



Volume: 4
Pg 1-25

Indigenous Beverage Production and Economic Empowerment of Rural Women in Rwanda

Chika Ezeanya-Esiobu, PhD
Senior Lecturer, University of Rwanda

Vedaste Ndugutse
Lecturer, University of Rwanda

Salomon Nshimiyimana
University of Rwanda

Across sub-Saharan Africa, indigenous non-alcoholic and alcoholic beverages are produced from locally available materials such as cereals, fresh milk, fruits, and vegetables. Women are usually the custodians of the indigenous technology needed to produce indigenous beverages. If properly harnessed, indigenous beverage production can grant rural women the economic power needed to enable them to realize their potential. This paper examines four beverages in Rwanda produced with the use of indigenous technology. The study looks at how the indigenous technology-based production of beverages created from banana and sorghum contributes to increased income and enhanced access for rural women. It also explores trends, challenges, and opportunities in improving the economic situation of rural women who are engaged in such business in Rwanda. The aim is to determine the contribution of this sector to the economic empowerment of rural women and how existing institutions and practices impede or create conditions for further advancement.

Keywords: Indigenous Beverages, Rural Women, Economic Empowerment, Rwanda, African Development

doi 10.18113/P8ik460438



1.0 Introduction

Indigenous beverages are popular in many African communities. Several social, religious, health, and therapeutic values are associated with indigenous beverages, making them a critical and integral part of the communities that produce and consume them (Aka et al. 2008; Djè et al. 2000; Nwachukwu et al. 2010). Across

sub-Saharan Africa, indigenous non-alcoholic and alcoholic beverages are produced from locally available materials such as cereals, fresh milk, fruits, and vegetables. In many instances, these raw materials are subjected to a fermentation or brewing process, often to improve one or more of the following: taste, nutrition, shelf life, alcoholic content, appearance, texture, etc. In more recent times, religious beliefs restrict the consumption of traditional beverages among some Africans to the non-alcoholic variety. Traditionally however, a segment of the population in Africa, including children, pregnant women, and the elderly, prefer non-alcoholic beverages or are customarily expected to consume such; alcoholic beverages are preferred or expected to be consumed by the male members. Alcoholic beverages play a dominant role in the social life across the region with palm wine, millet, maize, sorghum, honey, banana, and cassava usually utilized as raw materials in their production.

Rural women's economic empowerment can hardly be discussed without an understanding of the place of indigenous technology in acting as a resource with which rural women are able to achieve some form of financial independence and contribute to family upkeep. In traditional Africa, women are usually the custodians of the indigenous technology needed for the production of indigenous beverages. Usually working from home or in cooperatives, women produce for domestic use, selling to neighbors, or purely for commercial purposes. Indigenous beverage production can grant rural women the economic power needed to enable them to realize their maximum potential. An economically empowered woman is equipped with the necessary skills and resources to advance equally by being able to compete in markets and to access economic institutions (Markel and Jones 2014).

This paper examines four beverages in Rwanda produced with the use of indigenous technology, with a view to determining their contribution to the economic empowerment of rural women and how existing institutions and practices impede or create conditions for further advancement. Sorghum is a staple in the traditional diet, and one popular alcoholic and one popular non-alcoholic beverage made from sorghum are studied. Sorghum beer, *ikigage*, is a popular fermented beverage that is especially used during celebrations such as marriage, birth, and during festivals. *Ubushera* is the non-alcoholic beverage made using sorghum as raw material. Banana is another food that is widely consumed across Rwanda. Banana wine, *urgwagwa*, and the banana non-alcoholic drink, *umutobe*, are two different products made using banana as raw materials that are also studied. Although these drinks are traditional to Rwanda and previously widely consumed, they are losing market to imported drinks or locally manufactured sodas. The study looks at how the indigenous technology-based production of beverages from banana and sorghum contributes to increased income and enhanced access for rural women, and explores trends, challenges, and opportunities in improving the economic situation of rural women who are engaged in such business in Rwanda.

Key research questions the paper seeks to answer include: To what extent is indigenous technology a viable route to the economic empowerment of women in rural areas in sub-Saharan Africa? What are

economic benefits that accrue to women producing local beverages in rural Rwanda? What are impediments to the economic empowerment of women producers of indigenous beverages in rural Rwanda? Using indigenous technology, what avenues exist for the scaling-up of the production capacity of women producing local beverages in Rwanda?

As far as methods are concerned, the study used in-depth personal and focus group interviews to collect data from 100 rural producers of *urwagwa* (banana wine), *umutobe* (banana juice), *ubushera* (sorghum soft drink), and *ikigage* (sorghum beer). These producers oftentimes double as middlemen and retailers, and occupy small lock-up shops fitted with tables and chairs where consumers are served. Also interviewed were 10 producers of *umutobe* who bottle and sell their products to middlemen and distributors. This is, in addition to interviews conducted with government departments and other agencies, involved with the economic development of rural women, mainly to gain insight into policy and the understanding of government towards indigenous beverage production in rural Rwanda.

Although hugely popular among consumers in rural areas in Rwanda, little support is given to women producers of traditional beverages who utilize indigenous technology in their production processes. This is a huge gap that needs to be bridged, and this paper is, therefore, helpful for researchers, policy makers, and stakeholders involved or interested in rural development and in the economic empowerment of women.

This paper begins with a conceptual clarification of indigenous technology and its relationship with rural development. The economic empowerment of rural women is next discussed within the ambit of indigenous technology, followed by an analysis of the challenges of indigenous technology. Section three explores indigenous beverage production in Africa, with emphasis on products made with sorghum and banana. Section four is a presentation of the empirical research that focuses on the production and sale of indigenous beverages in rural Rwanda, with attention paid to the availability of resources, access to production materials and infrastructure, production standards, and capacity building. The final segment looks at more options for improving the lives of rural women via indigenous technology and is followed by the conclusion.

2.0 Indigenous Technology and Development

Indigenous technology refers to the technology that is localized and can be sustained by a community without the need for any form of importation of parts or expertise. In many instances, indigenous technology is either developed from scratch within a community over many years or imported and adapted to the available materials and needs of a community. Indigenous technology is indivisible from the culture and livelihood of local communities who often utilize it in their quest to survive and thrive (World Bank 1998; Senanayake 2006). Indigenous technology is easy to access, affordable, locally owned and managed, and found to be efficient and able to spur innovation and growth (Gorjestani 2000). The

global conference on indigenous knowledge held in Toronto in 1997 encouraged the World Bank and other donors to learn from local communities to ensure long-term development, noting that for sustainable development and for the identification of development needs, local people should be involved in their problem-solving mostly by utilizing locally available resources and know-how (Gorjestani 2000).

2.1 Indigenous Technology and the Economic Empowerment of Rural Women

Rural development refers to the improvement of the quality of life for rural dwellers. Rural areas thrive on the use of indigenous technology since small-scale local knowledge-based industries support the processing capacity of rural dwellers with available raw materials. The availability of raw materials for indigenous technology and the affordability of manufactured products to local communities lead to economic development that is based on the use of local human and material resources.

During the World Economic Forum in Davos in 2013, Christine Lagarde, Managing Director of the International Monetary Fund, noted that “when women do better, economies do better.” Research has established that when women have increased control over household resources, either through their own earnings or cash transfers, it enhances the possibilities of national growth and advancement. Evidence from countries as varied as Brazil, China, India, South Africa, and the United Kingdom shows that greater spending on family nutrition and the education of children can be achieved when women have greater access to household income (World Bank 2011). Women, especially in rural areas, are the storehouse of indigenous knowledge and utilize indigenous technology in agriculture and food processing, land use management, family healthcare, and other day-to-day survival activities (Olatokun and Ayanbode 2009). In Mali, for instance, rural women are involved in extracting oil from a plant called *Jatropha curcas*. This plant is also used as medicine: seeds are used in preventing bleeding and different kinds of infections, while leaves are used for the treatment of malaria. It is also used in soap production (Henning 2002). These activities in which women are involved have resulted in the ability of women to send more children to school, especially girls, provided more nutritious food for families, and cut down on time spent doing household chores (World Bank 2011).

2.2 Challenges Faced by Indigenous Technology

Although rural women widely utilize indigenous technology in their search for livelihood, there is a general preference for imported western technology across sub-Saharan Africa, with consumers often holding a preference for imported products or those manufactured using imported machinery. Several reasons adduce for this, including a general perception that indigenous technology-based processing industries do not meet some international standards (Aworh 2008). Some indigenous products have a short shelf life, ranging from one to seven days. This limits both the availability of products and interest in investing in those products. Another reason why there is little interest in developing indigenous technology is that poor rural dwellers, who often hold the technological know-how, have insufficient

capital and limited access to finances (Aworh 2008). As a result, more societies are losing knowledge and complex indigenous technology in favor of imported and sometimes ill-fitting western techniques, which most of the time add pressure to the environment, for instance, the use of chemicals in agriculture (Senanayake 2006).

3.0 Indigenous Beverage Production in Africa

The production of indigenous beverages is common in African countries. Millions of people, especially women, depend on indigenous beverages as a source of food and income. Though modern commercial alcoholic beverages are widely consumed, indigenous beverages are still produced and widely consumed in many parts of Africa, especially in rural areas. These beverages are produced mostly by women, constitute payment for labor, and serve as an important cash income for producers (Aka et al. 2014). Studies posit that in East Africa alone, the consumption of indigenous alcoholic beverages accounts for about 80 percent of the entire consumption of alcohol in the region. Apart from economic gains, indigenous beverages are also attached to various sociocultural aspects. These beverages are also consumed for various health benefits, including the provision of calories, proteins, and vitamin B (Lyumugabe et al. 2012).

Africans use various traditional methods and a number of raw materials to process indigenous beverages. In many local communities, a wide range of cereals and raw materials, such as sorghum, millets, banana, etc., are used to produce foods and a wide variety of alcoholic and non-alcoholic beverages (Monang 2011). In the past, indigenous alcoholic and non-alcoholic beverages were largely manufactured and consumed by local communities during social and religious feasts, such as celebrations for naming new babies and New Year harvests; and they were thus hardly produced for commercial purposes (Djè et al. 2000). However, in the past few decades, due to the increase in market demands for such products and pressure from governments on local producers to abide by health standards, indigenous alcoholic beverages are industrially produced and commercially available in many markets. This commercial production makes indigenous beverages more acceptable to urban dwellers and restricts the consumption of beverages produced using indigenous technology to the urban poor and rural dwellers.

Indigenous technology-produced beverages hold remarkable economic, social, and health benefits for the empowerment of rural women, but numerous challenges exist. Safety concerns, limited lifespan, storage, packaging, and preservation difficulties have combined to make some African countries adopt policies that, at best, encourage the formation of beverage processing associations and cooperatives for the production of better quality beverages. Unfortunately, there is an outright policy ban and discouragement of individual processors who produce little quantities with difficulties, and who do not respect all safety and health market standards (Kanyana et al. 2013).

3.1 Sorghum Drinks in Rwanda

Sorghum is a crop with strong cultural ties to Rwanda. Sorghum is featured alongside the sun, coffee, a basket, a cog wheel, and two shields as Rwanda's national symbols. In many social events, sorghum beer is still used, though not necessarily consumed, as a symbol of unity and family cohesion. Both in the ancient and modern history of Rwanda, sorghum drinks, *ubushera* (non-alcoholic) and *ikigage* (alcoholic), were produced by thousands of Rwandan families and used during various ceremonies like new baby naming, marriage, and sundry religious rituals.¹ Sorghum drinks are also used for health reasons in Rwanda. Sorghum porridge is given to little babies and is believed to be very rich in vitamins. In rural communities, school children, laborers, and workmen take sorghum drinks early in the morning as their breakfast, and many of them can work throughout the day without taking their lunch until dinner time. Furthermore, during the period of extreme famine, *impengeri*, sorghum cooked in hot water, usually serves as the staple food.

In the past, Rwanda was self-sufficient in sorghum production; however, recent reports indicate that even though sorghum is still grown in all districts, and an estimated 1,200 kilograms can be harvested per hectare, the country is now a net importer of sorghum. Recent reports predict that sorghum will lose its place to other cereals in Rwanda since the production of sorghum has dwindled due lack of cultivation knowledge, geographically unfavorable conditions, the invasion of weeds, such as *Striga*, that attack and affect the cereal, and some unfavorable government policies (Niyibigira et al. 2013). However, efforts are being taken by Rwanda Agriculture Board (RAB) in collaboration with various stakeholders to improve the production of sorghum.

3.2 Banana Drinks in Rwanda

The banana has a long history in Rwanda. Researchers and experts in Rwandan history are in agreement that bananas might have been introduced to the country between 1411-1444 CE, during the reign of Mibambwe I—the 11th King of Rwanda. It is narrated that after *Abanyoro* (troops from a neighboring country) defeated the Rwandan troops, and the latter scattered, *Abanyoro* started planting bananas across the areas they occupied (Kagame 1972). Since then, new varieties of bananas have been introduced to match the land and weather requirements, as well as with their ability to face pests, diseases, and plant nutritional problems.

The banana is a preferred crop in Rwanda and is consumed as food, dessert, and used to produce traditional beverages. Banana wine, *urwagwa*, and the banana non-alcoholic drink, *umutobe*, are two different products made using bananas as a raw material, but subjected to different processes. In the past, it was a common cultural practice for brides to include bananas in wedding packages because they are used to produce a local banana food called *matoke*, which is believed to be very important to the health of women. Women were also expected to ensure that a well-prepared *urwagwa* is served to their husband for

every meal and whenever the family receives important guests. In addition, banana leaves are culturally used by women as plates during new baby naming events and are also used as the covers of traditional pots during cooking.

Bananas were a highly sustainable crop in Rwanda, but with the introduction of various diseases and pests in the last 10 to 20 years, production has fallen by over 40 percent (Nsabimana et al. 2008). Indeed, Rwanda was among the top producers of banana in the East African Great Lakes Region. The rate of banana beverages consumption was higher two decades ago, but due to the fact that growing bananas requires large amounts of arable land that Rwanda lacks, the government of Rwanda has started sensitizing citizens to grow important food products other than bananas (Gaidashova et al. 2005). However, banana foods and traditional banana beverages are still consumed by a great number of Rwandans, and banana products constitute sources of income for many women producers in rural areas.

4.0 Production and Sale of Indigenous Beverage in Rural Rwanda: An Overview

The government of Rwanda, through several policy actions, has shown commitment to the development of rural communities. Through such programs as the Girinka ('One-cow-per-poor-family'), Ubudehe, Vision 2020, Umurenge, etc., many in rural Rwanda have transcended extreme poverty over the years. The government of Rwanda supports medium-scale bottlers of traditional beverages through regular trainings from the Ministry of Trade and Industry (MINICOM), Rwanda Bureau of Standard (RBS), and Private Sector Federation (PSF) on production processes, entrepreneurship, packaging and hygiene, branding and marketing, and financial literacy. These medium-scale producers also receive support from the government by way of endorsement should they wish to borrow from financial institutions. However, the government of Rwanda has not shown much support for rural women producers of indigenous beverages. On the part of major development partners in Rwanda, such as the United Nations and its agencies, World Bank, DFID, USAID, JICA, EU, Sida, and South Korea, projects embarked upon are usually crafted alongside government officials, and since the government has not indicated interest in empowering rural women producing indigenous beverages, none of these organizations are actively involved in supporting them.

To determine the economic situation of rural women who produce indigenous beverages, interviews were conducted among 100 women producers of 4 traditional beverages—*urwagwa* (banana wine with an alcohol content of 12 to 14 percent), *umutobe* (non-alcoholic banana juice), *ubushera* (non-alcoholic sorghum), and *ukigage* (sorghum beer with an alcohol content of between 2 to 4.5 percent). These women produce and sell using 20-liter containers (jerry cans). The shelf life of their products is usually an average of 3 days, as emphasis is on the freshness of the product. Many retail directly to consumers, while some also produce and sell to middlemen and consumers. Purposive sampling was used to identify these women in the Musanze and Burera districts in Rwanda. Most women did not complete primary education,

and the age range varied from women in their 20s who had been in the business for less than 5 years, to those in their 60s who had been in the business for decades. In order to compare the situation of the majority poor rural producers with their wealthier and more organized counterparts, additional interviews were conducted among 10 women bottlers of the alcoholic beverages who bottle and sell across Rwanda and sometimes export to neighboring countries. The shelf life of the latter products is between 1 and 3 years. While analyzing the responses of the poor rural producers, references where necessary will be made to these bottlers of indigenous beverages. Some government officials were also interviewed to determine the response of policy makers to the poor rural women producing these indigenous beverages.

4.1 Production Process

4.1.1 Steps in Sorghum Beer and Drink Production in Rwanda

Beer production in Rwanda undergoes three main steps, which are: production of malt (*amamera*), production of yeast (*umusemburo*), and brewing (*kwenga*).

Malting

Malting is the preliminary step in beer production and is comprised of three main steps: soaking, germination, and drying. Sorghum grains are first soaked for about twelve hours, and then drained and spread on a mat where a mixture of ash and water is generously sprayed on the grains, giving the sorghum a black color. Sprouting is induced by spreading sorghum grains on banana leaves and covering them with the same mixture. Sprouting takes about two to five days, depending on the temperature. Sprouting activates enzymes that help to hydrolyze starch (non-fermentable sugar) into fermentable sugars. Sprouted sorghum is known as *amamera*.

The next step is the drying process, where sprouted sorghum grains are dried under the sun, usually within an average period of three days. During the drying process, enzymes continue to hydrolyze starch, thereby increasing sugar content (fermentable sugars or simple sugars). Successful drying is determined by chewing, after which rootlets are removed and the sorghum grains are winnowed using a winnowing basket (*intara*) and stored for further use.

Production of Yeast

Yeast is a necessary ingredient in beer production, and *umusemburo* is the local yeast used in rural Rwanda for sorghum beer preparation. The first step of *umusemburo* preparation is called *gusabika*. It involves thoroughly mixing about 2 jerry cans (20 L capacity) of heated water with about 5 kg of malt flour, using a wooden stick called a *umwuko*. The mixture is allowed to cool in a clay pot for between 3 days to 1 week, and the product obtained is called *umusabike*. Thereafter, *umusabike* is taken and heated by strong fire until only one-third of it remains, and the product obtained is called *umuteke*. *Umuteke* is

allowed to cool in a clay pot for one day. Then, about 5 kg of malt is added. The mixture is observed for signs of gas production. If there is no sign of gas production, then a bad beer has been produced, which often leads to it being discarded. If the product shows signs of gas production, then about 8 kg of malt is added the next day and thoroughly mixed in. The end product is *umusemburo*, which is the brewer's yeast.

Brewing

In the brewing process, water is boiled and flour from malt is added. Then cold water is added, followed by hot water, before being mixed using a wooden stick (some brewers skip adding the cold water). More cold water is added to the mixture, which is thoroughly stirred with the wooden stick (the amount of water added may vary from one producer to another). The product obtained at this stage is called *umusururu*. *Umusururu* is transferred to another container and allowed to cool. After cooling, the yeast, *umusemburo*, is added, and the container is closed in such a way as to allow gas produced during fermentation to escape. Fermentation is left to occur overnight, and the product is served in a fermenting state the next day since producers do not know how to halt fermentation once it has begun.

4.1.2 Processing of Non-alcoholic Sorghum Drink

The non-alcoholic sorghum beverage known as *ubushera* follows all the steps mentioned above, with the omission of yeast addition. After getting malt from sorghum, milling is done to obtain flour.

4.1.3 Steps in Banana Wine and Juice Production (*Urwagwa* and *Umutobe*)

Production of banana wine (*urwagwa*) begins with collection of matured bananas. Bananas of different varieties have different sugar contents, and while some producers are selective, others are not. A pit called *urwina* is dug and heated with fire after which banana leaves are spread inside and the matured bananas added. The pit is then covered with leaves and soil in a process called *gutara*. Smoking the pit cover is done twice a day—morning and evening. Smoke induces production of ethylene, which is a form of ripening gas. Once ripened, banana is removed from the pit, peeled, and put into a wooden container called a *umuvure*. Grasses called *ishinge* are added to stimulate juice extraction, and mixing is done with hands until juice (*umutobe*) is obtained. However, in the process of extraction, sometimes no juice comes out, which is called *gutema*. This is because *vacuole*, which contains juice, is not broken to release juice. Producers do not have any control over this situation and are left with no option but to incur a loss, although using enzymes called *pectinase* can help. The juice can be separated with other materials by filtration, and water is added to the remaining mixture and mixed again so more juice can be obtained. The two juices have different sugar content and can be mixed or kept separately. For those who do not drink alcohol, the product is ready and can be heated and consumed. After the juice has been obtained, it is put in clay pot, which is also deposited in a pit (*urwina*). On the top of juice, coarse ground roasted

sorghum flour is added, and the product is covered well with banana leaves and soil. Fermentation takes place for about two days, after which the product is filtered and served.

All products are transported to their final destinations using 20 L jerry cans and usually served to consumers using open bottles for *urwagwa* or *umutobe*, and cups for *ikigage* or *ubushera*. For the fermented products, one of the main challenges is that producers are not able to control the fermentation process. The products are served while fermentation is still ongoing, which is thought to be the origin of short shelf life of the products. The products that are not meant to be fermented also end up being fermented because they are exposed to the air, which is also thought to be a reason of short shelf life.

5.0 Indigenous Beverage and Availability of Resources to Rural Women in Rwanda

5.1 Access to Income

Women who produce indigenous beverages in Rwanda have access to income through the sale of such products and are able to invest their profits in taking care of family needs, and sometimes further reinvest profits to grow their businesses. Since, traditionally, “women earn less and are less economically productive than men almost everywhere across the world” (Ana and Sudhir 2012, 40), the availability and easy access of indigenous technology to rural Rwandan women as a source of income should be of interest to development stakeholders.

Initial start-up capital for embarking on the sale of indigenous beverages is usually money saved up over a period of time or borrowed from family members or cooperatives. Women who produce *ikigage* (sorghum beer) make an average of \$1 per 20 L jerry can sold. Depending on patronage, women producers who restrict their sale to only consumers can sell between 3 and 10 jerry cans. Those who sell to middlemen, in addition to retailing directly to consumers, can sell up to 40 jerry cans per week.

Women who produce *ubushera* (sorghum drink) make an average of forty cents for each jerry can sold and, depending on location and patronage, sell an average of seven jerry cans daily for direct retailers, and up to sixteen jerry cans per day for those who sell to middlemen as well as directly to consumers.

Women who produce *umutobe* (banana juice) make an average of \$1 per jerry can sold, and, depending on patronage, can sell an average of 40 jerry cans per week. *Umutobe* juice makers totaling 90 percent sell to middlemen, who are usually small-scale bottlers of banana juice.

Women who produce *urgwagwa* (banana wine) make an average of one dollar per jerry can sold, and, depending on patronage, those who sell directly to consumers may sell an average of seven jerry cans per week, while those who also sell to middlemen may sell an average of fourteen jerry cans a week.

In a country where 80 percent of the population is made up of rural peasant farmers, who earn roughly the equivalent of \$0.82 per day, the extra income of an average \$20 per week provided by production of indigenous beverages is a needed addition to household income. Rural women consider the business of producing indigenous beverages to be profitable, and they are able to take care of basic household needs as a result of the business. These rural producers of indigenous beverages also employ labor depending on the volume of production, sometimes hiring up to 5 temporary workers per day.

Essentially, production of indigenous beverages allows rural women in Rwanda, who usually work more as unpaid family laborers, farm on smaller plots, and cultivate less profitable crops in comparison to their male counterparts, to have access to finances. Most of these women are able to purchase health insurance for their families, pay school fees, buy nutritious foods, and ensure the general wellbeing of their households from proceeds made from the indigenous technology-based production of traditional beverages.

5.2 Access to Financial Services

Extending access to financial services to poor rural women entrepreneurs is known to be a “key factor of successful rural development strategies. Designing appropriate financial products for women to be able to save, borrow and insure is essential to strengthen women’s role as producers and widen the economic opportunities available to them” (Fletschner and Kenney 2011). Rural women producers of indigenous beverages in Rwanda do not receive any form of support from government or financial institutions. Government officials who were interviewed acknowledged that there is no known policy that supports the extension of financial services to rural women producers of banana and sorghum beverages who use indigenous technology. Respondents totaling 90 percent noted that they can expand their business if they have access to more capital. So, lack of access to credit facility is a major impediment to business expansion.

Access to finances for rural women producers of indigenous beverages could take the form of “a menu of loans that takes into account the diversity of women’s needs and constraints: What are they trying to finance? How much will they need? What is a reasonable repayment schedule?” (Fletschner and Kenney 2011, 20). Rural women producers of indigenous beverages also note that their business is seasonal; therefore, it is important that loan conditions match seasonal production. Additionally, the government should consider “expanding the menu of acceptable collateral to also include social collateral and the type of physical assets women are more likely to own or control. Offer incremental loans based on individual repayment behavior to reach out to women who might not be able to provide collateral. Ensure women can apply for loans without their husbands’ or other male approval” (Fletschner and Kenney 2011, 20).

5.2.1 Taxes

According to a research output from the National Bureau of Economic Research, around the world, “women are less financially literate than men and are aware of this shortfall” (Lusardi and Mitchell 2011). Even for the well-educated business person in urban areas, navigating the terrain of tax preparation can prove a daunting task, and this is much more difficult for rural women producers of indigenous beverages. A respondent noted that her greatest challenge in the business is that, “when it is time to give tax, it becomes difficult, it interrupts business.” There is no training offered to these women on how to prepare taxes. The Rwanda Revenue Authority has implemented several reforms aimed at a simplification of the tax laws and procedures; however, many rural dwellers still find it difficult to navigate the tax reporting and payment processes. Some women resort to a dependence on their husbands for tax preparation, which can lead to the man having greater access to and control of her profit and even capital. It has been argued that, “it is important that development strategies that aim to boost rural women’s productive capacity must enhance women’s direct access to financial services, i.e. not mediated through their husbands” (Fletschner and Kenney 2011, 2). Beyond emphasizing that these rural women producers pay their sales tax, there is need for training and rendering of assistance to these women to help them in tax preparation.

Another related challenge is that although there is no policy support that ensures increased financial access for female indigenous beverage producers in rural Rwanda, this segment of the population does have to pay very high taxes on their businesses. In the words of a producer, “consumers are not many, but tax is high.” Rwanda’s sales tax rate is presently 18 percent, and most of the women in question consider this to be quite high, after they have taken care of production costs and shop rent. In this regard, it is necessary that in deciding the tax rate of poor rural women, consideration should be given to the fact that “low-income families experience far greater income fluctuations than higher-income families and, as a result, taxation of annual income disproportionately burdens low-income families” (Lily 2003).

5.3 Access to Production Materials

Access to raw materials for the production of sorghum and banana beverages is increasingly becoming a huge constraint to the advancement of the business of indigenous beverage production by rural women. According to a respondent, “sometimes, I am not able to supply enough to my customers due to lack of bananas.”

The growing dearth of bananas and sorghum in Rwanda might be connected with the government of Rwanda’s agricultural land use consolidation policy. Rwanda suffers from low agricultural output and the government of Rwanda is convinced that this is mostly due to production inefficiency occurring as a result of the preponderance of small farms. The government of Rwanda, in response to this challenge, instituted the Agricultural Land Use Consolidation Policy in 2008, with the aim of increasing “output of

all types of agricultural products with emphasis on export products, which have high potential and create large amounts of rural employment; this, under sustainable modes of production” (MINAGRI 2009).

The Agricultural Land Use Consolidation Policy mandates farmers in Rwanda to consolidate agricultural land and to uniformly cultivate assigned crops (Musahara et al. 2014, 8). This practice is known as regional ‘crop specialization,’ which refers to a situation where certain crops are allocated to regions where the terrain is considered best for their cultivation. The government of Rwanda promotes pure specialization, sometimes known as “mono cropping,” where one single crop is encouraged per region. Musahara et al. (2014) note that the government of Rwanda enacted the Land Use Consolidation Policy with the conviction that, “joining these small plots together to farm as a single unit would deliver important economies of scale in the acquisition of inputs, processing and marketing as well as efficiencies in access to extension services” (Musahara et al. 2014, 6).

In Rwanda, regional crop specialization is based on seven crops pre-selected by the government, which are maize, rice, wheat, beans, soybean, Irish potato, and cassava—all allocated to different rural localities in the country. These seven crops are exclusive of several of Rwanda’s indigenous foods such as bananas, sorghum, sweet potatoes, and pulses, which form the staples of the rural population. The market-oriented approach in selecting the crops for regional specialization means that raw materials like bananas and sorghum are increasingly losing state support, and producers of indigenous beverages are struggling.

Rather than discourage the cultivation and promotion of these two traditional crops, there is a need for the government of Rwanda to invest in research on how to improve them due to their economic importance to rural women. Diseases increasingly attack banana and sorghum plantations, so the government needs to step up investment in these crops for the indigenous beverage production sector to thrive. There is also a need to improve access to certain varieties of bananas, such as *kainji*, which is known to yield a lot of juice. The price of sorghum also widely fluctuates as a result of the lack of constant availability, thereby affecting the overall profit margin of these producers.

Another major challenge to the sourcing of production materials is firewood. In 2010, Rwanda’s Director of Forestry Field Programmes in the National Forestry Authority noted that the nation faces the threat of desertification, as only 533,000 hectares, or 20 percent, of the country was covered by forests (FAO 2011). Firewood and charcoal usage are recorded to be highest in the rural areas of Rwanda, and approximately 85 percent of Rwandans depend on biomass for household cooking (FAO 2011). The annual fuelwood consumption in Rwanda is at 2.8 million tons, while it is estimated that charcoal, when converted into wood usage, accounts for up to 50 percent of total wood-fuel consumption in the country (World Bank 2012). On average, households spend between 10 and 15 percent of their monthly incomes on the purchase of fuelwood and charcoal (FAO 2011).

In response to the high usage of wood and the depletion of Rwanda's forests, the government of Rwanda established the National Domestic Biogas Programme (NDBP) in 2007 to improve the provision of biogas to meet the cooking and lighting needs of households that own a minimum of 2 cows. Since its establishment, NDBP has installed domestic biogas in 4,600 households and has trained 555 masons in household biogas construction and maintenance, out of which 195 have registered businesses (REG 2014). In order to more readily assist these female indigenous beverage producers, there might be a need for NDBP to specifically create avenues that will encourage them to acquire biogas. Presently, the government of Rwanda heavily subsidizes biogas installation for rural dwellers, and the subsidy can be increased for such entrepreneurs.

5.4 Market Access for Products

The ability of rural women to access markets for their products can be hampered by several factors. These include transportation, gender norms like restricted mobility, and infrastructure (good roads). In the case of sorghum and banana beverage producers of rural Rwanda, impediments to market access include the lack of access to adequate capital. According to one respondent, "I have a big market, the constraint is capital. Once capital increases, I can sell it [*umutobe*] in different towns." Another says, "If I have enough capital, I can open new places to sell my product." *Umutobe* producers totaling 50 percent supply their products to bottling companies in their district of operation; however, there are times when there are too many sellers of banana wine, and this causes reduction in the amount paid by the banana wine bottling company. Some women, however, think that the market size is too small for growth to occur and feel restricted by the size. This is especially true for those who sell beverages with a shorter shelf life such as *ikigage*. However, rural women agree that if the government can work with them through the process of establishing cooperatives for the purpose of production and packaging of beverages, they will be able to both access more markets and still service their local customers adequately.

6.0 Indigenous Technology Production Standards Among Rural Women

6.1 Quality of End-product

The quality of indigenous beverages produced by rural women has been a source of concern for governments and consumers. Rural women producers of indigenous beverages in Rwanda who were interviewed acknowledge that there is much room for improving the quality of their products. When asked, most respondents pointed to the lack of adequate finances as being responsible for the oftentimes poor quality of their beverages. However, through closer and more in-depth interviewing, it began to emerge that poor quality can be attributed to several factors outside of access to finances. For instance, many respondents were skeptical as to the affordability of higher quality products by their patrons. According to one respondent, "Yes, I can improve the quality, but it will also affect the price, and our customer may not afford high prices." For another respondent, "Yes, I can use small amount of water

[instead of the large amount she presently uses] during dilution, but it can affect the price [increase it], and my customers cannot buy much at that price.”

The quality of raw materials is also a challenge. Many banana producers note that they increasingly face the challenge of buying bananas that do not produce juice. Respondents totaling 90 percent note that *biratema* (juiceless bananas) are a challenge that pervades and affects the quantity of juice produced, which can lead to excess dilution of end products. Further, due to the agricultural land use consolidation and crop specialization policies of the government of Rwanda, many producers of sorghum beverages now buy sorghum from neighboring Democratic Republic of Congo and from Uganda. They note that these products can be low quality and lacking in freshness, especially from Congo. According to one respondent, “Sometimes if you use bad quality of sorghum, you get bad product.”

6.2 Health and Safety

The hygienic standards of the production of indigenous beverages is a source of concern for governments and consumers. In Rwanda, there have been several reported cases of deaths and injuries to internal organs occurring as a result of consumption of traditional beverages produced and sold under unhygienic conditions. A Hazard Analysis and Critical Control Points (HACCP) based study of microbiological and physico-chemical quality of banana juice and beer was conducted on samples collected from indigenous producers across 4 localities in Rwanda. Results indicated “high total bacterial counts of 9.02-9.86 log₁₀ cfu mL⁻¹ with yeast and moulds as well as lactic acid bacteria being the predominant microbes. Coliform counts were high in artisanal processed banana beer, 7.65-8.11 log₁₀ cfu mL⁻¹ but were low or undetected in semi-industrial processed beer samples” (Kanyana et al. 2013).

Although all respondents claimed that they maintain the highest hygienic standards while preparing their beverages, most conceded that they can do with more training in that area. This is an area of particular interest to the government and is usually used as a reason for little or no support for traditional brewed drinks, if not outright hostility against traditional brewers of local beverages. One point to note here is that every industry in existence can be overtaken by irresponsible individuals who can endanger the life of the public, but only if not properly regulated. Rather than a blanket denial of support to such a viable and economically lucrative sector for rural women, the government of Rwanda might do better by first training the women on acceptable hygienic standards, in addition to increasing regulatory oversight of that sector. Since these traditional beverages are taxed, part of the tax levied on the beverages could go to supporting government departments that are directly involved in the regulation of the sector. Rural women who were interviewed conceded their lack of training in hygienic handling of the brewing process and requested government assistance in upgrading their knowledge.

6.3 Shelf Life and Packaging

The texture, flavor, appearance, and nutrition levels of foods can drop significantly over time, and worse still, such food can become microbiologically unsafe even prior to displaying physical signs of deterioration. International standard practice demands that in cases where consumer approval of food will be affected by deterioration, without any impact on consumer's safety and health, a best before date is applied to the product. According to the New South Wales Food Authority:

The length of the use by time for foods can be determined by using storage trials to estimate the physical, chemical and microbiological stability of the food. Interpretation of results requires technical experience and competence. Some products will require additional studies such as computer models of microbial growth or challenge studies. It is the manufacturer's responsibility to determine shelf life. Reliable use by or best before times cannot be determined by guesswork or by copying the shelf life of a competitor's product (NSW Food Authority 2010).

The shelf life of all four studied products averages about 3 days; *ikigage* has the shortest, which is 1 day, and *umutobe* has the highest, which is 5 days. Many respondents noted that they usually do not throw away expired products. Some mix it with freshly made products and sell it, which can be a health hazard, although it does not significantly lower the shelf life of the freshly made product. Others give or sell the expired products to owners of pigsties. All respondents decried the losses incurred as a result of not being able to sell off all products within applicable shelf life. None of the respondents package their products, and about 90 percent say it is because they lack both capital and knowledge to do so. Sale of products is restricted within the immediate vicinity of the producer and is seasonal. Sorghum drink producers, for instance, note that few clients patronize their businesses during the rainy season. For other beverages, farmers form the bulk of their customers, and during planting time when farmers do not have much money, patronage is drastically reduced. However, some respondents are not keen on packaging their products since, according to them; their patrons cannot afford the price of packaging. This introduces a new dimension to the widespread clamor for indigenous beverages to be packaged, as locals will then be unable to afford the drinks.

7.0 Capacity Building for Rural Women Producer

7.1 Training

An article published by the World Farmers' Organization (WFO) has noted that training rural women is critical to enhancing their use of natural resources in a sustainable manner and to increasing production and productivity (Mucavele 2017). Most rural women in Rwanda who engage in the production of

indigenous beverages learned their skills from family or friends and as apprentices or hired laborers of producers. There is no formal training process either supported by government or NGOs for established, up-and-coming, or would-be entrepreneurs. Rural women, however, understand the need for training and acknowledge that training is necessary in order to make any progress in the business. Training needs include the right production methods to ensure consistency of output; according to one respondent, “Sometimes I can produce beer which is not good. In that case nobody drinks it, which causes loss.” For another respondent, “When ripening process is not well done, there is a failure in juice extraction (*gutema*), which induces loss.” Rural women producers of indigenous beverages also need training in entrepreneurship and financial management. One respondent said, “Sometimes I may use money for other priorities and miss money for business.” Other training needs include courses on, for example, storage, hygiene, packaging, and marketing.

8.0 Infrastructure, Indigenous Technology, and Rural Women Economic Empowerment

8.1 Electricity

Globally, it is estimated that 1.2 billion people lack access to electricity, while sub-Saharan Africa is amongst the poorest served (IEA 2016). Reasons for this poor performance include a penchant by national governments to focus on the recovery of the cost of rural electrification, especially in cases where such has been financed by private interests. Recovering electricity costs is often nearly impossible from rural households with historically very low-income levels, and national governments have found it difficult to “effectively design tariffs and adapt regulatory systems that can make electricity more affordable to poorer communities” (IEA 2016).

Several studies have linked electricity to a growth in income (Ozturk 2010; Wolde-Rufael 2009). An empirical study conducted in rural Kenya directly linked increased electricity availability with increased productivity of studied enterprises (Kirubi et al. 2008). In rural Rwanda, women producers of indigenous beverages report that a lack of constant electricity is an impediment to their business since “power can go off which impedes functionality of hammer mills (used in grinding).” Additionally, women who wish to utilize the night time to produce beverages while their children are asleep cannot do so due to lack of electricity. Their workload is heavier during the day, which affects their productivity and output.

8.2 Transport

Although considered a lifeline for rural communities, rural roads are often in bad shape, making transportation extremely difficult, and at best, quite expensive for many rural dwellers, especially women. Studies carried out in Southeast Asia established that “villages provided with road access produced more than they did before” (O'Neill 2011). Many rural women in Rwanda point to bad roads and expensive transportation as reasons for their lack of business expansion; many women resort to selling beverages

from their homes. For one respondent, “If I have means, I can buy a vehicle, which will help me in transportation of my products.” For progress to be made, there is a need to improve rural road networks across Rwanda. The government of Rwanda already has this as a top developmental priority, according to the Government’s Vision 2020 document.

9.0 Gender Norms and Attitudes

About 90 percent of respondents report that a great challenge in selling is being owed money by their patrons over an extended period of time. Rwandan culture, especially in the rural areas, is traditional in nature, and women are not expected to be forward in relationships, including between customers and clients. Women are unable to aggressively pursue creditors who, knowing they are dealing with women, do not often feel any urgency to pay outstanding bills. Rwandan culture demands respect in every interaction, thus, a creditor, although he or she owes payment, can still expect to be respectfully attended to by the female entrepreneur during his next visit.

The husbands of these indigenous beverage sellers would have come in handy in dealing with such customers, however, rural women often do not wish that their husbands be privy to most of their financial transactions. This is not peculiar to Rwanda, as studies across countries and continents reflect the same reality:

Ashraf (2009) finds that spouses in the Philippines sometimes choose to keep savings in accounts their spouses cannot access. Doss (2001) finds that households in Ghana do not fully pool risk, and Duflo and Udry (2004) report that spouses in Cote d’Ivoire do not fully insure each other against rainfall-induced fluctuations in income. Robinson’s (2008) field experiment in Kenya suggests that risks are not shared efficiently within the household. And Fletschner (2009) reports that 15 percent of the women she surveyed in Paraguay said they were credit constrained even though their husbands claimed to have adequate access to credit (Fletschner and Kenney 2011, 9).

From the above it can be said that rural Rwandan women who have not shown much interest in doing business with their husbands are not the exception.

10.0 Improving the Lives of Rural Women through Indigenous Beverage Production

10.1 Can the Market be Brought to the Beer Parlors?

The possibility of bringing the market to these indigenous producers of beverages by making them tourist attractions for both domestic and international tourists should be considered. Countries have achieved the

status of geographical indication² for some traditional products. In *Local Development and Heritage: Traditional Food and Cuisine as Tourist Attractions in Rural Areas*, Jacinthe Bessiere (1998) notes that in the coming decades, “the heritage component, and more particularly food, is likely to be a factor in tourist attraction, integration and social dynamization.”

With good reason, much emphasis is laid by government and stakeholders on the fact that rural women producers of indigenous beverages should be assisted in packaging and selling their drinks to expand their market. This stance, however, excludes the huge possibilities inherent in freshly-made indigenous beverages served in traditional Rwandan parlors for encouraging both domestic and international tourism. For instance, one travels to Italy and visits a pizzeria to experience fresh Italian pizza and pasta; buying frozen pizza from off the shelf in Italy does not provide that experience. The same can be said of Chinese foods. Visiting China and eating fresh Chinese food does not equate to buying pre-packaged Chinese food off the shelf. Equally, many tourists will say that they prefer to eat local food consumed by the masses if they are sure of the hygienic standards rather than in high-brow restaurants. International tourists believe that it is in “street” food, which locals eat, that one can find the real taste of a territory. Even domestic consumers have a taste for fresh beverages and can drive for miles from the city to the villages to purchase them despite widespread availability of the packaged variety in the city. Nigerian palm wine is a case in point.

Rwanda has consistently ranked among the top three countries in Africa on the Ease of Doing Business Index Report for the past four years, and according to a recent World Bank report, Rwanda’s private sector is to be commended for playing a crucial role in the nation’s economic growth. The report reads in part, “Private sector development has played a catalytic role in Rwanda’s economic growth. The Government has undertaken measures to foster private sector participation in the country’s key industries, such as tourism” (World Bank 2016).

The government of Rwanda, private sector, and other stakeholders can work with rural women producing indigenous beverages to attract both domestic and international tourists, through, for instance, conducting training on hygiene, improved ambience³ and service (using traditional items), and customer service. The government of Rwanda can mandate the compulsory and unscheduled supervision of premises and production processes in order to ensure compliance. The government can identify some champions across sectors and *umudugudus* for training and assisting in scaling up their businesses not necessarily to metamorphose into packaged drinks, but as beer parlors where both domestic and international visitors can drive to reinvigorate with freshly brewed drinks. Those that the government has identified and assisted will serve as reference points for other practitioners in the rural areas to aspire towards improved quality, safety, hygiene, and branding. Marketing these champion outlets should also be part of the package, where exceptional rural Rwandan women producers of indigenous beverages can be marketed as

part of Rwanda's cultural heritage. Efforts to obtain international geographical indication for these products can also be started by Rwanda's Ministry of Trade and Commerce.

Beer parlors act as places of congregation for rural communities where socialization takes place and women are able to network, gain information for markets, and build social capital. Tourists, in addition to tasting freshly made local drinks, can interact with locals in their own community. Although one may argue that beer parlors could be stocked with packaged beverages, packaging leaves a lot of room for patrons to buy and consume products at home, or to send their wards to make purchases for home consumption. Serving freshly made beverages in beer parlors increases social bonding across communities. Therefore, rural women can cater to the taste for fresh beer/beverages, while medium-scale manufacturers cater to packaged products. Interviewed rural women make it clear that once packaged, the cost of the products will go beyond what the majority of their patrons can afford. It would make little sense to alienate rural consumers in the efforts to expand the market, as they also constitute a market themselves. Further, while there is much to be gained from packaging indigenous beverages, including expanded market access, the capital and other necessary resources required to make this possible have proven a challenge. Bottlers of indigenous beverages note the high cost of purchasing bottles, an inability to brand products, and high tax payment.

10.2 Cooperating Towards Expansion

The UN, EU, and major development partners active in sub-Saharan African have all stressed the importance of self-help and nation-led development strategies. Cooperatives straddle the private and public spheres since they are made up of individuals who are also civil society members and are often strongly recognized, even supported by the state. Globally, cooperatives have a good reputation as platforms for the promotion of women's economic empowerment. In India, the Self Employed Women Association (SEWA) is a good example of how women can develop a voice and unite to form a veritable channel for the fulfillment of the progressive aspirations of women. In Namibia, the Edufano women's cooperative has created and sustained successful international businesses for women farmers over the course of well over four decades. The government of Rwanda strongly supports the establishment of cooperatives, although rural women producers of indigenous beverages in Rwanda have not yet been able to form cooperatives. The women themselves recognize this as a big challenge and according to one respondent, "There are many people in this business, and the business is not well organized." Setting up cooperatives will enable rural women producers of indigenous beverages to form a strong network in order to more effectively tackle the numerous challenges that they face.

11.0 Conclusion

Indigenous technology is widely applied by rural women across Africa in both their domestic and commercial endeavors. Many of these women have leveraged the income generated from the production

of indigenous beverages to invest in livestock, health insurance, children's education, and other family needs. In order to be effective, efforts for the economic empowerment of rural women ought to take into consideration the present situation of rural women and their current level of access to technology: technology transfer has often proven unsustainable, especially in rural communities. Many rural women in Rwanda engage in the production of indigenous beverages using indigenous methods. While they experience high patronage from rural consumers, there is little or no support from the government of Rwanda and NGOs involved in rural development. The government appears to be skeptical of the rural, indigenous technology-based beverage industry, owing to unhygienic practices and a possible overriding perception of indigenous technology as unprogressive, even backward. However, the rural indigenous technology-based beverage sector has proven to be a sustainable source of income for rural women. Many challenges encountered by these women can only be addressed with a collaboration of the rural women themselves, their communities, and the strong support of the Rwandan government, including its agencies and development partners, since it is cultures, societies, and institutions that "create conditions that facilitate or undermine the possibilities for empowerment" (Markel and Jones 2014, 2).

References

- Aka, S., F. Camara, Y.Z. Nanga, Y. G. Loukou, and K.M. Dje. 2008. "Evaluation of Organic Acids and Sugars Contents During the Production of *Tchapalo*, a Traditional Sorghum Beer in Côte d'Ivoire." *J. Food Technol* 6(5): 189-195.
- Aka, S., G. Konan, G. Fokou, M. K. Dje, and B. Bonfoh. 2014. "Review on African Traditional Cereal Beverages." *American Journal of Research Communication* 2(5): 106.
- Ana, R., and S. Sudhir. 2012. "Empowering Women in Smart Economics." *Finance and Development* 49(1): 40-43.
- Aworh, O. C. 2008. "The Role of Traditional Food Processing Technologies in National Development: The West African Experience. Using Food Science and Technology to Improve Nutrition and Promote National Development." *International Union of Food Science & Technology*.
- Byaruhanga, F. 2016. "Umuganura: Celebrating Rwanda's Cultural Values." *The New Times*. August 8, 2016. <https://www.newtimes.co.rw/section/read/202421>.
- Djè, Y., M. Heuertz, C. Lefèbvre, and X.Vekemans. 2000. "Assessment of Genetic Diversity within and among Germplasm Accessories in Cultivated Sorghum Using Microsatellite Markers." *Theor Appl Genet*: 918-925.
- FAO. 2011. *Spatial Analysis of Woodfuel Production and Consumption in Rwanda Applying the Woodfuel Integrated Supply/Demand Overview Mapping (WISDOM) Methodology*. Rome, Italy: Food and Agricultural Organization.
- Fletschner, D., and K. L. Kenney. 2011. "Rural Women's Access to Financial Services: Credit, Savings and Insurance." ESA Working Paper No. 11-07 (Agricultural Development Economics Division of the Food and Agricultural Organization of the United Nations): 1-28.
- Gaidashova, S. V., S. O. Okech, C. S. Gold, and I. Nyagahungu. 2005. "Why Bananas? The Case for Rwanda." *The International Journal on Banana and Plantain* 14(1): 2.
- Gorjestani, N. 2000. *Indigenous Knowledge for Development: Opportunities and Challenge*. Washington, DC: World Bank.
- Henning, R. K. 2002. "Using the Indigenous Knowledge of *Jatropha*: The Use of *Jatropha Curcas* Oil as Raw Material and Fuel." *IK Notes*, No. 47. Africa Region's Knowledge and Learning Center.
- IEA. 2016. *World Energy Outlook*. Paris: International Energy Agency.
- Kagame, A. 1972. *Un Abrégé de l'Ethno-histoire du Rwanda Tome Premier*. Huye: Université Nationale du Rwanda.

- Kanyana, I., E. Ouma, and P. V. Asten. 2013. "Quality Assessment of Banana Juice and Beer in Rwanda." *Journal of Food Technology* 11(2): 42.
- Kirubi, C., A. Jacobson, D. Kammen, and A. Mills. 2008. "Community-based Electric Microgrids Can Contribute to Rural Development: Evidence from Kenya." *World Development* 37(7): 1208–1221.
- Lily, B. 2003. "Taxing the Poor: Income Averaging Considered." *Harvard Journal on Legislation* 40: 398-451.
- Lusardi, A., and O. Mitchell. 2011. *Financial Literacy Around the World: An Overview*. Cambridge: National Bureau of Economic Research.
- Lyumugabe, F., J. Gros, J. Nzungize, E. Bajyana, and P. Thonart. 2012. "Characteristics of African Traditional Beers Brewed with Sorghum Malt: A Review." *Biotechnol.Agron.Soc. Environ* 16(4): 1.
- Markel, E., and L. Jones. 2014. *Women's Economic Empowerment: Pushing the Frontiers of Inclusive Market Development*. Washington, DC: USAID.
- MINAGRI. 2009. *Strategic Plan for the Transformation of Agriculture in Rwanda - Phase II (PSTA II) Final Report*. Kigali: Rwanda Ministry of Agriculture and Animal Resources.
- Monang, S. B. 2011. "Microbiological and Chemical Characterization of Ting, a Sorghu-based Gluten-Free Fermented Cereal Product from Botswana." *PhD Thesis*. Canada: University of Alberta.
- Mucavele, Saquina. 2017. "The Role of Rural Women in Agriculture." World Farmers' Organisation. Accessed March 3, 2017. <http://www.wfo-oma.org/women-in-agriculture/articles/the-role-of-rural-women-in-agriculture.html>.
- Musahara, H., B. Nyamulinda, C. Bizimana, and T. Niyonzima. 2014. "Land Use Consolidation and Poverty Reduction in Rwanda." *Integrating Land Governance into the Post-2015 Agenda: Harnessing Synergies for Implementation and Monitoring Impact*. Annual World Bank Conference on Land and Poverty. March 24-27. Washington DC: World Bank.
- Niyibigira, Theogene, Kahi Ngugi, Santie de Villiers, Dan Kiambi, Eunice Mutitu, Sarah Osama, Abigail J. Ngugi, Mohamed Abdalla, Rasha Ali, Charles Mugoya, Clet Masiga, Daphrose Gahakwa. 2013. "Introgressing Striga Resistance from a Mapped Donor Source into a Rwandan Adapted Sorghum Variety." *Journal of Renewable Agriculture* 1(1):6-10.
- Nsabimana, A., G. Nantale, D. Karamura, and J. V. Staden. 2008. "Banana Cultivar Distribution in Rwanda." *African Crop Science Journal* 16(1): 2.
- NSW Food Authority. 2010. *Shelf Life Testing: "Use-by" Date for Food Safety*. Australia: New South Wales Food Authority. <http://www.foodauthority.nsw.gov.au>.

-
- Nwachukwu, E, O.K. Achi, and I.O. Ijeoma. 2010. "Lactic Acid Bacteria in Fermentation of Cereals for the Production of Indigenous Nigerian Foods." *African Journal of Food Science and Technology* 1(2): 021-026.
- Olatokun, W. M., and O. Ayanbode. 2009. "Use of Indigenous Knowledge by Women in a Nigerian Rural Community." *Indian Journal of Traditional Knowledge* 8(2): 287-295.
- O'Neill, P. 2011. "The Problem with Rural Transport is That it is Rural, the Solution is in Branding." *Transport for Development*, World Bank Group. Retrieved March 6, 2017. <http://blogs.worldbank.org/transport/the-problem-with-rural-transport-is-that-it-is-rural-the-solution-is-in-branding>.
- Ozturk, I. 2010. "A Literature Survey on Energy-growth Nexus." *Energy Policy* 38: 340–349.
- REG. 2014. *Biogas Project Brief*. Rwanda: Rwanda Energy Group, Energy Development Corporation Limited.
- Senanayake, S.G.J.N. 2006. "Indigenous Knowledge as a Key to Sustainable Development." *Journal of Agricultural Sciences – Sri Lanka* 2(1): 87–94.
- Wolde-Rufael, Y. 2009. "Energy Consumption and Economic Growth: The Experience of African Countries Revisited." *Energy Economics* 31(2): 217–224.
- World Bank. 1998. *Indigenous Knowledge for Development: A Framework for Action*. Washington, DC: World Bank.
- World Bank. 2011. *The World Development Report 2012: Gender Equality and Development*. Washington, DC: World Bank.
- World Bank. 2012. *Establishing a Green Charcoal Value Chain in Rwanda: A Feasibility Study*. Washington DC: World Bank.
- World Bank. 2016. *Africa's Pulse – An Analysis of Issues Shaping Africa's Economic Future*. Washington, DC: World Bank.

Endnotes

¹ In Rwanda, sorghum has played an important role during the celebration of the annual harvest day event known as *Umuganura*, which is held on August 1. *Umuganura* is one among 17 Rwandan rituals known as *Inzira z'Ubwiru*, and in the olden days, apart from the national celebration held at the King's court, other celebrations were held at the family level. Every woman was expected to prepare a very special sorghum beer for her husband so that when the king launched the celebration at the national level, families would also do the same (Byaruhanga 2016). On this occasion, mothers usually prepare the local homemade bread dish made from the sorghum flour, *rukacarara*, for

children. Although the celebration of *Umuganura* is gradually losing its significance across Rwanda, drinking and sharing sorghum beer are still part of the Rwandan tradition that is still observed and respected, especially in rural areas.

² According to the World Intellectual Property Organization (WIPO), “A geographical indication (GI) is a sign used on products that have a specific geographical origin and possess qualities or a reputation that are due to that origin. In order to function as a GI, a sign must identify a product as originating in a given place. In addition, the qualities, characteristics or reputation of the product should be essentially due to the place of origin. Since the qualities depend on the geographical place of production, there is a clear link between the product and its original place of production” (WIPO 2018).

³ Aesthetically, the shops where these beverages are sold will hardly appeal to a non-rural dweller as a place of relaxation and refreshment. Cut out wooden benches and tables serve as furniture, while drinks are served in stainless steel cups, or iron cups painted over and chipped in several places. Interior decoration is almost non-existent, and drinks are served often directly from 20 L yellow jerry cans positioned behind a wooden shelf. Rural women can be trained to form cooperatives and use traditional decorations that cost little, but appeal to the senses to decorate their parlors. Regarding hygiene, indigenous beverage producers need training, follow-up, and clearly stated guidelines and regulations to assist them in ensuring that products sold to consumers meet the highest standards. Trainings on measurements and production standards will also help to ensure consistency in quality.