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IK: Other Ways of Knowing

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Cover photo taken by Adam Pérou Hermans Amir

Cover photo caption: A handwoven bridge connecting the communities of Bechati and Tofala, SW Cameroon to the main road. The bridge is remade every few months. A local Fon [chief] fell from the bridge and disappeared, around the same time a silverback gorilla was killed nearby in Pinyin. Some community members wondered if this meant the gorilla and Fon were connected by a totem. Lebaliem, SW Cameroon. 2014.

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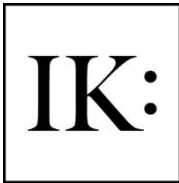
From the Editors

Welcome to Volume 5 of *IK: Other Ways of Knowing*.

This issue of *IK* is a continuation of Volume 4 and features three additional articles from a study commissioned by the Canadian branch of the International Development Research Centre (IDRC) and one article that is separately supported. The aim of the study is to increase women's participation in economic activities, productivity, and employment options in poor, rural communities in Rwanda and Tanzania. Researchers identified indigenous knowledge, technology, and traditional enterprise practices in which women were involved. Chika Ezeanya-Esiobu, Nathan Taremwa, and Vedaste Ndungutse contributed an article about traditional fermentation techniques and the possibilities they hold for the economic empowerment of women in rural Rwanda. Jehovaness Aikaeli and Beatrice Kalinda Mkenda contributed two articles; the first casts light on the constraints and ways to harness the potential of Maasai indigenous knowledge and skills of making body ornamental products. Their second article discusses the extent to which handicraft activities can generate viable income and employment for rural women in Tanzania. The fourth and final article in the peer-reviewed section, not commissioned by the IDRC, deals with gorilla conservation and is written by Adam Pérou Hermans Amir.

In addition to the peer-reviewed articles, this issue will feature a documentary and two book reviews. The documentary, *Abagoré*, which means "women" in Kinyarwanda, describes examples of successful indigenous technologies used by women, such as vegetable production, traditionally fermented yogurt, banana wine, and sorghum beer.

We hope you enjoy this issue.



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Who Knows What About Gorillas? Indigenous Knowledge, Global Justice, and Human-Gorilla Relations

Adam Pérou Hermans Amir, Ph.D.

Communications Coordinator, Tahltan Central Government

The gorillas of Africa are known around the world, but African stories of gorillas are not. Indigenous knowledge of gorillas is almost entirely absent from the global canon. The absence of African accounts reflects a history of colonial exclusion, inadequate opportunity, and epistemic injustice. Discounting indigenous knowledge limits understanding of gorillas and creates challenges for justifying gorilla conservation. To be just, conservation efforts must be endorsed by those most affected: the indigenous communities neighboring gorilla habitats. As indigenous ways of knowing are underrepresented in the very knowledge from which conservationists rationalize their efforts, adequate justification will require seeking out and amplifying African knowledge of gorillas. In engaging indigenous knowledge, outsiders must reflect on their own ways of knowing and be open to a dramatically different understanding. In the context of gorillas, this means learning other ways to know the apes and indigenous knowledge in order to inform and guide modern relationships between humans and gorillas.

Keywords: *Conservation, Epistemic Justice, Ethnoprimateology, Gorilla, Local Knowledge, Taboos*

1.0 Introduction

In the Lebiallem Highlands of Southwestern Cameroon, folk stories tell of totems shared between gorillas and certain people. Totems are spiritual counterparts. Herbalists use totems to gather medicinal plants; hunting gorillas puts them in danger. If the gorilla dies, the connected person dies as well (Etiendem 2008). In Lebiallem, killing a gorilla risks killing a friend, elder, or even a chief (*fon*). A local account describes how a village lost their most effective herbalist after a hunter killed a gorilla (ibid., 15). Even after crop-raiding and other conflicts, locals argue against hunting gorillas to avoid such risk. The possibility of human

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souls connected to certain wild animals inspires care, caution, and restraint in hunting (ibid.; Wright and Priston 2010).¹ Such folk stories may help guide positive human-gorilla relations, functioning akin to conservation (Etiendem et al. 2011). The totem belief is a form of a local conservation ethic.

The Lebialem Highlands are located in one of the most linguistically and culturally diverse regions of the world (Grimes 2000). Indigenous communities there have diverse and distinct ways of knowing gorillas, though their relationships are fading.² The gorillas of Lebialem, the Cross River subspecies of the Western lowland gorilla (*Gorilla gorilla diehli*), are critically endangered. Fewer than 300 remain, scattered over 13 hill sites in the Cross River headwaters along the border of Nigeria and Cameroon (Dunn et al. 2014). One hill site, Tofala, supports the approximately 20-30 gorillas left in Lebialem. Different conservation regimes span the gorillas' habitat, ranging from national parks to no habitat protection at all. Cross River gorilla conservationists need the support of indigenous communities, but many of those communities do not endorse conservation.

Where indigenous beliefs align with conservation, conservationists engage them. A traditional taboo on gorilla hunting helped conservationists establish the Kagwene Gorilla Sanctuary at a hill site in the Cameroonian Grassfields (Sunderland-Groves et al. 2009). Though taboos and totems offer local forms of conservation, many communities conflict with international efforts to conserve gorillas (Nkemnyi et al. 2013). Many locals perceive conserving gorillas and other wildlife as a foreign agenda representing outside interests. Their perception may come, in part, from the authority outsiders assert regarding wildlife. Westerners claim to know gorillas better and what to do about the gorillas' plight. For many good reasons, Western primatologists feel they hold the most accurate knowledge of gorillas. Also, for many good reasons, indigenous communities feel that their knowledge of gorillas is ignored.

During colonialism, control over knowledge production and authentication often prevented the inclusion of indigenous accounts (Goldman 2007). E.W. March (1957) described his failed attempt at hunting Cross River gorillas in Nigeria and his knowledge of the gorillas in great detail. He made no mention of indigenous Nigerian accounts. Contemporary scholarship on "knowledge of the ape in antiquity" describes possible Greek and Roman accounts of gorillas, but not African. Recounting his surprise that a gorilla appears depicted on a bowl from before the eighth century, Montagu wrote:

Startling, because knowledge of the gorilla was not established until the year 1847, when Savage and Wyman published the first account of the anthropoid. There can be little question that the gorilla had been beheld by human eyes long before the establishment of its existence in 1847... but it is extremely unlikely that those eyes ever belonged to a person other than a native living in close proximity to the native habitat of this animal (1940, 80).

Even Montagu, an anthropologist famous for his critique of race as a biological concept, oriented knowledge in this way: as only established if from the West. Indigenous knowledge of gorillas was dismissed as inaccurate, subjective, and not even worth noting.

Western ways of knowing claimed objectivity and greater rigor, but consider their struggles to describe the Cross River gorilla. Marschke (1903), a German zoologist, made the initial scientific classification, listing the Cross River gorillas as a distinct species, *Gorilla diehli*, based on measurements of eight skulls sent from the then-German colony of Kamerun.³ Marschke tended to declare each specimen he received a new species and was usually ignored (Beolens et al. 2009). His classification did not last long. Rothschild (1908), a British banker and zoologist, reclassified the gorillas as a subspecies five years later. Twenty years later, Coolidge (1929), a Harvard zoologist and a founder of both the International Union for Conservation of Nature (IUCN) and the World Wildlife Fund (WWF), lumped all gorillas together as a single species: *Gorilla gorilla* (Sarmiento and Oates 2000). Before Coolidge, the world had eleven species of gorilla (with many European names, e.g., *Gorilla jacobi*, *Gorilla schwarzi*, *Gorilla hansmeyeri*, *Gorilla zenkeri*, and *Gorilla graueri*) (Groves 2002).

Though Coolidge made some mistakes, e.g. his Cross River gorilla samples did not come from the Cross River region (Haddow and Ross 1951), his classification held for many years. In 1967, Groves reevaluated and reclassified gorilla taxonomy, splitting the ape into subspecies: Eastern (*Gorilla gorilla beringei*) and Western (*Gorilla gorilla gorilla*) (Groves 1970). Though nodding to the “Nigerian” (Cross River) specimens as the most distinct set within his Western gorilla data, Groves left all Western gorillas together as *Gorilla gorilla gorilla*. He split the eastern gorillas into mountain gorillas (*Gorilla gorilla beringei*) and an intermediate: eastern lowland gorillas (*Gorilla gorilla graueri*) (ibid.; Sarmiento and Oates 2000). Decades later, a series of studies convinced taxonomists to officially designate the Cross River gorillas as a subspecies: *Gorilla gorilla diehli* (e.g., Sarmiento and Oates 2000). Around the same time, they split the species of gorilla into two. Groves concluded his definitive account of gorilla taxonomy:

Science has advanced, but human behavior has not. People still hunt gorillas for food or trophies, and still cut down their forests; but now those same advances in science also enable forests to be cut down more efficiently, gorillas to be hunted more efficiently, human populations to increase ever faster, and press in on the remaining habitat, so that our second-closest relative is threatened with disappearing forever. More and more, the work of taxonomists and other biologists must be put at the service of conservation (2002, 30-31).

Splitting the species and delineating subspecies furthered conservation objectives as much as it tracked clearer scientific understanding of how to cleave and describe the natural world.⁴ Taxonomists reclassified gorillas less to clarify ontologies than to provide targets for conservation. Normative environmental ethics infiltrated the objective science of describing evolutionary distinctions and genetic differences between gorillas.

The taxonomic history shows the tenuous (but also self-reflective strength) of Western scientific knowledge and the complexity necessary to describe what makes Cross River gorillas distinct.

Conservation depends on the stability of this distinction. If Cross River gorillas are just more western lowland gorillas (of which there are hundreds of thousands in Cameroon, Gabon, and Congo), how important is it to conserve them? The unstable foundation of the Cross River gorilla's ontology, i.e. of what makes the Cross River gorilla a specific kind of thing in the world, is important for understanding the moral reasoning regarding the gorillas. Many of the arguments for the impositions of conservation in the Cross River headwaters rely on this ontology.

Western knowledge of gorillas is messy and complicated, but also authoritative. Conservation asserts Western ways of knowing gorillas as objective, impartial, and essential, which often contributes to ignoring the indigenous ways of knowing wildlife. Writing anonymously in 1934, F.S. Collier, Chief Conservator of Forests for Nigeria, argued:

To a native hunter in these rather inaccessible forests, a gazetted regulation means absolutely nothing unless he or his friends suffer penalties for infringing it. 'Scientific interest' is, of course, quite meaningless to them, and they will not refrain from hunting gorilla until it becomes inexpedient to do so. Unless there are Europeans on the spot who will take personal and active interest in the gorilla, there is little doubt that the Cameroons-Ogoja race of the species will be completely, if gradually, killed out in no very long period of years (Anonymous 1934, 102).

In 2013, following the killing of a Cross River gorilla, Louis Nkembi, a Cameroonian conservationist, explained: "This is a bad omen for the conservation world, given that it indicate[s] that the fight against poaching, ignorance, and people who do not yet understand the value of wildlife, is still very far from being achieved" (Nkembi and Leke 2013, 9). The issue is not only that indigenous knowledge is ignored, but that ignoring it allows outsiders to blame locals for the plight of the wildlife. Conservation efforts invite international intervention premised on the idea that Westerners know wildlife better and appreciate it more than the indigenous communities.

Linda Tuhiwai Smith calls this "the indigenous problem" (2012, 94-95). Conservation describes the locus of the threats to wildlife as in the local communities, rather than recognizing the role of grander social, political, and structural issues (ibid.). Efforts focus on policing the communities when the problems are much broader and stem from outside policies and pressures (e.g., Köhler 2005; Oishi 2013). The limited scope of problem orientation makes conservationists reaffirm their own beliefs, while ignoring their historical and current role in these issues. Igoe (2017, 110) describes conservationists as "deeply implicated in the very ruination that [they promise] to repair." For example, a limited orientation obscures the role the West played in the plight of gorillas, leaving out gorilla hunting and logging of forests in colonial times; contemporary global appetites for timber, cocoa, and other cash crops replacing forests; and the inequalities inherent in conserving gorilla habitat for ecotourism and science instead of for non-timber forest products and local use. By omitting their culpability, Westerners grant themselves the position of objective judge. They authorize themselves to determine conservation values and sensitize

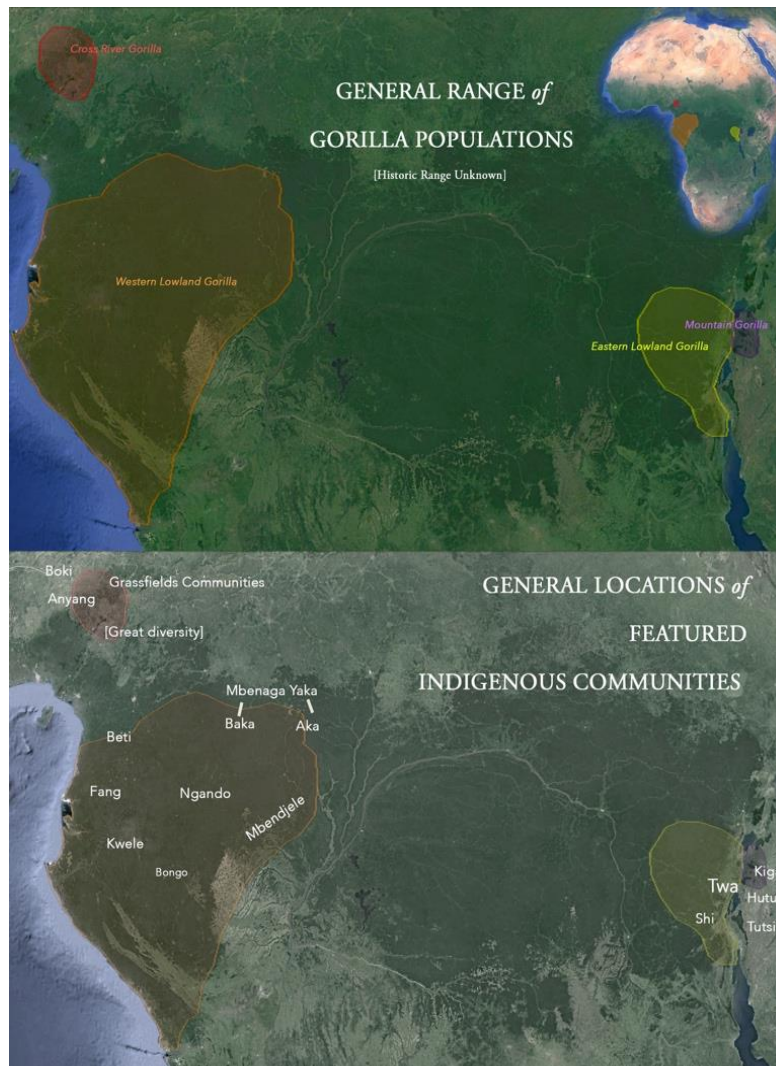
indigenous communities to these values because the communities are in need of education in Western environmental ethics. By seeking to “teach the value of wildlife,” conservationists further establish their position of superiority. As Smith describes (2012, 95), the disrespect and hypocrisy of this position exacerbates the problem: “For indigenous communities the issue is not just that they are blamed for their own failures but that it is also communicated to them, explicitly or implicitly, that they themselves have no solutions to their own problems... [This nurtures] deep resentment and radical resistance.” The legacy of the control over knowledge production is that international reasoning over what to do about the plight of gorillas depends upon Western research and thinking and lacks the context of indigenous African knowledge. As Goldman (2007, 310) writes, “By monopolizing what counts as valid knowledge—by claiming epistemological, methodological, and ontological superiority—Western science has silenced the knowledge of Africans.” This process began during colonization, but did not end with it. Some researchers now comment that locals do not know what gorillas look like (Rose et al. 2003; Webber and Vedder 2001). For generations, conservation regimes have kept many indigenous communities, especially those near the mountain gorilla (*Gorilla beringei beringei*), out of the forest and out of contact with gorillas. Across the gorillas’ range, from Nigeria to Rwanda, very little traditional knowledge of gorillas was recorded (Sicotte and Uwengeli 2002; Oishi 2013). As colonialism dislocated people from their place and culture, how much indigenous knowledge was lost? What were, and still are, indigenous ways of knowing gorillas and how might they help guide contemporary human-gorilla relations?

This paper focuses on the importance of engaging traditional and contemporary indigenous knowledge of gorillas. Section two deals with scholarship on gorillas to show how Western ways of knowing are validated and reinforced. I contrast them with hints of indigenous ways of knowing gorillas, then show how values inform the production of all knowledge of gorillas. Section three shows the consequences of omitting African accounts. Lastly, section four explores how indigenous knowledge can help improve understanding and guide modern human-gorilla relations. All of these sections highlight the importance of engaging indigenous knowledge with humility and respect, and not selectively engaging aspects that serve one’s own purpose. Throughout the paper, the general terms “gorillas” and “indigenous communities” are used as catch-alls for greater complexity. “Gorilla” refers to two species of closely related great apes: *Gorilla gorilla* and *Gorilla beringei*. The two species are morphologically and genetically distinct and separated by about 1,000 km (Tocheri et al. 2011). They split around 1-3 million years ago (ibid.). The two species further divide into two subspecies each: Cross River gorillas (*G. g. dielhi*); western lowland gorillas (*G. g. gorilla*); eastern lowland gorillas (*G. b. graueri*) and mountain gorillas (*Gorilla b. beringei*).

The indigenous communities across the gorillas’ range are too numerous to list. Language families can help identify general groups, but even these are vast. For example, the linguistic diversity of the Grassfields of Cameroon, at the northern range of all gorillas, hints at a cultural diversity almost without equal (Di Carlo 2011). Across their range, even single bands of gorillas may overlap with multiple indigenous communities. Historically, the Baka, Mbenga, Mbendjele Yaka, the Twa, and other forest-dwelling groups had perhaps the most overlap with gorillas (e.g., Lewis 2002).⁵ These people were

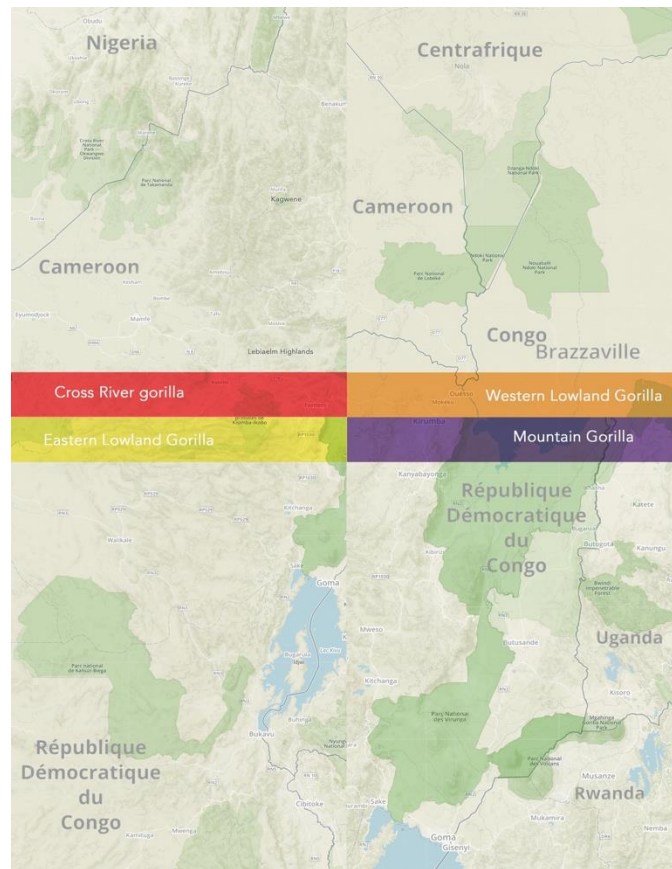
nomadic hunter-gatherers. They shared the forest habitat and had intimate knowledge of gorillas. Much more populous, often Bantu-speaking groups farmed on the fringes.⁶ In pre-colonial times, many lived in or near the forest. They also practiced hunting and gathering and had close relationships with wildlife, including gorillas (Köhler 2005). Colonial policies affected Bantu speakers much more directly and dislocated them from their relationships with the forest (ibid.).

Cross River gorillas in Nigeria live near Anyang, in the forest, and Boki communities, on the fringes. In Cameroon, they live near an incredibly diverse set of communities. For example, the band of Cross River gorillas at the Tofala Hill Site overlaps with 17 traditional kingdoms, including the Mundani, Bangwa, and M'mucok (Wright and Priston 2010). Western lowland gorillas are the most numerous of all gorillas and span the largest range. They can be found in Cameroon, Central African Republic [CAR], Congo-Brazzaville, Equatorial Guinea, and Gabon and overlap with numerous communities including the Mbendjele Yaka (made up of (Ba)Aka), Baka, Bulu, (Ba)Kwele, Njem, Fang, Mpiemu, Mbendjele, Ntumu, Ngando, and Bamileke).⁷ In the Eastern Democratic Republic of Congo [DRC], (Ba)Twa live in the montane forests. In South Kivu, Eastern lowland gorillas overlap with them, while groups, such as the (Ba)Shi, farm the valleys below. Not far away, in North Kivu, both the farming communities and the gorillas change. Here are mountain gorillas, who number fewer than a thousand, but have populations in three countries: DRC, Rwanda, and Uganda. The Twa share the slopes of the volcanoes with mountain gorillas while farmers including the (Ba)Kiga, (Ba)Nyarwanda, Fumbira, (Ba)Hutu, and Tutsi pastoralists work the lower landscapes. The process of knowledge production regarding gorillas, from historical literature reviews to contemporary science, obscures the diverse knowledge of all these groups.



Source: The UN Environment World Conservation Monitoring Centre (UNEP-WCMC); Ethnologue: Languages of the World, Twenty-second Edition

Figure 1: Maps of the Populations of Gorillas and a General Overview of Corresponding Indigenous Communities



Source: Google Earth

Figure 2: Map Details of Conservation Areas Discussed in the Text

2.0 Producing Knowledge About Gorillas

2.1 Western Histories of Western Ways of Knowing Gorillas

In 1959, George Schaller ventured to the Virunga Volcanoes to conduct the first study of gorillas in the wild. He began his work at a time when gorillas were little known to Western science. His two years of research became two classic manuscripts: *The Mountain Gorilla* (1963), the first thorough scientific study of the animal; and *The Year of the Gorilla* (1964), a more public account, celebrated for popularizing gorillas and dispelling the myth that they are dangerous brutes. Though Schaller's work preceded conservation biology, he anticipated its blend of entwining descriptive and normative knowledge. Schaller both described what gorillas are like and how humans should act towards them. He blended his ecology and ethology with ethics.

Schaller started his research with a literature review, noting how the gorilla “[appears] to possess some transcendent quality which inspires every visitor to its realm to put his experiences into print” (1964, 1). He noted that he “read through literally hundreds of popular books, articles, and newspaper stories, and

[...] examined scientific papers and glanced through textbooks” (ibid., 2). He did not comment on the absence of indigenous accounts. Why do so many visitors to the gorilla’s realm put the experience into print while locals do not? Does this show a lack of value of gorillas to locals or reveal something more problematic: who gets to put things in print? Throughout the research process for this paper, not a single book about gorillas written by an African was located. There were a few articles, dissertations, and newspaper stories, but nothing in more popular press or media. It was also difficult to learn about the relationships between indigenous communities and gorillas beyond the realm of science and conservation, with the notable exceptions of scholarship by Denis Ndeloh Etiendem (2008; Etiendem et al. 2011), Angela Meder (1999), and a few others featured in a following section.

Even if he had found them, Schaller probably would have been skeptical of indigenous accounts. He began his research wary of most of the gorilla reports he read, dismissing the accounts of white hunters “since the ape is studied along the sights of the rifle” (1964, 2). He dismissed adventurers too, as the “the finding of a gorilla nest or perhaps a brief sighting of the ape itself makes him an expert on all aspects of the gorilla’s life history,” and because of how they would turn to “native tales, rumors, and statements from older literature, no matter how dubious” to make up for their lack of knowledge (ibid.). With this line, on the second page of the book, Schaller revealed how he orients to indigenous accounts. Unlike the adventurers, he did not accept indigenous tales as knowledge. He maintained this orientation throughout his literature review and fieldwork.

Schaller’s historical survey of knowledge of the gorilla begins in circa 470 B.C. with Hanno, the Carthaginian navigator. Pliny, writing in 150 B.C., described that Hanno encountered the Greek Γόριλλαι (*gorillai*), a “tribe of hairy women,” on the coast of what is now Sierra Leone. They acquired three females but the apes died on board. Hanno brought their skins to Rome. Though, from the location and behavior of the *gorillai* (hooting and throwing stones), the apes were probably chimpanzees, the name persisted, eventually being reassigned by Savage and Wyman to describe the first type specimen of a gorilla skull as *Troglodytes gorilla* in 1847. Before Schaller wrote of Savage, his history jumped from 150 B.C. to 1559 A.D. and continued with an English sailor, Andrew Battell. The Portuguese captured Battell and held him prisoner north of the Congo River. Upon release, Battell described two apes from the region: *pongo* and *engeco*. His writing on *pongo* clearly describes the gorilla. The name *pongo* persisted and ended up reassigned too. During the 1800s, Western taxonomists confused themselves with their descriptions of the great apes. They referred to many specimens as orangutans, resulting in the actual ginger Asian apes now carrying *pongo* as their scientific name. Western ape knowledge has a somewhat interesting history as in the past, orangutans received the name for gorillas and gorillas received an indigenous name for chimpanzees.

From Battell, Schaller then focused on Lord Monboddo in 1774, then Bowdich in 1819, then Du Challi in 1856 (often described as the man to “discover” the gorilla). Du Challi was the first of these authors to see the animal alive, not just reflect on specimens or recount native tales of a mythic ape. Throughout Schaller’s survey, knowledge of the gorilla comes only from foreigners. To be charitable, Schaller could

only refer to Westerners' writing of African stories. Most Africans lacked the resources to share their own accounts. Their knowledge lost nuance in the process of translation and interpretations by foreigners.

Scholars continue to follow Schaller's approach to the history of gorilla knowledge. In "*Discovering Gorillas: The Journey from Mythic to Real*," Newman takes a similar orientation:

Reports of a great ape lurking in the depths of Africa go back over two thousand years, but confirmation that one actually existed did not take place until the middle of the nineteenth century. A rush of hopeful discoverers then ensued. Few succeeded in seeing any, much less studying them, and thus "knowledge" about gorillas consisted mostly of fanciful tale-telling based on reports from Africans. By and large, it depicted a savage beast of enormous power that terrorized people, especially women (2013, 36).

Newman (2013 and 2006) only considers foreigners' accounts in recounting the history of knowledge of gorillas. He describes the long history before the gorilla was "verified" and how the word "gorilla" disappeared from Western literature for over a thousand years. For two centuries, Western reports came from Africa with relative agreement on size, nature, and name of a wild, human-like beast, "but still no sightings, just stories told by Africans filtered through visitors all too willing to believe" (2006, 39). Hard evidence, Newman reports, did not emerge until 1847 when an American medical missionary, Thomas Savage, acquired a skull.



Source: Courtesy of Author

Figure 3: A Gorilla Mask Carved by Artists in Oku, a Community in the Grassfields of Cameroon
Oku has a great forest but has lost its gorillas. Artists make masks to help the children remember what's been lost.

2.2 Indigenous African Ways of Knowing Gorillas

Not all researchers were dismissive of indigenous knowledge. A hundred years ago, some anthropologists asked about it. The stories locals shared with them did not describe the wild, women-stealing beast of hunter's tales. In 1911, Albert Ernest Jenks wrote *Bulu Knowledge of the Gorilla and Chimpanzee*. The Bulu are a group of Fang people living in Central and Southeastern Cameroon. Jenks became wary of anyone's knowledge, noting: "It is almost impossible for the white man in Kamerun, though in the center of the gorilla's geographic range, to have intimate knowledge of that animal" (1911, 56). He notes the Bulu's "credulity" and "tendency to exaggerate" (ibid.), but then goes on to describe the Bulu's detailed knowledge of gorillas including: size of bands of gorillas and how the bands change in number, rank, and structure; nesting behavior; foraging and diets; and how they rear their young. The Bulu described the opposite of a ferocious brute. They explained that gorillas only attack when attacked first. They stressed the gorilla's human-like behavior, such as how the mothers cradle their babies in their arms or carry their wounded away (1911, 57). Jenks reported on an "authentic instance" when, after a hunter shot a gorilla, he cut off the foot and took it to the village. When he returned, the body was gone. They eventually found it far away, clearly carried by its companions.

The Bulu considered the gorillas among the smartest animals in the forest—though not as intelligent as the chimpanzees—and to be their close relatives. Jenks included two Bulu stories depicting a close relationship between gorillas and people. In "The Gorilla and the Man," a hungry gorilla continues to invade a family's house. In "The Gorilla and the Child," a gorilla steals a woman's baby. In both stories, the gorillas speak to people, asking for help and trust. In the first, the gorilla is killed. In the second, a man tries to kill the gorilla and kills the child instead.

Sanderson made a case for the Assumbo of Cameroon, noting that they are "honest people and not given to imaginative story-telling" and arguing that "they probably see more gorillas and know more of their habits than does any other group of human beings in the world, I think their opinions should at least be listened to" (1937, 186). Sanderson describes that the Assumbo believed the gorilla to be another race of humans, rejected a tale popular among other tribes that gorillas carry off women, and knew all the bands of gorillas by sight. They knew where each band would be, what the band looked like, and how many bands there were.

More recent research has helped continue locating indigenous knowledge. Alesha (2004, 48) describes how gorillas hold an array of cultural roles across Africa. She notes how "cult-like worship" of gorillas is present even far from gorilla habitat, even among savanna tribes. One Cameroonian community shared a variety of stories and beliefs about gorillas, even though not a single member had ever seen a gorilla (Rose et al. 2003). Etiendem (2008) collected local stories strikingly consistent with those collected over a century earlier across the region by Du Chaillu (1861). Both share stories that include: if a pregnant woman sees a gorilla, she will give birth to a gorilla baby; and if a gorilla is killed, a man connected to it via a totem will die. In Nigeria, hunters tell a variation: if a woman eats gorilla meat, she will give birth to a strong baby. Some Fang groups refer to the spirit of the gorilla as Essa-ngui, or Father Gorilla. They

believed gorilla spirits to be so potent that, upon encounter, a pregnant woman would give birth to a gorilla (ibid.). Scholars rarely noted the gendered aspects of indigenous knowledge and beliefs, though hints appear in such stories. Hodgkinson (2009, 224-225) found that most non-Aka women in the Dzanga region of CAR would not eat gorilla meat, but would buy it for their husbands. She believed this to be for reasons more to do with traditional taste or relation to stories like those above.

Forest dwelling groups have abundant knowledge, vibrant stories, and spiritual relations with gorillas (Joiris 1997; Remis and Robinson 2017). The Mbendjele Yaka of Congo-Brazzaville call Western lowland gorillas (*b)ebobo* (Lewis 2002). The Baka in Cameroon have at least ten additional terms to distinguish individuals, tracking the gorillas' age, sex, and relation to others; only the forest elephant, the most important cultural species, has a similar abundance of Baka descriptors (Oishi 2013). The Bantu-speaking Kwele, who call the gorilla *dzil*, also have several terms to classify gorillas of various types, but they are less detailed than those of the Baka.

Many beliefs are consistent across regions and communities. The Fang call gorilla *ngi* or *ngui*, the Bulu call them *njamong* (Alesha 2004, 49). The name of gorilla, *ngi*, references fire and a positive force, in contrast to the evil represented by the chimpanzee. Near Virunga, the gorilla is a dark spirit. Speaking its name, *ngagi*, brings bad luck (ibid.). The names are similar a thousand miles apart. Across southwestern CAR, southeastern Cameroon, and northern Gabon, stories tell of totems, transformations, and reincarnations as gorillas (Giles-Vernick and Rupp 2006). Du Chaillu (1861) heard similar tales over a century ago.

The Kwele tell of gorillas with a reincarnated human spirit, *dzil-elizaliza*. These may be gentle revenants or violent witches (Oishi 2013, 12). These gorillas often visit human settlements. If recognized as a *dzil-elizaliza*, the gorilla is protected, but because it can be hard to tell, people often avoid harming any gorilla they encounter (ibid.). If a hunter kills a *dzil-elizaliza*, he will find human blood and rank meat. Oishi heard of six to eight *dzil-elizaliza* encountered over the past twenty years, including one tale in which a *dzil-elizaliza* interrupted a funeral, danced to the drum, and then stayed around the village for a month. He was immediately presumed to be the spirit of the deceased man. Gorillas that appear soon after someone's death are often thought to hang around places familiar to that person; the relatives of the deceased often feel a strong affinity to the gorilla (ibid., 14). Mpiemu call the gorilla *ntchilo*. A contemporary Mpiemu account tells a tragic story of a man losing his daughter and the girl returning as a gorilla. The gorilla often appears near the spot where she died (Giles-Vernick and Rupp 2006, 63).

Both the Baka and Mbenmdjele tell that *bilo* (term used for Bantu-speaking farmers) are reincarnated as gorillas after they die (Lewis 2002, 94; Koehler 2000, 10). Kisliuk (1998, 203-206) shares a Aka story of a *milo* (singular of *bilo*) who died, turned "diabolic (*dzabolo*), went into the forest, and became a gorilla." As a gorilla, he did not like the forest food. Missing manioc and other human foods, he decided to return and live in the village, causing a great stir.

Köhler (2005) describes the shape-shifting differently. More like the totems in Lebialem, shape-shifting is distinct from reincarnation. It is more malevolent and practiced by witches to ambush enemies or raid

crops. He shares a story of an elderly woman admitting that she transformed into a gorilla and attacked a successful farmer as part of a conspiracy (ibid., 418). Mystical hunters can also transform as a means of hunting or escaping danger. Killing a gorilla with a human spirit, whether reincarnated or a living totem, will bring a curse.

Kota in Northeastern Gabon share tales of totems like those of Lebialem; they tell of transformations and people dying after gorillas are shot (Alesha 2004, 50). The Twa also believe in gorilla totems, and traditionally would not hunt them (ibid.). The Twa respect gorillas more than chimpanzees and believe gorillas to be more peaceful. Alesha claims that nearby Bantu, by contrast, fear gorillas more than chimpanzees (2004, 50-51).

Other groups, in the lowland forest, share a wary fear of gorillas. Ngando, Baka, Mpieum, and Baka hunters all tell of gorilla attacks (Giles-Vernick and Rupp 2006, 59). Gorillas can anticipate the actions by humans and will sometimes ambush; hunts can quickly turn violent (Oishi 2013). Baka women and children, traveling alone, have special plant charms for protection from gorillas (Giles-Vernick and Rupp 2006). Only the elephant is more dangerous to hunt; successful hunts bring great prestige (ibid.). Baka hunters tell of the gorilla's great intelligence, how they lay traps and play tricks; they describe hunts as battles of wits with individual gorillas (Oishi 2013).

Gorillas' strength, intelligence, and similarities to people make them potent symbols. Traditionally, gorilla parts held great power. The Ibo in Nigeria, far from gorilla habitat, sent hunters to retrieve gorilla parts for medicine and magic. Canines, fingernails, and dried hand fetishes brought good luck or fertility. Gorilla hair and skin offered protective charms, or decorated ancestor masks. For the Fang, the brain was of particular importance (Du Chaillu 1861). Rubbing a hand or wearing teeth can bring strength (Alesha 2004, 92). For the Bamileke in Cameroon, the chief alone can wear the sagittal crest of the silverback. Skulls provided protection to fetishized war shields in Nigeria, Cameroon, and Gabon. The Mboko in Northern Congo used gorillas' "dried skin [from] supraorbital ridges" to protect themselves from living gorillas (ibid., 94).

In southeastern Cameroon, Gando, particularly the Bodawa group who have a primate totem, tell stories of gorillas helping people carry burdens through the forest (Nelson and Vennant 2008, 14). They believe gorillas recognize them and let them pass safely; in turn, they do not eat the meat. Regional Aka groups share these stories and totems. Around Njikwa, in the Cameroonian Grassfields, many believe the gorillas to be their ancestors (Wittiger and Sunderland-Groves 2007). Older stories from Beti and Bulu describe people and gorillas sharing ancestors and kin, social spaces, and relations, until a fight over an elephant head (Laburthe-Tolra 1981, 427; Giles-Vernick and Rupp 2006, 56-57).

Sacred gorilla societies exist in Gabon and eastern Cameroon, e.g. the Ngi society of Pangwe (a Fang group), the Kwele's Gorilla Dance Society, and probably elsewhere, too (Siroto 1969; Meder 1999). Secret societies often do not share information, especially with outsiders or strangers.⁸ Alesha suggests that these cults are male-based and may still be active. Indigenous knowledge is not known, in part, because it is kept secret.

Almost all these accounts reflect outsiders documenting curious local beliefs.⁹ From these scant notes, it is hard to know how much indigenous people knew of gorilla behavior (though they must have known much to successfully hunt such an intelligent species). Many indigenous accounts of gorillas include magical or fairy-tale aspects. The stories describe real occurrences: village visits and crop-raiding by gorillas, the threat a wild gorilla may pose to a child, the danger of eating gorilla meat—while weaving these descriptive facts into a normative narrative, akin to a fable or a morality tale. The blend may have caused Western scholars, aiming at scientifically accurate accounts of gorillas, to be skeptical of the reliability of local stories. Instead of untangling the descriptive and normative elements, they dismissed the knowledge.

Schaller was consistent in his critiques, challenging the folk knowledge of both colonial hunters like Sanderson and indigenous communities. He noted that the habits of lowland gorillas remained largely unknown at the time of his writing. “Hunters shoot them, zoo collectors catch them, and explorers take random notes in passing, but only one scientist has made a definite long-term attempt to study the ape” (1964, 5-6). Again, Schaller referred only to Westerners including hunters, as knowing about gorillas, but he eventually referenced indigenous knowledge when discussing his fieldwork.

Unable to locate the gorillas in certain regions during the fieldwork, he “resorted to second-hand information about gorillas from miners, government officials, and especially from the native residents” (1964, 85). He described indigenous communities that hunted gorillas for food and gorilla attacks. He hinted at a few local beliefs, e.g. “the Wabembe in this region believe that the gorilla, the *kinguti*, is not an ape but a man who long ago retreated into the forest to avoid work” (1964, 86). Perhaps the Wabembe and other indigenous communities farming lower on the Virunga Mountains knew less of the mountain gorillas higher up on the slopes than the Bulu, who share a forest with the lowland gorillas, did. Or, perhaps Schaller’s relationships with the locals obstructed opportunities for them to share their knowledge. He wrote: “It is never easy to get to know the natives. They usually remain in a world of their own, and most attempts to draw them out are met with silent rebuff” (1964, 42). He may have heard stories, considered them more distracting than valuable, and chose not to include Africans’ accounts due to their perceived inaccuracy:

Reuben and the other guides told us many things about the family life of the gorillas, but like the other Africans we met, they were not reliable. When it came to confirming the presence or absence of the apes or of pointing out the various food plants, our guides were invaluable, but when they were describing the behavior of the gorillas they simply assumed that it resembled their own. Thus, gorilla males were said to bring food to their families, and a female about to give birth left the group and secluded herself (Schaller 1964, 45).

Schaller may have omitted indigenous knowledge out of frustration, too. He described difficulty in attaining even simple knowledge from locals while they searched for gorillas. The Twa would not tell him

what gorillas eat or how they nested but gave cryptic guidance such as, “If you call the animal you are seeking by name, you will never find it” (1964, 51). On a fresh trail, one man repeated “If you follow this trail, the gorillas will kill you,” repetitively, like a mantra (1964, 58). Different people or groups contradicted each other:

One Bantu had told me that gorillas grab flying spears when hunted and throw them back at the attacker. When I asked Bishumu [a Twa] about this he smiled and replied: “This is a fable. We tell such tales to the Hutu and they believe them. The gorillas fear man. They bark and roar and run away (1964, 53).

Schaller omits indigenous knowledge beyond the mentions above.¹⁰ Newman, too, passes over African tales in his accounts of knowledge of gorillas, though he does offer a few fanciful tales from sensational Western naturalists writing in the late 1800s, such as how gorillas smash elephants’ trunks with a tree-branch to defend their favorite fruit. When Newman does recount African stories, via the colonists who recorded them, his concern seems to be that African stories were so fanciful that the colonists “must have had their legs pulled” (2006, 38).

The concern that indigenous knowledge is not reliable or true, and therefore should be excluded, mistakes an important understanding of knowledge. Knowledge is not only scientific fact. Many indigenous accounts describe gorillas in relation to humans. Locals understand gorillas not as wild creatures living in remote forests, but through correspondence to their community, behavior, and interactions. Indigenous knowledge of gorillas helps guide and explain behavior; it helps navigate gorilla and human relationships. It differs from the objective knowledge sought by Western science, but is no less valuable.¹¹

As a scientist, Schaller was concerned with descriptive knowledge that offered an objective account of gorilla behavior. Descriptive knowledge presents the way the world is. It provides facts about gorillas. It is the sort of knowledge produced by scientific study. It does not explain why to conserve gorillas, only what gorillas are. Indigenous knowledge describes how to relate to gorillas, not just what gorillas do. Such normative knowledge describes how one should act in the world. It is more apt for considering moral questions about values and ethics regarding gorillas. It helps humans and gorillas coexist while considering morals to guide action and behavior. When indigenous accounts included information about how to interact with gorillas, they confused Western scientists who were looking for objective facts. Local stories were wrapped in metaphor, mixing observational facts with myths. Further, primatologists were visiting for research. They were not trying to build a community or raise a family among gorillas; they were trying to figure out what a gorilla is. To them, a gorilla was defined not by its interactions with humans, but by its role in the ecosystem. The gorilla knowledge Westerners produced, even if objectively-oriented and descriptive, rested on normative Western assumptions of what nature should be and what sorts of things about gorillas should be studied and characterized as descriptive of the species.

Western scientists wanted to study gorillas in their “natural” habitat. They wanted to know how gorillas act unaffected by people. Their position came from a Western tradition of separating humans and human

influence from nature. This position affected their research as they would not study gorillas when they interacted with the indigenous communities, but only as they acted alone out in the forest. The researchers did not want local anecdotes. They wanted proof from hard science—study of evidence, behavioral observations, and other data collected in the Western way. When the terms and criteria of Western science set the standard for valid knowledge, locals' observations and other ways of knowing about gorillas were lost.

Locals may not have always provided accurate descriptive knowledge. To them, it may have been more important to share knowledge that was relevant and useful, e.g. what one needed to know to interact with gorillas upon an encounter. Why discuss abstract ideas about what gorillas do out on their own—unless you plan to hunt them?

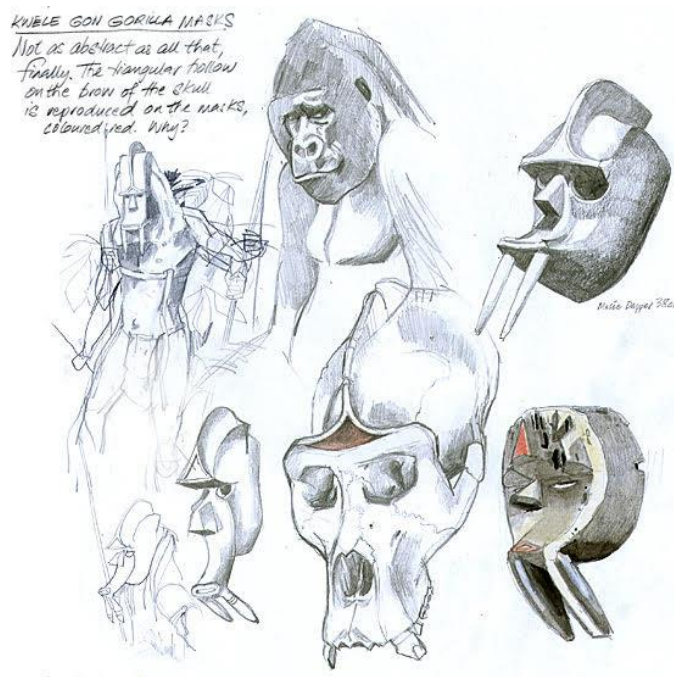
People in the indigenous communities who directly interact with the primates, such as hunters, have particularly nuanced knowledge. Gorillas are difficult to hunt. They do not fear humans the way other animals do (Köhler 2005, 419-420). Gorilla hunting remains a practice in some forests (Giles-Vernick and Rupp 2006, 59). Hunting gorillas requires intimate and intricate knowledge of the animal. Forest-dwelling groups understand gorilla behavior so well they can mimic it. In Gabon, hunters have a gorilla dance, to help them appear as gorillas and deceive them while hunting (Giles-Vernick and Rupp 2006; Reade 1864, 164-167). Hunters also have the ability to communicate with the gorillas by mimicking their vocalizations (Giles-Vernick and Rupp 2006). Baka hunters understand gorilla social structure, nesting behavior, and habitat selection (Oishi 2013). They know the diversity of social arrangements and how they change, and their knowledge tracks that of primatologists. For example:

An adult male living and foraging alone (*ndonga*), which seems to correspond to the 'solitary male' in modern primatology terms, is considered to be an old *ngille* (mature silverback) that has been driven away from his troop by younger adult males (*mokolo a ngille*) (Oishi 2013, 5).

Oishi argues the Baka have developed their own "empirical knowledge." Some Baka knowledge matches current primatology, other knowledge does not, "e.g., primatologists have a different interpretation of the solitary male phenomenon" (ibid.). The unique and precise knowledge hunters have about gorillas is often descriptive. Such Traditional Ecological Knowledge (TEK) is built on observations and interactions with a particular environment and provides descriptive accounts that align with the methods of science. Folk biologists and ethno-ecologists often work with TEK to co-produce descriptive knowledge about the natural world. Ethno-primateology emerged from anthropologists' observation that all primates overlap with human communities and that "coexistence translates into knowledge" (Sousa et al. 2014, 130).¹² Communities coexisting with gorillas have indigenous, descriptive knowledge of gorillas and their behavior. As Oishi (2013) shows, this is akin to Western knowledge of primates accrued with study, i.e. primatology.

Just as science produces descriptive Western knowledge, moral philosophy produces normative Western knowledge, such as ethics. Indigenous knowledge can be further distinguished as well. Where TEK tracks

science, other forms of indigenous knowledge are built on cultural history and traditional beliefs. They provide normative guidance. Indigenous cultural knowledge of gorillas both emerged from and guides the communities' long relationship with the animals. It is not so different from Western knowledge reflecting on relationships to nature, e.g. environmental ethics.



Source: Desmond Bovey

Figure 4: An Example of a Culture Relationship with Gorillas: Kwele Gorilla Masks from Gabon

2.3 Values Informing Knowledge Production

Schaller wrote *"The Year of the Gorilla"* to separate his feelings from his objective account of gorillas contained in his scientific manuscript *"The Mountain Gorilla."* His writings exemplify the blend of descriptive and normative knowledge that would come to characterize the discipline of conservation biology, a science with embedded values. Schaller's writings often blend facts and values, beginning with a descriptive statement that gorillas are gentle, followed by asserting they should be saved.

Schaller described how the first Westerner to see a mountain gorilla reacted by shooting it and how the mountain gorilla is now named after the shooter, Von Beringe. He recounted his enlightened relationship with the gorillas: "It was a wonderful feeling to sit near these animals and to record their actions as no one had ever done before," offering a new, better way to relate to gorillas (1964, 37). He refused to enter the forest with a gun and describes sitting with the gorillas in peace. He contrasts himself with Akeley, his

famous predecessor, who claimed “the white man who will allow the gorilla to get within ten feet of him without shooting is a plain darn fool” (1964, 10). Schaller feels immense wonder:

I felt a desire to communicate with him, to let him know by some small gesture that I intended no harm, that I wished only to be near him. Never before had I had this feeling on meeting an animal. As we watched each other across the valley, I wondered if he recognized the kinship that bound us (1964, 35).

Schaller’s blend is not unusual. Conservation biology often offers precise and descriptive knowledge along with guiding normative knowledge. Western reasoning justifying conservation builds upon Western scientific knowledge of nature. Conservationists produce descriptive knowledge about a species of conservation concern to aid in the normative project of conservation. The validity of the normative knowledge supporting the project—Western reasoning, especially environmental ethics—is assumed, ensured, and unchallenged in part because it is conjoined with science. Descriptive Western knowledge is presented as the most accurate way to understand the natural world and its precise facts clearly lead to moral prescriptions. Yet normative Western knowledge is produced in a certain way, from a certain context, and its foundations are far from sound or uncontested (Vucetich and Nelson 2013).

Indigenous normative knowledge can help guide and inform conservation efforts but has been lost, obscured, or overlooked. In its place, conservation education programs teach locals Western descriptive knowledge and embed Western environmental ethics (Western normative knowledge). For example, they stress the need to conserve the Cross River gorilla. They do not discuss their focus on the value of the rare evolutionary history of that particular type of gorilla. Engaging indigenous knowledge is especially important for improving understanding of historic and modern human-gorilla relations. If Western reasoning is guiding moral and political action in an international context without understanding indigenous normative knowledge, then such efforts may continue to replicate epistemic injustice, colonial hierarchies, and remain ripe for abuse (Kapoor 2002).

Conservationists and indigenous communities have much to offer and learn from each other. The issue is not with knowledge exchange or congruity, the issue is with one knowledge being considered more valid, accurate, and correct than the other. Lee notes “ethics, aesthetics and traditional values attached to primates are discussed in the literature, but on the ground, indigenous peoples’ interactions with primates tend to be predominantly negative in perception as well as consequence....” but rather than be discouraged, she adds, “If conservation only works when it is emergent rather than imposed, then perhaps it is time to listen more and tell less?” (2010, 929)

Scholarship on issues of knowledge and power warns of the many challenges in working across knowledges, from the problems of even conceiving of indigenous and Western knowledges as necessarily separate to concerns of unequal power and unshared cultural assumptions when engaging different ways of knowing. Few Africans have had the opportunity to study gorillas with the methods and resources of Western science. Even fewer Africans have had the opportunity or support to put their studies and ideas of

gorillas into print. The lack of African publications or authority does not track a lack of value or worth of indigenous knowledge of gorillas. Recognizing that this knowledge has been belittled, ignored, or even suppressed, explains why Westerners characterize indigenous communities' relationships with gorillas as antagonistic at worst, ambivalent at best.



Figure 5: A Community Meeting to Discuss Concerns with Conservation; Bomaji II, A Village Enclosed within Cross River National Park, Nigeria.

3.0 The Problems with the Absence of African Accounts

3.1 Epistemic Justice and Gorilla Conservation

Fricker's work on epistemic justice (2007) explains how injustice can occur in relation to African communities, African wildlife, and conservation education. She describes two types of epistemic injustice: testimonial and hermeneutical. Both are caused by prejudice, conscious or unconscious, against the speaker's social identity. Testimonial injustice occurs when a listener discounts a speaker's credibility, and thus knowledge, due to prejudice against the speaker's identity. An example of testimonial epistemic injustice occurs when a villager tells a story about how gorillas care for their young, and a primatologist dismisses the story as apocryphal due to the villager's lack of scientific language or study. Testimonial injustice can also be preemptive. Group members may be prevented from testifying due to a perceived lack of credibility. Injustice can also come from social structures that exclude groups from testimony. For example, during colonialism, Africans struggled to gain credibility or establish their knowledge of wildlife.

Anderson (2012) builds on Fricker's work by showing additional structural injustice. Systematic epistemic injustice occurs when a group's knowledge and credibility is continually discounted due to prejudice and discrimination, in turn denying them resources and other opportunities. Without proper education and opportunities, tools, or platforms for expressing or presenting their knowledge, a group's

knowledge may continue to be discounted, dismissed, or lost. “Testimonial exclusion becomes structural when institutions are set up to exclude people without anyone having to decide to do so” (2012, 166). Structural epistemic injustice may be the cause of the great dearth in Western and global literature of African knowledge on African animals such as giraffes, gorillas, hyenas.

Hermeneutical injustice may identify the cause even better. Fricker (2007) describes hermeneutical injustice as always structural, occurring when the prejudicial marginalization of a speaker and their knowledge group prevents society (including both the speaker and the listener) from having the “interpretive resources” to make sense of the speaker’s claims and experience. African communities suffer from hermeneutical injustice because they lack the interpretive resources to isolate the injustice they suffer through prejudicial epistemic marginalization. When confronted with conservation efforts that challenge their relationships to the natural world, they are unable to explain their alternative ways of knowing nature since they do not have the resources or established authority to present their knowledge as equally valued. Unable to show how they appreciate wildlife in their own ways, local communities seem like they undervalue it. As a result, conservationists enroll local children in education programs and conduct sensitization programs for adults. Locals struggled to offer their own accounts of their relationships to wildlife in response. Instead, they must accept the knowledge presented by visiting Westerners and the Westerners’ corresponding normative prescriptions. Local African knowledge is absent from science, media, and reasoning that support the conservation actions of wild animals. It seems as only Westerners can speak for the needs of wild Africa. With their superior knowledge, Westerners know the best way forward for local communities. Since Africans are unable to present their knowledge as equally valuable, they suffer from structural injustice. The listeners and readers are unaware of the missing African accounts.

For both testimonial and hermeneutical injustice, the exclusion of the victims is based in prejudice. Even though the victims have sought to articulate their knowledge and experiences, they were marginalized. Although many wildlife researchers visit Africa, few research, record, and publish the voices or ideas of Africans in relation to wildlife or conservation. Fewer provide the training, tools, or resources for Africans to document and present their own knowledge. As Garland describes:

...the historical and racial politics of the international wildlife field are such that [African’s] intimacies [with wild animals] rarely translate into the kinds of successes enjoyed by their non-African counterparts and employers. Africans are simply not currently a central part of the narrative that renders African wild animals glamorous and valuable in the global scheme of things” (2008, 67).

The lack of fair distribution of resources and opportunities present a more familiar case of injustice. Fairness and distribution are challenging to quantify in a global context, but parsing questions of global justice is important in cases of international interactions such as gorilla conservation.

3.2. Unjust Benefits and Burdens

Distributive injustice refers to the unfair distribution of the benefits and burdens of conservation (see, e.g., Martin et al. 2015). It is the great postcolonial challenge facing Western conservationists. In an unjust global environment, with such inequality and disproportionate power, how can international conservation be conducted in a just manner? Conservation efforts tend to subordinate global justice questions to the moral righteousness of their cause. In contrast, the field of political ecology raises important questions such as: who benefits and who suffers from wildlife conservation? Conservation biologists tend to describe nature without engaging the political implications of their work or their power to do so. Those who control the language of nature prescribe conservation. They make and inform the normative decisions of which wildlife should be conserved, how, and why. Just as people may degrade nature, they also construct nature through conservation, establish populations and habitats, and foster a certain type of ecosystem. The political questions of who defines what construction should entail and who is responsible for constructing nature are both important.

Epistemic injustice is characterized by other unjust acts of marginalization and oppression. The exclusion of indigenous knowledge echoes the removal of indigenous communities to create space for colonial inhabitation (Igoe 2017). The separation and abstraction of interpretations reinforce the erasure and excludes indigenous communities by controlling their narratives around wildlife and conservation space.

Historically, the power to define and respond to ecological problems often falls upon colonial lines, tracking boundaries determined by colonial powers. As international concern grows for African wildlife, African environments continue to fall under outside influence. Westerners determine, define, and pursue desired ecological landscapes beyond their home countries. The hierarchy in control of land began with colonialism and continues with conservation. The main drivers of global conservation are all Western institutions, but none of the millions of conservation refugees are in the West (Dowie 2011).

For example, the Twa are among the most marginalized by gorilla conservations.¹³ In 1964, what is now Bwindi Impenetrable National Park became a gorilla sanctuary and as a result, the authorities expelled the Twa from the forest (Poole 2003). Belgian authorities established what is now Kahuzi-Biéga National Park in 1937, but the charter did not allow them to evict people living in the forest (Barume 2000). They added the region around Mount Biéga after consultation with the *mwamis* (chiefs). When the reserve became a national park in 1970, they evicted the Twa without compensation or new land. Around 580 Twa families were expelled (ibid.). In the 1990s, authorities evicted the Twa from the Virunga National Park in the Democratic Republic of Congo (DRC), Volcanoes National Park in Rwanda, and Mgahinga Gorilla National Park in Uganda (Poole 2003). Without land rights, these groups suffer great insecurity, especially as civil unrest and increasing unregulated exploitation further degrade the forest. Although conservation regimes allow hunting in buffer zones, all activities except ecotourism and research are prohibited from the areas of the national parks in which the gorillas inhabit (ibid.). A Twa man describes:

We are treated like animals. Our whole life has been distorted. We cannot even claim our rights before courts and tribunals. We cannot hunt or fish any more. Our children cannot gain access to schools. Our

wives do not benefit from any health care service. We do not even have access to land. Every time we attempt to get land as others do, we are told that we cannot... (Barume 2000, 93).

The Twa suffer further discrimination that is distinct from their neighbors (Barume 2000). Sicotte and Uwengeli (2002) show that other Rwandans compare the Twa to animals, disparaging them for not farming or building proper homes. Other forest-dwelling groups in Cameroon, Congo-Brazzaville, and the Central African Republic (CAR) suffer similar marginalization after evictions from parks and restrictions on their forest access and use (Lewis 2002; Köhler 2005; Nelson and Venant 2008; Remis and Robinson 2017). Many feel the needs of the gorillas are the priority of outsiders; gorillas are not only perceived to be protected *from* them, but *over* them as well. Sandbrook (2006, 173) reports similar sentiment in Uganda, where decisions not to allow a road, and thus easier travel through the forest, made people feel the gorillas' needs were placed before their own. People also lost access to traditional cultural and burial sites within the forest (ibid.). There is similar concern around the Cross River gorilla habitat in Nigeria and Cameroon (Amir 2019).

Questions of justice fall along three lines: retributive, reparative, and distributive. Distributive and reparative justice are applicable to conservation. Reparative justice describes the need to repair the natural world after degrading it, at least when others depend on it for ecosystem services (if not for the sake of the natural world itself). Whether humans have duties to the natural world—be it to individual animals, species, or even ecosystems—is an enormous and contentious concern discussed across environmental ethics literature. Thus, reparative justice may require that, if one degrades nature, one need repair it for others. Justice may also require that one not degrade nature if repair is impossible. States or other entities may bear responsibility for looking after nature, particularly when it is unique. This is called the “burden of endemism.” African countries home to gorillas—Nigeria, Cameroon, Central African Republic, Equatorial Guinea, Gabon, Congo-Brazzaville, Democratic Republic of Congo, Rwanda, and Uganda—may have a responsibility to conserve gorillas. If they do not, the gorillas will be lost to the world forever.



Figure 6: Ndimuh Bertrand Shanco, a Cameroonian Conservationist and Researcher, at Work in Bechati, Lebialem Highlands

3.3 The Burden of Endemism

Now, in the 21st century's global culture, there are many shared values. Such cosmopolitanism means the global community knows about gorillas and people across the planet—in New York, London, Seoul, São Paulo, Minsk, Lagos, Yaounde, and Ouagadougou—care about gorillas. The value of gorillas can be construed beyond any intrinsic value they may or may not hold. Many people should care about gorillas because they are special to the world. Even if these people have never seen a gorilla, they value the gorillas' existence. Nine African countries oversee conserving gorillas as they are the only countries where they exist. These efforts are comparable to those of the Chinese with pandas and of the Americans with Hawaiian monk seals, kangaroo rats, and prairie chickens.

The burden of endemism includes international expectations. The global community makes demands for the gorillas, sometimes at the expense of the gorillas' home country. For example, a group of international organizations, including the British government, are trying to block a super-highway from being constructed in Cross River, Nigeria. The super-highway would connect the port of Calabar with the large town of Obudu. It would also cut through Cross River National Park, home to the Cross River gorilla. The German firm Broad Spectrum Industrial Services and the China Harbour Engineering Company are funding the construction. Critics argue that the construction violates many international agreements Nigeria has signed, including the Convention on Biological Diversity, UN Framework Convention on Climate Change, and the Convention on Migratory Species, all of which may bring sanctions against Nigeria if the project goes through. Governor Ayate says he is committed to completing the project and the protection of Cross River biodiversity. The unique nature of the Cross River forests and their inhabitants makes the global community feel they have a stake in the Cross River state's development

plans (which are also a global endeavor due to international investors and the global market supporting the expansion).

Endemism is not only a burden; it can also offer a source of pride. These nine countries can be recognized by the world as the only places where gorillas can be found. Indigenous people may be appreciated as wise caretakers and begin receiving credit for conserving gorillas to date.

The challenge is justifying conservation to those who are directly affected. For gorillas, conservation campaigns often target the wider international community rather than the locals. This may be to raise pressure against the local governments, but in so doing, it often villainizes the locals. For example, the Cross River gorillas may be most threatened by a global challenge like cocoa production and chocolate consumption, yet few people make lifestyle or behavioral changes to support gorilla conservation like they do for chocolate consumption. It's evident that there is minimal global connection.

4.0 Engaging Indigenous Knowledge to Improve Understanding

4.1. Conservation as an Indigenous Value

Many locals say they do not support gorilla conservation because it does not take their views into consideration (Nelson and Vennant 2008; Powell et al. 2010; Nkemnyi et al. 2013). Near Virunga, interviewees connected caring for gorillas as part of white culture, akin to the way Rwandans cared for their cows (Sicotte and Uwengeli 2002). The increasing establishment of ecotourism, in which locals take on roles of servitude to connect outsiders to gorillas further such impressions. Tumusiime and Svarstad (2011) report that communities around Bwindi describe both the great burden gorilla conservation places on them and high hopes that the gorillas will bring economic improvement through tourism. They endorse the park, but are disappointed by the lack of benefits and power in decision-making. The political and economic orientation of these positions may belie the lost cultural relationship. Their conversations around conservation do not concern gorillas but relations between locals and outsiders. They focus on issues of sovereignty, power, and value. Despite crop-raiding, physical danger and the vast habitat needs, few communities have problems with the gorillas.

Indigenous values do not necessarily oppose conservation. They may oppose the methods of international efforts, but not the idea of conservation (Ekpe 2015). Some communities call for conservation themselves, noting depleted game and extensive logging (Jackson 2004). In Cameroon, the Bagyeli sought gun restrictions because they were worried about overexploitation of wildlife (ibid.). Also, to the west, the Baka sought better control of commercial hunting by outsiders. Communities within Cross River National Park share similar concerns, blaming the ease and efficiency of modern hunting technology and foreign poachers. Locals explain they know better than to hunt gorillas.

Many indigenous communities already have their own forms of conservation. International efforts often forget, if not omit, local social institutions—taboos, myths, and wildlife tales—that correspond with their goals (Ekpe 2015). Traditional beliefs and stories can greatly affect people's values and relationship to the

natural world, especially as elements of cultural identity. Taboos reveal explicit normative guidance for these communities. Etiendem describes the effect of taboos in the Lebialem Highlands:

...informal institutions and traditional practices such as local tales and taboos, guided by cultural norms, can play an active role in nature conservation. In these areas, it is social norms, rather than governmental juridical laws and rules, that determine human behavior. People do not disregard taboos against hunting gorillas because, if they do, they may be punished by the ancestors or traditional institutions, unlike the wildlife law, which is either poorly understood or hardly recognized (2008, 15).

Taboos offer a method of community conservation that align with both local culture and conservation goals. The way taboos are spread and shared— myth, narrative, apocryphal accounts—addresses the topic of conservation. Taboos protect value while storytelling describes it since stories are an indigenous way of rationalizing conservation.

Taboos can be difficult to justify to both outsiders and new generations, but their existence among communities shows that indigenous knowledge includes normative codes guiding human-gorilla relations. Conservationists may be reluctant to work from local stories and taboos because they worry about supporting traditional beliefs and values that are false. Once a person breaks a taboo and nothing happens, what keeps that person from losing respect for the taboo, the connected values, and the indigenous conservation ethic? Conservationists may feel that promoting “false” beliefs is either patronizing or harmful because it perpetuates misinformation and confusion.

Insights from epistemology and particularly ethnophilosophy may be helpful. First, value does not necessarily track factual truth. One can be clear and correct that gorillas have thirty-two teeth, but have no reason to care about them. Second, truth takes many forms. After centuries of thought and debate, philosophers struggle to define what makes something true. Truth is not limited to correspondence to scientific fact. Indigenous beliefs and stories contain many elements of truth—about their world, their relationships to each other, and nature. Moral truths, for example, are often contained in such stories because they transmit values. Lastly, Westerners need to be wary of how Western thought, including epistemology and ethics, functions as paradigms. Conservationists are passionate and devoted to saving gorillas and other wildlife even if their moral foundations are challenged and contested.



Figure 7: A Conservation Education Class in Wula, Nigeria, A Community Neighboring Cross River Gorillas; Louis Nkonyu Has Students Explain What a Gorilla Looks Like

4.2 Educating Away Indigenous Knowledge

To respect indigenous ways of knowing, conservationists must engage indigenous values and morality directly, especially as conservation seeks to prescribe new values and moral frameworks. Working within indigenous ways of knowing shows respect for their past choices, behavior, and governance. It reflects their appreciation of the past and current cultural identity particularly in relation to nature. By contrast, most current efforts either subsume indigenous knowledge into their own framework or actively work to replace it.

Though conservation efforts reference indigenous values to gain local support, education and sensitization programs based in Western knowledge often directly challenge local interests. Such efforts take a missionary role of raising consciousness and teaching locals to value their wildlife. A downside to this is that it obscures or even ignores normative knowledge already present in indigenous communities. The imposition of Western education may exacerbate local concerns with conservation as it takes the project beyond governing local behavior and resource access and into challenging indigenous culture, values, and morals.

Indigenous knowledge is conspicuously absent from the moral debate over how and why to conserve nature. Akin to how science overwhelms indigenous ways of knowing nature, Western philosophy denigrates other ethical approaches by dismissing their methods and reasoning, charging them with poor logic, and unfamiliar argument structure (Jaggar and Tobin 2013). Ethnophilosophers seek to address this, focusing on studying and appreciating indigenous philosophical systems. They also quickly point out that the distinction is not necessary; Western normative claims are based in a certain culture and it is a “local” philosophical system based in the West. All philosophers are ethnophilosophers.

The missionary approach of conservation education implies hierarchies of moral knowledge. The desire to raise awareness and convert the unenlightened reveal disparate positions of power and equality. When conservation education programs teach Western ways of knowing nature at the expense of indigenous knowledge, they overwhelm the rich nuance, stories, and descriptions of indigenous communities' relationships with the animals. These relationships, connected to community, history, and identity can be a source of great cultural and intellectual value.

Cultural knowledge, especially, can guide behavior. Hunters hold both knowledge of the location of gorillas and of their cultural importance. Though hunters can directly conflict with conservation goals, they also tend to have deep and complex relationships with their prey. For example, local hunters expanded conservationists' understanding of the Cross River gorillas' range when they found more nests in one year than conservationists had over eight years (Nicholas et al. 2010).

Despite the rhetoric depicting hunting as a main conservation threat, gorilla hunting has never been in direct conceptual conflict with conservation since people never hunted gorillas to exterminate them. However, hunting gorillas shows that they are valued. Traditionally, communities such as the Anyang regulated gorilla hunting; it was only allowed for the initiation of a new chief (Meder 1999; Alesha 2004). Strict rules dictated the use of the gorilla's body: the chief ate the brain and another high-ranking person ate the heart. If anyone else killed a gorilla at any other time, the chief sentenced the hunter to death. Oishi (2013) and Jost (2012, 133-134) found that contemporary Aka hunters do not hunt gorillas intentionally, but will if the opportunity, or danger, arises.

The population of gorillas is low because traditional regulations and government enforcement is so weak and the value of gorilla meat to urban markets is high. Any type of hunting now poses a direct threat to their survival. The economization via the bushmeat market and an increased global appreciation for the gorillas make hunting no longer a justifiable cultural expression. The loss of certain local cultural activities for the sake of gorilla conservation may only further the need to conserve other aspects of cultural identity, memory, and relationships related to gorillas.

Discounting such indigenous knowledge misses the important understanding about how to coexist and conserve wildlife. It also raises concerns of injustice and issues with how to relate with each other. By teaching Western environmental ethics as facts, conservation education teaches morality like a pastor, not an ethicist. Conservation efforts are certain of their moral authority that local values and beliefs are not considered unless they support conservation. Conservation raises tough questions about how to live in the world at both an individual and community level. Conservation efforts should help indigenous communities consider and navigate the ethical and political dilemmas while remaining wary of environmental-ethical relativism. For example, education programs can orient towards a fair and just exchange of normative knowledge in relation to environmental problems to arrive at a mutual moral understanding.



Source: Nzhu Jimangemi [The Gorilla's Wife]

Figure 8: The Fon of Bechati warns a young hunter, played by Nkemtazem Squiky, about the dangers of hunting wild animals, such as apes and elephants, which may be connected to people through totems. A still from Nzhu Jimangemi [The Gorilla's Wife], a participatory film retelling the gorilla totem story. Bechati, South West, Cameroon. 2014.

4.3 Expanding beyond Conservation-positive Indigenous Knowledge

The knowledge of indigenous communities can both challenge and support wildlife conservation. On one hand, by imbuing wild species with value, local beliefs and narratives can protect them. In contrast, the hunting, eating, and medical use of gorillas and other primates often follow traditional cultural beliefs and practices. The waning of traditional beliefs in the face of modernization and globalization can have both positive and negative effects.

When conservation engages indigenous knowledge, it selects only the conservation-positive local beliefs. In this way, it incorporates indigenous knowledge into its framework while still retaining its authority. For example, describing the “transvalue” (cultural, economic, ecological) of gorillas for both Western and African communities, Malone et al. (2014, 22) argue that “emphasizing the connections between different ways of valuing wildlife and integrating social as well as ecological research can reinvigorate global and local populations, providing a way forward for conservation.” Recognizing shared values is an important step, but outsiders cannot engage only these values as representative of indigenous interests or a fair characterization of indigenous knowledge. Indigenous knowledge is not considered equal except when it supports Western values. This limits the nuance, richness, and thought contained within the knowledge and maintains concerns of epistemic injustice by dismissing the other values embedded in the knowledge. It becomes less a conversation between ways of knowing and more a means of using one knowledge to validate another.

Adequately engaging indigenous knowledge requires humility. Outsiders need to allow the terms of conversation to change. They also need to learn to question the authority and nature of their own understanding. They must explore how their values and position affect their own ways of knowing and limit their understanding of others. Joiris (1997), for example, shows how indigenous groups in CAR (both Bantu-speaking farmers and forest-dwelling hunters and gathers) conceptualize gorillas and other wildlife differently from “the whites” (Europeans and Africans working for the national park). Indigenous categorizations of wildlife include “good to eat,” “not good to eat,” and “good to think with.”¹⁴ “Good to think with” animals, such as gorillas, may have taboos, but not be categorized as bad for eating. The whites’ taxonomy is defined by conservation. Wildlife is a protected species, non-protected, or pest (*ibid.*, 99). Joiris argues that even if the two groups shared aspirations, reconciling conservation efforts with indigenous interests would require “a more profound western attempt at understanding local reality” (1997, 95, 103).

Knowledge of an animal is much more than a description of the creature. Much is contained in the metaphors, ways of knowing, and stories told about animals. Old Western records of indigenous tales tell of gorillas abducting people (Giles-Vernick and Rupp 2006, 58). Giles-Vernick and Rupp speculate such stories may function as metaphors for both the local and international slave trade (2006, 59):

Certainly, the parallels between the two forms of abduction are striking, both of them motivated by a voracious appetite for human beings, their labor, and the products of their labor. The similarities between ape aggression and struggles over labor suggest, therefore, that ape stories expressed the very real anxieties that Africans suffered. Reade, in fact, mentions that he gained some of his information about gorillas from slaves who worked as hunters (1864, 164).

Such stories, though rarely recognized as African, have seeped into global narratives. Meyer (1992, 58-62) and Giles-Vernick and Rupp (2006, 71-72) speculate that they are the source of King Kong, the giant gorilla movie icon. Western accounts at the time reflected their own concerns about their connection to slavery and their unease with evolution. The Europeans and Americans’ recorded accounts of gorillas venturing to the central African forest in the late nineteenth century. They wrote at a fraught conceptual time for understanding animals due to Darwin’s revelations about nature. Dickenson (2000) describes these authors as “packaging and selling the gorilla” to Western audiences.¹⁵ Dickenson describes how tropes of the time, including “boundary transgressions, dark doubles, haunting pasts, and threats of regression,” appear in their accounts, reflecting the anxiety of revelations about evolution and one’s place in relation to God, apes, and each other. Western accounts of gorillas have always been wrapped in metaphor.

Modern indigenous accounts help explain human-gorilla relations with conservation, but they often speak to something greater. In the CAR and Gabon, Giles-Vernick and Rupp (2006, 51) found that gorilla stories help people make claims about access to and control over human productive and reproductive labor, forest resources and spaces, and other forms of wealth; racial and ethnic relations; and human

existence and death, and they illuminate the complex social and political tensions generated by conservation interventions.

Gorillas have long functioned as metaphors for discussing local relationships. In the CAR, Mbendjele call *bilo* “*bebebo*” more as a descriptive statement than an insult (Lewis 2002, 210). They believe gorillas and *bilo* share similar characteristics, attitudes, and behavior; both are boisterous, aggressive, and large. Lewis (2002, 215) recounts Mbendjele will “point out forest foods saying with mirth, ‘*Bilo* and gorillas eat this!’” or joke about gorillas barking in the forest as if they own a particular section, akin to a *bilo* defending his farm. Mbendjele do not have private ownership; gorillas help them understand and interact with a different culture. Many of their stories about *bilo* and gorilla are *gano*: fables that include moral knowledge (ibid., 216-217).

In Congo-Brazzaville, the Baka have similar stories and accounts of their *bilo* (Köhler 2005).¹⁶ They call them gorillas because the farmers claim territories and seek to control them. The farmers think the timid Baka are chimpanzees. Köhler argues, they wield their metaphor differently, to implicitly challenge the Baka’s humanity. The Baka use metaphors to discuss the “gorillaness of Bantu” and the “Bantu-ness of gorillas,” while the Bantu call the Baka “chimps” to justify their marginalization and reject their access to rights (ibid., 420). The Mbendjele are called chimps as well. Ngando and Aka accuse each other of transforming into apes, too. Giles-Vernick and Rupp (2006, 65) show how such characterizations relate to arguments over rights, access to resources, and conflicts over power and authority. Köhler (2005, 420) offers the example of how Baka also now call soldiers gorillas because they accept bribes just like gorillas raid crops.

These conceptions affect how outsiders understand indigenous relations with gorillas. Köhler (2005) shows how Westerners romanticize forest-dwelling groups such as the Baka. They are seen as “archetypal ecologists,” almost of nature (akin to how the Bantu see them). Like the gorillas, they are endangered and evolved for the forest and are seen as more indigenous. These notions make these people less threatening to gorillas and make their knowledge more valuable, while helping to villainize the Bantu-speaking farmers “as invading the forest with little or no conservation ethic” (ibid., 407). This challenges the Bantu-speakers’ rights to land and forest resources, and dismisses their knowledge and values. It allows Westerners to side with “traditional” ways and reject modernity for indigenous groups, as if one group’s relation with the gorillas is more benign. Ironically, conservation regimes dislocate and empower forest-dwellers, evicting them from their homes and then hiring them to guide others in. While “modern” Bantu-speakers are seen as threats for pursuing change and development, “the Baka, however, could easily be integrated into conservation-related research as knowledgeable trackers and guides to forest fauna and flora, as have Pygmies in other national parks. They would likewise fit well into low-level (eco)tourist projects of safari hunting, photo-safaris, and other forms of guided forest tours” (ibid., 416).

These are also morality tales, “In a familiar scenario of good and evil forces, the idyllic Pygmy picture is complemented with the construction of their ethnically and phenotypically distinct farming neighbors as antagonists of forests and wildlife” (ibid., 413). These characterizations are so pervasive in both

indigenous and outside thought. Köhler shows that it is hard to know the truth and to remove the mythic elements when exploring these groups and their relations with gorillas. Heeding this, this paper engages forest-dweller and Bantu knowledge of gorillas as equal.

Both groups are marginalized by current gorilla conservation regimes, which usually allow only for two activities in protected areas: research and tourism. Like researchers, tourists hold great power over these landscapes, amplified by their financial power. In 2018, a one-hour visit with mountain gorillas costs \$1,500 USD per person in Rwanda. Only a few other sites like Virunga, Bwindi, Mgahinga, and Kahuzi Biega have habituated gorillas and ecotourism programs. The eventual benefits of ecotourism are often touted to encourage local support for conservation. Such orientations allow the interests of foreign tourists to affect not only indigenous rights and lifestyles, but regional and national governance as well. Tourist perceptions of gorillas hold great weight. Emboldened by education, wildlife media, and conservation rhetoric, most tourists think they know gorillas and their needs. Laudati (2010) found that 86 percent of tourists to Bwindi believed the natural areas of the park needed to be expanded and the unnatural area, such as the surrounding communities, need to be restricted and depopulated.

Tourists have a notion of wild gorillas in a pristine jungle and they desire to experience and document this vision. As they spread, share, and replicate, tourist narratives become the dominant way of knowing gorillas, or at least of knowing what makes gorillas valuable (Igoe 2017). This is a very particular way of knowing nature, at once romantic and removed, based on spectacle and trust in technological expertise to describe, monitor, and care for it (ibid., 76-77). Tourist expectations are also self-fulfilling because they create the context they desire (ibid.). They transform actual spaces of nature into images, “which in turn are transformed into money and are used to fix and transform actual spaces of nature and produce more images. As demand for these spaces and images grows over time, these looping transformations often intensify and perpetuate over time” (ibid., 9-10). Tourism has very real impacts for indigenous communities who are policed to maintain the spectacle of the wild gorillas tourists expect and desire (Laudati 2010, 733). They are sometimes consumed and expected to adhere to the paying tourists’ expectations of what they should be, e.g. more exotic and traditional (ibid.).

Regardless of different ways of knowing them, gorillas will act and behave in a certain way because their agency affects how they are understood. For example, in the revenant reincarnation stories, the lone gorillas that appear in villages are usually silverbacks, old, gray males expelled from their band by younger rivals (Köhler 2005). Their old age and appearance reflect the elderly as well. Their bold behavior, unusual for wild gorillas, strike people as further proof of the human spirit inside and prevents them from harming the individual, which encourages the gorilla’s comfort around humans. The presence of ecotourism relaxes gorillas around people. This emboldens them to leave the forest to raid crops and explore more human spaces, leading to increased conflicts and a sense that current conservation regimes are not enough (Laudati 2010, 732).

In addition, Cross River gorillas at Kagwene have been recorded throwing objects at people. Wittiger and Sunderland-Groves (2007) guess the gorillas perhaps learned this trick after watching humans. Kagwene’s

gorillas are unusually comfortable around people because the people are comfortable around them. Traditional beliefs describing the gorillas as ancestors guide peaceful and positive human-gorilla interactions. The sense of safety allows Kagwene's gorillas the chance to interact with humans more often. In turn, they learn and exhibit similar behaviors, further reinforcing impressions that they are ancestors and relatives.



Figure 9: Serika Lucas, The Traditional Leader of Njikwa, The Community Neighboring Kagwene Gorilla Sanctuary

5.0 Conclusion

Who knows what about gorillas? Anyone who studies, encounters, or observes gorillas. It's clear that levels of knowledge vary widely. Different relationships with the apes lead to different sorts of knowledge. Primatologists hold precise, careful knowledge after great study, but also understanding built on relationships of acquisition, exotification, adventure, and distance. They do not know the gorilla as a neighbor. It may be an evolutionary relation, but not a cultural one. Indigenous groups hold an array of knowledge, some totems and taboos, others of wariness and distrust. Some relationships wane with modernity, and knowledge is lost as forest access becomes restricted and gorilla populations dwindle. Others develop knowledge as they track gorillas daily for ecotourism, guard them for conservation, work with Western researchers, and become researchers and conservationists themselves. The goal of this essay is to encourage support for the many ways of knowing gorillas. In a moment of crisis, let us know gorillas not only in Western ways, for this will dictate how they are understood, how they are characterized, how and why they are conserved, and what we are left with. This not only limits thinking of possible solutions, it limits the sorts of world and relationships we may end up with.

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Endnotes

¹ This belief is not very different from Western arguments that the great apes and other social and intelligent animals have something like a soul.

² The words "indigenous" and "local" are not interchangeable. "Indigenous" references a historical connection to a place with a corresponding distinct culture. Viergever (1999, 335) describes, "In most articles and studies on indigenous knowledge, indigenous simply means traditional or local. The difference between traditional and indigenous communities is that indigenous knowledge peoples' communities, despite the pressure to integrate within the larger society of the national states of which they are part, still have their own distinct cultures. On the other hand, local communities usually do not have a distinct cultural identity that separates them from the larger society, or at least not to the same extent as in the case of indigenous peoples' communities."

³ Herr S. Diehl, an employee of the German Northwestern Kamerun company and possibly a temporary governor of Kamerun in 1900, acquired the skulls from villages in what is now Takamanda National Park (Beolens et al. 2009). The Cross River gorilla still carries the name.

⁴ Geneticists continue to aim for accuracy in classifying species. Though the early 2000s brought continued confusion and contestation of the appropriate phylogenetic position of the Cross River gorilla based on the genetic data, in 2018 they remain a subspecies with the support of most primatologists (Bergl and Vigilant 2007).

⁵ See Lewis (2002, 49-51) for a careful explanation of forest-dwelling groups and their names.

⁶ 'Bantu' is a rough reference for groups speaking Bantu languages (of which there are hundreds). Many authors use Bantu to refer to farmers. Köhler (2005, 426) notes Bantu groups are also "linguistically and ethnically distinct peoples and the use of a generic term such as 'Bantu', to distinguish them as a group from the Baka, does not imply a link between Bantu languages, cultures, and phenotypical traits, particularly since there are both Bantu-speaking Pygmy groups and non-Pygmy, Bantu-speaking hunter-gatherers."

⁷ The "ba" that precedes the names of many African groups means "people of."

⁸ Lewis (2002, 215) describes how "in Yaka tradition, notions of exclusive individual ownership are only rigorously applied to ritual and mystical knowledge, or intellectual property. Certain personal possessions are considered to be owned by individuals, but unlike ritual and mystical knowledge, they can be shared..."

⁹ Despite problems, the records remain of value. Giles-Vernick and Rupp (2006, 55-56) note that though colonial Euro-American writing of Africa was exaggerated, racist, and exploitative, "outsiders' stories about... gorillas in the nineteenth century bear a striking resemblance to our contemporary ethnographic evidence and recent ethnographies."

¹⁰ Schaller was more interested when he thought local myth tracked scientific fact. For example, he provides an accurate, complete, local tale about hippopotamuses, allocating more space to the story than to any discussion about gorillas (1964, 64).

¹¹ For example, Lopez describes how modern Western understandings of wildlife seem strange to Inuit ways of knowing: "...because we have objectified animals, we are able to treat them impersonally. This means not only the animals that live around us, but animals that live in distant lands. For [Inuit], most relationships with animals are local and personal. The animals one encounters are part of one's community, and one has obligations to them. A most confusing aspect of Western culture for [Inuit] to grasp is our depersonalization of relationships with the human and animal members of our communities. And it is compounded, rather than simplified, by their attempting to learn how to objectify animals" (1986, 80).

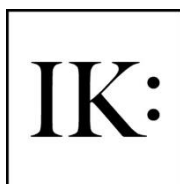
¹² Lopez's description of how indigenous communities come to know a landscape applies well to how they learn to know the gorilla as well. He says, "Over time, small bits of knowledge about a region accumulate among local residents in the form of stories. These are remembered in the community; even what is unusual does not become lost and therefore irrelevant. These

narratives comprise for a native an intricate, long-term view of a particular landscape. And the stories are corroborated daily, even as they are being refined upon by members of the community traveling between what is truly known and what is only imagined or unsuspected. Outside the region this complex, but easily shared “reality,” is hard to get across without reducing it to generalities, to misleading or imprecise abstraction” (1986, 273).

¹³ This is in part because the more populous Bantu-speaking tribes suffered much more directly and immediately from colonization. They had been displaced and disrupted a century before. See Köhler 2005.

¹⁴ I am working from Köhler’s translation (2005, 428-429).

¹⁵ Quoted in Giles-Verick 2006: 55-56.



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Commercialization and Marketing of Women's Indigenous Knowledge Products: A Case Study of Maasai Body Ornamental Products in Arusha, Tanzania

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This study casts light on constraints and potentials of Maasai indigenous knowledge and body ornament production skills. Synergy between indigenous and Western knowledge is appreciated in literature. Study findings show that Maasai women produce indigenous body ornamental products with ample business opportunities. However, there have been little commercialization and marketing initiatives for these products. Marketing information is limited and penetration into the market is shallow. Regression results reveal that a domestic market is important for generating income for Maasai women. Nonetheless, switching to export/tourist markets has a high potential for additional earnings. Productivity, market participation, income, and employment are undermined by low education levels and specialization in production, *inter alia*.

Keywords: *Maasai Women, Indigenous Knowledge, Body Ornamental Products, Income and Employment*

1.0 Introduction

The Maasai tribe is one of the Nilotic traditional pastoralist communities living mostly in northern Tanzania and southern Kenya. Maasai tradition clearly defines socio-economic roles by gender. While men's major economic activity is semi-nomadic livestock keeping, Maasai women are engaged in general family care and indigenous body ornamental production. They sell their products to consumers, middlemen, tradesmen, and use them for the family. Most Maasai people of Tanzania live in Maasai lands in Arusha Region, within

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a wide rift valley strip extending to Maasai land on the Kenyan side. Traditionally, Maasai people were purely pastoralists who kept cattle, sheep, and goats for food. Nevertheless, over the past four decades the tribe has undergone an important transformation to a semi-nomadic society, with a number of members now engaged in other jobs like game guides, purveyors of cultural practices in the tourism industry, security guards in urban areas, and sellers of traditional medicines and body ornamental products. A number of Maasai people have turned into small-scale crop farmers and ranchers, while a few of them have taken jobs in different modern professions of natural and social sciences. Due to competition for multi-purpose land amid degradation of nomadic grazing land, increasing demand for permanent habitats has influenced a turnabout to economic activities other than pastoralism, which were considered taboo or inappropriate for Maasai. Despite globalization occurring since the period before colonialism, Maasai culture and tradition has remained unchallenged by what could be elsewhere reckoned as the fortunes of modernization.

Although Maasai men continue to succeed in diversifying their economic activities, women do not have a variety of economic engagement options to choose from because the tribe's patriarchal culture renders women unauthoritative and powerless (Ngoitiko 2008). Notwithstanding marginalization, Maasai women utilize unique indigenous skills to make ornamental products that are marketable within, and largely outside, their community. Among the indigenously crafted products are: beaded necklaces, belts, earrings, wallets, handbags, bracelet bangles/cuffs, woven garments, leather bracelets, wrist bands, and various souvenirs. Besides handling domestic chores, Maasai women are traditionally artists. Most Maasai women have vast traditional knowledge and skills for creating intricate beadwork, which dominates fashion shows and the tourist markets of Tanzania and Kenya. However, the irony is that very few Maasai women have the ability to create decent employment from their indigenous knowledge to sustainably generate substantial income from their artistry (Maasai Association 2015).

Middlemen and traders profit from the Maasai women's products since they market them to tourists. Unfortunately, Maasai women are the core of ornamental product production, but receive a small portion of the profits. The production process is entirely done in the Maasai matrifocal organization structure, but amid commercialization difficulties because the marketing of such products takes place in the outside ring of the traders/middlemen whose relationship with Maasai women is of independent producer-distributor interaction (Coast 2002). In most cases, women finance all the material inputs and spend their own time to make goods. The intermediating distributors purchase the final products to sell them through different outlets, formal (with receipts issued and tax paid) and informal (without evidence of sale and tax payment). Since women producers are either uninformed about the market value of their products, which cause low prices, or do not have ample access to the higher markets, like the tourist market, their profits are low.

Although Maasai women have indigenous knowledge and skills to make marketable body ornamental products, throughout the course of history they have remained poor. The economic power of Maasai women is substantially inferior to that of men, who have engaged in agro-pastoral activities, i.e. doing both crop cultivation and pastoralism.

To clearly understand Maasai women's situation, it is important to reflect on the historical background of their traditions and existing debates. On one hand, some Maasai women would like to remain "typically traditional" and have been resistant to cultural changes, therefore, being satisfied with their positions/roles (Börjeson et al. 2008; Hodgson 2005; Hodgson 1997). On the other hand, there is the notion that Maasai women have struggled to liberate themselves from gender inequality in their society for a long time (Talle 1987; Talle 1990; Hodgson 2005; Hodgson 2011). This movement has been supported by non-governmental organizations like Maasai Women's Development Organisation (MWEDO) in Tanzania. In addition to the gendered debates on rights and roles, the Maasai community has struggled for recognition, resources, and rights in their countries of Tanzania and Kenya (Kantai 2007; Hodgson 2011). According to Gledhill (2004) and Harvey (2005), the contemporary political movements and economic demands associated with the neoliberal restructuring of states and economies (as propagated by the World Bank, International Monetary Fund, and other multinationals) have induced such struggles.

1.1 Research Questions

This study seeks to answer a few important questions and discuss ways to emancipate the Maasai women through harnessing the potential of their indigenous knowledge and skills for making valuable body ornamental products. The main research question is focused on how to create decent employment for Maasai women by participating in trading ornamental products at the top niche of the market in Arusha. Specific questions include:

- i. What is the potential market size for Maasai women's ornamental products?
- ii. What determines income from Maasai women's ornamental products, and hence employment potential?
- iii. What are the factors limiting the market access for Maasai women producing ornamental products?
- iv. How can production, commercialization, and marketing of Maasai women's ornamental products be scaled up for more income and job creation?

Overall, indigenous knowledge studies regarded traditional practices and products as worthwhile in terms of use in their respective communities, but not actually as products with high universal commercial value. Indigenous knowledge derives impetus from its applications to cultural conservation, the ease of use, low cost of acquisition and transfer, and empowerment of local people through the participation in development and adaptability to the environment (Gata 1993; Jupp 2007). Nonetheless, indigenous knowledge must be appreciated and upheld to meet its developmental role in the modern era of science and technology. Emphasis on the integration of IK (indigenous knowledge) in science and technology will aid development. This paper discusses how indigenous Maasai body ornamental products can be appreciated and contribute to increase women's economic gains and job creation.

2.0 Theoretical and Empirical Perspectives on Indigenous Knowledge

Knowledge is power, whether indigenous or not. The only difference is that the former entails subjugated knowledge in view of historical treatise of contemporary functionalist and formal systemization (Foucault 1980). It is not just knowledge that matters, but its benefits, too. According to Foucault's theory of discourse, subjugated knowledge is exactly what has been, in modern times, regarded as indigenous knowledge that is not considered scientifically compelling recognition of contemporary knowledge. Subjugated knowledge is placed at the low level of the hierarchy of recognized useful knowledge, and therefore, has been disqualified as unpopular knowledge of the locals. Nevertheless, the knowledge itself is what matters and not its origin. The subjugation of some type of knowledge is contingent to each specific situation. While some knowledge could be subjugated in some socio-economic conditions, whether due to a level of sophistication reached or other reasons, in other places it may be a state of art knowledge. Foucault (1980) underscores that from the late 1960s, there has been an upsurge in understanding the essential association between the buried knowledge and erudition, therefore, continuing the cognition of IK in the hierarchy of knowledge and science.

Indigenous knowledge has a role in development processes as a part of social capital for production and livelihood (Harding 1998). While the world is advancing in science and technology, adopting new means and approaches in societies takes place gradually. In communities like the Maasai, identity is fairly conserved, and the process of change is gradual. In the setting where there is a divide between indigenous knowledge and erudition of modernity; in the world with northern and southern sides—the north harboring the most affluent people and south harboring the poorest people—affordability of knowledge and technology is a critical issue to production and growth of the south. Even if indigenous knowledge is perceived as subjugated in some sense, it still remains a cheap complement that is needed for cognitive diversity of knowledge adoptions (Posey and Dutfield 1996). However, using one kind of knowledge does not necessarily discredit other types. Although there is an argument concerning knowledge complementarity, there is an equally important argument for the substitution of heuristically gained indigenous knowledge versus modern knowledge where erudition is not comprehended, inaccessible, costly, and customarily unacceptable.

Maasai women should have the right to sell in any market they wish to, while also gaining the highest profit. The theory of access (Ribot and Peluso 2003) hypothesizes the reasons access to resources and markets may be a problem. Ribot and Peluso (2003) define access as “the ability to derive benefits from things.” The commercialization and marketing of Maasai body ornamental products is constrained by women's inability to derive benefits from the market. In this study, these benefits are regarded as “resources” for transfer of value from buyers to the makers/sellers. Access is regarded as a matter of “power” rather than “right” to participate in the market. Understanding the processes that limit Maasai women in the market from gaining adequate benefits is the objective of this study. We are concerned with widening women's participation in selling their products at lucrative prices instead of being represented, and/or over-exploited by middlemen within and outside the country.

One factor that hinders effective participation in the market is the information gap. This problem that occurs when one party is more informed than the other about their respective transaction, i.e., the famous issue of asymmetric information. Information asymmetry can lead to arrogation of costless returns similar to financial arbitrages. In the case of the Maasai, business people prey on the women who produce goods. As a result, Maasai women receive little because their lack of knowledge causes them to sell products to middlemen at unfair prices. Stiglitz's (1975) screening theory explains how poorly informed agents can extract information from those who are better informed by offering a menu of alternative contracts for a specific transaction, like screening through self-selection in an attempt to resolve the information asymmetry problem. Even so, the screening theory warns that if the seller is too poor, he/she may not be able to understand the important information. This can partly explain why poor Maasai women producing ornamental products amid the information gaps are unable to extract and use information that is relevant to the establishment of their deserved compensation, thus leaving exorbitant profits to the traders of their products in the formal market.

The marketing mix theory addresses issues that are concerned with a set of actions and strategies used to promote brands or products in the market. According to MacCarthy (1960), the first four contents (nicknamed the 4 Ps) of marketing mix theory are: (i) *product*, if marketing is done for products that are in demand, more of the goods will be sold in the market than if the products were not targeted to fit the consumer's wants at the time; (ii) *place*, products being marketed must be at an accessible place where targeted customers can easily purchase the goods; (iii) *price*, products should reflect requisite value for money. For consumers, products should not have to be cheapest to suit their purposes, but prices have to be in tandem with their use value; and (iv) *promotion*, if there are no appealing advertisements, sales promotion, and displays, it can be difficult to penetrate the market.

In the 1980s, the theory of the 4Ps was extended by Booms and Bitner (1981) to add three contents of marketing as markets evolve over time: (i) *people*, unless an organization has the right people to run its businesses, it cannot offer effective products; (ii) *processes*, the process of product delivery is important for one to achieve sales goals; and (iii) *physical evidence*, in any transaction there must be physical evidence for consumers to feel comfortable and secure. In a market where there is no evidence, marketing can be stifled by fear of authenticity and legitimacy.

Beyond the 7Ps, there has been a question as to whether there can be an eighth P. The answer is yes; *productivity and quality* are part of the marketing mix, which facilitates commercialization. The management efficiency and quality of products capture a wide scope of the clientele base (Kotler 2000; Kotler and Gary 1994).

To assess hindrances to commercialization and marketing of indigenous body ornamental products, the gaps owing to described weaknesses and failure in catching up with these 8Ps of marketing must be utilized. The theory hypothesizes a standstill in commercialization and marketing of goods and services overall.

Empirical evidence shows the role of various factors found significant for the protection, promotion, development, and management of indigenous knowledge systems and products. Management of the rights belonging to indigenous knowledge holders and the establishment of accreditation and certification of practitioners are instrumental to sustainable contribution of this strand of knowledge and technology in the communities (Magni 2016). These factors will be an area of interest for this study.

Another key factor to consider is the role of education. Literature shows that indigenous groups conceive education as learning for life experience, which is not confined to formal schooling or a fixed curriculum (Kanstrup-Jensen 2006). There are arguments for and against formal education regarding indigenous knowledge and technology. Formal schooling has the dual potential of losing indigenous knowledge, while, on the other hand, it can also preserve it (Stavenhagen 2015). Through formal education, one can see the benefits of indigenous knowledge complement Western knowledge and can be used to craft solutions to human problems. Therefore, this rescues the disappearing indigenous knowledge in lieu of acquired comprehension that is, at times, believed to be superior. In this study, observing the role of formal education in relation to indigenous knowledge shows how it influences gains from traditional economy.

There is a positive relationship between formal education and indigenous knowledge profit. Formal education adds value to indigenous knowledge products at either the production and/or marketing stages. Studies on Latin America (Barnhardt 2008; Barnhardt and Kawagley 2005) uncover the overall importance and positive impact of the dual learning process (formal and indigenous). Such findings were applied in indigenous educational systems of Alaska native communities and proved to be effective. Women and elderly people are responsible for transferring indigenous knowledge, and once attained, it becomes an integral pool of knowledge applied in solving problems in the development process (Marika et al. 2009). If otherwise, then it means there is clear demarcation between the value created by indigenous learning and that created in the context of what is perceived formal from a Western point of view. Either of these inferences will have important policy implications in this study.

The development and sustainability of indigenous products depend highly on their commercialization and marketing. The commercialization and marketing of products determine market access, i.e., who is reached to purchase products. Maasai women can reach customers of their ornamental products individually through displays on the roadsides or through weekly markets. They also access tourist sites, selling to retail traders and middlemen who also sell to traders. Africa and India show that indigenous knowledge is fundamentally important to both the production and marketing of products in their localities (Kala 2002). Marketing, production, and design are essential functions of economic activity. Therefore, indigenous knowledge is multidimensional as it associates with a full range of key economic functions. The focus of this study addresses the commercialization and marketing of indigenous products as it is not commonly discussed.

Production efficiency is enhanced by the level of specialization. A specialized producer is more likely to be more experienced and therefore produce units more quickly than a non-specialized producer. It is

worth noting that specialization increases the ability to intuit comparative advantage, exhaust gains from exchange, and effectively choose production that is valuable regarding the choices of others. However, not everyone becomes a specialist in the community, and for that matter we do not argue for full efficiency since that could be achieved only in the case where all were specialized (Crockett et al. 2005). Maasai women are not all specialized in body ornamental products, but there is added value if they make this activity one of their major economic undertakings in order to reap the benefits of their unique skills. The level of specialization that results from the concentration of body ornamental products contributes significantly to the earnings of Maasai producers. To uncover this data, surveys identified the women's income from body ornamental products in comparison to the levels of specialization.

Information and communication methods influence the commercialization and marketing of goods. Information can be transferred orally, electronically, in print, and/or by intermediators/middlemen between sellers and buyers, and so forth (Fill and Jamieson 2011). According to Wise (2006), marketing communication involves tactics and strategies to deliver the desired marketing messages. Marketing also enables the entrepreneur to identify goods and services the customers need. In the course of decision making, an entrepreneur would adopt strategies to use in a bid to expand his/her market niche (Onah and Allison 2007). Onah and Allison's study of Nigeria found that small and medium entrepreneurs do not invest in marketing their products. Some limiting factors are budgetary constraints and the ignorance of its eventual dividend. This study explores the extent to which indigenous Maasai women producers harness the advantages of marketing. If women utilize their opportunities, it should be reflected in their incomes.

The central focus of this study concerns improving rural women's employment through the enhancement of indigenous knowledge and technology. It's important to examine how Maasai women have managed to create jobs in the traditional ornamental products sector. Employment can be viewed in two contexts. First, where one engages on her own, and second, where she employs others on some payment terms to produce for her. The focus of this study is on the latter aspect of job creation for women who may not be able to access materials or meet the cost of production, but are endowed with skills to make indigenous products. Literature appreciates the role of knowledge and skills transferred from generation to generation. Ingold (2001) explains, "We are able to be so knowledgeable only because we stand on the shoulders of our predecessors." This is exactly the underlying skills-base for Maasai women engaged in beadwork. Generally, knowledge and skill in the Maasai community are transferred through oral tradition. Empirical literature has not widely measured the magnitude of jobs created by indigenous knowledge in communities of Africa, although there are remarks of high employment potential and output from IK products. So, how much indigenous knowledge is integrated into the socio-economic development framework and how many jobs have been created following that integration? (Magni 2016). According to the Australian Chamber of Commerce and Industry (ACCI) (2001), if participation in Community Development and Employment Projects (CDEP) was excluded from the official unemployment count, the unemployment rate of indigenous Australians would reach as high as 40 percent. The study shows unemployment disparity between indigenous communities (like Aboriginal and Torres Strait Islanders)

and the formal modern industry. However, to achieve the employment objective, one has to be employable and this relies on skill, particularly regarding accessible indigenous training.

Sustainability of the indigenous economy is centred on training and knowledge transfer, which come from experiential learning that also allows indigenous people to adapt to changes overtime (Bates 2009; Briggs 2005). It is imperative to know that indigenous knowledge transfer is not homogenous across societies as it depends on several factors, both demographic and non-demographic, like age, gender, type of occupation, tradition, and political influence. Nevertheless, while sustainability becomes an issue of importance, this study is centred on contemporary improvement and recognition of IK's role in employment creation, particularly for women in rural areas where formal Western education, knowledge, and skills have not penetrated.

This study looks into issues that arise from the work done so far as well as other leading questions of IK contributions and challenges. The literature describes the level of effort placed on the narration of the historical role of IK as an alternative to Western knowledge and its defence against subjugation. We see a reason to underscore contributions of IK to indigenous societies in terms of their livelihoods, and to refute perceptions regarding IK as inferior and backward knowledge. It is obvious there are returns/benefits of indigenous knowledge products, but there is scanty literature articulating the extents of those returns. In a modern context of Western knowledge, marketing services are viewed as an important ingredient of value addition. Nevertheless, there is little evidence on how such techniques of modern nature could be adopted in indigenous production to enhance productivity, employment, and incomes. These are the kind of issues motivating research on IK at this time, when the world is progressing in a sophisticated way. This discussion is focused on the roles of each type of knowledge, and/or how certain knowledge could be augmented in some way by the other type of knowledge.

2.1 Employment of Women in Tanzania

The Integrated Labour Force Surveys (NBS 2006 and 2014) of 2006 and 2014 summarize facts involving women employment in Tanzania. The surveys show women constitute a large portion of the labor force in comparison to men in Tanzania (Table 1). Specifically, in the rural areas, women account for 31.4 percent of the national labor force while men account for 29.8 percent. If unemployment rates increase in the rural areas it is more likely to affect women more than men. In turn, the employment of rural women is a matter of paramount importance.

Area	Male	Percent	Female	Percent	Total
Dar es Salaam	1,538,596	6.0	1,686,349	6.5	3,224,946
Other Urban	3,143,382	12.2	3,609,016	14.0	6,752,398
Rural	7,677,459	29.8	8,095,313	31.4	15,772,772
Total	12,359,437		13,390,678		25,750,116

Source: ILFS (2014), Analytical Report

Note: Proportionate distributions are relative to the total population of the country's workforce.

Table 1: Distribution of Working Age Population, 15+ Years by Sex and Area

As demonstrated in Table 2, women's monthly incomes in Tanzania are generally low. A male's monthly average income in the self-employment group was Tsh. 279,636, while women earned only about half at Tsh. 144,300 (NBS 2014). Women in rural areas mostly comprise the self-employment category.

Age Group	2006			2014		
	Male	Female	Both Sexes	Male	Female	Both Sexes
Paid employed income						
15 - 24	59,717	27,442	46,933	143,637	126,672	135,958
25 -34	79,621	67,339	76,304	321,282	287,498	310,325
35 - 64	146,009	131,830	142,499	413,148	389,084	406,749
65 +	56,843	25,311	49,978	412,373	111,336	372,531
Total	106,272	79,032	98,454	328,856	265,604	308,075
Self-employed income						
15 - 24	69,066	45,109	57,251	153,166	103,640	128,436
25 -34	88,143	63,100	77,039	258,443	147,502	205,118
35 - 64	113,472	51,592	85,619	328,324	156,686	248,136
65 +	47,894	18,947	36,399	161,705	66,652	122,744
Total	94,373	53,163	75,693	279,636	144,300	215,541

Source: ILFS (2006 and 2014)

Table 2: Mean Monthly Income (Tsh.) of Paid and Self-employed Persons, 15+ Years by Age Group and Sex

While scaling up women's employment opportunities, the women, whose labor contributions are significant, receive lower wages than men due to socio-economic factors, such as traditional assignment of in-house roles to women while men engage in financially productive activities.

For example, women engage more in agriculture and household duties than men do (Table 3). Both of these sectors generally receive low pay for more labor-intensive jobs.

Sector	Male	Female	Total
Central and Local government	365,993	266,494	632,487
Parastatal organization	59,306	13,351	72,657
Agriculture	6,016,199	6,141,933	12,158,132
Private informal sector	1,937,860	1,782,442	3,720,302
Private other sector	1,253,331	653,334	1,906,664
Household duties	510,711	1,029,184	1,539,895
Total	10,143,400	9,886,739	20,030,139

Source: ILFS (2014)

Table 3: Distribution of Employed Population Aged, 15+ Years by Sector and Sex, 2014

When distributed by the level of education and sex, data show that more women than men are employed in jobs that require minimal education (Table 4). Due to their lack of education, women are less likely to have decent jobs and earn high incomes since there is a correlation between high education levels and high salaries.

Education Level	Male	Female	Total
Primary and below	1,887,928	2,405,433	4,293,360
Secondary	489,340	477,182	966,523
Vocational training	100,423	48,629	149,052
Tertiary non university	24,119	16,637	40,756
University	10,869	4,503	15,373
Total	2,512,679	2,952,384	5,465,064

Source: ILFS (2014)

Table 4: Distribution of Employed Population, 15+ Years in Informal Sector by Level of Education and Sex, 2014

In terms of different employment parameters, women are more disadvantaged than men in almost all dimensions regardless of geographical location. Although the problem of unemployment is a general concern for everyone, it directly affects more women. Therefore, it's imperative for women to increase their employability, productivity, and income. This study was derived from the need to unlock employment opportunities for women by leveraging their indigenous knowledge and skills.

3.0 Methodology

The study follows a conventional approach to employment participation choice/decision based on earnings and other individual characteristics. This is because Maasai women do not choose to engage in the production of indigenous body ornamental products. They're usually prescribed these jobs because of Maasai traditions. The study uses field survey data from the Arusha region, which facilitates quantitative and qualitative analyses for this case. In addition to the four specific research questions, there are many other analytical frameworks that help cover the full range of issues in this study. Different aspects of this study require different techniques, so the analytical approaches are multivariate to adapt to a number of interplaying factors.

3.1 Analysis of the Market Potential for Ornamental Products

To analyze the market potential for ornamental products, a questionnaire was structured to capture information about the mix of products and the points of sale for the women. Frequency and cross tabulations of statistics are used to examine women's products and their points of sale.

Secondly, the study surveys the sales made by traders to other domestic and foreign buyers at the Maasai markets in Arusha. This section also highlights the women's marketing approaches and customers. The same methods are used to analyze their approaches and sale points. The questionnaire also captured information from the sellers of Maasai ornamental products.

3.2 Determinants of the Ornamental Products' Income

The survey collects data on the incomes made through the sale of indigenous body ornamental products. We understand that income is an important motivation to people's engagement in economic activity; if income from some work is high, it is likely that a large number of people will be attracted to that type of job, provided that they are qualified for it; and if it is low, a number of them may quit that job for some other, provided they have alternative skills. This is a question of opportunity cost of employment taken. Income is determined by several factors, including input costs, level of productivity, quality of goods, and market factors, *inter alia*. For the sake of this particular study, constant factors were used to aid the statistical analysis like all producers hand-weave their products, they put in the same input costs, and they all experience the same economic and production conditions.

Despite these factors, there are some differences across the population of Maasai women living in Arusha such as education, gender of household head, an individual's access to markets, and applied marketing communication. The data captured these differences, which are reflected in the women's incomes. Women may be operating quite homogeneously in the Maasai community, but they can make a different income by accessing other commercial services. The goal of this study is to uncover the socioeconomic factors that influence women's incomes. Market factors are prioritized while using a simple linear regression model to facilitate this study.

3.3 Data

In applying a linear regression on survey data, it is important to note that estimating regression coefficients of the standard linear model is not applicable in conventional Ordinary Least Squares (OLS) manner (Shah, Holt, and Folsom 1977; Binder 1983). The point behind this theory of survey data regression relies on the fact that a finite full population is sampled, which is different from the classical regression theory of infinite population. Important advantages of modelling responses to survey questions as function of sample data are: (i) it is easier and more efficient than using high-dimensional multi-way tables; and (ii) is useful for summarizing how changes in the explanatory variables affect the dependent variable; and (iii) it corrects inherent heteroscedasticity imbedded in survey data. In terms of design-based

inference paradigms, no information matrices exist because variance estimators are generalizations of White's heteroscedasticity-robust estimators, i.e., corrects for heteroscedasticity.

The linear survey regression model for women's income determinants is:

$$(1) y_i = \alpha_0 + \alpha_1 x_{1i} + \dots + \alpha_n x_{ni} + \varepsilon_i$$

y_i represents the income of an interviewee, i , and $\alpha_0, \dots, \alpha_n$ are the model parameters explaining the relationship between explanatory variables (denoted as x 's) and the pendent variable, *income*, while ε_i is an error term. The error term is assumed to be independent observations and normally distributed, with a mean of zero and constant variance, $N(0, \sigma^2)$. This implies:

$$(2) y_i = N(\alpha_0 + \alpha_1 x_{1i} + \dots + \alpha_n x_{ni}, \sigma^2); \text{ and}$$

$$(3) E(y_i) = \alpha_0 + \alpha_1 x_{1i} + \dots + \alpha_n x_{ni}$$

The analyses are interested in the effect of each exogenous variable, x , on income variable, y . The model is a multiple regression for isolating effects of each hypothesized explanatory variable after accounting for others. Controlling the effects of other variables underscores the extent to which the respective variables form real ornamental product income. In practice, α_0 , is either estimated or suppressed depending on the researchers own understanding and theoretical background. The parameter α_0 is a constant or autonomous determinant. Whether to retain it or suppress it in regression, when one is estimating a linear regression, should be able to answer a question about what happens if all explanatory variables were ineffective. Would the dependent variable still be realizable – at least in part? If yes, it means there is an autonomous determinant, α_0 ; if no, then there is a reason to suppress constants in the respective regression.

To avoid error in the linear survey regression model, it's important to identify the variables determining or influencing the sample design so that they can be included in the model. In this case the focus was the commercialization and marketing of indigenous body ornamental products. The questionnaire was structured to these variables, which occupy a significant part in modelling. However, when respondents to those variables are identified, their inclusion in the model may not be warranted from the subject-matter point of view. In order to avoid biased results, standardized software was used (STATA in this case) to do survey linear regressions. This captures the effect of the complexities involved in survey design. To see the problems with standard linear regression in survey data, consider a simple (heteroscedastic) format of Equation (1), $y_i = \alpha_0 + \alpha_1 x_i + \varepsilon_i$, with $\varepsilon_i | x_i \sim N(0, \sigma_i^2)$. The usual OLS estimator of α_1 , call it a_1 , where sums and products are weighted by the reciprocals of σ_i^2 , whose value is assumed to be known, would be an unbiased estimator of α_1 , if the model holds. The estimator of the variances of the OLS, $v(a)$, is model-unbiased under the appropriate specification (the homoscedastic model in the case of $v(a)$). Although this is the case for the usual OLS regressions, there may be doubt about the validity of the OLS model in estimating complex data. For this reason, instead of estimating α_1 , it may be more appropriate to estimate the finite population counterpart of α_1 , which can be denoted as A . Although a (the OLS estimator) is a model-unbiased estimator for $\alpha_1 \approx A$, it is not generally design-unbiased.

Following the possible problem of OLS estimation, which is similar for Generalized Least Squares (GLS), the estimators in the linear survey regression model are modified to take care of the highlighted complexity, especially in any case where there may be a need for an identifier variable to be included. If a standard software is used for survey data regression, it is capable of considering such complexities in estimation, which is done in this study. Using survey linear regression smoothly resolves the design and model bias problems. Further details on how this works can be explored in Nathan and Holt (1980).

From the general estimation, Equation (1), the estimation model is,

$$(4) \text{ income} = \alpha_0 + \alpha_1 \text{market access} + \alpha_2 \text{education} + \alpha_3 \text{specialisation level} + \alpha_4 \text{marketing approach} + \alpha_5 \text{goods delivery mode} + \alpha_6 \text{gender H/H head} + \varepsilon_i$$

Exogenous variables are chosen based on literature and with the interests and themes of this study. Nevertheless, variables in Equation (4) are on aggregate terms, and so they are explained to highlight the way they are operationalized empirically in this case.

3.4 Terms

- i. *Income*: Drawn from the surveyed information reported by respondents. Expressed in shillings.
- ii. *Market Access*: Refers to the market segment/niche identified by Maasai women to establish the relationships between access points and income earned. Sales can be completed with individual users (locals), tourists (foreigners), cooperatives, middlemen (between women and traders), or directly to traders (loosely, the wholesalers).
- iii. *Education*: Education data were collected at the highest level attained, from those without formal education to tertiary education level. Levels were expressed as none, primary, secondary, or tertiary.
- iv. *Level of Specialization*: Women ranked their levels of specialization in ornamental goods production relative to other activities they perform in their households. Expressed as high, moderate, or low.
- v. *Marketing Approaches*: Drawn from the survey regarding the way women disseminate information about their ornamental products (orally, electronically, print, through middlemen, or a combination) and its impacts on women's earnings.
- vi. *Goods Delivery Mode*: The variable is captured from interviews. It reflects alternative ways by which ornamental products are distributed to buyers.
- vii. *Gender of Household Head*: This is drawn from the survey data and is used in the model as a dummy variable with a value of 1 if female-headed and 2 if male-headed.

3.5 Hypotheses

- i. There is a positive impact of market access, education, and specialization on women's incomes.

- ii. There are positive influences from widely used marketing approaches and delivery modes on women's incomes.
- iii. There is a positive impact of female household headship on women's incomes.

In estimating Equation (4), the constant term is repressed to reflect a reality of “zero slope” of the fitted line for a case of income that comes strictly from commercialized body ornamental products. If the predetermined variables are completely inoperative, sales returns should be unrealizable to Maasai women dealing in this line of production. Some products will still be there, but may be for their own household subsistence use, and not for income generation. However, women will also be making income from other sources.

3.6 Factors Limiting Market Access of Maasai Women Producing Ornamental Products

The preceding regression will establish the relevance of different types of access/avenues for Maasai women to engage in the market. The estimation will indicate the important factors limiting their market participation. The rationale for this experiment is to make recommendations that address the limits of participation for women, in turn motivating employment and profits in this sector. It is worth noting that limitations are found internally and externally of the community. In terms of the quality of the goods produced, if the market is not satisfied with quality, the sellers' access will be limited. When addressing sustainability and quality improvement, the ways in which knowledge is transferred is also an important matter. In addition, other demographic factors will be analyzed, including the gender of the household head, to uncover the implications for women's activities related to the production and marketing of ornamental products, *inter alia*. Analysis will adopt quantitative techniques by using frequency and cross tabulations to summarize and analyze the responses to questions focused on market access factors. A few qualitative observations obtained in the field will also be included.

4.0 Ways to Scale Up Production, Commercialization, and Marketing of Indigenous Ornamental Products for More Income and Job Creation

To find out the ways to scale up production, commercialization, and marketing of indigenous ornamental products for more income and job creation, literature and field data will be used to form suggestions that can help change views toward indigenous knowledge products and show them as important for production, income, and job creation for Maasai women in rural areas.

4.1 Data Source and Description

The study applies primary data collected from Arusha in Northeast Tanzania, the native region for the Maasai tribe. The data were collected using a structured questionnaire with questions pertinent to answering specific research questions.

Survey Population: the study targeted Maasai women living in the Arusha region. The *sample frame* includes all women living in two districts of Arusha, Mjini and Monduli. These districts were purposefully chosen since they are among the most famous districts for producing and selling indigenous Maasai body ornamental products and are also accessible to interviewers. Arusha Mjini, which is a large Maasai market for products produced in rural Maasai places, and six villages of Monduli district were surveyed (Table 5).

District	Villages/Area	Number
Arusha Mjini	1. Maasai Market	31
Monduli	2. Esilale	6
	3. Lashaine	14
	4. Meserani	15
	5. Mto wa Mbu	5
	6. Naserani	1
	7. Ularashi	48
Total		120

Table 5: Sample Distribution by Villages

Out of 120 respondents, 31 were from Arusha Mjini and 89 from Monduli. A total of 94 respondents were Maasai women who produced and sold body ornamental products. Out of 94, 16 women had retail sale slots in the Arusha Maasai market where they sold their products. Others were producers who sold ornamental products as first-hand owners through different channels. A total of 17 respondents were specialized in selling Maasai ornamental products, but did not engage in production.

Sampling involved a combination of both purposeful and random procedures to select the elements from the mentioned areas. Two districts in Arusha were chosen for the study because they are recognized for the production and sales of Maasai body ornamental products. The selection of villages/areas was dictated by the scale of production and sales of Maasai body ornamental products. Monduli Ularashi, Meserani, and Lashaine comprised the majority of respondents due to their substantial production levels. These villages have large populations of Maasai women producing body ornamental products owing partly to their proximity to markets. Even so, we adopted a random sampling procedure to select the elements (i.e., women and sellers) who were interviewed.

Figure 1 shows the age profiles of respondents. Most respondents (70 percent) were between the ages of 26 and 45. Only 2 percent of respondents were above the age of 66 years and there was no observed child labor in the production of Maasai ornamental products. All women engaged in this activity were above 20 years old except one who was 19. The reason for this finding could be due to the fact that this job is somewhat technical and is largely handled by experienced women.

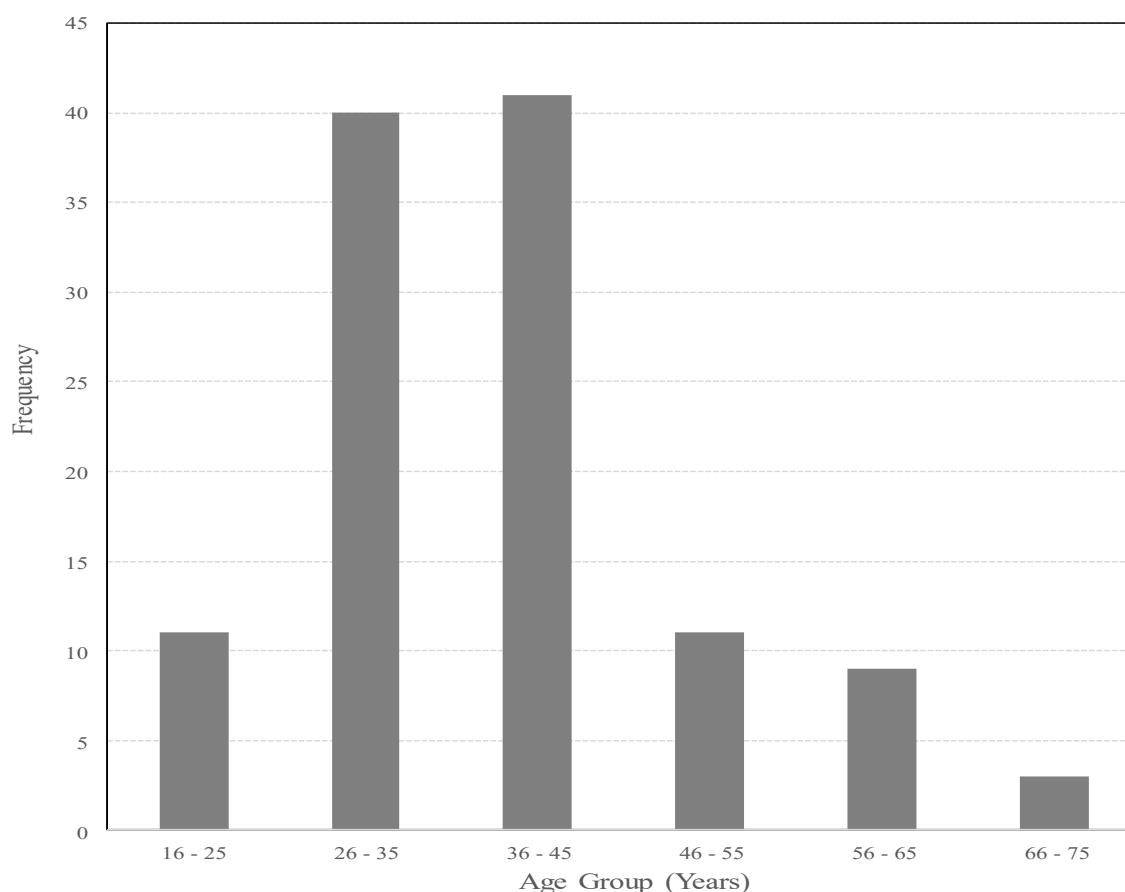


Figure 1: Age Profile of Respondents

Maasai women producing body ornamental products are not highly educated. Approximately 43 percent of them did not attain any formal education, while coincidentally the same proportion (43 percent) had only attended primary education as the highest level attained. About 12 percent attained secondary education, while only about 1 percent had tertiary education. The few with secondary and tertiary education were not actually the producers of indigenous Maasai ornamental products, but the sellers who owned shops in the Maasai market.

Education Level	Frequency	Percent
No Formal Education	52	43.3
Primary School	52	43.3
Secondary School	15	12.5
Tertiary Education	1	0.8

Table 6: Educational Background of Respondents

Most respondents were married (74 percent), while the rest were single (15 percent) or widowed (10 percent). The effects of women's activities, incomes, and welfare in the household were studied, especially in terms of the gender of the household head. In Maasai communities, the roles of males and females are well defined; however, this study explores the effects of each gender as household heads on women's production and sales of ornamental products.

Marital status	Frequency	Percent
Single	18	15.0
Married	89	74.2
Divorced/separated	1	0.8
Widow	12	10.0

Table 7: Marital Status of Respondents

Maasai women are a source of labor to the tribe, while men are usually engaged in livestock rearing and security of the community. Women are engaged in almost all other spheres, including farming and other businesses. Table 8 summarizes the economic functions Maasai women perform.

Activity	Engagement (%)
Farming	36.3
Livestock	31.9
Business	29.7
Other	2.2

Table 8: Main Activity of Maasai Women Respondents

Maasai women produce ornamental products to supplement income activity after they execute their main economic activities (farming, livestock keeping, and other businesses). Unfortunately, producing ornamental products does not serve as a major economic function of the Maasai women, but it is rather a subsidiary activity.

4.2 Analysis and Discussion of Findings

4.2.1 Market Potential for Maasai Women's Indigenous Products

While analyzing the data, it's important to keep the four research questions in mind. The first question addresses the potential market for indigenous ornamental products. In addition, marketing and commercialization strategies are discussed to change policies and increase women's employment and income since Maasai women produce most of the products that are sold both in domestic and foreign markets (Table 9).

Types of Goods Produced	No. of Women Producing	Average Price/Unit
Leather Neck Beads	39	13,667
Leather Belts	67	26,000
Hand Ridges	78	6,864
Pendant Velvet Ties	68	40,406
Pendant Bracelets	68	20,786
Heather Zip Maasai Cuffs	8	13,333
Maasai Beaded Collars	40	8,000
Beaded Decorations for Lower Leg	76	13,367
Leather Hobo Bags	4	16,460
Leather and Straw Bags	4	42,000

Note: Column 2 is the number of women producing each type, respectively, out of 94 who revealed participation in production.

Table 9: Main Types of Body Ornamental Products Produced by Maasai Women in Arusha

Some products that are produced by most women are: hand rings, leather belts, pendants, velvet ties, and bracelets, while others, notably the leather hobo bags and straw bags, are made by few women. The correlation coefficient between the women's inclination to make their respective products and their prices is 0.24, indicating weak quantity-price interdependence. One cannot argue that production of some type of ornamental products relates significantly with the price attained in the market. There is a high correlation between the prices attained by the seller/traders of these goods and the women's prices (coefficient of 0.85). This implies that the producer's and consumer's prices are highly interdependent. For that reason, if the sellers would secure equivalent prices in their segment of the market, women could get better prices too.

The product mix of ornamental goods is assorted, however, there is shallow participation of women in the market. The widely-accessed segment of the market is composed of local individual users, which was accessed by around 81 percent of women, followed by the tourists' niche, which was accessed by 35.5 percent of women. Other market segments were not adequately reached, including sales to cooperatives, traders, and middlemen. Sales to individual local users and tourists are done largely by Maasai women in designated places, including the satellite local markets, roadsides, and tourist grounds around national parks. There are very few traders who collect ornamental products directly from Maasai women at home. Some middlemen do purchase ornamental products from homes to sell to traders in Arusha city (Figure 2).

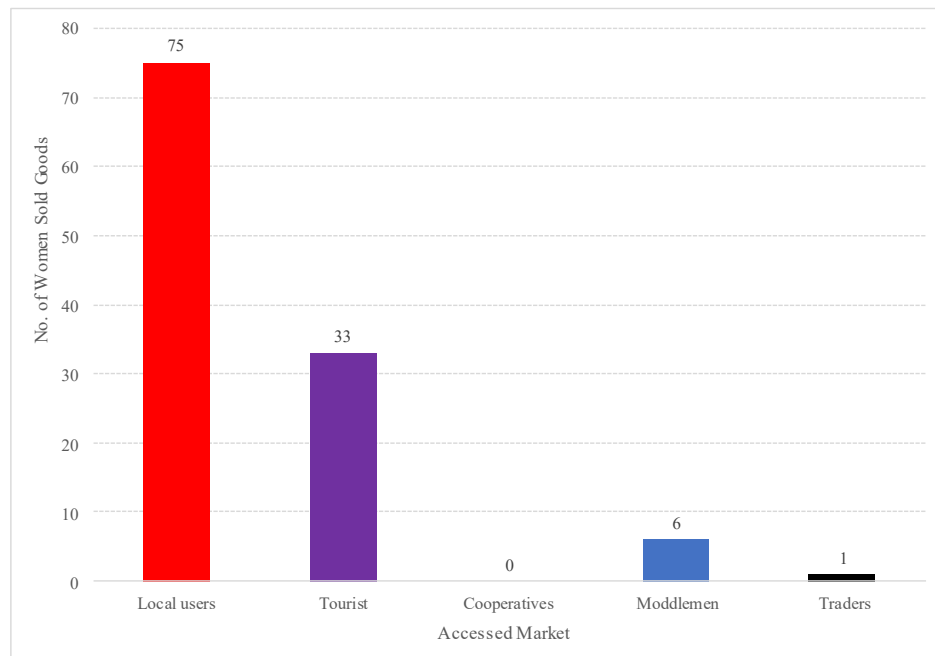


Figure 2: Maasai Women's Sales by Market Category

Figure 2 shows access gaps for women as they attempt to reach buyers on their own. Respondents were not involved in any marketing cooperative societies that marketed Maasai products. This simply means bargaining is done on an individual basis. The individualized approach to the market results in the women's inability to reach distant (export) markets, low bargaining power, limited competitiveness, and the possibility of traders and middlemen to purchase goods at low prices. Price signals are generally sent to women by buyers who purchase products as non-commercial users. Otherwise, it is signaled by middlemen when they purchase and sell at a margin to the traders who dispense those goods as formalized retailers. Further, Maasai women do not know the international scope of their products. Instead, they sell to foreigners visiting tourist parks from outside the country. This is not anomalous since the products have evolved from traditional knowledge or are recognized internationally. One Maasai woman said, "Buyers just come as I display on the roadsides. I don't have any marketing strategy, but I explain my products when the buyers ask." In this respect, it's evident that there is a need for marketing cooperatives. The *modus operandi* of the potential cooperative society can be thought through, but the fact that remains is Maasai ornamental products have already attracted demand from within and outside the country. The cooperative society could mobilize women to expand the production and sales of their products at good prices. As statistics show, the market for Maasai body ornamental products is not yet structured in an organized way. Since Maasai women produce and market their products individually, if commercial reorganization is done within the indigenous settings where they are produced, more goods will be created in response to a wider market, therefore increasing employment and demand.

High quality products are important to increasing demand. The quality of Maasai body ornamental products was assessed from the sellers of those products in terms of Likert scale; low, moderate, or high.

The Likert scale gives a range of response choices – from one extreme to another; and usually, it includes a moderate or neutral midpoint. About 67 percent of sellers indicated a high-quality rating, while the remaining 33 percent perceived the products as of moderate quality. There were no low- quality ratings. Regarding these outcomes, the ornamental goods produced using indigenous knowledge can be quite competitive in the market if quality and marketing improvements are made. The widespread sale of products will also provide important market feedback on the quality to advance the women’s knowledge in this line of activity. These advancements could increase income and employment in the rural sector, especially for the women.

Local customers are the most important group of buyers (as shown in Figure 2) since the established sellers of those goods prefer the foreign market over the domestic market. In contrast to the Maasai shops located in urban areas, sellers prefer foreign markets since they are more accessible to tourists.

Approximately 60 percent of the sellers reported that foreign sales are more significant than sales to domestic buyers. This means that indigenous Maasai body ornamental products have potential in export markets. Women producers experience difficulty in rural areas despite the fact that in formal markets, their goods are a part of the country’s tradable products.

4.2.2 Women’s Income

The second determinant of indigenous Maasai women ornamental products’ income is analyzed using a linear survey regression model. The dependent variable in the regression equation is the level of income, but independent variables are generally dichotomous. Exogenous variables account for the choices made by women or different situations that are likely to cause variations in their incomes. Since the independent variable is not dichotomous, simple linear survey regression is preferred to a binary variable regression model. Table 10 describes Maasai women’s income solely earned from ornamental products.

	Percentiles	Smallest		
1%	4.561212	4.561212		
5%	6.841817	4.561212		
10%	9.122423	4.561212	Obs	94
25%	18.244850	6.841817		
50%	45.61211		Mean	57.06852
		Largest	Std. Dev.	61.82227
75%	68.41817	182.448500		
90%	136.8363	228.060600	Variance	3821.993
95%	182.4485	228.060600	Skewness	2.794774
99%	410.509	410.509000	Kurtosis	13.75049

Note: Exchange rate source is BOT Annual Report 2015/16 (Tsh. 2,192.4/1US\$ at end June 2016).

Table 10: Descriptive Statistics of Incomes from Body Ornamental Products (US \$)

The summary statistics indicate a mean income of Tsh. 125,120 per month, with standard deviation of Tsh. 137,727, showing a widely-dispersed span of earnings. The first quartile of women was grouped with income levels less than Tsh. 39,989 per month. The second quartile had incomes of up to Tsh. 99,995. The third quartile registered incomes of Tsh. 150,004, and the 99th percentile recorded as high as Tsh. 900,002 in once case. The range of incomes is quite large. For example, the difference between the 75th and 99th percentiles is over 300,000 Tsh. Figure 3 portrays a normal distribution of respondents' incomes.

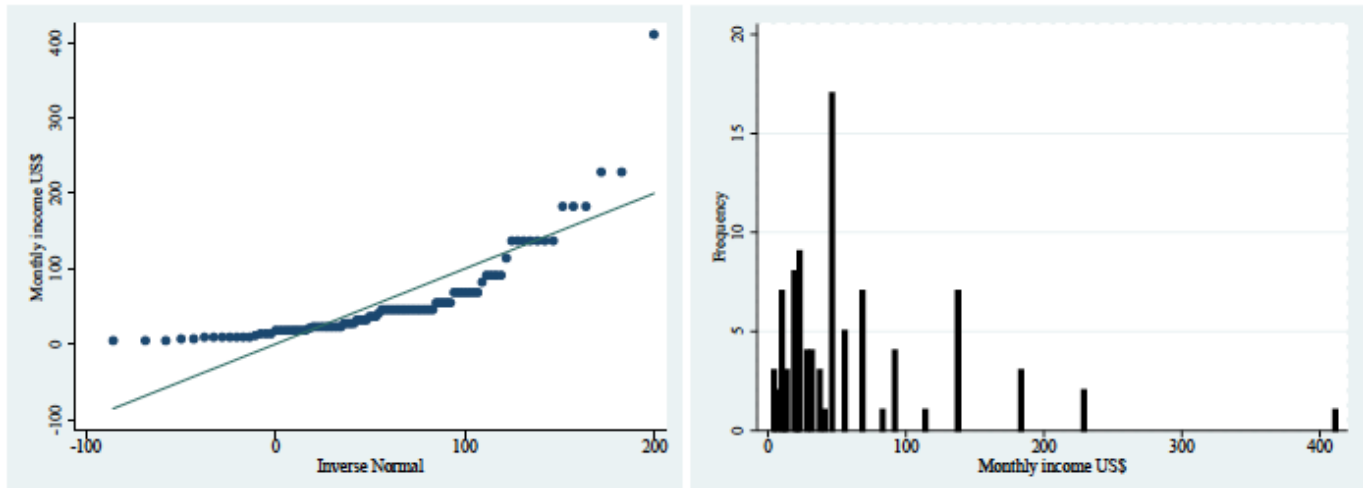


Figure 3: Normal Quantile Plot and Frequency Distribution

Maasai women's incomes from indigenous body ornamental products are skewed to the right side of the sample distribution, and with thick-tail owing to the dispersed distribution. However, the issue of unequal earnings is beyond the scope of this study of partial incomes solely gained through the sale of ornamental products.

To explain the dichotomous explanatory variables, there are no detailed descriptive statistics presented due to the small and random sample of this study. Below there is a summary of important proportions in Table 11.

		Proportion (%)
Type of Accessed Market	Individual locals	0.8065
	Individual tourist	0.3548
	Cooperatives	0.0000
	Middlemen	0.0645
	Traders	0.0108
Level of Education Attained	None	0.5161
	Primary	0.4194
	Secondary	0.0645
	Tertiary	0.0000
Level of Specialization	High	0.3226
	Moderate	0.5914
	Low	0.0860
Marketing Method Commonly Used	Oral	0.9785
	Electronic /Print	0.3763
	Middlemen	0.0430
	Some Combination	0.0000
Goods Delivery Mode	Collected at Home	0.5376
	Market	0.3763
	Middlemen	0.0860
	Traders	0.0108
	Some combination	0.0108
Household -Head Gender	Female	0.4839
	Male	0.5161

Table 11: Proportions of Observed Distribution of Respective Exogenous Variables

As the summary in the table illustrates, there are obvious commercialization and marketing problems for indigenous Maasai women's products. Specifically, the goods are generally delivered to homes (54 percent), while 38 percent depend on the traffic of the local markets to sell their products. Producers do not have ample contracts with large traders or intermediating organizations and cooperatives to purchase and distribute products. As a result, the possibility of getting reasonable prices for their goods is difficult. Approximately 98 percent of producers rely on word of mouth and in-person transactions, while only 38 percent of them can use electronic and printouts to disseminate information about their products. The level of specialization in the production of body ornamental products is moderate (59 percent of women with an averaged specialization) because production is actually a supplementary activity to other economic engagements; however, there are a few women who spent most of their time producing those goods, and so, around 32 percent of women are highly specialized in this activity. Most women did not attend formal Western schools. Instead, they received their knowledge from indigenous training (52 percent), whereas those who attained primary school constitute 42 percent of the sample. The largest number of women (81 percent) access domestic markets of local individuals and 35 percent sell to foreigners who visit Arusha.

Generally, 52 percent of visited households were headed by men and 48 percent were headed by women. When considering this fact, it is important to understand traditional Maasai households. Typically, males

are largely polygamists with several wives. Wives are usually placed in separate households and given some mandate to manage their respective homes and the men speak for them. When a Maasai woman is the household head, it means she is entrusted with the management of a home, including children, livestock, and other family property. Even so, she is not above a male spouse by authority if married. Although women do not traditionally own properties, they act as custodians while bringing up children in cases where husbands are not alive, since Maasai women are typically married to older men. These facts indicate that a women households' headship is generally temporary. Nonetheless, in this study we recognize women household heads as indicated because they have influence in this position during their family life.

Equation (4), located on page 53, shows the strengths of the hypothesized variables in explaining the levels of income earned by Maasai women from ornamental products (Table 12). Variables "tertiary education" and "sales through cooperatives" were eliminated for accuracy.

Number of strata = 1
Number of PSUs = 94

Number of obs = 94
Population size = 94
Design df = 93
R-squared = 0.6186

	<i>Income</i>	<i>Coef.</i>	<i>Std. Err.</i>	<i>t</i>	<i>P> t </i>	<i>[95% Conf. Interval]</i>	
Accessed market	Local individuals	83366.21	35275.5	2.360	0.0200	13316.05	153416.4
	Foreign tourists	87255.62	45630.82	1.910	0.0590	-3358.137	177869.4
	Middlemen	23602.09	68632.07	0.340	0.7320	-112687.6	159891.8
	Traders	-27263.85	45029.13	-0.610	0.5460	-116682.8	62155.08
Education	No formal education	5293.938	76923.82	0.070	0.9450	-147461.5	158049.4
	Primary education	-33702.68	67723.55	-0.500	0.6200	-168188.2	100782.9
Level of specialization reached	Moderate specialization	-3421.516	32926.99	-0.100	0.9170	-68807.98	61964.95
	Low specialization	-107861.7	38499.26	-2.800	0.0060	-184313.6	-31409.78
Marketing approach used	Oral	77406.79	68522.65	1.130	0.2620	-58665.62	213479.2
	Electronic/print	18137.32	48686.84	0.370	0.7100	-78545.09	114819.7
	Middlemen	-21563.22	83707.1	-0.260	0.7970	-187788.9	144662.5
	Combination of marketing methods	3357.698	50381.38	0.070	0.9470	-96689.74	103405.1
Goods delivery mode	Home sales	-43533.58	37045.6	-1.180	0.2430	-117098.8	30031.64
	Market sales	-53076.6	33909.9	-1.570	0.1210	-120414.9	14261.74
	Middlemen sales	60040.12	48765.02	1.230	0.2210	-36797.54	156877.8
	Traders sales	322767.9	85537.89	3.770	0.0000	152906.6	492629.2
	Combination of sales methods	28666.81	42073.75	0.680	0.4970	-54883.32	112216.9
	Gender	-3308.344	28198.37	-0.120	0.9070	-59304.72	52688.03

Table 12: Linear Survey Regression Results

Some insignificant variables in the study are education, marketing approaches, and gender of the household head. The theory hypothesizes that higher formal education implies better income, but this is not proved to be the case for Maasai women producing ornamental products in Arusha. The same goes for the gender of the household head in relation to marketing strategies and income generation. The significant variables include the types of markets that women can reach, level of production specialization attained, and the types of delivery for goods.

Local individuals, foreign tourists, middlemen, and traders were used for the most common market segments in the estimation model to investigate market access in a disaggregated view. The findings indicate that local individuals have a positive coefficient, which is significant at 5 percent. The average income rise, owed to switching to this segment of market, can amount to Tsh. 83,366 per month for the studied group of women. The local individual market is the easiest market segment for Maasai women to reach and remains important. If domestic markets for these products increase, there is a high potential for profit.

Women's venture to sell their indigenous body ornamental products to foreign tourists is positive to their income and significant at 10 percent. The average income gains from switching to this market segments is Tsh. 87,256 per month for the studied sample. These results show a reasonable potential from tourist markets, if women could access it. Because of a communication barrier and other reasons, it is not a market niche that can be well-accessed by a significant number of Maasai women. A mechanism to access this market should be designed for women through organizations or cooperatives that aid in marketing and commercialization. As noted earlier, women in the enumerated villages don't belong to any cooperatives. This limits expansion into export markets of indigenous products.

The use of middlemen and traders to make transactions has proven ineffective, which is why women choose to do it themselves. They don't appreciate the importance of these people and they have not seen enough incentives to attract them to these market channels. In some ways, they are not trustworthy compared to organizations and cooperative societies. Women are distrustful in the cases where there is an information gap concerning producer-consumer price margins. Instead of using middlemen and individual traders as intermediaries, they attempt to access domestic and foreign individuals' markets.

The level of specialization attained was analyzed in two perspectives; *low* and *moderate* specializations, while *high* specialization was not included in the analysis since there were no women who indicated to have reached that level. Since there is minimal dedication to the production and sale of ornamental products, income is impacted. For the regression, two specific variables represented respective levels reached by each respondent dichotomously, and the earned incomes were regressed against the reported status. For each state, specification was put separately in binary form, i.e. the one perceived moderately specialized was coded 1, and 0 otherwise. Similarly, the one perceived lowly specialized was coded 1, and 0 otherwise. This was done to simplify the results, including the resulting coefficients. Low specialization in production was negative at a 1 percent level. Switching from some specialization attained to low or no specialization levels would scale down average incomes of the specialized individuals by Tsh. 107,862 per month. Specialized producers should be the ones making relatively high incomes, so, for better outcomes, specialization in production must be given priority. The findings are consistent with the postulation that low specialization negatively impacts income owing to inefficiency.

The delivery of goods through traders who are centered in market place have significant positive impacts on women's income. The trade mode was significant at a 5 percent level, and it indicates that a shift from other sales methods to formal trade could raise income by Tsh. 322,768, which is a substantial amount for

indigenous Maasai women in this sector. Trading stores are owned by specialized producers who perform formal transactions. Delivery through home collections, the use of middlemen, and selling in the weekly markets do not seem to have significant potential for increasing incomes. Establishing formal trading can be demanding for indigenous Maasai women, but it is not an insurmountable challenge. If there is a cooperative society or organizational arrangement that helps with marketing and commercialization, formal trade inside and outside the country will result in higher income and employment.

4.2.3 Factors Limiting Market Participation of Maasai Women Producing Ornamental Products

The third objective of the study was to investigate the factors limiting the market participation of Maasai women producing ornamental products. Without a market for their goods, women can't predict production. Their lack of market access is among the many factors that hinder production and reduce employment expansion possibilities. The factors limiting market participation are both internal and external to the Maasai community. Several factors limiting the participation of Maasai women in the market that were observed are briefly described here:

- i. *Security of Jobs*: Some Maasai women work with middlemen and traders who purchase goods to sell in the urban market without written contracts. Out of 90 women who were asked about contracts, only 8 had sales contracts with middlemen and traders. If there were firm contracts, some middlemen/traders could purchase and pay even after selling the products. In the absence of sales contracts, women cannot offer their products for deferred payments. This reduces long-term relationships and dynamic interactions among producers and sellers in the market, rendering women to extra risk and limited production. Further, even the physical evidence (i.e. the material part of the marketing mix services) at selling point is largely missing. Only 14 women out of 91 who responded to the question on physical evidence revealed that they have it.
- ii. *Absence of Marketing Strategies*: Most Maasai women producing ornamental products do not follow marketing strategies. They display their goods in the weekly local markets and on the roadsides. They also receive calls from customers about their products. They don't use advertisements, trade fairs, or other sophisticated marketing methods to promote their products. When asked about marketing strategies, women most commonly replied, "I don't have marketing strategy."
- iii. *Low Price Disincentive*: Maasai women face a hurdle of unfavorable prices for their products because they do not reach the lucrative, end-users' segment, especially in terms of exports (Table 13). Approximately 60 percent of women find the low prices to be a hindrance, which causes them to opt out of producing and selling large amounts of indigenous body ornamental products. Most women complained about little market access, saying, "We cannot access lucrative markets. We spread out products on the sunny roadsides to display, and finally we sell them at very low prices."

Price Is Not Good Enough in the Market	54	60.0
Technology Is Limiting Productivity	36	40.0
Cheating by Middlemen	14	15.6
Distance from the Market (Goods Market Segment Not Reachable)	46	51.1
Communication is a Hindering Factor	44	48.9
Men Dominate decisions, i.e. Women's Freedom Is Limited	4	4.4
Education Is a Limiting Factor in Engagement in this Activity	20	22.2
Other	24	26.7

Note: The numbers and proportion are out of 90 respondents who answered a question on respective hindering factors.

Table 13: Challenges to Production and Marketing of Ornamental Products

As discussed earlier, in a competitive environment, Maasai women may not be able to compete on their own unless they are affiliated with an organization, like a cooperative society or group, to attain high bargaining power. A desperate interviewee revealed her inability to bargain as she said, “In as much as I can recover the cost of inputs and make some little margin as return, I would sell my products because reaching the good buyers is not easy.”

- iv. *Distance from the Market:* Women must travel long distances to reach market places to sell their ornamental products. Table 9 shows that 50 percent of respondents see this as an obstacle to market participation. One woman said, “I live too far. During rainy season, I cannot go to the market.”
- v. *Communication Barrier:* A large number of women speak Maasai, some little Kiswahili, but they seldom speak English. Communication is an important factor in the promotion and commercialization of goods (Table 9). Language barriers constrain women’s participation since they are unable to negotiate on their own, thus using middlemen who sometimes take advantage of their ignorance. Around 44 percent of women pointed out communication as a hindrance to their market participation. This is for both Kiswahili and English language fluency, on top of little connectivity to the potential domestic and foreign markets participants. One woman talks about the risks involved with using a translator, saying, “I could make much better gains if I negotiated myself. I have to ask an intermediary to speak for me when I get a customer who speaks English ... but it is possible that he/she may not act in my interest.”
- vi. *Technology Limits Productivity:* Maasai women do their work by hand using simple tools. Referring to Table 9, 40 percent of respondents indicated technology as a deterrent to women’s productivity. Production of ornamental goods is time-consuming and inefficient following other roles women must assume concurrently. There is no technological change observed over time since Maasai people have remained quite traditional. Using advanced tools or simple machines would enhance the productivity of women in this sector.

- vii. *Other Factors Limiting Market Participation:* Other factors that were mentioned by a reasonable proportion of women include educational barriers (22 percent) and the dishonesty of middlemen (16 percent). In a traditional perspective, training children and relatives is encouraged and practiced (Table 14).

Knowledge transfer	Number	Percent
Encouraging Others to Produce	90	98
Succession Plan Available	83	90
Transfer of Knowledge		
Training	16	18
Attachment	72	82
Recipients of Transferred Knowledge		
Children	75	87
Relatives	23	27
Others	2	2

Note: Numbers and proportions are out of 91 respondents who answered a question on education and knowledge transfer

Table 14: Maasai Women Training and Knowledge Transfer

Indigenous women are largely trained through artisanship (72 percent of women use this method). Some women are taught how to do such activities in systematic Maasai cultural training. Knowledge and skills are sustained through continuous learning and practice in the community. Almost all women (98 percent) encourage others to learn and produce Maasai body ornamental products. Approximately 90 percent of them have traditional succession plans of production of ornamental products; particularly, the plans to pass down their knowledge.

4.2.4 Scaling Up Production, Commercialization, and Marketing

The last research question concerned the ways to scale up production, commercialization, and marketing of indigenous Maasai women's ornamental products for higher income and job creation. This question was answered using a variety of sources, including literature and analytical field data. Major issues that need to be addressed across the study include: knowledge and technology used, harnessing the power of information, assuring good quality products and market access, resetting the view on indigenous knowledge products as instrumental in women's employment and income in rural areas, reorganizing women to beat competition and getting fair deals, and guaranteeing effective demand for products. To address these issues there is a wide scope of actions to be taken, including adopting strategic and policy strategies for effective outcomes.

On knowledge and technology, the study shows a disconnect between indigenous knowledge training and modern Western education. The findings show that more than 50 percent of the interviewed women did not attend formal Western schools. Instead, they depended on cultural training and knowledge transfer mechanisms for knowledge. While this works in the context of cultural heritage, there is a large gap in

terms of formal and cultural learning. If traditional Maasai women received formal education and combined those skills with cultural learning to execute their production, they would make higher incomes and increase employment in the indigenous ornamental products sector. Only a few women engaged in the production and marketing of ornamental products received secondary education. Strikingly, no women received tertiary education in this sector. Implementing education policies that mesh cultural skill training sessions into the formal school's curriculum can be helpful in attracting Maasai children to formal education since they are not required to abandon their values. Schools located in Maasai land can include training sessions for indigenous skills training to students in different dimensions/specialties in the curriculum. If traditionalists are cognizant of the school motivation and there is no repeal of useful traditional information, this may encourage children to join schools. Using this method, education becomes more attractive to indigenous people. Otherwise, they see formal education as a complete conversion from their traditional lifestyles despite the obvious benefits of education. The survey results show that the average income of Maasai women without formal education was Tsh. 95,958 per month, while those with primary and secondary education was Tsh. 113,158 and Tsh. 148,333 per month, respectively. This indicates some additional dividend of formal education that accrues to women and the higher the level of formal education they attain. This also supports a combination of synergies between formal and indigenous knowledge.

Issues pertaining to quality, occupation, and market access are integral to commercialization and marketing of goods, which leads to higher income and employment levels. Maasai women cannot accomplish commercialization and marketing on their own. The study reveals that marketing is done by word of mouth at sale points, which are largely on the roadsides and in tourist centers in neighboring locations. Awareness must be raised about Maasai ornamental products in export markets. Maasai women may not be able to organize themselves in cooperatives that manage formal organizations necessary to their market access. Policies that establish marketing cooperatives for Maasai women help them engage together in the production, commercialization, and marketing of their products.

The quality of goods plays a big factor, especially in environments where competition is harsh. It's important to note that Maasai body ornamental products are competing with similar goods. If women do not produce high quality products, they will not attract potential buyers based on customer satisfaction. Although none of the sellers of the products perceived products as of low quality, 33 percent observed the goods were of moderate quality. Improving the quality of products will increase wider commercialization and marketing. However, improving quality requires an enhanced sophistication that comes from education, skills, and market exposure.

Changing the view on indigenous products to be important for women's employment and income in the rural areas is central to scaling up the production, commercialization, and marketing of the products. The stigma of indigenous products in the domestic market greatly affects sales. It is the country's responsibility to uphold the domestic treasury of endowed knowledge to unlock opportunities for its people. The central point is not whether indigenous knowledge is inferior or superior, but it is about its contributions. Home products are revered through the purchase and use of them. This mindset relates such

products are good and worthwhile for consumption, and they can benefit the people. These products can also serve as a symbol for the national attire if Tanzanians see the value of identity and potential benefit from innovation that has already existed in the country.

5.0 Concluding Remarks and Policy Implications

5.1 Conclusion

The study focused on the commercialization and marketing of indigenous body ornamental products. The motivation of the study was centred on the desire to find ways to unlock and increase employment opportunities for rural women through the available indigenous knowledge and technology. The paper does not embrace indigenous knowledge as superior to modern knowledge, but instead upholds IK as more accessible and cheaper. IK is also responsible for higher levels of productivity, employment, and income of rural women. Indigenous knowledge and modern Western knowledge are complementary to each other since they address different subjects.

The findings show that Maasai ornamental products can be a lucrative business opportunity for Maasai women despite the fact there has been little commercialization and marketing of those products. Marketing information for IK products is limited, and penetration into the market remains shallow. Regression results show that domestic individuals make up a significant part of the income from Maasai women's retail. Nonetheless, switching to export (tourist) markets has a high potential for additional earnings. Although the quality of goods is generally satisfactory, none of the marketing strategies used by Maasai women have been good enough to increase their incomes. Most shops that sell Maasai ornamental products are located in urban areas, sellers interact with tourists and external market dealers, and the sellers/traders attribute more importance to foreign buyers than domestic buyers. There is a high potential of exporting Maasai ornamental products for the sellers, but women who work individually, and without institutional facilitation of economies of scale and gains from the export market, cannot penetrate the market.

Most Maasai women don't sign contacts with large traders/middlemen or use organizations like cooperatives to purchase and distribute their products, which means the likelihood of selling goods at attractive prices is reduced. The marketing method used is largely based on convincing the people they meet to purchase their products by word-of-mouth; this implies that women's outreach is constrained by marketing information. Productivity is strained by specialization in the production of body ornamental products since women producers are engaged in too many other socio-economic activities in their communities.

Middlemen and traders are not effective in helping the women penetrate the market because they can take advantage of them. Women typically do in-person deals. There are positive effects on women's income if goods are delivered through traders centered in market places. Shifting from other sales methods to formal trading would raise income substantially as well.

There are several other factors limiting the participation of Maasai women in the production and marketing of ornamental products, including: lack of security of jobs as there are no production or sales contracts; absence of sound marketing strategies; low price disincentives, owing to inadequate women's bargaining power and limited exposure; and geographical difficulties related to distances from the market. Others include communication barriers, resistance towards technology improvements for equipment and tools, and knowledge sustained through continuous traditional learning and practice in the community. In contrast, there is minimal linkage between formal education and indigenous training.

An array of ways to scale up production and marketing of indigenous Maasai ornamental products includes the need to address issues of: knowledge and the technological gap through education and training in a manner that can link indigenous knowledge and formal Western education, and assisting women's organization to help them get fair deals in the market through cooperatives and other initiatives that can guarantee effective demand for their products. Resetting the mindset towards indigenous knowledge products is important for employment and income in rural areas to scale up production, commercialization, and marketing of the products.

5.2 Policy Implications

Policy implications to the development stakeholders resulting from the findings of this study are stated below:

- i. Establish marketing cooperatives to help women access wider markets. Cooperatives will disseminate market information, attain collective bargaining, and increase feasibility within and outside the country.
- ii. Organize women in specialized production groups to raise efficiency and increase productivity and income.
- iii. Establish distribution centers/points for Maasai women to sell their products at designated places (in urban and satellite locations) as a way to avoid the exploitation of middlemen.
- iv. Encourage the use of contracts to bridge the financing gap because prospective buyers can advance seed funding to women and assure market for their products at good prices.
- v. Create better roads to shorten travel time to/from the market and ensure the effective flow of goods and services.
- vi. Provide adult language education to unlock communication barriers in the Maasai community. Basic business communication skills (in Kiswahili and English) can help women negotiate transactions themselves.
- vii. Integrate cultural-skills training into the formal schools located in Maasai communities to attract children to the schools. This will guarantee the retention of good cultural values even when children attend formal schools. It will also help children blend and harness skills to improve the production of indigenous products, *inter alia*.
- viii. Raise awareness about Maasai body ornamental products by exhibition and promotion in export markets.

- ix. Encourage people to purchase indigenous knowledge products, hence increasing the employment and income of the producers.

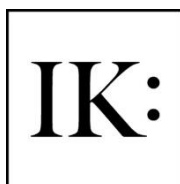
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Indigenous Knowledge and Prospects for Income and Employment Generation: The Case of Handicraft Production among Rural Women in Tanzania

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This paper examines the extent to which handicraft activities can generate viable income and employment for rural women in Tanzania. Based on survey data collected from three regions of Tanzania (Iringa, Dodoma, and Mbeya), the study finds that women engaged in handicrafts earn lower mean incomes than those in farming and livestock keeping. Handicraft activities are not done throughout the entire year, and selling activities have peak periods. The key challenges women face are: marketing, inadequate capital, difficulties in acquiring raw materials, and low prices. Some policy implications include: linking handicrafts to tourism activities so the activity can be promoted as a viable employment option for rural women; providing women with access to affordable loans and inputs; providing marketing channels for selling handicraft products; providing support in marketing products internationally; and providing training on improving the quality of products so that the women can compete in both local and international markets.

Keywords: *Indigenous Knowledge, Women, Handicrafts, Tanzania*

1.0 Introduction

The Tanzanian economy is predominantly agricultural. It is the main source of livelihood for more than 70 percent of people who participate in various activities in rural areas; its value added as a percentage of GDP averaged 31 percent in the past decade. In addition, agricultural export earnings contributed an average of 19 percent to total exports between 2000 and 2015 (World Bank

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2016; Bank of Tanzania 2005, 2010, and 2017). Of the total labor force engaged in agriculture, women comprise the majority, and they contribute more to agricultural activities than men. Thus, it is not an overstatement to say women are a key resource not only in the domestic sphere, but also in the labor and work sphere.

Since poverty is higher and there are more women in the rural areas of Tanzania, these women bear a disproportionate share of poverty. According to the 2012 Population Census, 70.4 percent of Tanzania's population were located in rural areas, and of these, more than half were female (National Bureau of Statistics 2013b). The pattern of poverty by location in Table 1 shows the head count ratio in rural areas is much higher than in urban areas, as well as in Dar es Salaam. Although the head count ratio in rural areas decreased from 39.4 in 2007 to 33.3 in 2011/2012, it still remains high. Thus, the assertion that poverty in Tanzania is a rural phenomenon is unquestionable (Economic and Social Research Foundation, United Nations Development Programme, and Government of the United Republic of Tanzania 2014).

Area	Head count (2007)	Head count (2011/12)
Rural	39.4	33.3
Other Urban Areas	22.7	21.7
Dar es Salaam	14.1	4.1

Source: National Bureau of Statistics (2013), 2011/2012 Household Budget Survey

Table 1: Head Count Ratio by Area

The disproportionate level of poverty that women endure is largely due to the skewed power asymmetry across gender that is even more pronounced in rural areas than in urban areas. Firstly, women in rural areas have to live with income shortfalls, which impel them to do without some basic necessities. This is due to the seasonal nature of agricultural activities. Secondly, the deprivation of basic amenities and social services in rural areas, for example a lack of running water, means that women walk several kilometers to fetch water. Thirdly, women endure the drudgery of physical labor in agricultural and household activities since they provide a significant share of labor in both areas. These factors, which are compounded by the oppressive power relations, work to the disadvantage of girls and women at the family level. This context and the responsibilities that women bear make it imperative for them to engage in various income-generating activities to supplement the income from agricultural activities so that they do not have to endure as much physical labor. As such, it is important to encourage and support women's efforts in non-agricultural income generating activities, specifically handicrafts.

Various studies have recognized the importance of handicraft production by rural women as a key source of employment and income generation in developing countries (Towseef et al. 2014; Richard 2007; Ngo

2005). For example, research in Sierra Leone found that 80 percent of women produce tie dye (or popularly known as *batik*), and in some areas, handicrafts provide a key source of foreign earnings. This potential for employment and income generation in handicrafts is appealing because women already possess the necessary skills since they have acquired them through indigenous knowledge (Rogerson 2000). In Tanzania, handicraft production has been analyzed, and a study by Ipsos Synovate in Kenya (2012, 9) concluded, "...the handicraft industry in Tanzania is rich and diverse in terms of product portfolio, volume, quality and variety..."

Besides this, a United Nations Educational, Scientific and Cultural Organization (UNESCO) study shows that the crafts sector contribution to developing countries' economy and exports is growing as youth and women increasingly engage in these activities as a solution for rural and urban unemployment (Richard 2007). Further, women's groups specializing in handicrafts have engaged in lucrative deals with foreign organizations to arrange markets for their products abroad. Such marketing deals have boosted the earnings of women (Instituto Oikos 2015; Selasini 2008). There are encouraging media reports on opportunities for selling these products in other African countries. For example, there is a strong market in South Africa for Tanzanian handicrafts, owing to their exceptional and attractive quality (Pesa Times 2014).

This research explored the viability of handicraft making among rural women as an income and employment generating activity using primary data collected from rural Tanzania. The study also uses secondary sources and existing literature on indigenous knowledge and income generating activities of rural women in general. Given the potential that already exists in making handicrafts and how they can enhance the incomes of women and create employment opportunities, the study investigated the *actual* income and employment opportunities that exist among women in rural Tanzania. Further, given the importance of ensuring that income and employment generation among rural women is enhanced and included in the policy agenda, this research draws some policy implications.

The research sought to answer the following questions:

- i. Why do rural women engage in handicraft production, and how do they acquire their skills?
- ii. How important is handicraft making as an income and employment-generating activity?
- iii. What determines the income of women in rural Tanzania?
- iv. What challenges do women face in handicraft production?

The paper is structured as follows: section one introduces the paper, followed by section two, which generally discusses the concept of indigenous knowledge in relation to handicrafts and gives the context in which women operate. Section two also builds a case for prioritizing income and employment generation for women in rural Tanzania. Section three discusses the findings from the survey data, while section four discusses estimation results from a simple model on determinants of earnings of rural women. Section five discusses the challenges with scaling up handicraft production for income generation, while section six concludes the paper and draws some policy implications.

2.0 Indigenous Knowledge, Rural Women, and Income Generating Opportunities

The theoretical discussion in this section centers on the following: Firstly, it defines indigenous knowledge. Secondly, it provides the context of the study by examining the situation of women in rural Tanzania, regarding the challenges they face in providing for their families. Thirdly, it supports income and employment-generating opportunities using indigenous knowledge in handicrafts for rural women.

2.1 What is Indigenous Knowledge?

There is no single definition for indigenous knowledge in literature. The following definitions capture its overall essence: it is knowledge that is unique to societies, which is used for making decisions in various aspects of local peoples' livelihoods, such as agriculture, healthcare, food preparation, education, and natural resource management. Indigenous knowledge encompasses the wisdom, knowledge, customs, taboos, beliefs, teachings and practices of local villagers (East African Centre of Excellence 2009). Indigenous people learn the total sum of the knowledge and skills which people in a particular geographical area possess, and which enables them to get the most out of their natural environment. Such knowledge and skills are passed down from previous generations (Maferethlhane 2012). Knowledge and skills are adapted and developed by the new generation to adjust to changing circumstances and environmental conditions. Indigenous knowledge is:

The accumulated set of common sense knowledge and ideas of the local people about their everyday realities of living. It is the local knowledge that is unique to the given community and forms the basis for their local level decision- making in agriculture and connects people directly with their environment (Warren and Rajasekaran 1993).

These efforts, through generations, enable them to devise survival strategies, while appreciating the various definitions of indigenous knowledge. It's important to decipher what the various definitions capture. The following are the key elements and commonalities derived from the previous definitions: it is locally based and developed within the communities; it is used to solve problems within society; and it is dynamic.

Besides the existence of several definitions in the literature, there are also various terms that are used to describe this knowledge: "local knowledge," "traditional knowledge," "indigenous traditional knowledge," "indigenous technical knowledge," "traditional environmental knowledge," "rural knowledge," "traditional ecological knowledge," "folk knowledge," and "traditional wisdom" (Ryser 2012; Chisenga 2002). Essentially, these terms capture the idea that the knowledge is locally derived and developed within societies where people live. Using the division suggested by Preston-Whyte (1983), indigenous knowledge in handicraft activities covered in this study of African indigenous products documents the production of traditional baskets, clay pots, sleeping mats, and beadwork. The products can also include some made with a mixture of foreign and indigenous technologies such as carpets, woollen tapestries, pottery items, paintings, wood and stone carvings, and more modern jewellery. The

key handicrafts produced in the area where this study took place are baskets, clay pots, clay stoves, and mats. The knowledge used in making these products is acquired through families, friends, and the community, although nowadays, some institutions, such as churches, schools, and some non-governmental organizations (NGOs), organize training on handicraft making, and some even link groups of women to exports markets (Maasai Women Development Organization or MWEDO¹ in Arusha). By and large, knowledge is passed on through generations.

2.2 Women's Socioeconomic Conditions in Rural Tanzania

Income generating activities for rural women in Tanzania must assume great significance owing to the socioeconomic context. Besides the many responsibilities that women have at the household level, such as providing labor in farming activities and the domestic sphere, the reality of living costs impel women to engage in additional income-generating activities to supplement their agricultural income. This section briefly discusses the socioeconomic context of rural areas, women's economic difficulties, and the desire to find ways to generate extra income to meet the household needs.

2.2.1 Poverty and Fertility

According to the 2011/2012 Tanzania Household Budget Survey, the average household size in rural areas is 5.3, compared to 4 in Dar es Salaam Metropolitan and 4.7 in other urban areas in the country. Not surprising, this pattern in which rural areas have a higher household size has persisted across all Household Budget Surveys, and it does not appear to be declining. As a result, the mean proportion of dependents in rural areas is higher than in urban areas: at 0.51 compared to 0.34 in Dar es Salaam and 0.42 in other urban areas. The Household Budget Survey further finds that poverty increases with household size: the Basic Needs Poverty for a household with one person is estimated to be 2.1, and this increases with the household size such that when the household size is beyond 10 people, the poverty headcount ratio reaches 41.9.

These statistics tell a story that is consistent with the general thinking: that poverty is more widespread in rural areas than in urban areas, and high fertility is associated with higher poverty. However, it is important not to impute a wrong lesson from this association: that because high fertility is associated with high poverty, then, in order to reduce poverty, one must reduce fertility. The fallacy in this line of thinking must be clear. The solution at the family level of a poor household faced with extreme poverty and high child mortality, deprivation of basic amenities such as household energy and water, and lack of employment for the mother, and no pension, is not to have more children. Thus, unless these associated deprivations are addressed, families will not freely choose to lower fertility. Reducing fertility requires addressing these associated afflictions that poor families suffer.

2.2.2 Education Level

World Bank data shows that the literacy level of Tanzanian women is lower than that of men: the 2012 data shows that the adult literacy rate for men was 10 percent higher than that of women (World Bank

2016). The difference in the literacy rate between men and women was much higher in previous years where data is available: for 2002 and 2010, the difference was 15 percent. Though the figures for 2012 show improvement, the 10 percent difference is still high.

The difference in the education level of women and men is more revealing if examined by location. The 2014 Integrated Labour Force Survey (NBS 2015) data shows that in rural Tanzania, the number of females who have never attended school is higher than that of males. Of the 3.5 million rural people of working age, 2.4 million were uneducated women. Compared to other urban areas and Dar es Salaam, the number of women without education is not very high: only 104,000 and 410,000, respectively, compared to just 34,000 and 129,000 men, respectively. Of course, in terms of percentage, it is higher for rural women than for urban women (see Appendix A Table 1). The high number of women who have never attended school in rural areas can be explained by cultural norms such as early marriage and the preference to educate boys over girls because girls are expected to provide domestic labor.

2.2.3 Health Facilities

Good health is an important aspect of human development. Among women, good health is particularly important since they carry the burden of pregnancy, which requires a good state of health to bear healthy children. Women in good health generally find it easier to overcome challenges associated with poverty. For example, a healthy woman will engage in gainful employment and other ways of generating income for her family. Thus, good health is important for poverty reduction, especially when complemented with other aspects of human capital such as education.

In general, rural women in Tanzania face more challenging health issues than their counterparts in urban areas: health facilities are scarce, and, when available, they are not well supplied with medicines and medical equipment. Cases are often documented of women delivering in the open, without a health care assistant, as well as women traveling long distances to access health facilities. In their study of Kilombero, Nyamtema et al. (2012) find sub-standard prenatal care in rural Tanzania causes morbidity among women, noting that the top reasons for poor quality services were a shortage of qualified staff and irregular supply of prenatal equipment and drugs. The 2015-2016 Demographic Health Survey also indicates lower percentages for rural women in the following maternal indicators: percentage delivered by a skilled provider, percentage delivered in a facility, and percentage of women who had a postnatal check-up in the first two days after birth (Ministry of Health, Community Development, Gender, Elderly and Children et al. 2016).

2.2.4 Sanitation and Water Facilities

Tanzania struggles to offer sanitation and water facilities to its people. According to the World Bank (2015a), water coverage in rural areas and urban areas in 2011 was 45 percent and 80 percent, respectively. Clearly, rural women are at a disadvantage in terms of meeting their requirements for water, as they spend more hours fetching it. Appendix A Table 2 shows about 30 percent of rural households

have to travel over a kilometer or more to get their drinking water, whereas a significant percentage (over 70) of urban households fetch their drinking water in under half a kilometer.

The long distance that women in rural areas travel to fetch water means that they lose time for completing other household activities. The concept of time poverty² clearly points to such use of time by rural women. Besides being time poor, having inadequate access to water and sanitation facilities leads to health problems (such as diarrhea, dysentery, and typhoid), especially among children (World Bank 2015b), which places the lives of women and children more at risk for death from such diseases (Thomas et al. 2013).

2.3 Rural Women and the Imperative for Creating Employment Opportunities

Detailed data that can provide an illuminating picture of the connection between employment and poverty, particularly by gender, in the rural areas, is not available. However, Table 2 shows the association of poverty and economic activity of the household head. Table 2 shows that being a housewife as an economic activity is associated with one of the highest poverty rates. Further, employed household heads enjoy one of the lowest poverty rates at 10 percent, while self-employed household heads suffer from poverty at a rate of 31 percent. In addition, household heads working as unpaid family helpers in businesses suffer from poverty at a rate of 41.8 percent. It is important to note that in most cases, even if they are not household heads, women are the ones who mostly work as unpaid family helpers.

Activity Status of Head	Food Poverty	Basic Needs Poverty
Employee	1.4	10.0
Self-employed With/Without Employees	11.2	31.0
Unpaid Family Helper in Business	0.0	41.8
Housewife	10.8	27.8
Student	9.4	25.1
Long Term Unemployed	7.2	23.6
Retired	0.5	4.7
Too Old/Disabled	11.6	43.0
Other	10.1	27.0
Tanzania Mainland	9.7	28.2

Source: National Bureau of Statistics (2014), Tanzania Household Budget Survey Report

Table 2: Distribution of Poverty (in percentages) by Activity Status of the Household Head in the 12 months before the Survey, Tanzania Mainland, 2011/12

Further insight on the connection between employment status and poverty by gender is given in Table 3, where employment is broken down into more commonly used categories of paid employment. It shows that men are two times more likely to have paid employment than women, while approximately 72 percent of females are engaged in self-employment in agriculture; the figure for males is 62 percent. Combining the information contained in Table 2 and Table 3, the following interesting insights are revealed: i) employees suffer less poverty than those in other forms of economic engagement; ii) more males are paid employees in comparison to females; iii) those who are self-employed (Table 2) suffer one of the highest poverty rates; iv) more females are self-employed or working on their own farms (71.7 percent) as opposed to males (62.4 percent).

Employment Status	Male (%)	Female (%)	Total (%)
Paid Employee	15.3	6.1	10.5
Self-employed (Non-agricultural) With Employees	2.6	1.0	1.8
Self-employed (Non-agricultural) Without Employees	10.0	8.2	9.1
Unpaid Family Helpers (Non-agricultural)	1.5	5.3	3.5
Unpaid Family Helpers (Agricultural)	8.1	7.7	7.9
Work on Own Farm	62.4	71.7	67.2
Total	100.0	100.0	100.0

Source: Ministry of Finance (2010), Tanzania Gender Indicators

Table 3: Employment Status by Gender 2006

From Table 1, poverty rates are higher in rural areas than in urban areas, which suggests that being self-employed and working on farms leads to high poverty rates. Since more women are self-employed in rural areas, they suffer from poverty more than men. Another key observation is that women in rural areas predominantly engage in agricultural activities to provide the required income for their households. However, agricultural activities are precarious and are subject to the vagaries of the weather. Most agricultural activities in Tanzania are rain fed, and as such, shortages of food and income affect households that rely on agriculture for their livelihood, which makes it particularly difficult during droughts. Thus, there are risks in engaging in agricultural activities for rural households. This makes it imperative to have alternative income-generating activities that will offer households and women (as managers and caretakers) a steady income to supplement the income generated from agricultural activities.

Based on this overview, there are three significant rationales for rural women to engage in additional income-generating activities: i) they can reduce poverty through earning an income to afford basic amenities, and reduce the demand for more children; ii) they can increase the opportunity cost for their

time, which will contribute to a low fertility rate. The reduction in fertility will, in the long run, contribute to poverty reduction; and iii) they will help to supplement income from agricultural activities, which is important in droughts and when agricultural prices are low.

Richard (2007) presents essential characteristics of handicraft production that create potential employment for rural women. First, job creation is low cost because handicrafts are a home-based industry that does not require many expenses to set up. Second, women use indigenous knowledge that is locally acquired along with the raw materials that are locally available. Third, agricultural and pastoral communities exemplify craft making, using traditional knowledge for generating additional income when crops fail or when natural disasters affect their crops.

3.0 Handicraft Production in Rural Tanzania: Evidence from Survey Data

3.1 Data and Research Methodology

The research methodology used for this study can be characterized as descriptive with a survey design. The study collected primary data in June 2016, from 3 rural areas of Tanzania: Iringa, Mbeya, and Dodoma. The target population was rural women who produce handicrafts in those regions. Since data on the population of women who make handicrafts is not found in official statistics, it was necessary to seek out the women from the villages. The areas were purposely identified from literature as areas that are known for handicraft production. The sample for each region was determined proportionate to the total population in that region, which was applied to the 200 questionnaires that we envisaged to administer. After data cleaning, the observations were reduced to 195 individuals, and 4 women groups.

Both closed and open-ended questions were used in the questionnaires to collect data. The questions were formulated to gather information from women about their daily activities, the challenges they face, and suggestions to deal with these challenges. This study is one of a kind as it assesses the current status of handicraft making among rural women. Questionnaires were administered to women that produce various handicrafts—baskets, mats (sleeping and floor), clay pots, clay stoves, caps, beads, batik, *vitambaa* (various fabrics), soap, cakes, clay pitcher, sweaters, and brooms—and engage in farming and livestock keeping. Table 4 gives the respondents by region (by gender of household head).

Region	N	Gender of Household Head		Occupation/Activity	
		Female	Male	Handicrafts	Farming/livestock
Dodoma	69	69	0	29	40
Iringa	46	14	32	21	25
Mbeya	80	28	52	37	43
Total	195	111	84	87	108

Source: Survey data

Table 4: Respondents by Gender of Household Head and Occupation

While all women in the sample in Dodoma are heads of their household, in Iringa and Mbeya, a significant number of them come from male-headed households. Overall, 57 percent of the sampled women are from female-headed households. Appendix A Table 3 shows that 69 percent of respondents whose main occupation is handicrafts are married. With regards to number of children, 46 percent of the respondents have between 4 and 6 children.

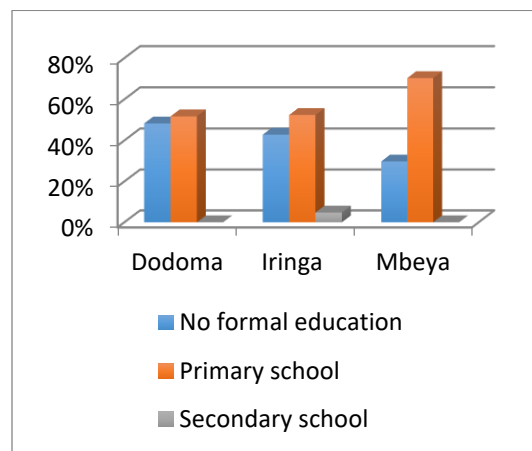
3.2 Profile of Respondents

3.2.1 Education Level and Access to Health Facilities

Most of the respondents have primary school education as their highest level of education attained; with Iringa having the highest percentage (Appendix A Figure 1). Handicraft producers also received little to no formal education with ranging percentages depicted in Figure 1 and Figure 2. In general, Dodoma has the highest percentage of women with no formal education, followed by Mbeya. When the data is disaggregated according to activity or occupation, the overall picture is the same: Dodoma leads in terms of having the highest percentage of women with no formal education in handicrafts production, followed by Iringa. For women in farming and livestock keeping, Iringa has the highest percentage of women with primary level education.

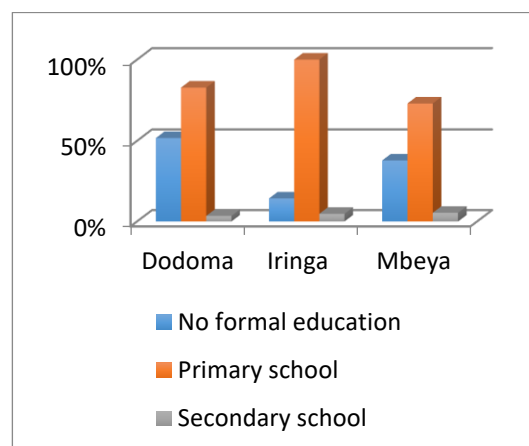
The low level of education exhibited by the respondents can partly be explained by the difficulty in accessing education and other social services by women. For example, Dodoma women suffer the highest percentage of difficulty accessing health services, education, and training services. Women in Dodoma from the sample group have the lowest level of education. In Iringa and Mbeya, more than 50 percent of women find it difficult to access education services. The findings from the study and literature confirm the fact that rural women face difficulties in accessing health services. We found that in Dodoma and Mbeya, a significant percentage of women find it fairly difficult to access health services. On the other hand, in Iringa, about one-third of the respondents find it easy to access health services (Figure 3 and Figure 4).

The reason why women find it difficult to access education and health facilities can be attributed to their rural geographical location as facilities are not widely available in comparison to those in urban areas. Thus, rural women face more health challenges than their counterparts in urban areas due to fewer basic health facilities. When facilities are available, they are not well equipped with medicines, medical personnel, and necessary infrastructure (ESRF et al. 2014). Often, rural women report walking long distances to access health facilities. The issue of transportation is also present in the education sphere. Schools are located far from communities where women live, forcing students to travel long distances to reach them (Human Rights Watch 2018). According to the Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC 2019), there are on average two Folk Development Centres (FCDs) in each region in Tanzania, a number which does not meet the needs of rural women who are often dispersed in remote rural areas.



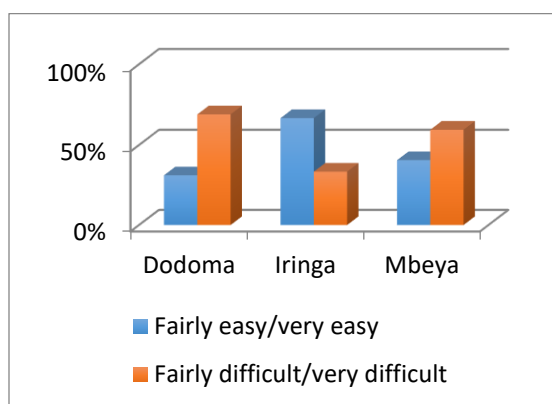
Source: Survey data

Figure 1: Highest Level of Education Attained: Handicraft Producers



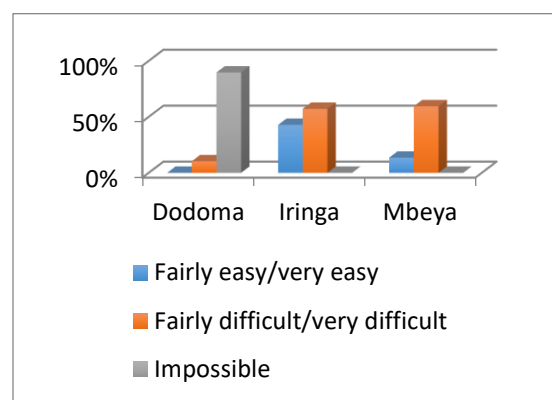
Source: Survey data

Figure 2: Highest Level of Education Attained: Farmers/Livestock Keepers



Source: Survey data

Figure 3: Ease of Accessing Health Services by Region

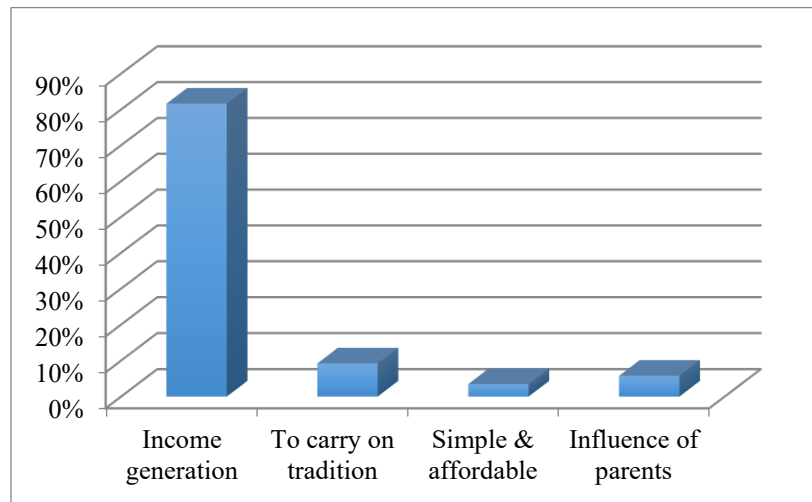


Source: Survey data

Figure 4: Ease of Accessing Education and Training Services by Region

3.3.2 Reason for Engaging in Handicraft Production and Acquisition of Skills

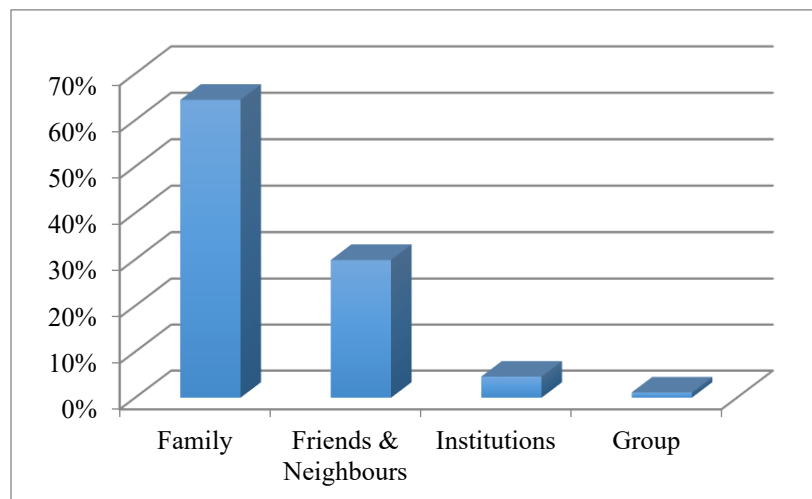
The study enquired about the reasons women chose to engage in handicraft making. Figure 5 supports the concept of additional income for families (82 percent). Since knowledge of handicraft production is passed on from generation to generation, 15 percent of women indicated that they chose to engage in making handicrafts to continue the tradition. A small percentage (3 percent) indicated they found it simple and affordable to start.



Source: Survey data

Figure 5: Reasons for Engaging in Handicrafts

The survey also confirms the generational findings from literature as rural women learn their skills from family members. In Figure 6, 64 percent of the women received their skills from family members while 30 percent from friends and neighbors. Only 5 percent of women learned their skills from institutions or groups. This confirms the assertion that indigenous knowledge is often passed on through families within a given location. This concept can be attributed to their parents' occupations in farming (46 percent), along with a significant percentage of mothers (36 percent) and fathers (5 percent) involved in handicraft making. The small influence of institutions or groups proves there is a training gap for women in handicraft activities.



Source: Survey data

Figure 6: How Handicraft Skills are Acquired

3.2.3 Saving and Group Memberships

Over 70 percent of women in handicrafts indicated they had savings. Of these women, 61 percent of them decided when and how to use the savings, while 33 percent of them jointly made these decisions with their husbands. In terms of regional variation, more women in Iringa and Mbeya made decisions without their husbands.

In contrast, in groups, saving decisions are made by all members of the group. Among all women who made handicrafts, only 12 were members of groups (savings or handicraft groups). When asked to discuss the benefits from belonging to groups, more than half indicated that groups enable them to save and borrow money. Some of the other benefits are: entrepreneurship training, assistance with problems, accessing markets, and product pricing.

Another aspect to consider is where women save their money. While the survey did not collect data on where the rural women save their money, women who belong to groups like SACCOS (Savings and Credit Cooperative Societies), Neema Group, Silk Group, Vikapu Bomba, Tumaini Ndiwili, and Ususi na Ufinyanzi Lulanzi are most likely to save within these groups. Among the benefits of belonging to a group is the ability to save and borrow money. Women who do not belong to groups either save their money at home in a safe place or through mobile money. This conjecture is derived from a Finscope study that revealed between 2013 and 2017, there was a 14 percent increase in people saving money on mobile wallets. This was the most common way of saving money. The second method, saving and keeping money at home, has declined. The Finscope study revealed that adults from poor households, people living in rural areas, young people, farmers, and women were among groups that were less likely to own a SIM card or a phone (Finscope Tanzania 2017). Through this information, one can conclude that most rural women save their money in a safe place at home.

3.2.4 Location of Activity, Source of Start-up Capital, Costs, and Earnings

The survey confirms that handicraft making is a home-based activity with all women in handicraft production working from their home, except one woman who conducted her activities both at home and at her shop. The home-based nature of these activities allows women to generate income while attending chores. For women who belong to groups, three quarters of them (that is three groups) perform their activities at home while only one group had a field office. Thus, there is little variation in the locations where handicraft production takes place.

The study found that not all women in handicrafts needed start-up capital: approximately half of the women needed start-up capital, and of these women, 89 percent of them used their own savings as start-up capital. Other sources for start-up capital include borrowing from friends and family (9 percent) and getting a loan; however, only one respondent got a loan.

The costs and income of women's activities is given in Table 5. Information from women belonging to groups is also included for comparison. It shows that women in handicraft production have the lowest mean input costs, operating expenses, income, and household expenditures.

	Obs.	Mean	Std. Dev.	Min	Max
Handicrafts					
Cost of Inputs	65	24675.8	80346.04	1000	650000
Operating Expenses	16	23700	26415.2	1200	77000
Average Income Per Month	75	59986.7	80559.3	5000	600000
Belong to a Group	12	132833.3	164521.8	30000	600000
Did Not Belong to a Group	62	46653.2	41596.6	5000	200000
HH Expenditure Per Month	72	61569.4	57480.2	10000	300000
Farmers/Livestock Keepers					
Cost of Inputs	76	69177.6	93161.8	1000	500000
Operating Expenses	25	220166.6	295451.9	6000	1100000
Average Income Per Month	84	195109	335876.2	5833	2500000
HH Expenditure Per Month	81	112820.6	82753.03	10000	380000
Groups					
Cost of Inputs	4	565000	491629.9	90000	1170000
Operating Expenses	4	211250	309848.8	30000	675000
Average Income Per Month	4	960000	1403519.0	180000	3060000

Source: Survey data

Table 5: Costs and Earnings by Activity

When comparing the mean incomes of women who belong to groups to those who do not, Table 5 shows that the mean income of women who belong to groups is much higher than that of women who do not belong to groups, with their mean income being doubled. The mean income of the groups based in Iringa is 16 times higher than that of individual handicraft producers and 5 times than farmers/livestock keepers. This comparison requires a rigorous analysis of what determines the average income of rural women while also bearing in mind that earnings differ according to occupation.

When comparing the average income of a woman in handicraft production to the minimum wage of the agriculture sector, the average income for women in handicrafts is lower than the minimum wage in agriculture for the private sector at 100,000 Tsh per month (URT 2013). For groups, the average monthly income is higher by approximately 32 percent. This is a clear indication of the low average incomes that

women in handicrafts receive. These statistics also serve to motivate independent producers to join groups to increase their incomes.

When considering handicraft production as a viable employment option, one must consider the following: the average time women spend working on their products and the time they are fully employed throughout the year. Findings from the survey show that on average, women spend six months working on their products. Throughout this time, there are “peak months” in which handicraft sales are the highest. Typically, peak months are between June and October. Peak months also coincide with the best times for viewing wildlife in the Tanzanian parks (Tanzania Tourist Board 2019). This connection shows the link between handicraft sales and tourism, as sales are high during the best months for viewing wildlife in Tanzania’s national parks and are lower in the off season.

This timeline implies that women in handicrafts do not collect income for approximately half a year. The time they spend in production impacts their earnings. In order to supplement their seasonal income, they are forced to do other activities when they are not working on their products. The data shows that for women whose main occupation is handicraft making, about 84 percent had secondary occupations, mainly farming/livestock keeping and trading³. Since the women are not fully employed for six months, they engage in other income generating activities to supplement family income. The diversification of activities ensures that the household maintains a certain level of income to accommodate their family’s needs. Supplementing income is a survival strategy for women, given the seasonal nature of handicraft making activities.

A challenge in devising policies to improve income levels for women who sell handicrafts is addressing the seasonality of their occupation. The survey enquired whether the women worked on their products in every month of the year. Of the women whose main occupation was handicraft making, 63 percent indicated that they did not work on the products in every month of the year. On average, the women worked on their products for six months hence they are not fully employed in handicraft making. During the off time, they perform secondary activities to supplement their income. A policy change that can address seasonality would ensure that the women work on their handicrafts throughout the year to help their earnings from handicraft sales. Specifically, a policy that would ensure steady income could include producers supplying products to cultural centers within the country and export markets. As a result, they would work on their products throughout the year to keep up with demand. This would also increase their marketing and expand their outreach.

4.0 What Determines the Average Income of Rural Women?

Understanding the determinants of the women’s income helps in policy creation. The human capital theory has guided empirical analysis about the determinants of earnings in literature (Willis 1986; Kerr and Teal 2012). According to the theory, education that provides skills to individuals is an investment that gives social and private benefits, namely, higher lifetime earnings of individuals, higher tax collections, more awareness of educated individuals’ issues in relation to health, and increased trust in communities.

In the work place, higher skills are translated into higher productivity and people who are educated are also easier to train on the job.

Studies on the effect of education on earnings, pioneered by Willis (1986) and Becker (1964), focus on estimating an earnings function given in Equation 1:

$$(1) y_i = f(s_i, A_i, z_i) + u_i$$

Where y denotes earnings; s as the number of schooling years; z are variables that affect earnings such as years of experience and family characteristics, which differ across individuals; A is an unobservable variable that denotes an individual's ability; and u is a disturbance term.

Estimation of Equation 1 involves assuming a hypothetical economy where workers differ by the number of schooling years (s), age (t), and experience in the labor market. A variable x is defined as: $x = t - s - b$, where b is the age at which an individual begins schooling. With this in consideration, Equation 1 (Mincer 1974) can be rewritten as:

$$(2) y = \varphi(s, x) + u$$

The model estimated, which is called the human capital earnings function (De Bartolo 1999) is then given as:

$$(3) \ln y = \beta_0 + \beta_1 x + \beta_0 x^2 + \beta_0 s + u$$

In equation 3, the logarithm of earnings ($\ln y$) is modelled in accordance to individual characteristics as well as other factors that enhance earnings. While estimating the results of the empirical data, the variables used are given in Appendix A Table 4. The data used for estimation and its characteristics were investigated first. The income statistics are reported in Table 6, and Figure 7 (the histogram overlaid with a normal distribution) and Figure 8 (a kernel density estimate⁴ overlaid with a normal distribution) give the distribution of the dependent variable, *lnavgincome*. Visually, the dependent variable is normally distributed, with a Kurtosis value⁵ of approximately 3. The normality of earnings is confirmed by the Shapiro-Wilk W test, which shows that the hypothesis accepts *lnavgincome*.

Mean	Median	Skewness	Kurtosis	Variance	Standard Deviation
11.001	10.819	0.401	2.972	1.393	1.180
Shapiro-Wilk W Test for Normal Data					
Variable	Obs	W	V	Z	Prob>z
lnavgincome	159	0.984	2.006	1.583	0.057

Table 6: Income Statistics

It is important to clarify here that since women who are engaged in handicraft making supplement their income during the low season, we identified those women whose *main* occupation was handicraft making. Then we further asked them whether they engaged in any secondary occupation; of the 87 women whose main occupation was handicraft making, 73 also engaged in other activities. For statistical analysis, it was assumed that handicraft production generated a significant proportion of household income and that the monthly income given related to income generated from handicrafts to see its effects on earnings.

	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
<i>age</i>	0.078**	0.031	2.51	0.013	0.016	0.139
<i>age2</i>	-0.001**	0.000	-2.32	0.022	-0.001	-0.000
<i>married</i>	0.402**	0.175	2.30	0.023	0.056	0.747
<i>noeduc</i>	-0.052	0.196	-0.27	0.790	-0.439	0.334
<i>hand</i>	-0.708***	0.168	-4.22	0.000	-1.039	-0.376
<i>saver</i>	0.590***	0.197	3.00	0.003	0.202	0.979
<i>inheritall</i>	0.665***	0.185	3.60	0.000	0.299	1.030
<i>sellerhus</i>	-0.947**	0.381	-2.49	0.014	-1.700	-0.194
<i>cons</i>	9.249	0.828	11.18	0.000	7.613	10.886
Statistics: Number of obs = 147; F (8, 138) = 9.40; Prob > F = 0.000; R-squared = 0.353;						
Adj R-squared = 0.315						

Note: Dependent variable is *lavgincome* (log of average monthly income); ***, **, * - significant at 1 percent, 5 percent, and 10 percent, respectively.

Table 7: Regression Results

4.1 Estimation Results

The regression results in Table 7 show the signs on the coefficients are those hypothesized in literature, and all the coefficients are statistically significant, except for the coefficient on *noeduc*. Age is positively related to average earnings in that the older a woman is, the more likely her average earnings will be higher. The coefficient on age-squared is negative, and it is statistically significant at 5 percent: as women get older, average earnings fall after a certain threshold. The negative result on the *hand* variable indicates that women whose main occupation is in handicrafts earn lower average earnings than women in farming, and the coefficient is statistically significant at 1 percent. The variable *saver* is positively related to average earnings, and the coefficient is statistically significant at 1 percent, meaning that women who save are likely to have higher average earnings than those who do not.

With regards to inheritance, the results indicate that inheritance of key property by family members is positively related to average earnings, and the coefficient is statistically significant at 1 percent. This result is significant in looking at unfair cultural practices that only grant inheritance to males. The results show that when women recognize their right to inherit key property, their incentive to contribute to family income is heightened. Further, results show that there is a negative relationship between husbands as sellers of products and average earnings of women: the dominance of men has a negative effect on women's average income, and the coefficient is statistically significant at 1 percent. This supports the importance of empowering women for their own development. If men are allowed to sell their products, it negatively impacts their earnings. Studies have shown that in general, men are likely to spend household income on non-essentials (Waseem 2004).

These results can be insightful when creating policies that address the various constraints regarding women's earnings. Studies in other countries indicate that women involved in handicrafts tend to have higher incomes than those in farming activities or formal employment. For example, in Vietnam, the average income from handicrafts is higher than both the national average income and average rural income (Ngo 2005). In Nepal, exports of handicrafts significantly contribute to the export earnings of the country, and they constitute the largest export item (Government of Nepal, Ministry of Industry, Commerce and Supplies 2019). In Ethiopia, a technical report by the International Trade Centre (ITC 2010) indicates handicrafts are the most important source of income for the poor.

In drawing these comparisons, one can use them as an example for Tanzania. In Vietnam, there is historical governmental support through policies for the handicraft sector. The Vietnamese economy transitioned from a centrally-planned economy to being market-oriented in 1986 (a transformation period called *Dao Moi*). Now, Vietnam enjoys hundreds of years of making traditional crafts (Ngo 2005). While the government's role in starting craft villages was limited, it has over the years assumed a supportive role through policies that ensured that craft villages thrived and became more productive. The policies encourage the export of handicrafts by simplifying the process of obtaining permits to export along with tax incentives. Specifically, eliminating an export tax for handicrafts set at 0%; a refund of value-added tax, no tax payments for indigenous people for the first three years of starting a business, supporting entrepreneurs to participate in international fairs, obtaining land more easily than other businesses, and receiving funding for training craftspeople (Szydlowski 2008). These supportive policies have contributed to Vietnam's success in handicrafts exports. Other benefits include employing over a third of Vietnam's rural labor force to contribute to household income (Mahanty and Dang 2012).

In Nepal, handicraft exports contribute significantly to export earnings. Handicrafts are currently Nepal's largest export item (Government of Nepal et al. 2019). Nepal's success in the export of handicrafts is attributed to the following factors: improvements to the quality of products; new designs that are tailored to suit international tastes; and better marketing campaigns to target the specific markets. Over the years, more Nepalese traders participated in trade fairs both locally and internationally, which have enabled them to get more orders and to reach wider markets (Economist Intelligence Unit 2014).

While considering rural Tanzania, the success in Nepal indicates the need to address the constraints that women producing handicrafts face in order to improve their average incomes. The commonalities between Vietnam and Nepal are encouraging the development of indigenous knowledge in crafts and establishing supportive policies to help the crafts industry look beyond their national borders.

5.0 Scaling up Handicraft Production for Income Generation in Rural Tanzania: What Are the Challenges?

Enhancing employment and income-generating activities for rural women requires identifying and addressing the challenges they face. The main challenges that the women in the study indicated were: marketing, inadequate capital, difficulties obtaining raw materials, and low prices. When the women were asked to indicate ways in which these challenges could be eliminated, they mentioned increasing assistance in accessing reliable markets, affordable loans, and land to grow their key product, *mululu*. *Mululu* is a type of grass that grows in swampy areas. However, the grass is depleting due to agricultural activities.

It is not surprising that these women face marketing problems. The survey results show the most common marketing strategy is word of mouth at 98 percent, while some sell their products at churches, auctions, and by peddling. About 83 percent of the women indicated they sell their products directly to consumers, while a few sell them to traders (16 percent) and middlemen (8 percent), and 12 percent sell to a combination of consumers and middlemen. These marketing channels reveal the extent to which these women understand their market and how competitive their products are, locally and internationally. By and large, their main customers are final consumers, and they market their products mostly by word of mouth. This indicates a limited understanding of their market and their competitiveness beyond their own local community. This is a hurdle against innovation and taking advantage of markets beyond local ones. As a consequence, their ability to earn more from their products is negatively affected.

The women who produce the products also sell them with some help from family members. Since handicraft production takes place within the home, children and husbands offer their help. Compared to women in farming/livestock, women in handicraft production, especially in Iringa, still significantly participate in selling their produce. The involvement of husbands becomes more visible in selling produce, followed by women selling jointly with their husbands. The involvement of children is minimal. One explanation could be that men often see handicrafts as a women's activity, and hence do not participate as much. This difference is depicted in Figure 2 and Figure 3 in Appendix A.

Inadequate capital is common not only in rural areas but also among urban informal sector entrepreneurs (Mkenda and Aikaeli 2014; Rogerson 2000). The finding corroborates results discussed earlier regarding start-up capital; 89 percent of women either use their own savings or borrow from friends/family to begin their businesses. Only one respondent received a loan. Financial constraints affect the diversification and expansion of their products.

The problem of inadequate capital is likely to be a symptom of other problems related to an under-developed rural financial market and lack of knowledge on government funding. With a developed rural financial market, women can utilize loans to finance their activities. Information on development funds for women must also be disseminated for other women. More importantly, availability of such funds must be given to women in villages so they can access funds as well. While the development of rural financial services is important, developing a market for handicrafts will boost the producer's confidence as sales rise.

Further, entrepreneurial groups will make women's development funds more effective. Belonging to a group can help women access finances more easily as well as training on marketing and entrepreneurship that NGOs offer to women. The study shows 86 percent of women handicraft producers did not belong to any group, which negatively affects their ability to access support services offered by groups. Those who belonged to groups indicated that group membership enabled them to enjoy benefits such as saving and borrowing, training on entrepreneurship, problem solving, accessing markets, and obtaining higher prices. Group membership also helps women find raw materials. A group with a known managerial set up can better secure land through the local government or through purchasing land, as opposed to independent women who might take years to save enough money.

Rural women indicated access to financial assistance as one of the major constraints they face. Financial difficulties limit the extent to which they can expand their activities. The problem with accessing microfinance institutions (MFIs) in rural areas is that women find them difficult to use because of their high interest rates, short repayment periods, and restricted lending groups. As for banks, women are required to have a license for their business and provide collateral. Since most women operate informally and are poor, they cannot provide licenses and collateral to secure loans.

It is also important to note that microfinance institutions (MFIs) often require women to belong to groups in order to access loans. Social collateral instead of physical collateral is seen as more convenient and affordable to poor entrepreneurs who generate income from informal activities. The idea is that as a group, the possibility of repaying the loan is higher because members, through social ties, are able to screen, monitor, and ensure that the loans are repaid (Postelnicu et al. 2013). Women who engage in similar activities should use each other for support for their businesses.

However, studies have found that sometimes groups do not last, and as a result, a few individuals who care more than the others end up with the burden of repaying the loans that were taken out by the group. Studies also found that members of the group sometimes run away with the money, leaving the few to repay the loan for them (Brown et al. 2015). Thus, it is important that when women form groups, they should be committed to achieving similar goals. Indeed, benefits such as training and access to markets are better secured when they are organized in groups.

6.0 Conclusion and Policy Implications

This study examined whether indigenous knowledge in handicraft making among rural women in Tanzania can be a viable option for income and employment generation. It focused on primary data collected from three regions, namely Iringa, Mbeya, and Dodoma, using a structured questionnaire with a mixture of closed and open-ended questions. Key aspects of this study were observations of the women, their environment, the products and materials used, and pictures.

The conclusions of the study and policy implications are as follows: first, the mean income generated from handicraft activities is lower than that from livestock keeping or farming. This is not encouraging given the potential that exists for earning more from such activities. The lower mean incomes from such activities could increase if the women were alleviated from the constraints previously addressed so they can earn higher incomes from the production of handicrafts.

A way to improve incomes of women in handicrafts is by linking their handicraft activities to tourism activities. It is widely acknowledged that tourism and handicrafts are linked: the development of tourism bolsters handicrafts in terms of sales and innovation. This is because tourists often want to take a piece of the local cultures they visit as souvenirs. For countries where the tourism industry is booming, the handicrafts are often tailored to the tourists' preferences (see for example, Nepal; Government of Nepal et al. 2019). In turn, the women who produce the handicrafts benefit from sales. Handicraft making is a key way tourist markets include impoverished people and generate pro-poor income (International Trade Centre 2010).

Handicraft production and tourism both promote the cultural assets of their nations. Besides their unique wildlife and attractions (Tanzania is specifically popular for wildlife tourism), the purchase of high-quality handicrafts motivates tourists to spread the word or even return. Thus, handicrafts promote tourism and in return, tourism is important for growth of handicraft production and sales, as well as preservation of local culture (Yavari 2008; O'Connor 2008; and Yunis 2008).

Handicraft products should be made available to tourists in major circuits where they stay, as well as in non-traditional places like supermarkets where consumers go to purchase household goods like coffee. This is important for areas that are far from the traditional tourist points, such as Arusha and Kilimanjaro, where Maasai handicrafts are marketed fairly easily due to the existence of popular outlets for handicrafts made by Maasai women: the Maasai Market in Arusha and several curio shops in Moshi (the main town in Kilimanjaro Region). In addition, Moshi is the town tourists use to climb the Kilimanjaro Mountain, and Arusha is the gateway to popular tourist sites such as the Ngorongoro Crater and the Serengeti National Park, to name just a few. Further, the government's current drive to boost domestic tourism should involve aspects that emphasize unique handicrafts that Tanzanians can buy for their homes for both decorative purposes and other uses. For example, the use of baskets made by rural women can help cut down the use of plastic shopping bags. Further, education on interior design that incorporates traditional handicrafts should be encouraged and marketed so that Tanzanians can learn and appreciate such handicrafts.

Marketing challenges can be attributed as one of the factors behind the low mean incomes of rural women because their main channel of marketing is by word of mouth. Oral marketing has limited outreach and leads to low advertisements and earnings. Thus, improving the marketing of crafts can help women earn higher incomes. A possible way to do this is to connect them with well-established marketing organizations. For example, the Maasai women in Arusha are connected with an NGO called MWEDO to market their products. Through such organized marketing, the women's products are priced better.

The crafts rural women make can also be sold for higher prices if the quality is improved. By and large, the quality of the crafts trails behind those of Arusha and other countries. Improving the quality of the products can help women compete in the local and global market for handicrafts. For example, the Maasai crafts made by women in Arusha are a higher quality because they are exported.

Policy makers should consider establishing cultural centers or villages where crafts, cultural artifacts, and unique traditions could be displayed and sold like those in Rwanda, Malaysia, Namibia, Uganda, and South Africa. These cultural centers can be in partnership with the government or the private sector as a way to provide outlets for women to sell their products. Such outlets can provide a steady market and fair price for the women's products, which in turn can help increase their creativity through getting feedback on their products from tourists and other buyers in terms of the products selling well or needing adjustments or improvements, or some requiring tailoring to the needs of buyers. Handicraft products, like other products, thrive based on improvements as required by the market. The centers can also ensure the products displayed and sold meet international quality standards. This will especially help the women who operate in regions that are far from key tourist destinations in Tanzania.

Secondly, the study finds that most women have little to no education, which can occasionally result in lower profits. In the model, high levels of education have positive effects on earnings, although the coefficient is insignificant.

A way to improve this situation is to offer them entrepreneurial skills, given that they already possess the traditionally-acquired skills of making handicrafts, which enable them to run their activities more efficiently and find ways to address the constraints they face. Other issues that should be addressed in training are the ability to identify markets, producing according to demand, and improving craft quality to be competitive in both local and export markets.

Thirdly, another challenge that women in handicraft production face is inadequate loans or capital. A possible way to address this constraint is to encourage rural women to form groups or cooperatives enabling them to access various funding services and training opportunities. This is because, more often than not, financing organizations and those that offer entrepreneurship training to women prefer providing such services to groups, as they are traceable and have permanent work places.

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Appendix A

Area	Level of Education	Male	Female	Total
Dar es Salaam	Never Attended	2.23%	0.01%	4.29%
	Pre-primary	0.04%	0.02%	0.03%
	Primary	52.13%	57.17%	54.74%
	Secondary	35.60%	30.15%	32.75%
	Tertiary	10.06%	6.48%	8.19%
Other Urban	Never Attended	4.10%	11.39%	7.99%
	Pre-primary	0.02%	0.01%	0.02%
	Primary	60.05%	60.87%	26.25%
	Secondary	28.95%	23.89%	26.25%
	Tertiary	6.87%	3.84%	5.25%
Rural	Never Attended	15.27%	29.96%	22.81%
	Pre-primary	0.13%	0.08%	0.11%
	Primary	70.56%	59.90%	65.09%
	Secondary	12.66%	9.19%	10.88%
	Tertiary	1.39%	0.87%	1.12%

**Note: Percentage of population for each area.*

Source: NBS 2015

Appendix A Table 1: Percentage Distribution of Working Age Population (Ages 15 Years and Above) by Area, Level of Education and Sex, 2014*

Distance (Km)	Dar es Salaam	Other Urban	Rural	Total
0.0-0.4	90.5	72.1	46.2	54.6
0.5-0.9	8.7	16.1	25.0	22.0
1.0-1.9	0.7	5.9	14.9	12.1
2.0 or Above	0.1	5.9	13.8	11.2
Total	100.0	100.0	100.0	100.0

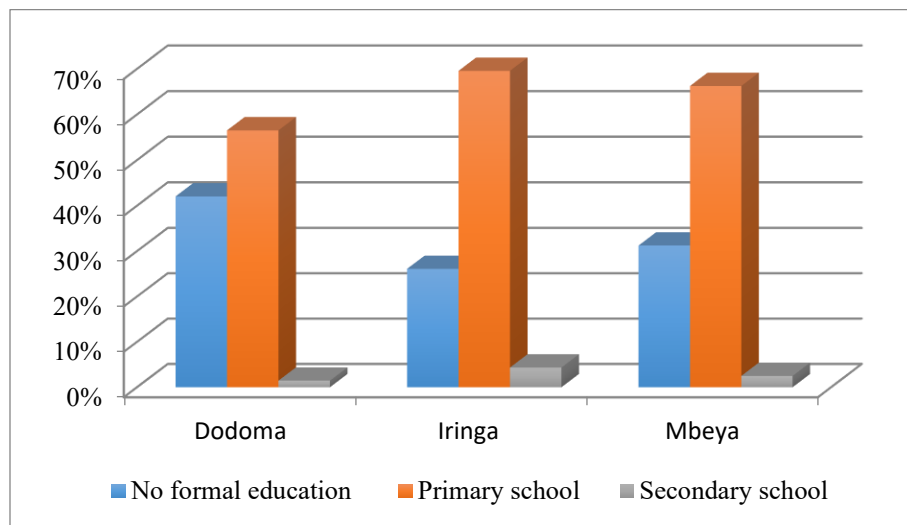
Source: National Bureau of Statistics (2015), Integrated Labour Force Survey 2014: Analytical Report, Dar es Salaam.

Appendix A Table 2: Percentage Distribution of Households by Distance to Sources of Drinking Water and Area, Tanzania Mainland, 2014

Number of Children	Marital status				
	Single	Married	Divorced	Widow	Total
None	1	0	0	1	2
1-3	3	22	2	6	33
4-6	0	31	4	5	40
More than 6	0	7	1	4	12
Total	4	60	7	16	87

Source: Survey data

Appendix A Table 3: Marital Status and Family size



Source: Survey data

Appendix A Figure 1: Highest Level of Education by Region: Whole Sample

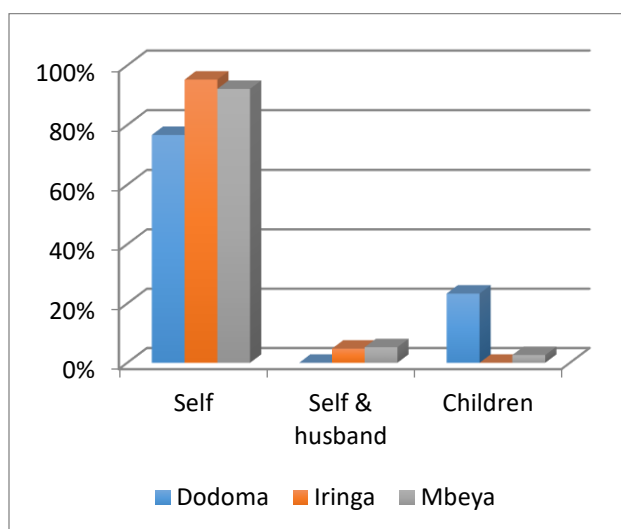
Variables	Description
<i>lavgincome</i>	<p><i>Log of average monthly income of all women:</i> <i>To get the average income that women make in their handicraft activities, we collected data on the cost of inputs and the sales revenue they got from selling the products. Then income was revenue less costs of inputs and other expenses.</i></p> <p><i>However, the data was unreliable as a significant number of women inflated their costs, leading to a negative profit (income), and there were a lot of missing observations⁶. We then decided to use the income data that we asked the women to provide, without taking out the costs. This is the income data that we used in the estimation.</i></p>
Age	<p><i>Age of respondents in number of years:</i> <i>Typically, age is important as a determinant of earnings over individuals' lifetime. Age is expected to have a positive effect on earnings.</i></p> <p><i>In literature, age is taken as a proxy for experience (Heckman et al. 2008; Foxton and Massey 2015).</i></p>

Age 2	<i>Age of respondents in number of years squared*: Adding age-squared as a covariate allows us not to take for granted that the effect of age on earnings is linear. Due to the Taylor series approximations that tell us that for many smooth functions, they can be approximated by a polynomial, and thus age-squared allows us to estimate the coefficients for the approximation for a known or unknown non-linear function of age (Foxton and Massey 2015).</i>
Married	<i>A dummy variable = 1 if married; 0 otherwise: A dummy that takes the value of 1 if married, and 0 otherwise; the effect of marriage on earnings from various studies has been mixed, and varies over the course of a lifetime for women (Hewitt et al. 2002). We include marital status here, and we conjecture that it affects labor supply or labor force participation, and, in turn, earnings.</i>
Noeduc	<i>A dummy variable = 1 if no education; 0 otherwise: Education is expected to have a positive influence on earnings. For women in handicrafts, most of them did not have more than primary school education, and hence we wanted to know how their level of earnings affects their earnings. In this case, noeduc is likely to have a negative effect on earnings.</i>
Hand	<i>A dummy variable = 1 if engaged in handicraft; 0 otherwise: This is a dummy that allows us to deal with women whose main occupation is handicrafts. It takes the value of 1 if a woman engages in handicraft making and 0 otherwise. It measures the effect of engaging in handicrafts on income/earnings, holding other factors constant.</i>

Saver	<i>A dummy variable = 1 if has savings; 0 otherwise: This is a dummy that takes the value of 1 if the woman saves and 0 otherwise. It is expected that savings have a positive effect on women's income. This might be due to the ability to acquire inputs and other tools used in expanding production, which, in turn, leads to a higher income.</i>
Inheritall	<i>A dummy variable = 1 if all family members can inherit property; 0 otherwise: This is a dummy that takes the value of 1 if all members of the household can inherit family property, and 0 otherwise. It is expected that inheritance by all members of the household increase earnings as it is an incentive for them to work harder without worrying about losing their wealth.</i>
Sellerhus	<i>A dummy variable = 1 if product is sold by husband; 0 otherwise: This is a dummy that takes the value of 1 if the husband sells the handicraft product, and 0 otherwise. When husbands take care of selling the product, it is expected that it reduces the income of women because husbands misuse some of the money from handicraft sales. In literature, it is documented that husbands tend to spend money meant for the household on activities and goods that are unrelated to household welfare (Waseem 2004).</i>

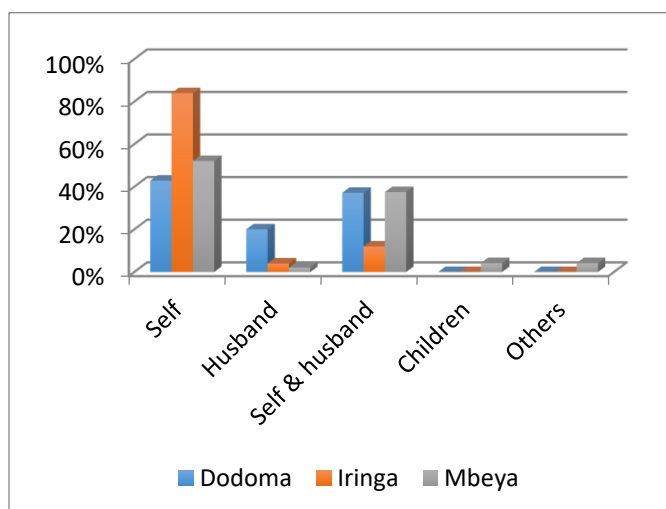
*Note: *The inclusion of age-squared in regression analysis of earnings of individuals as a covariate allows proper modelling the effect of age on earnings, which may not be linear.*

Appendix A Table 4: Description of Variables Used in the Model



Source: Survey data

Appendix A Figure 2: Selling: Handicrafts



Source: Survey data

Appendix A Figure 3: Selling: Farming/livestock

Appendix Gallery B: Handicrafts Products Made and Inputs Used by Rural Women in Tanzania



Appendix B Figure 1: Fresh Mululu for Weaving Mats



Appendix B Figure 2: Mululu Set Out to Dry



Appendix B Figure 3: Dyed Mululu



Appendix B Figure 4: Clay Pots and Clay for Making Pots



Appendix B Figure 5: Instrument for Weaving



Appendix B Figure 6: Unfinished Basket



Appendix B Figure 7: Women Displaying Mululu, Clay Stove, and Baskets



Appendix B Figure 8: Woman Inside Her Home, Where She Works



Appendix B Figure 9: Women Displaying Their Mululu, Clay Stove, and Showing How Weaving Baskets Is Done



Appendix B Figure 10: Man Displaying a Woven Mat (Undyed)



Appendix B Figure 11: Man Displaying a Woven Mat (Dyed)



Appendix B Figure 12: Finished Baskets and Clay Pot



Appendix B Figure 13: Floor Mat and Clay Pot



Appendix B Figure 14: Finished Small Basket



Appendix B Figure 15: Finished Clay Stove and Basket



Appendix B Figure 16: Finished Clay Stoves



Appendix B Figure 17: Finished Clay Pot Left to Dry

Endnotes

¹ See more at <http://maasaiwomentanzania.com>.

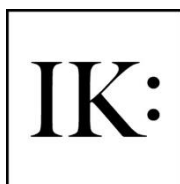
² Time poverty is understood to mean that a person does not have “enough time for rest and leisure after taking into account the time spent working, whether in the labor market, for domestic work, or for other activities such as fetching water and wood” (Blackden and Wodon 2006, 6).

³ We are unable to provide concrete evidence of consumption smoothing since we did not collect monthly data on expenditure and income from the various sources.

⁴ Kernel Density Estimation (KDE) is one of the non-parametric ways of estimating the probability density function (pdf) of a dataset, which does not assume any underlying density function but learns the shape of the density from the data automatically (Chen 2017). It creates a smooth curve given a set of data, as opposed to the discrete histogram. The most commonly used kernel is the normal distribution function.

⁵ Kurtosis is a measure how peaked or flat a distribution is compared to a normal distribution. Besides being a valid descriptive statistic that defines the shape of the distribution of the data, it is useful in determining how close the data is to a normal distribution, in order for applying common methods of analysis. The value of kurtosis for a standard normal distribution is 3 (Rindskopf and Shiyko 2010).

⁶ Data cleaning left us with only 14 observations, which could hardly be used for regression analysis.



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Rural Women Economic Empowerment, Indigenous Fermented Milk Production, and the Challenges of Modernity

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Traditionally, women are known as producers of fermented milk in many African communities. In more recent times, the production of fermented milk using indigenous technology is more widely practiced by women in rural areas. In rendering support to small and medium-scale industries, many African governments, NGOs, and the private sector strongly encourage the use of commercial starter culture in milk fermentation, while some go as far as discouraging or withholding support for traditional fermentation. Most women in rural areas across Africa are unable to afford commercial starter cultures or do not have the knowledge and other required resources to use them. Yet, traditionally fermented milk holds prospects as a means of economic empowerment for rural women. This study examines the challenges and opportunities for women who live in rural areas of Rwanda and use indigenous knowledge and technology in their milk fermentation process. The study seeks to enhance the understanding of traditional fermentation techniques and the possibilities they hold for the economic empowerment of women in rural Rwanda. In this pursuit, emphasis is placed on the cost of production in terms of finances, ease of access to raw materials, and ease and speed of production, in addition to other production dynamics, including hygiene. Further, the research explores the health and nutritional benefits of traditional fermentation methods, as well as possible side effects. Finally, the shelf life and taste of traditional processing methods are explored alongside modern fermented milk (using starter culture), all with a view to determining how much benefits accrue to one more than the other.

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Keywords: *Fermented Foods, Ikivuguto, Traditional Fermentation, Starter Culture, Indigenous Knowledge, Indigenous Technology, Fermented Milk*

1.0 Introduction

Across the world, fermented foods have historically and traditionally been included as part of communities' staple diets. These foods, fermented using indigenous technology and products, are considered to possess a unique and distinct taste and are nutritious and helpful in maintaining health and preventing diseases. Lactic acid bacteria and yeasts have been identified as the major group of microorganisms that are generated when foods are fermented using traditional methods; indeed, in the fermentation of indigenous foods, naturally occurring microorganisms are utilized as starter cultures.

Traditionally, women are known as producers of fermented milk in many African communities. In more recent times, the production of fermented milk using indigenous technology is more widely practiced by women in rural areas. In Rwanda, *ikivuguto* is a popular fermented milk product that is produced traditionally by the "spontaneous acidification of raw milk by a microflora present both on utensils and containers used for milk preservation and in the near environment of cattle" (Karenzi et al. 2013, 383). The final product, *ikivuguto*, resembles yogurt. There can be slight or noticeable variations in taste and texture of traditionally fermented *ikivuguto*. This can result from the complexity of the flora that create the traditional sour milk, which differs based on location. In addition, up until a certain point in the fermentation process, "lactic flora lives alongside a pathogenic flora, which also varies depending on the level of the personal hygiene of those preparing the *ikivuguto*" (Karenzi et al. 2013, 384). During fermentation, lactic acid bacteria compete for nutrients with the remaining bacteria. They outgrow them and produce byproducts that inhibit growth of pathogenic and spoilage bacteria (Ananou et al., 2007). In modern fermentation, synthetic or commercial starter cultures are applied to the product to begin the fermentation process. There are different starter cultures available globally that are used in the production of fermented foods. In Rwanda, commercial production of *ikivuguto* uses starter cultures. Starter cultures can provide a more predictable and standardized end product; however, commercial starter cultures have also been known to have their own set of challenges, which include: lack of sufficient production of lactic acid, lack of production of required flavor, or outright defects in flavor; the use of commercial starter cultures can also result in body and texture defects in the final product.

In rendering support to small and medium-scale industries, many African governments, NGOs, and the private sector strongly encourage the use of commercial starter cultures in milk fermentation, while some outrightly discourage or withhold support for traditional fermentation processes. Most women in rural areas across Africa are unable to afford commercial starter cultures or do not have the knowledge and

other required resources to use them. Yet, traditionally fermented milk holds prospects as a means of economic empowerment for rural women.

1.1 Objective of Study and Research Questions

The general objective of this study is to determine the possibilities of economic empowerment for rural women, focusing on the use of indigenous technology used to ferment milk in Rwanda. More specifically, the study examines the challenges and opportunities these women face when using indigenous technology to ferment milk. The study seeks to enhance the understanding of traditional fermentation techniques and the possibilities they hold for the economic empowerment of women in rural Rwanda. In the pursuit of its stated objectives, the paper will place emphasis on the cost of production, in terms of finances; ease of access to raw materials; and ease and speed of production, in addition to other production dynamics, including hygiene. Further, the research will try to explore the health and nutritional benefits of traditionally fermented ikivuguto for rural dwellers, as well as possible side effects. Finally, the shelf life and taste of traditional processing methods will be explored alongside modern fermented milk (using commercial starter culture), all with a view to determine if any value chain benefits accrue to one more than the other.

The research is necessary, taking into account the minimum investment—by government, organizations, and stakeholders—in the use of indigenous technology in the production of fermented milk in Rwanda. The aim will be to establish possible economic benefits accruable to rural women and, by extension Rwanda, if indigenous technology is encouraged. The study is useful for students, policymakers, scientists, economists, agriculturists, entrepreneurs, development practitioners, and any person interested or involved, through practice or research, in the economic empowerment of rural women. Questions the research will raise include:

- i. What role does indigenous technology play in ikivuguto production in rural Rwanda?
- ii. What economic empowerment possibilities exist for women living in rural Rwanda involved in ikivuguto production?
- iii. What possibilities exist for scaling-up production and improving the value chain of indigenously produced ikivuguto?
- iv. What level of support exists for rural women involved in local production of ikivuguto?
- v. What challenges exist that impede the economic empowerment of women producing ikivuguto in rural areas?

1.2 Research Methods

The study utilizes an open-ended questionnaire to gather information from women in rural areas who are involved in the production of fermented milk using indigenous technology. Consumers of these products were also interviewed, in addition to select government agencies and organizations involved in food regulation, rural development, and the economic empowerment of women.

1.3 Indigenous Technology

Indigenous technology can be characterized as that craftsmanship and science that is exceptional to a given culture and designed to address societal challenges. Indigenous technology has been characterized as innovation utilized by locals, which constitutes a critical piece of a community's heritage (EIONET 2012). Technology is considered significant towards accomplishing food security and, for the most part, development. Labe (2008) opines that indigenous technology-based innovation provides contrasting options to Western know-how, giving more alternatives for taking care of issues locally, thus fostering sustainable development. Indigenous innovation, therefore, holds many advantages for groups that have created them as it reduces dependency on imported technology, which rural dwellers are often unable to afford, fully grasp or maintain over a period of time.

1.3.1 Indigenous Technology and Rural Economic Empowerment

Dayanatha (2006) recognized five noteworthy attributes of indigenous technology in rural development. First, indigenous technology requires very little capital as every piece of equipment needed during construction is sourced locally. Second, indigenous technology sources raw materials from the local environment, therefore is easy to maintain and sustain. Third, the use of indigenous technology can sometimes be restricted to its particular area of invention as there are no universal structures for the spread of indigenous technological knowledge. Fourth, indigenous technology can diffuse from the original place of innovation and be adapted to other areas where there is availability of raw materials and environmental similarities. Fifth, indigenous technology has added to verifiable improvements in agricultural yield, especially in rural areas, and continues to contribute significantly to universal knowledge of science, innovation, and social legacy.

Local farmers often utilize indigenous knowledge-based biotechnology to deliver improved yields, while requiring less input of resources. Through indigenous knowledge-based biotechnology, such as crossbreeding, the qualities of plants and animals are improved. These improved attributes result in highly evolved plant and animal varieties and, by extension, economic empowerment for farmers and communities.

However, both indigenous and modern technologies empower farmers to build profitability. Although modern technology can empower rural people, it is often neither sustainable nor readily accessible since it is capital intensive, requires expertise to maintain or repair, and spare parts for equipment can be difficult to replace. Therefore, indigenous technologies still remain the major empowerment tools for sustainable rural development.

1.3.2 Use of Indigenous Technology in Agricultural Production

Indigenous agriculturists created different procedures to enhance or maintain soil richness. For instance, farmers in southern Sudan and Zaire noticed that the termite hills are especially useful for developing sorghum and cowpea. Biological pest control has been of increased interest lately; yet indigenous

technology practices related thereto have been in use for over a century. In China, for instance, citrus growers place nests of the predacious ant *Oecophylla smaragdini* in orange trees to reduce insect damage. In India, local farmers intentionally plant sunflowers in wheat fields to aid the biocontrol of rats by owls at the stage of grain development (Sinha 1994). Indigenous cultivating practices are an age-long practice among Nigerian farmers (Apantaku 2000), who are still generally conservative in their ways. There are other technologies that are jealously guarded by local farmers. Examples of these are the indigenous technology used for the prevention of weaver birds attacking rice and the prevention of infestations of black ants on farms.

2.0 Fermented Milk

Fermentation is the process by which the chemical components of a substance are broken down through the sustained activities of bacteria, yeasts, or other microorganisms. Fermented or cultured milk is the product that results when lactic acid is allowed to act on milk over a period of time, thereby enhancing its taste, texture, chemical components, and even shelf life. Milk is fermented differently throughout the world. In southern and eastern Africa, for instance, the general handling technique for fermented milk is to channel the raw milk into a smoked clay pot or jug gourd and move the vessel to a warm place until the milk has soured and coagulated (Kerven 1987).

2.1 Nutritional Content and Health Benefits of Fermented Milk

There are more than 3,500 traditionally fermented foods around the world (EUFIC 1999), and each is packed with a variety of macro and micro nutrients. For fermented milk, the lactose content is lower than that in the parent milk due to the presence of lactic acid. Lactic acid has a distinct sour taste that is identified with fermented products. Additionally, fermented milk may also contain more folate than regular milk since a few strains of organisms synthesize folate (Wouters et al. 2002).

Fermented milk is packed with lactic acid micro-organisms, which can have an immense impact on intestinal microflora, increasing its resistance to harmful bacteria (Gill 1998). In humans, *Lactobacillus casei* strain Shirota (LcS) preparation has been shown to prevent the recurrence of superficial bladder cancer (Ohashi et al. 2002), and a possible effect of LcS on the immune system has been suggested (Matsuzaki 1998). Further, several studies with *Lactobacillus sp.* preparation and fermented milks have been published (Kumar Verma et al. 2012) and reported alleviation of constipation using *L. acidophilus* NCDO 1748, *L. casei* Shirota, and *Lactobacillus* GG. Casein hydrolysate, delivered by an extracellular proteinase from *L. helveticus* (CP790), has been proven to have an antihypertensive effect in rats. Two antihypertensive peptides have additionally been purified from sour milk fermented with *L. helveticus* and *Saccharomyces cerevisiae*. These two peptides hinder angiotensin-changing over a compound that proselytes angiotensinogen I to angiotensinogen II, which is an intense vasoconstrictor (Maeno et al. 1996).

2.2 Fermented Milk Around the World

Kephir is a form of fermented milk, found mostly in Europe and parts of the Middle East, and is nutritionally dense. Kephir is known to contain high amounts of thiamine, riboflavin, pantothenic acid, and vitamin C (the vitamin content varies, depending on milk source), as well as protein (with a higher protein content when kephir grains are cultured in whey or soy milk) and minerals (Sarkar 2007). Kephir additionally contains more amounts of threonine, serine, alanine, and lysine than milk (Guzel Seydim 2003; Sarkar 2007). Kumys is another form of fermented milk popular in Asia, and contains (/100 g) around 90 g of moisture, 2.1 g of protein (1.2 g of casein and 0.9 g of whey proteins), 5.5 g of lactose, 1.2 g of fat, and 0.3 g of powder, in addition to the final results of microbial fermentation, i.e. lactic acid (1.8 g), ethanol (0.6–2.5), and CO₂ (0.5–0.9) (Uniacke-Lowe et al. 2010). Tarag, another variant of fermented milk popular in China, contains (/100 g) 4.6 g of fat, 5.6 g of protein, and 2.0 g of lactose in 100 g of fermented milk (Zhang et al. 2009).

The section below gives a summarized overview of the availability of fermented milk in select locations globally.

i. Kephir (Argentina, France, Portugal, Taiwan, and Turkey)

Kephir is a thick fermented milk beverage created from bovine, goat, sheep, or horse milk, which can contain different measures of alcohol and carbon dioxide. Kephir is produced using crude, purified, or UHT treated milk (Lopitz-Otsoa et al. 2006). While kephir is created commercially in numerous nations, especially in Eastern Europe, it is also made in homes in Argentina, France, Portugal, Taiwan, and Turkey.

ii. Tarag (China)

Matured goats are usually used in the production of Tarag, which is a staple food among the Mongolian people in China, who allegedly can consume one to two liters of tarag per individual every day (Zhang et al. 2009). Tarag is produced using raw, whole milk from the Zang and Chaidamu breeds of goats.

iii. Rob, Zabadi, and Gariss (Sudan)

The Sudanese history of utilizing milk dates to 5000 years ago. Sudanese of the Meroe Kingdom (690 BC-AD 323) may have known how to ferment dairy animals' milk (Abdelgadir et al. 1998). Dirar (1993) classified the Sudanese fermented dairy products into two noteworthy categories: the really indigenous, which includes Ransack, Gariss, Biruni, and Mish; and the semi-indigenous, which includes Zabadi and Gibna beida (Dirar 1993; Abdelgadir et al. 1998).

iv. Kadam (Mali)

Kadam is a conventional refreshment in Mali, especially in the hot season. Leftover milk is collected and left to sour. Contingent upon the season, the souring may take a couple of hours or a few days.

v. Ikivuguto (Rwanda)

Milk represents an important food, and its nutritional value, as well as its many health benefits, has been well-known to the Rwandese society since ancient times. Milk and its products, including the ikivuguto, assume a key part in the economic and social life of Rwandans. The conventional method for creating Ikivuguto is that once the cow has been milked, the milk is put in a container called an “*inkongoro*.” After this, the milk is transferred to a big, wooden container called “*icyansi*,” and is left at room temperature in a warm and clean place called “*uruhimbi*.” To keep the product safe, the container is normally secured either with a straw-woven cover, known as “*umutemeri*,” or with a top produced using a calabash. An aging time of no less than two to three days is required.

3.0 Milk Production and Fermentation in Rwanda

Milk production in Rwanda has steadily grown over the years due to an increase in the number of cows and improved cow breeds. Gradual increase in milk production in Rwanda was observed since the beginning of the last decade; from 50,000 Mt (million tons) in 2000 to about 731,000 Mt in 2015 (IFAD 2016). The increase in milk production is associated with the increase in the total number of cows, improved breeds, and animal health care. Before 1994, Rwanda had around 600,000 head of cattle, which increased to 1,349,792 in 2016. Of that cattle population in Rwanda, 615,631 (45 percent) were local breeds, 439,414 (33 percent) were dairy crossbreeds, and 294,747 (22 percent) were pure dairy breeds (IFAD 2016). The dairy sector was found to be the fastest growing agricultural sector in Rwanda, accounting for 10.5 percent of agricultural GDP (IFAD 2016); agriculture accounts for over 33 percent of Rwanda’s GDP (Daly et al. 2016). The increase in cattle and milk production in Rwanda is linked to programs initiated by the government of Rwanda such as Girinka, which is a poverty reduction program that gives one cow, free of charge, to a poor family, artificial insemination, animal health, and animal husbandry (IFAD2016).

However, milk consumption in Rwanda is still low compared to the recommendation of 220 liters per capita by WHO (Heifer International 2008). In the 1990s, milk consumption was less than 20 liters per person per year, and 64 liters in 2015 (IFAD 2016). In the National Dairy Strategy of 2013-2017, MINAGRI (2013) revealed that milk consumption in Rwanda was 40 liters per person per year, with the target of 80 liters per year in 2020. Around 75 percent of milk is consumed in rural areas (Karenzi et al. 2013). Ikivuguto is one of most liked milk products and is widely consumed in many areas of the country in addition to being interconnected with Rwandan culture. Since the majority of milk sold informally is used for ikivuguto, the government seeks to improve the way milk is collected by ensuring that milk is tested at the points of sale (IFAD 2016). Further, the government is in the process of formalizing milk collection and increasing the consumption of processed milk rather than raw milk (IFAD 2016). Article 5 of the Ministerial Order for selling milk states that milk must be tested for quality (MINAGRI 2016). Article 14 specifies that the person selling fermented milk must apply in writing for a license at the sector level where the kiosk is located (MINAGRI 2016). Article 15 states that for fermented milk and ghee to be sold at the kiosk, they must comply with standards established by the Rwanda Standard Board

(MINAGRI 2016). The Rwanda government supports the marketing and consumption of all types of milk and milk products after testing the quality.

3.1 Milk Collection, Transport, and Quality Control in Rwanda

Milk collection in Rwanda is of two types: formal and informal. It is reported that the formal collection count is between 10 and 15 percent, while the informal collection count is between 85 and 90 percent (Daly et al. 2016). Karenzi et al. (2013) report that 96 percent of milk is sold informally. Most of the formally collected milk goes to industrial processing before marketing, while the milk collected informally is subjected to traditional processing or is marketed raw. Informal milk collection can be suspicious due to some instances of adulteration and poor hygiene. Transporting milk in plastic jerry cans, which is not uncommon in Rwanda, increases the total bacteria count and shortens the stability of the product. The government is proposing to collect all milk through collection centers before marketing to ensure its quality. One hundred milk collection centers were built in Rwanda, out of the 177 needed to collect all the milk. However, only 28 milk centers are fully functional (IFAD 2016).

Milk is an unstable product that must be handled with care, and it must be checked for quality before processing or consumption. Hand milking is commonly practiced in Rwanda (around 98.6 percent); the remaining 1.4 percent is milked mechanically. Mechanized milking is mainly done in Kigali (Land O'Lakes, Inc. 2012). It was reported that the majority (98.5 percent) of people wash their hands before milking, and 80 percent of udders are washed prior to milking (Land O'Lakes, Inc. 2012). In rural areas, wooden equipment is used for milking and storing milk (*inkongoro* is used for milking, and *icyansi* is for storing). Some use plastic equipment for storage; however, wooden and plastic equipment are not easy to clean, and they can harbor microorganisms, which can compromise the quality of milk. It is advised that milk should reach its cooling center within two hours of milking (DMS 2009; Land O'Lakes, Inc. 2012). Milk testing is also at a low level, and it was reported that 47 percent of milk sold by farmers is not tested at the point of sale (Land O'Lakes, Inc. 2012).

The principal tests for milk are acidity and density (Majyambere 2012). Other tests conducted include visual observation and taste. The lack of cooling systems in rural areas leads to the waste of a lot of milk. Some milk is adulterated, leading to the rejection or production of products with poor quality (Land O'Lakes, Inc. 2012). It was reported that 62.5 percent of milk processors encounter adulterated milk less than 3 times a week, while 12.5 percent encounter adulterated milk more than 3 times a week. It was also reported that milk leaves collection centers having an average of 500,000 to 700,000 total bacteria count per ml (TBC/ml), and by the time milk reaches the processing plant, it grows from 800,000 to 1,300,000 TBC/ml, and the Rwanda Standard Board (RSB) recommendation is less than 1,000,000 TBC/ml (Land O'Lakes, Inc. 2012). If the milk clots when boiled, it cannot be processed due to a high acidity related to a high number of bacteria (Majyambere 2012). Milk should be handled with care and quickly chilled in order to prevent microbial proliferation, which can compromise its quality.

3.2 Processing Traditional Fermented Milk, 'Ikivuguto,' in Rwanda

Ikivuguto is a fermented milk product consumed in many parts of Rwanda. Fermentation is done by environmental microorganisms emanating from milking equipment or from the air. This causes ikivuguto's quality to vary from one batch to another or from one place to another. In some areas, milk is allowed to stand in a container after milking, and microorganisms present in the containers intervene in fermentation (Karenzi et al. 2013). In many rural areas, wooden equipment is used, such as an *inkongoro* for milking, and an *icyansi* (*igicuba*) for fermentation. Either wooden or another type of lid can be used. After fermentation stirring is done, the product obtained is called ikivuguto, which is consumed directly (Karenzi et al. 2013).

In some areas, ikivuguto is churned by women; the process takes around two hours, using an *igisabo* (a big calabash). Butter (*ikimuri*) is separated, and the remaining milk product is called *amacunda*. Amacunda is used for drinking, while *ikimuri* is subjected to an aging process and used either as frying oil in food preparation, or as a cosmetic product. Another method of preparing ikivuguto is to add pre-fermented ikivuguto (starter culture) to heated and cooled milk, then allowing it to stand at room temperature to ferment. Fermentation is more controlled in the second type than in the first. Once a good ikivuguto is used, the end product will also be good; however, there is a fear of disseminating pathogens once the milk used as starter culture is contaminated since quality control is rarely done. In some areas, after fermentation is complete, products are refrigerated so that they can last longer. In both types of fermentation, microorganisms that intervene in fermentation are responsible for the taste, flavor, and texture of the final product (Karenzi et al. 2013).

3.3 Microorganisms Involved in Ikivuguto Fermentation

There are different microorganisms that intervene in ikivuguto fermentation, and they are known as LAB (Lactic Acid Bacteria). There are different types of LAB for milk fermentation, including *Lactobacillus*, *Lactococcus*, *Streptococcus*, and *Leuconostoc* sp. (Gehemu 2015). LAB involved in ikivuguto fermentation are *Lactococcus lactis* and *Leuconostoc pseudomesenteroide*, as well as *Leuconostoc mesenteroides* subsp. *mesenteroides* to a lesser extent since it does not grow alone in milk (Karenzi et al. 2013). *Lactococcus lactis* takes 8 hours to complete fermentation at pH 4.6, and *Leuconostoc pseudomesenteroides* takes 14 hours with a titratable acidity of 80°D (Karenzi et al. 2013). When ikivuguto is kept at 4°C, it can last for 36 days without deterioration (Karenzi et al. 2013). Ikivuguto was reported to have more resemblance in both consistency and flavor to a Sweden product called "*Filmjöl*k," which is fermented by *Lactococcus lactis* and *Leuconostoc mesenteroides*, mesophilic lactic acid bacteria. The consistency of ikivuguto also resembles that of yogurt, which is fermented by thermophilic LAB *Lactobacillus bulgaricus* and *Streptococcus thermophilus* (Karenzi et al. 2013). LAB contribute to the preservation of milk due to the acid production and increase in flavor, and LAB fermented products were found to be beneficial to health due to different bioactive compounds they produce (Gehemu 2015).

3.4 Use of Synthetic Starter Culture in Milk Fermentation in Rwanda

Fermented milk is obtained by adding starter culture to raw milk to obtain sour milk. During fermentation, lactic acid bacteria convert lactose into lactic acid, which is responsible for the sourness of milk. In this process, the pH drops below 4.6, which contributes to the preservation of milk by preventing pathogens to grow (DMS 2009; Gehemu 2015). During fermentation, other byproducts develop and are responsible for the pleasant flavor and aroma of the product (Gehemu 2015). During the manufacturing of ikivuguto, whole or skimmed milk can be used. Starter culture used is made of a mixture of *Streptococcus cremoris*, *Streptococcus diacetylactis*, and *Leuconostoc citrovorum* (DMS 2009). Starter culture is added at the rate of 2 to 3 percent to milk, which is pasteurized and cooled at room temperature (DMS 2009).

3.5 Consumer Behavior Regarding Ikivuguto Consumption in Rwanda

Milk is consumed in both processed and unprocessed forms. A high amount of milk is sold to the informal sector where it is either processed or consumed raw. A majority of ikivuguto consumers are in the informal sector because their products are affordable for consumers of middle and low purchasing power. The price of formally processed milk doubles after processing due to the processing cost and packaging material. For example, the cost of packaging material for yogurt is estimated to range between 15 and 20 percent of total production (Daly et al. 2016). The high cost of industrially processed milk leads to the consumption of ikivuguto by a high number of people from different economic statuses (Majyambere 2012). A survey conducted in the Nyanza district revealed that ikivuguto is preferred by adults, and they do not feed it to children because it is sour. They fear that it is not nutritious, and spontaneous fermentation can introduce pathogens that can cause the product to be unsafe (Kazaroho et al. 2016). Fermented milk is consumed alone or with meals (Kamanzi and Mapiye 2012). A high consumption rate of ikivuguto was also reported by other authors (Majyambere 2012; Karenzi et al. 2013). Milk sold informally is over 70 percent of the total production, and retailers sell it in the forms of raw milk, curd milk, or ikivuguto, and UHT milk (DMS 2009). Table 1 shows that fermented or curdled milk is the second highest consumed variety, after boiled milk.

Milk Product	Raw Milk	Boiled Milk	Pasteurized Milk	Curdled Milk (Ikivuguto)	Cheese
Percentage	1	43	13	38	5

Source: Land O'Lakes, Inc. 2012

Table 1: Form of Milk Consumption in Rwanda

4.0 Material and Methods

4.1 Socio-economic Characteristics of Respondents

In this survey, mostly females of different ages, matrimonial status, and levels of education, were interviewed. The processor/seller respondents were composed of 87 percent females and 13 percent males. Regarding the age, the highest proportion of respondents (80 percent) was between 19 and 45 years old, and 20 percent were above 45 years old. No person below 18 years old was encountered during the survey of ikivuguto producers and sellers, which can mean that people under 18 are too young to enter the business. It was also observed that 71 percent of respondents were married, 27 percent were single, and 2 percent were widowers. Regarding the education level of processor respondents, the study showed that 82 percent attended at least secondary school, and 28 percent attended primary school, whereas 7 percent had no formal education. On the other hand, interviewed consumers were composed of 42 percent males and 52 percent females, and the majority (90 percent) ranged from 19 to 45 years old. Ikivuguto processing and commercialization is mainly a business for women, and its processors can be found at all levels of education and people, with secondary education occupying more than half of processors. Due to the short shelf life of ikivuguto, all processors/producers we talked to also retail directly to consumers. A breakdown of ikivuguto producers and consumers we interviewed can be found below (Table 2).

District	Processors/Sellers	Consumers
(Eastern Province)		
Gatsibo	28	9
Nyagatare	26	5
Kayonza	1	4
Ngoma	13	3
Kirehere	1	1
(Western Province)		
Nyabuhu	6	6
(Northern Province)		
Musanze	13	5
Burera	2	1
Gicumbi	3	-
(Southern Province)		
Huye	4	-
Nyanza	3	1

Table 2: Ikivuguto Producers and Consumers' Locations

Government organizations were interviewed about the promotion of ikivuguto. From the Rwanda Standard Board (RSB), a top standard development officer was interviewed. From the Ministry of Agriculture and Animal Resources (MINAGRI), the Director of Agriculture and Livestock Inspection and Certification Services was interviewed. From the Ministry of Health (MINISANTE), a health sector policy specialist was interviewed, and from Nyanza Dairy, which is a government owned milk processing plant that processes ikivuguto, a production manager was interviewed.

5.0 Discussion

5.1 Availability and Quality

Ikivuguto is produced by fermenting cow milk. Milk production varies from cow to cow, and local breeds produce less milk compared to exotic breeds (MINAGRI 2013). Seasons also influence the availability of

milk. Milk is abundant in the rainy season when feeds are plentiful, while during the hot season, production is significantly less. The study shows that milk is available all the time in all parts of Rwanda, but with fluctuations. Approximately 63 percent of processors get enough milk all the time; 15 percent get enough during the rainy season and see a shortage in the hot season; and 22 percent never get enough milk. Hot seasons normally occur in June, July, August, and September. Processors get their milk from different sources, and the majority (above 86 percent) obtain raw milk directly from farmers or middlemen.

5.2 Quality Control

Quality control is important for ikivuguto processing since low quality can compromise the health of consumers and the quality of the end-product. Before processing, modern and traditional methods can be used to assess the quality of raw milk. Approximately 48 percent of respondents use modern methods for quality control, 20 percent use traditional methods, and 32 percent never test raw milk due to the trust they have in their suppliers. The quality control of milk was also reported by Land O'Lakes, Inc. (2012) where 47 percent of milk is not tested at the point of sale. However, the use of the traditional method was not reported. Testers conduct small tests, such as density, using a lactodensimeter or the clot-on-boiling method (Land O'Lakes, Inc. 2012). Others buy raw milk from milk collection centers where they are sure that milk has been tested during purchase. Some testers use smell, while others taste the product. For experienced buyers, visual observation is enough to know when milk has been adulterated with water. Good quality milk is thick with a good-looking cream. Milk can be poured on the ground, and when it spreads and dries quickly, it is an indicator that it is adulterated with water. Good quality milk does not spread and dry. To further test whether milk is adulterated with water, it is allowed to stand for some time. During this time, water will separate from other components of milk if the milk is adulterated with water. Moreover, boiling good quality milk brings up the foam while poor quality milk doesn't bring foam to the top. Those who rely on trust always buy from suppliers they know very well, who practice hygienic conditions, and who do not dare to adulterate their milk. Feedback from consumers is also mainly used by those who trust their suppliers.

5.3 Ikivuguto Processing

Approximately 75 percent of respondents use traditional fermentation which in this case is simply raw milk, left to ferment without the use of starter culture or additives, while the remaining 25 percent either use traditional or modern starter culture. During ikivuguto processing, raw milk is boiled in a pan after a quality check. Fire wood or charcoals are used as a heat source. Once boiled, milk is cooled at room temperature while using a mixer to prevent creaming. After cooling, milk is filtered into a well cleaned saucepan or bucket, and a small quantity of previously fermented milk, known as *imvuzo*, is added to initiate fermentation. Others may add industrially made *imvuzo*; however, some do not add anything. In these three cases, milk stands overnight in a fermenter (bucket, saucepan, or can) for fermentation; this takes 12 hours or longer. Fermentation is slow at a low temperature, and quicker at a high temperature.

Natural fermentation is responsible for the variation in ikivuguto from one batch to another (Karenzi et al. 2013). After fermentation, ikivuguto is obtained, and after stirring, it can be consumed directly (Karenzi et al. 2013). The final product can be kept in a fridge to stop fermentation for later consumption. However, those who do not have a fridge transfer ikivuguto into jerry cans for storage. The product is served to customers in glass cups.

5.4 Consumer Perception

The ideal ikivuguto is firm and homogenous in texture, not too sour, and white in color. It does not have other scents apart from the natural milk. Consumers prefer non-industrially produced ikivuguto to the industrially produced variety because of its natural taste. Additives in commercially produced ikivuguto can alter its taste, texture, and flavor. Microorganisms, which intervene in fermentation, were reported to be responsible for the taste, flavor, and texture of the final product (Gehemu 2015; Karenzi et al. 2013). Consumers are also concerned with the effects of the additives on their health and testified that traditionally processed ikivuguto is thicker than its industrial-made counterpart. Table 3 shows consumer perception concerning the different quality parameters of ikivuguto where safety was classified as the most important. Failure to meet product safety can endanger the lives of consumers by exposing them to diseases.

Intrinsic Quality	Very Important	Important	Neutral	Somewhat Important	Not Important
Sensory	51.72	24.14	17.24	6.9	0
Safety	89.66	10.34	0	0	0
Shelf life	75.86	24.14	0	0	0
Convenience	31.03	55.17	6.9	6.9	0
Health	55.17	44.83	0	0	0

Table 3: Characteristics of Ikivuguto

5.5 Shelf Life

Ikivuguto is a product with short shelf life. Shelf life depends on the storage conditions. The shelf life of ikivuguto tends to increase when stored in the fridge and shortens at room temperature. The study revealed that the shelf life of ikivuguto, for more than 80 percent of processors, is 2 to 3 days. During fermentation, the pH drops below 4.6, contributing to the preservation of milk by preventing pathogens' growth (DMS 2009; Gehemu 2015). This shelf life is short for a commercial product. The main reason for this short shelf life may be linked to a lack of facilities like refrigeration. The fridge's temperature hinders

lactic acid bacteria (LAB) from continuing fermentation by stabilizing the quality of the product. On the other hand, milk kept at room temperature continues to undergo fermentation, and when the increase of acidity is too high, the product becomes sour and less palatable. On the other hand, the short shelf life of ikivuguto may be linked to a lack of packaging materials. It was found that 80 percent of ikivuguto is not packaged, and the remaining 20 percent is packaged in plastic jerry cans. This implies that environmental microorganisms can enter the product during serving, thereby contributing to the deterioration of the product. Packaging in plastic jerry cans is also suspicious because these materials are obtained after exhausting edible oil, and they are not easy to clean.

5.6 Health and Nutritional Benefits of Ikivuguto

Milk is a product with a high amount of nutrients. It contains protein, carbohydrates, lipids, vitamins, and is a good source of minerals. In combination with bread, milk can be a complete diet. During fermentation, health promoting agents are produced by LAB. LAB fermented products were found to be beneficial to health due to different bioactive compounds they produce (Gehemu 2015). Consuming ikivuguto helps body protection against different types of diseases. Interviewed consumers were all aware of the health benefits associated with milk; while 55 percent classified milk as very important, 45 percent classified it as important. Ikivuguto is used to test and detoxify intoxicated people. Once an intoxicated person drinks ikivuguto, he may vomit, which can help to alleviate toxicity.

5.7 Ikivuguto and Economic Empowerment in Rwanda

Ikivuguto is known everywhere in the country and is an integral part of the local culture. It is a product that is locally made, affordable, and consumed by people of different categories. A majority of interviewed consumers (85 percent) reported that they have been consuming ikivuguto for over a decade, and, among them, some have been consuming it since they were infants. Land O'Lakes, Inc. (2012) reported that ikivuguto is consumed at the rate of 38 percent compared to other types of milk. Kazaroho et al. (2016) reported that ikivuguto is preferred by adults and is consumed alone or with meals (Kamanzi and Mapiye 2012). Regarding ikivuguto consumption (Figure 1), more than 1/3 of consumers spend between 2,000 RWF and 5,000 RWF on ikivuguto per month, and slightly less than 1/3 spent between 10,000 RWF to 20,000 RWF per month. Consumers who spend more than 20,000 RWF per month total 14 percent. Ikivuguto is consumed by people from different backgrounds, with rural areas dominating the market.

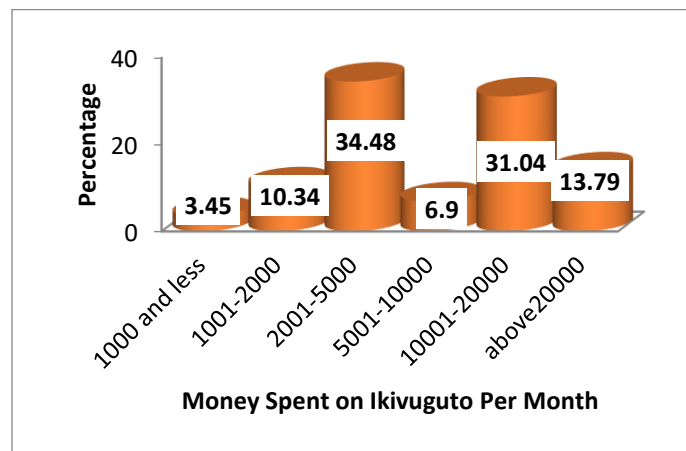


Figure 1: Money Spent on Ikivuguto per Month by Consumers

5.8 Ikivuguto and Women Producers

Ikivuguto has been used for ages and it does not need to be advertised for consumers to purchase it. It is produced using cheap, raw materials, and its price is affordable. The price of milk depends on the area of the country. Areas with a high quantity of milk tend to have a lower price, while areas with low quantity tend to have higher prices. In areas with an abundant milk supply, the price ranges between 150 and 250 RWF per liter, as shown in Figure 2. The majority of ikivuguto processors earn 100 RWF or less per liter. The profitability of small-scale dairy sectors was also reported by IFAD (2016). Those who process more are likely to earn more. However, the processing capacity of ikivuguto producers is still low since the processing capacity of 62 percent of producers is still less or equal to 20 liters per day.

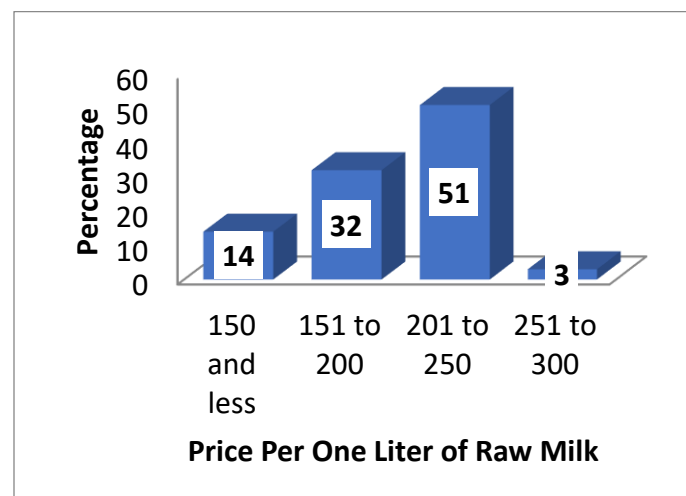


Figure 2: Price of Raw Milk

Consumers are willing to accept increasing prices if the quality of ikivuguto improves. All interviewed consumers (100 percent) reported that ikivuguto should not be banned for any reason. However, they are

willing to pay additional costs for improved ikivuguto. The promotion of ikivuguto through certification is another option that the government is considering for traditionally processed and sold ikivuguto, although this will come at a considerable cost to the government (MINAGRI 2013). Ikivuguto was reported to be a profitable product, and its competitiveness is confirmed by more than 93 percent of respondents. About 70 percent of processors reported that they sell all their products. Most people involved in processing and selling ikivuguto are female, while males outnumber females in supply and consumption (Table 4).

Activity	Gender	Percentage
Raw Material Suppliers	Male	62.86
	Female	37.14
Processors	Male	3
	Female	97
Sellers	Male	10
	Female	90
Middlemen	Male	94
	Female	6
Consumers	Male	62.86
	Female	37.14

Table 4: Gender Distribution in the Value Chain of Ikivuguto

5.9 Government Support

In Rwanda, the government supports small scale enterprises through various means, including the facilitation to conduct business and the provision of finances and trainings. Although the government of Rwanda facilitates businesses, however, a majority of people (95 percent) revealed that they have not received any support from the government, and 5 percent received support in terms of training. The government is seeking to improve the way milk is collected by making sure that milk is tested at the point of sale (IFAD 2016). This will help in processing safe products and reduce spoilage during production. Moreover, fermented milk sold at kiosks must comply with standards established by the Rwanda Standard Board (MINAGRI 2016). Similarly, the Rwanda Standard Board (RSB) is in the process of providing training and issuing safety certificates to small scale processing plants; the ikivuguto sector is no

exception. This will help consumers trust the quality of processed ikivuguto, and the product will be able to be sold far from areas of production, which will increase the income of the processors.

5.10 Challenges for Rural Women Ikivuguto Producers

Milk production is not constant throughout the year, and it is a very sensitive product that requires careful handling. Milk production is high during the wet season when feed is abundant and decreases in the dry season due to the reduction of feed. Approximately 28 percent of processors did not experience price fluctuation in processing, 33 percent experienced wide fluctuation, and 39 percent reported slight fluctuation. The variation in prices affects 43 percent of business people involved in the ikivuguto market. Effects on businesses are mainly related to the shortage of milk for processing, increase in price of both raw and processed milk, and reduction of consumers due to the increase in price. Milk production can be increased through animal health and animal husbandry (IFAD 2016). To maintain uniformity in milk supply, it is better to make sure that feed is available throughout the year. The availability of feed may be achieved by storing grasses, like silage or hay, during the abundant production time, so that they can be used during dry season. To satisfy those who never get enough milk and increase milk production, a possible solution could be the addition to herds of some animals of exotic breeds that have high milk production, but also high maintenance requirements (MINAGRI 2013).

Milk is a very sensitive product, and it is affected by inadequate infrastructures, knowledge, and the capital of processors. This study revealed that in the business of ikivuguto, 25 percent of processors have encountered spoilage of ikivuguto during processing, and they are unaware of the causes of spoilage. Training can help processors know and test quality parameters of good raw material (DMS 2009). Many processors do not know how to measure the quality of raw milk, which leads to buying low quality milk that cannot be processed or to the selling of low quality product. There is no doubt that those who depend on trust (approximately 32 percent) are unaware of the quality parameters of milk. Moreover, the lack of a cooling system is responsible for wasting a lot of milk, which can lead to rejection or poor quality products (Land O'Lakes, Inc. 2012). Electricity cuts lead to the rapid growth of microorganisms, thereby spoiling both raw and processed milk. The quality of milk can also be compromised during handling by using plastic or non-stainless-steel equipment. Poor roads, transporting milk at high temperatures, and using bicycles for transportation contribute to milk loss before reaching the market or processing area (DMS 2009; ADF 2011). Some consumers wish to take ikivuguto to their homes; however, that is not possible due to lack of packaging materials. It was also revealed that 93 percent of ikivuguto producers do not involve middlemen in selling their products. This means that ikivuguto is consumed in the area of production. Ikivuguto producers should be trained on how to expand their businesses by reaching different areas of the country, and even on exporting it. Most processors produce low quantity ikivuguto, and this is linked to insufficient capital, requiring a link between the processors and the banks so that processors can increase their production.

6.0 Conclusion

Ikivuguto is a traditionally fermented milk product and is fermented by environmental microorganisms. Most people involved in the ikivuguto business are females. The product is consumed by both men and women and is consumed and commercialized by people of different ages and levels of education. It is a competitive product and predominates in rural areas. Compared to other milk products, ikivuguto ranks first for being consumed by a high number of people. The reduced milk supply and its increased price in the dry season affect the ikivuguto business. Ikivuguto has a shelf life of two to three days; however, it can be prolonged when it is kept in a refrigerator. Some people involved in the ikivuguto business are not aware of the quality parameters of milk, and they experience spoilage during processing. Insufficiency of infrastructure and low capital are also constraints in the milk sector.

According to the findings, traditionally fermented ikivuguto holds the potential to improve the economic situation of many rural women in Rwanda. The majority of ikivuguto processors earn 100 RWF or less per liter. The more ikivuguto is processed, the more likely it is to earn more money per liter. Ikivuguto was reported to be a profitable product, and its competitiveness is confirmed by more than 93 percent of respondents. About 70 percent of processors reported that they sell all their products; however, the processing capacity of rural women producing ikivuguto is still low since the processing capacity of 62 percent of producers interviewed is still less or equal to 20 liters per day.

There have been concerns regarding hygiene in the production of ikivuguto that may lead to the government banning the product; however, consumers are willing to accept increased prices if the quality of ikivuguto improves. All interviewed consumers (100 percent) reported that traditionally fermented ikivuguto should not be banned for any reason, such as poor hygiene in the production, opting instead to pay additional costs for improved ikivuguto. Rather than placing a ban on the traditional production of ikivuguto, the proposed certification of producers by the Ministry of Agriculture is likely to increase the number of its consumers.

Further, there are certain constraints that impede the extent to which rural women can benefit from the production and marketing of ikivuguto. These impediments relate to poor roads, milk transportation at high temperatures, and bicycle transportation. The amount of milk lost due to these constraints is estimated to be 35 percent. Roads, water, electricity, and training are needed and will provide huge benefits to rural women producing ikivuguto. The provision of cooling facilities will help increase quality and quantity. Training ikivuguto producers on hygiene and quality to produce reliable products is also necessary. During training, an emphasis should be placed on the prevention of adulteration and on the microbiological quality of milk. Packaging materials increase the price of the product and are out of reach of rural women who sell their products unpackaged, thereby shortening its shelf life. Promoting rural tourism in relation to indigenous beverages, such as fresh, unpackaged ikivuguto, can improve rural women's income without the financial burden of packaging. Most female producers of ikivuguto are interested in expanding their business, but they are not able to do so due to lack of capital. Forming cooperatives can help address this issue. On the whole, ikivuguto is a viable product that can greatly

empower rural women economically, especially when the noted challenges and constraints in this paper are addressed appropriately.

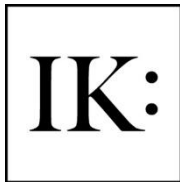
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Abagoré (Empowering Rural Women in Rwanda)

A StoryHouse Communications Production, 2017

Producer: Chika Ezeanya Esiobu, Ph.D.

Director: Obiamaka Onyebum

Cinematographer: Rehema Abdul

Editors: Obiamaka Onyebum and Samuel Femi

Translator/Research Assistant: Annet Uwase

Transcriptions: Bariti Business

Below is a summary of Abagoré that is designed to stand alone or accompany the documentary. Please find the documentary linked [here](#).

1.0 Introduction

In Rwanda, women living in rural areas use indigenous knowledge and technology to improve their lives. By utilizing the rich knowledge passed down from generations, these women provide for their families by making and selling indigenous products. This documentary discusses the relationship between the empowerment of women living in rural areas and the production and sale of these valuable products.

Experts and the women themselves comment on this important relationship. As the documentary progresses, the production processes of banana wine, sorghum beer, indigenous vegetables, and sour milk are explored and demonstrated. This footage provides a visual experience for viewers to understand more about the women and their livelihoods, as well as the production of indigenous products.

Dr. Chika Ezeanya Esiobu, Senior Lecturer in the College of Business and Economics at The University of Rwanda, opens the documentary saying,

I think it's important to emphasize that the question of indigenous technology is not against whatever technology is going to come from the outside. They can both work together, but it's important that the foundational technological advance be founded not on important ideas, but on what the nation has and can build for itself, while

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IK: Other Ways of Knowing

also borrowing ideas and existing technology from other nations.

Next, Nyirangaruye Dancilla, a woman living in rural Rwanda, explains,

It was someone that advised me to start making banana wine after I became a widow and there was nobody to even give me soap. He said, ‘Instead of begging, let me teach you what you can do to afford school fees for your children.’ So, banana wine was my source of income to buy things like schoolbooks and to cover other small bills. That’s how I survived.

Dr. Marie-Christine Gasingriwa, Director General for Science, Technology, and Research with the Ministry of Education in Rwanda, states, “From the perspective of what we know, when we talk about tradition, we attach so much value to indigenous knowledge because we are what we are thanks to technology our parents used. Now, when we talk about modern technology, it is adding to what we have.”

Paul Okwi, Program Officer of the Inclusive Economic Program for the International Development Research Center says,

Our position is to improve the jobs, employment, especially for women in developing countries. The program we’re working on takes an innovative approach of looking at rural areas with the focus of indigenous knowledge, indigenous technology. We believe that local solutions work best for local problems. This project seeks to build the capacity of rural women in terms of enhancing their capabilities to grow their businesses, looking at the traditional businesses. It looks at enhancing their capacities to lead their rural folks in terms of production of indigenous products. We’re also looking at possibilities of supporting the policy areas in terms of enhancing the growth of this business system.

Dr. Chika Ezeanya Esiobu explains:

This project is focused on how women in Rwanda can be economically empowered using indigenous technology, their own local technology, not imported technology from outside; for being able to generate development, economic empowerment; using what is readily available within these local constituencies. In Rwanda, there are many indigenous ways of producing different items, products. For this particular project we’re looking at about four products: banana wine, sorghum beer, indigenous vegetables, and sour milk. When you come to Rwanda you find that quite a few people consume cabbage, carrot, cucumber, tomatoes. Of course, these are good and nutritious; however, before these vegetables were introduced to Rwanda, there were certain traditional vegetables that Rwandans used to cultivate and eat that have proven to be even much more nutritious than the imported vegetables that are now being consumed.

But you find they are not so much consumed these days. We had to go to them and ask: ‘why do you cultivate these vegetables? How much access do you have? How can your production be improved? How can consumers be encouraged to increase consumption of these vegetables?’ Because it has proven to be more nutritious than cabbage, carrots, and cucumbers.

We’re also looking at sour milk, *ikivuguto*, produced using traditional fermentation methods. In Rwanda, you find that it appears there is more emphasis put on encouraging the use of synthetic starter cultures, but then, for hundreds of years, Rwandans have been using traditional fermentation method with several advantages: it is cheaper, more accessible, even what is produced is much better, according to consumers, and has more nutritional content than the one that is produced using the synthetic imported cultures.

2.0 Meet the Women

In this section, several women describe their lives in rural Rwanda.

Nyirangaruye Dancilla says, “I sell banana wine for a living, and I’m also a farmer. I have spent five years selling banana wine.”

Nizeyimana Donatille says, “I make sorghum beer. I’ve been making it for five years.”

Mary Kagabo says, “I’m a farmer. I’ve been making sour milk for 10 years.”

Mukandekezi Francoise says, “I’ve been growing these vegetables for 10 years.”

After the rural women speak, Dr. Chika Ezeanya Esiobu states,

The research on indigenous technology for creating employment for women is very important, especially in Sub-Saharan Africa. For several decades, development in Africa has taken an outside-in approach. A situation where conversations surrounding development usually emanate from international organizations, central government, while in these development conversations there are very few voices of those who will actually be the recipients of development efforts. So, this research is very important because we are going to focus on the women, the people who are actually at the center of development decisions. So, we are going to them to say, ‘What do you need? What are you doing with what you have?’ And from there, we’ll be able to chart a development trajectory for these women. It’s very difficult to generate development when technology is imported because it doesn’t take root in local communities. But when technology grows from Point A to Point B, from what is known to what is unknown, it is easier for technology to take root and expand, and for that

community to become an extent of creativity and innovation based on available technology.

3.0 Empowered by Indigenous Technology

Nyirangaruye Dancilla first explains,

Because of poor living conditions I made enquiries from someone on how I would survive. We agreed that for me to live, he would loan me some money to buy bananas to make banana wine. I was loaned 5,000 RWF [Rwandan Francs]. That time I was selling a jerrican of 20 liters of banana wine for 1,000 Francs. The cost increased to RWF 2,000, and now, we currently sell a jerrican at RWF 4,000. The more costly the bananas get, the more we increase our prices. Therefore, I earn a living by making banana wine. Sometimes when the wine spoils, and I don't have money, I borrow money from the cooperative society. When I make profit, I pay them back. With the proceeds gained from making the banana wine, I bought that cow.

Nizeyimana Donatille also states: "I wasn't taught how to make sorghum beer. I did some research to find out how I can survive. I make like 10 jerricans. A jerrican sells for RWF 3,000. I use black sorghum flour. It costs RWF 500 per kilo."

Mary Kagabo says, "We grew up in a farming environment, and when we moved to Rwanda, we met people who were doing business, and milk was on high demand. So, I decided to do the business of selling sour milk. I buy the milk, prepare it for fermentation, and then resell the sour milk when it is ready."

Mukandekezi Francoise states,

I started growing these vegetables when I realized that these vegetables prevent diseases and because I realized that my family was feeding poorly, yet I had means to grow better food. I started growing these vegetables, and my family is now well. We are no longer sickly. When my neighbors lack vegetables, they come, and I give them for proper feeding in their homes, too. That way we reduce diseases in the village.

3.1 Indigenous Technology for Banana Wine (Urgwagwa)

Nyirangaruye Dancilla explains the process of making banana wine:

This is how I split the bananas. My kids help me prepare the banana leaves; I'm going to put the banana leaves in a hole, well covered so they can become ripe. I blow the smoke inside the hole because it hastens the ripening of the bananas. They stay about 5 days here. Then I remove them to make the wine. I remove

them and peel them. If we don't encounter any problems at this stage of processing the bananas, it will bring out very good wine. If I make it in the morning and put it on the fire, by evening the wine will be ready. I use a worker for processing the bananas because I'm not very strong. I have to press it until it begins to foam. When there is a lot of foam, it flows like there is water. We are going to put this juice from the banana into a jerrican. We will also add some water to dilute it. Now this is how we extract. After, I will put it in a saucepan, then I'll add more water. Then I'll put it on fire to make the wine. If I don't boil the wine on fire like this, it will be spoilt by tomorrow. The benefit I get from making the banana wine is that when I sell it, I get more money to buy soap, food, and other necessities. But if it gets bad before I boil it, it's really a big loss. After boiling the wine, I will sieve it to remove all the chaff and also maintain good hygiene. I have to wash the jerricans very well and keep them in a clean place. Then my customers pick them from here and take them to the market. Then I wait for them to sell and bring me the money.

3.2 Indigenous Technology for Sorghum Beer (Ikigage)

Nizeyimana Donatille explains the process of making sorghum beer:

When I want to prepare sorghum beer, I go to a sorghum seller and we bargain a price. After we agree on a price, I get the sorghum. Then I weigh the sorghum and get the exact quantity that I want to use. After weighing it, based on the money I have, I go to a special machine for milling it. After I get the flour, I take it home. When I get home, I put a pot of water on the stove to boil. I put some sorghum flour in a drum, and after the water in the stove has boiled, I pour it into the drum. After adding water, I put flour and then mix for a while. Then I stir and stir until it is fine. After stirring properly, I add water to cool down the temperature. Then I cover it for 24 hours and open it the next morning. The sorghum beer is done and ready for consumption. As soon as the sorghum beer is ready, those who wish to sell it come to buy at a wholesale price and then resell it. There's alcohol we have that we normally add to the mixture; after adding it, we cover with some flour. It has become so sweet.

3.3 Indigenous Technology for Sour Milk (Ikivugutu)

Mary Kagabo explains the process of making sour milk:

For sour milk, we get the fresh milk from the cows and boil it; then we store it in a nice clean place in different containers. We separate the milk into bits to enable it to cool. Hot milk is never used for making sour milk. We only use warm milk for the process. In the evening, around 7p.m., we get the milk ready and store it in a

clean place. Then we bring out the containers to be used for the fermentation. There's this milk called 'invuzu;' it is usually added to form or make yoghurt. This 'invuzu' or slightly soured milk is added to one of the clean containers and then mixed with very little water. You then get the cooled unfermented milk and you sieve it into the invuzu mixture. After sieving, you add a little milk (invuzu) on top of it. After that, you cover the milk and store it in a clean place. In the morning, you will find it in the form of yogurt.

3.4 Indigenous Technology for Vegetables (Mgoba)

Mukandekezi Francoise explains the process of growing vegetables:

The way we start is that these vegetables grow by themselves. For example, if this single one falls somewhere, it later grows. After it grows, I remove it and plant it properly. When planted properly, it then spreads so much that it can even fill a big garden, coming from this single leaf that fell. If you have the finances to get fertilizers and some chemicals to the vegetables, the farm will yield a better harvest. This old lady's vegetable farm looks that way because of the little fertilizer added to it. If she had added more fertilizer, the yield would have been much more. From my point of view, local or Rwandan vegetables are the most preferred because Rwandan vegetables have been found to be medicinal for everyone. When you add these vegetables to your meal, it gives you vitamins thereby providing a healthy diet. That's why people have an affinity for Rwandan vegetables—because it keeps them healthy when they eat them. All vegetables that are available are there for a reason, and they add value to your life. But the traditional vegetables are more important because they grow naturally on their own, and they have all the vitamins and minerals needed by a person's body. That's why people take their time to plant them, so everybody can have access to them.

4.0 Challenges the Women Have and the Role of the Government

Nyirangaruye Dancilla speaks about her main challenges in making banana wine:

I have never received financial support from the government or anybody. I could borrow RWF 5,000 from a friend and try my best to pay them back when I get the money. This is how I survive on a daily basis. The main challenge I face in my business is that sometimes my wine expires. When this happens, I lack business. I sit around doing nothing. When selling my juice, the problem I face is with washing the jerricans because I'm not strong enough. That's when I ask one of the girls to help me with washing. They also carry the heavy bananas for me.

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Nizeyimana Donatille speaks about the challenges she faces in making sorghum beer:

The challenges I face include lack of water, since I have to pay money and go all the way to the tarmac road to buy water. Secondly, I use a lot of firewood. I buy a pile of firewood at RWF 3,000. Lastly, I will say that another challenge is being able to satisfy all my clients. So, my challenges are water, firewood and money to buy the sorghum seeds for RWF 500 a kilo.

Mary Kagabo explains the challenges in making sour milk:

We face challenges in buying and boiling the milk; we have problems with getting firewood because we can't cook plenty of milk on a charcoal stove, except on big charcoal stoves, and it's not easy to find charcoal to fit into it. The situation in our country is that firewood has become rare, and the government doesn't want us to cut trees from the environment. The government wants people to use other alternatives and that's why they help people use biogas, for example. But again a casserole, which can take 20, or 25, or even 45 liters of milk, can go on firewood, but not on a charcoal stove or biogas. Firewood is hard to find, and when you get it, it is very expensive. Two logs go for 400 RWF. The main challenge we face in selling the milk is prolonged power outage as this can cause the things in the fridge to get spoilt. Another challenge is that sometimes we don't get customers or very few, causing the milk to stay for some days and get spoilt. These challenges don't occur every day, though. They usually happen once in a while. It also depends on the season. When it is the rainy season, people who drink milk are very few. They prefer to drink tea. But in the summer people come for milk.

Mukandekezi Francoise speaks about the challenges in growing vegetables:

The main challenge we face is lack of fertilizer. If we had more fertilizer, we would increase the quantity of vegetables produced. In order to get a good harvest, we need to put in enough manure. With more manure, I could cultivate 3 to 4 meters of land and get more harvest. I would appreciate if I'm helped in getting more fertilizer, or even a cow that would provide manure for me. For example, this piece of land is 1 square meter and from it I can generate RWF 10,000 if I don't have fertilizer. But if I had fertilizer, I would generate RWF 20,000, and my family, as well as my neighbors and people around me, would have food to eat. But because there is no manure, I can't have a good harvest.

5.0 Conclusion

Dr. Chika Ezeanya Esiobu states,

Development partners, civil society, and private sector and non-governmental organizations can play a key role. We know that Africa is still an aid dependent continent for the most part, but one of the disadvantages of aid is that it is short-term. It does not really emphasize growth that springs from within. So, one way that development partners can encourage indigenous technology is by investing in capacity—building around existing indigenous technology.

Paul Okwi says,

In this particular case, Africa has come a long way, we are losing some of the indigenous systems, and we need to enhance them because they have been the livelihoods of these communities for centuries. We can't lose these systems that can sustain families and employ many people. We want to enhance them and scale up the opportunities for the people. Policy makers have gone to indigenous knowledge and technical systems— it is not new to them. We feel that the young generation could be easily forgotten in this process. So, we have engaged the policy makers; we have talked to them at the time of design of the product and told them what exactly we want to achieve with this. The policy makers are keen to support the empowerment of women in these areas in Rwanda and Tanzania. The policy makers can be instrumental in implementing these ideas, scaling up. It is not easy, but most African countries are looking back at traditional systems and seeing how they can integrate these in the current planning process.

Dr. Chika Ezeanya Esiobu says,

I think it's important for us to understand that most of the economies we consider developed had started by growing their own indigenous knowledge and technology. Across the world, in different sectors, you find traditional knowledge and technology forming the foundation for modern technology because it is easier to build from what is known. When technology is something that is taught locally, gotten from the immediate environment, it becomes a lot easier for innovation. So, it would be difficult for any country to advance technologically without emphasizing indigenous technology. It is very important for sub-Saharan African countries to focus on indigenous technology while also not neglecting more advanced technology. The question of indigenous technology is not against whatever technology is going to come from outside; they can both work together. But it's important that the foundation of technological advancement of a nation be

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founded not on imported technology, but on what the nation has and can build for itself while also borrowing ideas and technology from other nations.

A Review of *We Are Dancing for You: Native Feminisms and the Revitalization of Women's Coming-of-Age Ceremonies*

Book Review by Renya K. Ramirez

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We Are Dancing for You: Native Feminisms and the Revitalization of Women's Coming-of-Age Ceremonies. By Risling Baldy, Cutcha. 2018. University of Washington Press. 208 pp. Paperback ISBN: 9780295743448

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Risling Baldy writes an important and exciting contribution to Native feminisms, anthropology, history, and Native studies. She contributes to all of these fields by discussing how the menstruation of Native women is not taboo, dirty, and/or bad as past anthropologists have emphasized, but rather challenges this notion and celebrates the rituals that celebrate Native women's empowerment and the strong, central place of young California Native women in tribal nations, cultures, and societies. The book focuses on the revitalization of a coming-of-age ceremony for the Hoopa Valley Tribe. Female tribal members had not participated in the Flower Dance for decades and they decided to revitalize this important ceremony. The women of the tribe talked to female elders about their memories of the Flower Dance and learned additional information from anthropological sources, archival records and, oral histories. Risling Baldy emphasizes how cultural revitalization of this powerful coming-of-age ceremony led to young women's empowerment by including their experiences and voices to demonstrate the beauty and power of this ritual. Risling Baldy's strong challenge of Eurocentric and colonial notions of menstruation is very important for Native women to learn about in order to decolonize negative messages that surround women daily about their bodies and menstruation experience. She adds greatly to Native feminisms by highlighting how deeply settler colonialism has hurt Native women, in particular, and weaving together the importance of decolonization, Native women's coming-of-age ceremonies, and Native women's centrality in our tribal nations. Her book will encourage our Native communities to recover and practice our Indigenous coming-of-age ceremonies as a central tool for the empowerment of young women and decolonization.

She does an excellent job placing herself squarely within the text and explaining what brought her to write about this crucial topic. Indeed, she courageously includes her own personal experiences that contributed to her decision to write this very significant book. She shares a decolonizing research methodology by working with fellow tribal members as intellectuals and research partners in the development and analysis of her tribal nation's coming-of-age ceremonies. She breaks down theoretical ideas into easy-to-understand language, which makes the book accessible to all readers. This book is extremely well-researched, documented, and her inclusion of her own subject position makes the book a wonderful read. Furthermore, Risling Baldy's beautiful prose makes the entire book a page turner. I greatly encourage everyone to read this important book and contribution to Native feminisms. It will open the reader's eyes to the courageous strength of Indigenous women and the power of Native California coming-of-age ceremonies. I certainly will include this book in my Native feminisms and Gender in Cross Cultural

Context classes and encourage other professors to teach this incredibly significant book, too. I hope this book can circulate in bookstores for the general audience, college bookstores, and bookstores throughout Indian Country. Her book is well-written, well-argued, and a joy to read for scholars and general audiences alike!

A Review of *Rethinking Mexican Indigenismo: The INI's Coordinating Center in Highland Chiapas and the Fate of a Utopian Project*

Book Review by María L. Olin Muñoz

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Rethinking Mexican Indigenismo: The INI's Coordinating Center in Highland Chiapas and the Fate of a Utopian Project. By Lewis, Stephen E. 2018. Albuquerque: New Mexico University Press.

360 pp. Hardcover ISBN: 978-0-8263-5902-5

doi 10.26209/ik561144



Stephen Lewis' *Rethinking Mexican Indigenismo: The INI's Coordinating Center in Highland Chiapas and the Fate of a Utopian Project* examines the lofty ideals and efforts behind the National Indigenist Institute's (Instituto Nacional Indigenista- INI) premier project during the middle part of the twentieth century. Organized into three sections, the book details the limited successes of the Indigenist Coordinating Center (Centro Coordinador Indigenista—CCI) project in Chiapas as well as its many failures. Lewis argues that Chiapas, the highlands in particular, became the incubator for applied indigenismo in Mexico.

In the first section, Lewis explains that the INI's gaze fell on Chiapas precisely because it came to represent a major challenge to INI officials seeking to assimilate Mexico's indigenous population. Ethnic divisions, deep poverty, significant alcoholism, and the continued presence of *caciquismo* (patron-client relationship), highlighted by the works of anthropologists Sol Tax and Alfonso Villa Rojas, made Chiapas the desired petri dish to begin the work of transforming indigenous Mexicans into modern citizens. Of course, the assumption was that indigenous Mexicans were incapable of being modern on their own terms. In this section, the most fascinating discussion deals with the multiplicity of actors and the complexity of their relationships—ladino v. indígena, state v. federal actors, indigenistas v. ladino, and indigenista v. indigenista. One of the book's strengths is that these complex power struggles to guide and/or thwart the Coordinating Center projects in the highlands are shown throughout; from education projects to struggles over alcohol production and consumer cooperatives, these relationships were strained at best.

The second part of the book lays out the ways INI was forced to shift from a plan for major economic development in the region to the more "moderate" task of assimilating Tseltal and Tsotsil communities. To do so, CCI officials resorted to multiple approaches in attempts, not always successful, to establish fruitful relationships with ethnic communities, including recruiting young local indigenous men as bilingual promoters and go-betweens, to mediating between Western medicine and local traditions, to taking on a powerful alcohol monopoly held by the Pedrero family. These efforts netted mixed results. For example, the scathing report on the Pedrero family's hold over aguardiente industry in the region resulted in an overhaul of the federal tax code on alcohol products and hiring of honest state liquor personnel. Yet, INI's attempts to weaken the hold of the Pedrero family did not succeed as the social, economic, and political clout of the family in the State remained.

Perhaps one of the most fascinating questions the author asks of his research is whether INI inadvertently did more to create a new generation of local caciques than to disassemble existing ones. The incorporation of bilingual promoters—local indigenous men (largely) who were literate and being paid for their services—meant these men could, and did, leverage these newfound advantages in many ways. Lewis shows that some of these bilingual promoters not only eventually situated themselves as municipal presidents across the highlands, but were paid for these roles when municipal presidents had not received compensation before. It appears that these advantages allowed this generation of men to craft positions of power while circumventing established local hierarchies. Still, these CCI bilingual promoters had been part of an earlier program during the 1930s that trained them as scribes and guided them into religious obligations and leadership roles during the 1940s. By that account, INI may have contributed to the rise of these bilingual promoters as a type of local cacique, yet not solely responsible.

Also, in this second section, in a discussion of the puppet theatre Teatro Petul, Lewis does a good job of laying out the ways INI attempted to use Petul to “teach” children and adults about the importance of education, Western medicine, and personal hygiene. It is in explaining why the puppet show eventually lost relevance for Tseltal and Tsotsil children and adults in the late 1960s where the author falls short. The tepid suggestion that puppets were seen as tools of the devil is not convincing. Given the author’s focus on the political and economic changes that were shaping government funding and support for INI projects, is it not also possible that the Tseltal and Tsotsil communities in the Chiapas Highlands had grown tired of Petul’s message and packaging considering their overall lived experience had not been as radically transformed by the CCI project as the indigenistas of the 1950s had hoped? Perhaps Petul’s “advice” and promises simply failed to resonate with them by the end of the 1960s.

Lewis’s *Rethinking Mexican Indigenismo* is a welcomed addition to the growing scholarship that attempts to make sense of Mexico’s rapid decline as a continental leader on indigenous policies, which is the focus of part three of the book. Through his study of the National Indigenist Institute’s CCI project in the Chiapas highlands, Lewis is able to show the failure of such an ambitious project where indigenistas sought to mold the elusive revolutionary citizen out of indígenas, both in Chiapas and throughout the country.

New Resources on Indigenous Knowledge

This section lists recent publications related to indigenous knowledge. It is not intended to be comprehensive but covers a wide range of disciplines and provides a snapshot of the depth and breadth of research on indigenous issues.

Akker, Paul van den. 2018. *Time, History and Ritual in a K'iche' Community: Contemporary Maya Calendar Knowledge and Practices in the Highlands of Guatemala*. Archaeological Studies Leiden University. Leiden, The Netherlands: Leiden University Press.

Alves, Rômulo Romeu Nóbrega, and Ulysses Paulino Albuquerque, eds. 2018. *Ethnozoology: Animals in Our Lives*. London: Elsevier.

Arora, Kavita. 2018. *Indigenous Forest Management in the Andaman and Nicobar Islands, India*. Cham, Switzerland: Springer.

Borona, Kendi. 2019. *Reclaiming Indigenous Knowledge Systems: Towards Sustainable People-Forest Relationships in Kenya*. Newcastle Upon Tyne, UK: Cambridge Scholars Press.

Bryant-Tokalau, Jenny. 2018. *Indigenous Pacific Approaches to Climate Change: Pacific Island Countries*. Palgrave Studies in Disaster Anthropology. Cham, Switzerland: Palgrave Macmillan.

Cahir, Fred. 2018. *Aboriginal Biocultural Knowledge in South-Eastern Australia: Perspectives of Early Colonists*. Clayton South, Australia: CSIRO Publishing.

Carter, Lyn. 2019. *Indigenous Pacific Approaches to Climate Change: Aotearoa/New Zealand*. Palgrave Studies in Disaster Anthropology. Cham, Switzerland: Palgrave Macmillan.

Chimakonam, Jonathan O. 2019. *Ezumezu: A System of Logic for African Philosophy and Studies*. Cham, Switzerland: Springer.

Christensen, Julia, Christopher Cox, and Lisa Szabo-Jones, eds. 2018. *Activating the Heart: Storytelling, Knowledge Sharing, and Relationship*. Indigenous Studies Series. Waterloo, ON: Wilfrid Laurier University Press.

Ciofalo, Nuria, ed. 2019. *Indigenous Psychologies in an Era of Decolonization*. International and Cultural Psychology. Cham, Switzerland: Springer.

Clapperton, Jonathan, and Liza Piper, eds. 2019. *Environmental Activism on the Ground: Small Green and Indigenous Organizing*. Canadian History and Environment Series. Calgary: University of Calgary Press.

Clark, Doug Bock. 2019. *The Last Whalers: Three Years in the Far Pacific with a Courageous Tribe and a Vanishing Way of Life*. New York: Little, Brown and Company.

Clément, Daniel. 2018. *Bungling Host: The Nature of Indigenous Oral Literature*. Translated by Peter

Frost. Lincoln: University of Nebraska Press.

Corradi, Giselle, Koen de Feyter, Ellen Desmet, and Katrijn Vanhees, eds. 2019. *Critical Indigenous Rights Studies*. Routledge Research in Human Rights Law. London: Routledge.

Cox, James L. 2018. *Restoring the Chain of Memory: T.G.H. Strehlow and the Repatriation of Australian Indigenous Knowledge*. London: Equinox Publishing.

Crowe, Andrew. 2018. *Pathway of the Birds: The Voyaging Achievements of Māori and their Polynesian Ancestors*. Honolulu: University of Hawai'i Press.

Daly, Tara. 2019. *Beyond Human: Vital Materialisms in the Andean Avant-Gardes*. Bucknell Studies in Latin American Literature and Theory. Lewisburg, PA: Bucknell University Press.

Das, Shinjini. 2019. *Vernacular Medicine in Colonial India: Family, Market and Homoeopathy*. Cambridge: Cambridge University Press.

Davis, Jenny L. 2018. *Talking Indian: Identity and Language Revitalization in the Chickasaw Renaissance*. Tucson: University of Arizona Press.

Deane, Susannah. 2018. *Tibetan Medicine, Buddhism and Psychiatry: Mental Health and Healing in a Tibetan Exile Community*. Medical Anthropology Series. Durham, NC: Carolina Academic Press.

Dei, George J. Sefa, and Mandeep Jajj, eds. 2018. *Knowledge and Decolonial Politics: A Critical Reader. Anti-Colonial Educational Perspectives for Transformative Change*. Leiden, The Netherlands: Brill.

Deur, Douglas, and the Knowledge-Holders of the Quinault Indian Nation. 2019. *Gifted Earth: The Ethnobotany of the Quinault and Neighboring Tribes*. Corvallis: Oregon State University Press.

Donaldson, Emily C. 2019. *Working with the Ancestors: Mana and Place in the Marquesas Islands. (Culture, Place, and Nature)*. Seattle: University of Washington Press.

Downey, Allan. 2018. *Creator's Game: Lacrosse, Identity, and Indigenous Nationhood*. Vancouver: University of British Columbia.

Dreamson, Neal. 2018. *Pedagogical Alliances Between Indigenous and Non-Dualistic Cultures: Meta-Cultural Education*. Routledge International Studies in the Philosophy of Education. London: Routledge.

Duggan, Genevieve, and Hans Hägerdal. 2018. *Savu: History and Oral Tradition on an Island of Indonesia*. Singapore: NUS Press.

Eriksen, Thomas Hylland, Sanna Valkonen, and Jarno Valkonen, eds. 2019. *Knowing from the Indigenous North: Sámi Approaches to History, Politics and Belonging*. London: Routledge.

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- Fisher, R. Michael. 2018. *Fearless Engagement of Four Arrows: The True Story of an Indigenous-Based Social Transformer*. Counterpoints. New York: Peter Lang.
- Food and Agriculture Organization of the United Nations. 2018. *Health, Knowledge and Flavours: Recovering the Traditional Culinary Knowledge of Women in Latin America and the Caribbean for Food Biodiversity Management and Enhancement*. Santiago de Chile: Food and Agriculture Organization of the United Nations.
- Fowler, Cynthia T., and James R. Welch, eds. 2018. *Fire Otherwise: Ethnobiology of Burning for a Changing World*. Salt Lake City: University of Utah Press.
- Fre, Zeremariam. 2018. *Knowledge Sovereignty Among African Cattle Herders*. London: UCL Press.
- Friedland, Hadley Louise. 2018. *Wetiko Legal Principles: Cree and Anishinabek Responses to Violence and Victimization*. Toronto: University of Toronto Press.
- Frisbie, Charlotte Johnson; with recipes by Tall Woman and assistance from Augusta Sandoval. 2018. *Food Sovereignty the Navajo Way: Cooking with Tall Woman*. Albuquerque: University of New Mexico.
- Gill, Sam. 2019. *Creative Encounters, Appreciating Difference: Perspectives and Strategies*. Lanham, MD: Lexington Books.
- Giraldo Herrera, César E. 2018. *Microbes and Other Shamanic Beings*. Cham, Switzerland: Palgrave Macmillan.
- Goertz, Jolynn Amrine, ed., with the Confederated Tribes of the Chehalis Reservation; collected and translated by Franz Boas. 2018. *Chehalis Stories*. Lincoln: University of Nebraska Press.
- Greymorning, Neyooxet, ed. 2019. *Being Indigenous: Perspectives on Activism, Culture, Language and Identity*. New York: Routledge.
- Habu, Junko, Tsuyoshi Sasaki, and Mayumi Fukunaga, eds. 2018. *Yama, Kawa, Umi no chi o Tsunaga: Tohoku ni Okeru Zairaichi to Kankyo Kyoiku no Genzai = Weaving the Knowledge of Mountains, Rivers and the Ocean: Traditional Ecological Knowledge and Ecoliteracy in Tohoku, Northern, Japan*. Hiratsuka, Japan: Tokai University Press.
- Halbmayer, Ernst. 2018. *Indigenous Modernities in South America*. Wantage, UK: Sean Kingston Publishing.

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- Hameed, Shahul, Siham El-Kfafi, and Rawiri Waretini-Karena, eds. 2019. *Handbook of Research on Indigenous Knowledge and Bi-Culturalism in a Global Context*. Advances in Religious and Cultural Studies Book Series. Hershey, PA: IGI Global Publishers.
- Harjo, Laura. 2019. *Spiral to the Stars: Mvskoke Tools of Futurity*. Critical Issues in Indigenous Studies. Tucson: University of Arizona Press.
- Henfrey, Thomas. 2018. *Edges, Fringes, Frontiers: Integral Ecology, Indigenous Knowledge and Sustainability in Guyana*. Studies in Environmental Anthropology and Ethnobiology. New York: Berghahn Books.
- Henry, Robert, Amanda LaVallee, Nancy Van Styvendale, and Robert Alexander Innes, eds. 2018. *Global Indigenous Health: Reconciling the Past, Engaging the Present, Animating the Future*. Tucson: University of Arizona Press.
- Herman, R. D. K., ed. 2019. *Giving Back: Research and Reciprocity in Indigenous Settings*. Corvallis: Oregon State University Press.
- Impey, Angela. 2018. *Song Walking: Women, Music, and Environmental Justice in an African Borderland*. Chicago Studies in Ethnomusicology. Chicago: University of Chicago Press.
- Johnson, Leslie Main, ed. 2019. *Wisdom Engaged: Traditional Knowledge for Northern Community Well-Being*. Patterns of Northern Traditional Healing Series. Edmonton: University of Alberta Press.
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UN Launches International Year of Indigenous Languages 2019

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On February 1, 2019, the United Nations officially launched the International Year of Indigenous Languages (IYIL2019) at the UN Headquarters in New York. The IYIL2019 aims to promote and protect indigenous languages and improve the lives of those who speak them. There are 770 million indigenous people across 90 countries, constituting 6 percent of the global population.

As mentioned on the UN News website, in the article “Call to Revitalize ‘Language of the Ancestors’ for Survival of Future Generations: Indigenous Chief,” Kanen'tó:kon Hemlock, a Mohawk community Bear Clan Chief from Kahnawà:ke, said in his inaugural remarks, “We lose our connection and our ancient ways of knowing of the earth when our languages fall silent,” stressing, “For the sake of future generations, we must ensure they too can speak the language of our ancestors.”

UN General Assembly President María Fernanda Espinosa Garcés underscored the close connection between indigenous languages and ancestral culture and knowledge, saying, “They are much more than tools for communication, they are channels for human legacies to be handed down. Each indigenous language has an incalculable value for humankind,” she said, calling each “a treasure laden with history, values, literature, spirituality, perspectives, and knowledge, developed and garnered over a millennium.”

Indigenous languages also open the door to ancestral practices and knowledge in subjects like agriculture, biology, astronomy, medicine, and meteorology. Although there are still 4,000 languages in existence across the globe, many are on the brink of extinction. Indigenous languages represent complex systems of knowledge and communication and should be recognized as a strategic national resource for development, peace building, and reconciliation.

More information about IYIL2019 can be found on the event’s webpage.

New Research Institution to Counteract Violence Against Indigenous Women

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On January 18, 2019, local indigenous communities and their allies came together at the University of California Berkeley to celebrate the launch of the Sovereign Bodies Institute (SBI), a new home for research that aims to address and counteract violent crimes against indigenous peoples.

SBI will work alongside indigenous organizers and scholars, community establishments, and tribal nations to track violence against indigenous communities. Its goal is to empower communities to fight ongoing violence by improving services for survivors of violence and providing a deeper understanding of sexual and gender violence against indigenous people. Funded by Seventh Generation, SBI has offices in Oakland and Humboldt County.

The main aims of the SBI, as stated on its website, are:

- Conducting, supporting, and mobilizing culturally-informed and community-engaged research on gender and sexual violence against indigenous people
- Uplifting indigenous researchers, knowledge keepers, and data visualists in their work to research and disseminate data on gender and sexual violence against indigenous people
- Empowering indigenous communities and nations to continue their work to end gender and sexual violence against indigenous people through data-driven partnerships that enhance research efforts, develop best practices, and transform data into action to protect and heal their peoples

More information about the Sovereign Bodies Institute can be found on their webpage.

Fourth Global Meeting of the Indigenous Peoples' Forum at IFAD

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The Fourth Global Meeting of the Indigenous People's Forum, organized by the International Fund for Agricultural Development (IFAD) in Rome, took place on February 13, 2019. This edition focused on the promotion of indigenous peoples' knowledge and innovation for climate resilience and sustainable development, providing an opportunity for indigenous peoples and IFAD staff to analyze and learn from previous experiences while strengthening their collaboration for rural transformation.

As mentioned on the slowfood.com website in the article "Fourth Global Meeting of the Indigenous Peoples' Forum at IFAD," the importance of engaging with indigenous peoples in climate change policies and action was recognized by the Conference of Parties (COP) to the United Nations Framework Convention on Climate Change in Paris in 2015. The operationalization of the Local Communities and Indigenous Peoples Platform established by COP 23 in 2017 and the adoption by the Green Climate Fund of an Indigenous Peoples' Policy in 2018 are two major advances in the participation of indigenous peoples in decision-making related to climate action and for the protection of their rights.

Tribes Use Western and Indigenous Science to Prepare for Climate Change

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Northwestern tribes and the Climate Impacts Group at the University of Washington have joined forces to help protect salmon, roots, trees, and other important resources, as announced in the article “Tribes Use Western and Indigenous Science to Prepare for Climate Change.”

A collaborative effort by Meade Krosby (a conservation scientist with the Climate Impacts Group at the University of Washington), Don Sampson (climate change project manager for the Affiliated Tribes of Northwest Indians—a group of 57 tribes in 6 western states), and other regional tribal partners, are putting indigenous communities in the US northwest at the forefront of climate adaptation planning. The project uses advanced computer modeling to help tribes understand the precise impacts climate change will have in their territories, so they can plan to adapt.

The result of the two-year project is an online tool that provides 50 tribes with high-resolution climate forecasts showing how specific resources, such as salmon, berries, and roots, will be affected in their area. The tool is “pure Western science,” says Krosby, but the site also provides examples of tribes using traditional knowledge, or a combination of traditional knowledge and Western science, to develop climate adaptation plans. As explained on the project’s website, “A vulnerability assessment is a process for evaluating how the things we care about (e.g., a place, community, or resource) could be affected by climate change. Tribal vulnerability assessments use a variety of approaches, from those that use primarily indigenous methodologies, to others that rely primarily on Western science, and those that braid these two approaches together.”

Join the L-ICIK Listserv

Readers of *IK: Other Ways of Knowing* are invited to join the free listserv managed by the Interinstitutional Center for Indigenous Knowledge, which is open to anyone interested in indigenous knowledge.

The nearly one thousand subscribers to ICIK's listserv receive postings that include informative articles from reliable sources.

The listserv will provide you with advance notice of ICIK seminars that can be viewed in real time via Mediasite or viewed at your leisure as an archived video on the ICIK website. The listserv will also inform you of upcoming conferences and current articles about indigenous peoples and their cultures as well as calls for submission of proposals issued by government and non-governmental programs.

To join the ICIK listserv, go to the ICIK website, then click "Join the ICIK Listserv" on the home page and provide your name and e-mail address.