating IK into mainstream development interventions could facilitate the development and implementation of more culturally acceptable initiatives that are more likely to achieve desirable outcomes.
- b. The Nigerian government has passed many laws against gender discrimination, but the spirit of these laws is not necessarily reflected in practice. The government tends to be silent on protecting women's rights on issues of IK and traditional knowledge. Because women are often "invisible" in community decision-making and research, stakeholders should carefully map out their methods to ensure that women's voices are effectively heard. The use of women-specific methods in research has been shown to be effective not only in identifying differences between men's and women's situations, but also in ensuring that women are

heard. It is necessary reject the patriarchal tendency to think and decide for women, regardless of the idealism of our intentions. At the same time, we must be aware of the tremendous challenges that women face in asserting their rights and work to overcome those barriers.

- c. Women should be empowered to use their IK and traditional knowledge in order to protect and promote biodiversity. There is currently no provision to ensure that Indigenous women have equal access to, control over, and the right to share in payments that might result from the use of IK. When traditional knowledge is used to commercial purposes, discriminatory practices, rooted in the gendered nature of society, often mean that women do not get an equitable share in the distribution of benefits. Women, just like men, have a stake in a creating and supporting healthy ecosystems.

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