AN ANALYSIS OF THE COMMERCIALIZATION OF WEST AFRICAN ANCIENT GRAIN FONIO: IMPACTS ON WOMEN EMPOWERMENT AND FOOD SECURITY

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ABSTRACT

The global commercialization of ancient grains is becoming increasingly popular due to consumers’ preferences for healthy, organic, and gluten-free food products. As the global population rapidly rises and climate extremes impact agricultural production, there is a growing need for climate-resistant crops. Many popular ancient grains, such as quinoa, teff, and fonio, are resistant to abiotic and biotic stresses and are high in nutritional value. These ancient grains are considered allies to food security, important for future agricultural production, and can foster economic empowerment for local smallholder farmers. The local and global commercialization of fonio (Digitaria exilis) is at its early stages. This paper aims to evaluate the commercialization of quinoa (Chenopodium quinoa) and teff (Eragrostis tef) while drawing from the lessons learned to offer a more sustainable approach to the production of fonio. The paper will further explore whether the commercialization of fonio can foster women’s economic empowerment. The analysis and findings suggest areas of policy intervention and concludes that through an enabling environment, the commercialization of fonio can stimulate growth and food security.
BIOGRAPHICAL SKETCH

Luca grew up between Mozambique, California, the South of France, and Ireland, and has always been curious about different cultures and worldviews. She has her B.A. in Business and Economics from Trinity College, Dublin and her Masters in Global Development from Cornell University. Luca is interested in the intersection of social impact and business and wants to work with projects that facilitate economic empowerment for individuals. She is particularly interested in women and youth empowerment in Sub-Saharan Africa.

Prior to Cornell, Luca worked in a sustainable tea company in Bangalore, India, and then worked in Senegal as a Community Economic Development volunteer with the Peace Corps. During her time in the Peace Corps, with the help of her local counterparts, Luca pioneered a youth-based waste management enterprise, initiated an agribusiness food incubation center, trained women’s groups in entrepreneurship, financial, and food transformation activities, and liaised between the Sedhiou Chamber of Commerce and private enterprises to develop the value chain of an ancient grain, fonio. Building on her experiences in international development, Luca focused her studies at Cornell on economic development in Sub-Saharan Africa, and her studies furthered her interest in women and youth empowerment.
To my parents, Mark and Marion.

Thank you for inspiring me to do my best.

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LIST OF ABBREVIATIONS

AFARD: Association des Femmes Africaines pour la Recherche et le Developpement
AfCFTA: African Continental Free Trade Area Agreement
CAADP: Comprehensive Africa Agriculture Development Program
ECOWAS: Economic Community of West African States
ENAHO: Encuesta Nacional de Hogares
FAFS: Federation des Associations Feminines du Senegal
FAO: UN Food and Agriculture Organization
GDP: Gross Domestic Product
GP: Groupement de Producteurs
GT: Groupement de Transformatrices HSPH: Harvard School of Public Health
IFAD: International Foundation for Agricultural Development
IFPRI: International Food Policy Research Institute
IPCC: Intergovernmental Panel on Climate Change
ITA: International Trade Administration
MSEs: Micro and Small Enterprises
NGO: Non-Governmental Organization
NUS: Neglected and Underutilized Species
PRES: Programme de Résilience Économique et Sociale
SSA: Sub-Saharan Africa
SDG: Sustainable Development Goals
UN: United Nations
UNDP: United Nations Development Programme
UNFPA: United Nations Population Fund
US: United States
WHO: World Health Organization
Chapter 1: Introduction

1.1 Purpose of the Paper

Consumers’ demand for healthy foods such as ancient grains is rising rapidly due to their gluten-free, low glycemic, and high protein properties (Wang & Çakır, 2021). At the same time, the world population is anticipated to be 10 billion people in 2050, and global climate change is adversely impacting people’s communities leading to food and water insecurity for billions of people (UNDP, 2011; Roser & Ritchie, 2019). These changing environmental, social, and human trends adversely impact agricultural production and yields and further impact food security, causing great concern as already 1.9 billion people worldwide are moderately or severely food insecure (Roser & Ritchie, 2019). To meet the growing demand for food, production must increase. Sustainability is a challenge as this requires ethical practices that protect arable food production land, labor rights, and genetic diversity while simultaneously producing healthy and affordable foods. The commercialization of indigenous crops can offer incredible opportunities to foster resilience in climate-smart agricultural production while fighting poverty, hunger, and malnutrition (Baldermann et al., 2016; Yu, 2019).

Oxford Lexico defines food security as “the state of having reliable access to a sufficient quantity of affordable, nutritious food” (Lexico, 2021a). The paper highlights the pressing need for sustainable agricultural development in Sub-Saharan Africa (SSA) to improve food security. Fonio (Digitaria exilis), coming from the Wolof name foño, is an ancient grain grown in the Sahel region of West Africa. The purpose of this paper is to provide a descriptive analysis of fonio and investigate whether its local and global commercialization might foster women’s economic empowerment and fight food insecurity in Senegal.
The global commercialization of indigenous crops is complex and multifaceted. For example, quinoa’s global commercialization demonstrated an initial increase in smallholder farmers’ welfare; yet, the distribution of benefits was short-lived, highlighting the critical role of national policies during globalization. Therefore, this paper examines the implications of the commercialization of quinoa (*Chenopodium quinoa*) in the Andes and teff (*Eragrostis tef*) in Ethiopia. Finally, recognizing that each context where these grains are produced is different, the paper draws on these lessons to suggest a more sustainable approach for fonio development. This could result in new opportunities for improved food security and women empowerment.

### 1.2 ‘Superfood’ and Ancient Grain Fonio

The food industry is experiencing rapid changes in consumer preferences for healthy, organic, vegan, gluten-free, and fair trade food products leading to the growing popularity in ‘superfoods’ (Graeff-Hönninger & Khajehei, 2019). There is no regulated definition of a ‘superfood’; however, the Merriam-Webster Dictionary defines it as “a food that is rich in compounds (such as antioxidants, fiber, or fatty acids) considered beneficial to a person’s health […] Antioxidants are molecules that may help reduce the amount of damaging free radicals in the body, and therefore are believed to be health-promoting” (Merriam Webster, 2021) and Oxford Lexico defines it as “a nutrient-rich food considered to be especially beneficial for health and well-being” (Lexico, 2021b).

Fonio is a West African cereal that dates back to 5000 BC (Cruz et al., 2016). In recent years fonio has gained popularity in the Western world, with the media calling it “the new quinoa” and is known as a ‘superfood’ (Greenwald, 2020; Levy, 2020; Roberts, 2014). It is fast-growing, drought-resistant, and highly nutritional. It can grow on semi-arid soils, produces grain in just 6 to 8 weeks, and requires very little water to develop (The National Academic
Fonio has similar characteristics to quinoa and teff. All three grains offer highly nutritional alternatives to unaffordable protein foods and are widely recognized as a solution to malnutrition (FAO, 2018). These are also seen as allies to food security and climate change as they tend to be resistant to abiotic and biotic stresses (Alandia et al., 2020; Cruz et al., 2016; Gebreselassie & Sharp, 2007). The development of these crops also offers opportunities for improved farmer empowerment through increased welfare and autonomy (FAO, 2013; Stevens, 2017; Wang & Çakır, 2021).

Quinoa, teff, and fonio are commonly known as Neglected and Underutilized Species (NUS). These NUS are being promoted by diverse groups, including the World Bank, the United Nations Food and Agriculture Organization (FAO), Biodiversity International, and the International Foundation for Agricultural Development (IFAD), acknowledging the importance of developing orphan, local crops. This ever-increasing popularity of ‘superfoods,’ coupled with consumers’ willingness to pay premium prices for these, has created a billion-dollar industry (HSPH, 2018). However, these ‘superfoods’ are consumed far from their origins and out of their cultural context. Therefore, there must be policies in place that “balance the potential efficiency gains with the distribution of benefits and costs desired by society” (Pinstrup-Andersen & Watson, 2011, p.300). The development of fonio can diversify the human diet, increase farmers’ economic empowerment, and enable more sustainable and resilient food systems; however, there must be interlinkage between its globalization and national policies.
Chapter 2: Methods

2.1 Primary Data

The paper is made up of primary and secondary data and has received IRB certification.

An accurate value chain analysis of fonio is challenging as few systemic studies are based on reliable and representative surveys. Therefore, in order to provide a clear understanding of fonio’s current commercialization in Senegal, the fonio case study is made up of primary data and secondary data. The primary data was collected through interviews with representatives in the Chamber of Commerce in Sedhiou, Senegal.

*Interview questions for fonio experts:*

*Cultivation:*
- Please tell me about fonio’s cultivation process in Senegal.

*Market:*
- How would you generally describe the fonio market in Senegal?
- Who eats fonio in Senegal?
- What is the economic, social, and cultural significance of fonio? Does this affect the consumer market?
- Is there potential for growth in the local market?

*Challenges and Opportunities:*
- What are the main challenges and opportunities faced by stakeholders along the value chain?
- Are there local or international opportunities to expand the fonio value chain? If so, since when? Where is the interest coming from?
- Are there initiatives in place to address the challenges faced by fonio producers? What are the solutions to these challenges?

*Support/Protection:*
- Is there an issue around ownership or protection of this grain?
- Is there government support for smallholders in Senegal?
- Is there smallholder support from the private sector or NGOs? If so, what type of support? What is their function?

*General Questions:*
- Do you have a personal story with fonio? Please feel free to share any information on the grain.
- How would you explain or describe the value chain of fonio in Senegal?
- Overall, what future do you see for fonio in Senegal?
- Anything else which I didn’t ask about that you’d like to add?

The collected data was analysed by drawing on the emerging themes and the gathered insights are included in the ‘Case Study on Fonio’.
2.1 Secondary Data

The secondary data in this paper includes Senegal’s economic, political, and social environment, the historical background of the grain, and a literature review. There are three thematic areas covered in the literature review. The first theme is agricultural development in SSA as fonio is home to the Sahel region in West Africa. Agricultural production is affected by climatic changes, rising population, and changing consumer preferences (Anderson et al., 2020; IPCC, 2019). As these trends continue, there needs to be strategies in place to address these challenges. Evidence shows that Africa has the necessary natural resources to meet the increasing agricultural needs (IPCC, 2019). However, it is crucial to approach this production increase in a sustainable way, particularly since the region still suffers from the highest levels of food insecurity (FAO, 2021). This paper reviews the agricultural sector in SSA highlighting the critical role of crops such as fonio that are resistant to biotic and abiotic stresses.

The two other themes are: the commercialization of quinoa and the commercialization of teff. These reflect upon various academic papers to understand the grains’ local and global commercialization. This paper then reviews the implications of their development, and draws on lessons learned from these to provide recommendations for a more sustainable approach for fonio’s development. The lessons learned also contribute to the economic empowerment analysis of fonio.

2.3 Theoretical Framework Overview

Empowerment is an essential concept for international development and is supported by global institutions such as the World Health Organization (WHO), World Bank, and United Nations (UN) (Hennink et al., 2012). Hennink et al. (2012) highlight the lack of clarity in defining empowerment, and through the analysis of 49 international development narratives of
empowerment, the authors identify a conceptual empowerment framework. The conceptual framework comprises six mechanisms: knowledge, agency, opportunity, capacity-building, resources, and sustainability; and five domains: health, political, natural resources, spiritual, and economical. These mechanisms and domains are closely interrelated and interconnected, and they are used in different combinations depending on who is being empowered: an individual, community, or organization. The authors created this framework to strengthen community initiatives that foster upward economic mobility, as a clear understanding of empowerment can be a mechanism towards sustainable development practices.

This paper uses the analyses of the ancient grains quinoa and teff coupled with the case study on fonio, to investigate whether the commercialization of fonio might foster women’s empowerment. This paper does so using the conceptual framework developed by Hennink et al. (2012). This paper focuses on individual empowerment, which is defined as a “process of transformation that enables individuals to make independent decisions and take action on these decisions to make changes in their lives” (Hennink et al., 2012, p.206). The core mechanisms for individual empowerment are, agency ‘the capacity to act independently and make choices,’ knowledge ‘access to education, training and information from formal or other sources,’ and opportunity structure ‘the existence of an enabling environment of social, political, institutional and community support to foster individual and community development’ (Hennink et al., 2012, p.206). The domain, in this case, is economic empowerment.
Chapter 3: Literature Review

3.1 Agricultural development in SSA

Challenges in Agricultural Production

Over the last century, scientific evidence shows that due to increased greenhouse emissions, the global mean temperatures of the earth have been rapidly rising, resulting in climate extremes (UNDP, 2011). Global warming contributes to desertification, land degradation, shifts of climate zones, and changing precipitation patterns, which negatively impact coastal systems, biodiversity, freshwater resources, and livelihoods. It has also led to climate-induced disasters such as droughts, flooding, and tornadoes, to name a few (IPCC, 2019). These abrupt weather patterns have disproportionate impacts on developing countries that rely on agriculture as a livelihood (Anderson et al., 2020).

Crop productivity is being impacted because drought is causing salinization and aridity of soils and is leading to a decrease in crop yields “for each degree of global temperature increase, wheat yields are expected to reduce by 4-6%” (Anderson et al., 2020, p.198). Land degradation is a particular challenge in SSA and directly impacts food security: “46% of Africa’s land area suffers from degradation, affecting at least 485 million people and costing 9.3 billion USD per year” (Sakho-Jimbira & Hathie, 2020, p.7). In the Sahel region, which is home to fonio, the land is more highly affected, with only 3 to 30% not undegraded, and 64% of arable land in Senegal is degraded due to salinization and erosion (AGNES, 2020). Senegal is already suffering from a sharp decline in fallow land and savannah vegetation because of agricultural expansion, and the Sahel region is expected to experience a 3% per annum decrease in agricultural production (AGNES, 2020). There is an urgent need for improved and sustainable farming practices and new tools to adapt to these changes. If trends continue, half of the currently cultivated land in Africa could be unusable by 2050 (IPCC, 2019).
Importance of Agriculture in SSA

SSA accounts for more than 1.1 billion people. It is the fastest-growing region in the world – the population is expected to be 2.2 billion by 2050 and more than 4 billion by 2100 (World Bank, 2021). Food security in SSA is still a significant challenge, with 54% of the population suffering from moderate or severe food insecurity and a hunger prevalence nearing 20% (FAO, 2021). Agriculture is a critical sector of the Sub-Saharan African economy, representing 40% of the region’s Gross Domestic Product (GDP), and employs approximately 60% of the active labor (AGNES, 2020). However, it is a climate-sensitive livelihood, and the worrying hunger trends coincide with the impacts of climate change on agriculture. The region is also urbanizing rapidly from 14% in 1950 to the present 42%, and 50% of the population is expected to reside in urban areas by 2035 (Sakho-Jimbira & Hathie, 2020). The rapid urbanization coupled with the rapid population growth is leading to further changes in distribution systems, food demand, and markets (“Agriculture in Sub-Saharan Africa,” 2016).

One of the leading factors of rapid urbanization is the youth bulge; 70% of the population is under 30, which highlights the necessity of youth-centered development strategies. Most of these youth are engaged in the agricultural sector in rural areas, making up approximately 40% of total youth in SSA (“Agriculture in Sub-Saharan Africa,” 2016). Creating innovative and attractive agricultural jobs is important to further engage young women and men in the agricultural sector.

The importance of improving the agricultural sector is reflected in the 2030 Agenda for Sustainable Development. Through the UN Sustainable Development Goals (SDGs), the Agenda aims to end poverty and hunger, promote sustainable agricultural growth, and improve
nutrition. The SDGs strive to double the incomes and agricultural productivity of smallholder food producers, particularly women and indigenous people (UN, 2021). Women in SSA are drivers in the agricultural sector; however, they predominantly work on subsistence crops and not value-added crops (Rodgers & Akram-Lodhi, 2019). Women are met with significant constraints such as a lack of access to critical resources, such as land and credit. For instance, “In Kenya, only 1 percent of land titles are owned by women, with 5 to 6 percent held in joint names” (Cutura, 2006, p.1). It is challenging for women to access credit and financing in a collateral-based banking system if they do not have ownership of land or property.

Women are also disadvantaged due to their high involvement in household activities and their lack of access to education, resulting in less time to devote to farming activities (Kiraka et al., 2013). The limited access to essential resources affects their agricultural productivity, and women farmers are 20 to 30% less productive than male farmers (Sakho-Jimbira & Hathie, 2020). Studies show that increased women’s participation and involvement in decision-making, leadership positions, and natural resource management leads to productivity gains and increased sustainability of climate change policies (UNDP, 2011). As seen in this paper’s empowerment framework analysis, increasing women’s empowerment and addressing the youth bulge are essential steps towards sustainable and long-lasting agricultural production in the region.

The SDGs focus on smallholder food producers as they are the backbone of the economy in many Sub-Saharan African countries (Abraham & Pingali, 2020). Approximately two-thirds of SSA live in rural areas, with 60% of the population being smallholder farmers and 80% of food consumed in the region coming from small farms (Abraham & Pingali, 2020). The role of agriculture is also reflected in the Maputo and Malabo Declarations. Through the Maputo
Declaration, the African Union Assembly of Heads of State and Government adopted the African Union Comprehensive Africa Agriculture Development Program (CAADP) in 2003. CAADP aims to improve nutrition and food security coupled with an increase in agricultural-led activities in Africa while ensuring an annual growth of agricultural output of at least 6% (Sakho-Jimbira & Hathie, 2020).

In 2014, the African Union also launched the “Year of Agriculture and Food Security”; the Malabo Declaration committed to accelerating agricultural growth and transformation. The African Heads of State and Government committed to ending hunger by 2025. Accounting for the vast regional differences, African regions with appropriate governance, institutional capacities, and economic policies have shown promise of sustainable and long-lasting agricultural development and food security (“Agriculture in Sub-Saharan Africa,” 2016). However, in many cases, governance hinders the adoption of sustainable farming strategies. There is a lack of incentives for smallholder farmers to adopt land degradation interventions such as water and soil conservation. Many African regions are still faced with the challenge of mainstreaming land degradation control plans at a national level (Sakho-Jimbira & Hathie, 2020). The lack of efficient transportation infrastructure, lack of access to markets, and a lack of current and accurate information are also major barriers to smallholder farmers’ expansion and growth (Abraham & Pingali, 2020).

Investing in sustainable land management on a local level is a challenging demand due to the high levels of poverty and ongoing drought; these strategies take a relatively long time to realize their benefits and are not attractive. The continued increase in global mean temperatures will result in lesser and lesser arable land and further food insecurity. These ongoing challenges
highlight the opportunities offered by indigenous grains naturally more resistant to abiotic and biotic stresses (Anderson et al., 2020; UNDP, 2011).

With an anticipated 10 billion people globally by 2050, abrupt climatic changes, and increased consumer preferences for healthy and organic foods, a substantial increase in agricultural production is foreseen. SSA has the potential to meet this increasing demand for food as it has more than half of the world’s uncultivated yet agriculturally suitable land coupled with extensive and under-utilized water resources (Minten et al., 2016). The global challenge is to maximize agricultural yields and minimize environmental, social, and human impacts. Improved access to adapted land management strategies, new seed varieties or indigenous crops, and efficient mechanization coupled with increased infrastructure investments and public-private partnerships are solutions to meeting the rising population’s needs sustainably (Anderson et al., 2020; Pinstrup-Andersen & Watson, 2011).

3.2 Quinoa

Background of Quinoa

Quinoa (Chenopodium quinoa, Wild.) is originally from the highland regions of the Andes, with Peru and Bolivia being the largest global producers accounting for 74% of global exports (Alandia et al., 2020). Quinoa, also known as an NUS and orphan crop, is more than 5000 years old and an ally to food security. The grain can grow under various agro-ecological conditions including, highlands, coastal, valley, salt flats, and subtropical areas, and is resistant to abiotic stresses such as drought, frost, and salinity (Alandia et al., 2020). Quinoa is a gluten-free grain with a low glycemic index. It has an essential balance of amino acids, fatty acids, micronutrients, vitamins, and antioxidants, which are not found in staple grains (rice, maize,
wheat). Hence, quinoa is considered of higher quality. It can be used as an alternative for special diets and is widely consumed in developed countries.

Quinoa’s rapid globalization has created controversy in worldwide. Before the 1970s, quinoa was characterized by subsistence farming, only grown on small farms of less than five hectares. Locals consumed quinoa for many meals and it is an important cultural crop; however, it was never a staple crop. In Penu, Peru (which is the town that produces 80% of all quinoa in the country), quinoa only represents 4% of the household budget, and in other parts of Peru, only 0.5% (Stevens, 2017). In the 1980s, consumer preferences for healthy diets increased, and quinoa was introduced in the U.S. as a novel ‘superfood.’ By the end of the 1980s, quinoa was actively present for research in 11 countries outside of the Andes (Alandia et al., 2020).

For almost two decades, prices remained under $2 USD per kilo until 2008, when quinoa’s popularity as a specialty food increased dramatically in the Western world. The year 2013 was named International Year of Quinoa by the UN and between 2008 and 2013 prices increased almost 400%, with 1 kilo priced up to $7 USD and production increasing twofold. This time is known as the quinoa boom (Alandia et al., 2020). The spike in prices, coupled with an increasing demand for quinoa, attracted highly skilled competitors in the coastal areas of the Andes and the United States (US), Canada, Spain, and the Netherlands. Large-scale producers along the coast of Peru took over during the boom, and national-level production surged, with coastal production going from 1603 tons to 45270 tons (Alandia et al., 2020).

Currently, more than 120 countries produce quinoa. This rise in competition led to a surplus of production. The increase in production led to changes in land use, such as mono-cropping, to increase profits and yields. In addition, large-scale producers moved away from small-scale
traditional integrated farming systems to use more mechanized systems. The production surplus led to markets closing and the downward correction of quinoa prices (Alandia et al., 2020).

Commercialization Implications of Quinoa

There are various debates on whether the global commercialization of quinoa is good or bad for the local Andeans. During the boom, news outlets such as The Guardian, the Globe and Mail, and the New York Times published articles noting that the rising popularity of quinoa in the West was hurting the locals. They argued the locals could no longer afford their staple crop and were embracing cheaper, processed foods instead (Blythman, 2013; Romero, 2011; Verner, 2013). Studies have shown that these claims are without merit (Bellemare et al., 2016; Stevens, 2017).

According to a study carried out by the FAO in Bolivia, 81% of surveyed farmers said that their primary source of income was quinoa. The study shows that the quinoa boom undoubtedly improved incomes, access to credit, and productivity (FAO, 2013). The ENAHO survey (yearly survey carried out on 22,000 randomly selected households by the Peruvian government) found that households that grow and eat quinoa, households who eat and don’t grow quinoa, and households who neither grow nor eat it all showed an increase in their welfare as the price of quinoa rose between 2000 and 2012. These studies reflect an increase in the living standards in Peru. The results showed that people ate slightly less quinoa in Peru as a whole, 6.07 kilograms in 2004 versus 4.09 kilograms in 2012, reflecting the rise in price (Stevens, 2017). The decrease in quinoa consumption is attributed to the locals spending their higher incomes on a more diversified diet, improving their overall food security (FAO, 2013). However, in Penu, households slightly increased their consumption of quinoa, 22.22 kilograms versus 23.62
kilograms between 2004 and 2012 despite a fourfold price increase. The study found no signs of changes in calories, protein, or carbohydrates, just lower high-fat foods to afford the more expensive quinoa (Stevens, 2015).

Quinoa’s popularity led to a sharp increase in production resulting in the unsustainable cultivation and harvesting of quinoa, leading to land degradation and a reduction in cultivated quinoa varieties (FAO, 2013). Exports are focused on only a few of the 3,000 types of quinoa, prompting quinoa producers to abandon many of the varieties created by Andean farmers, which are the future of quinoa species that adapt to climate change (Cherfas, 2016). The move away from indigenous varieties and traditional farming techniques threatens quinoa’s agricultural biodiversity, cultural and ecological sustainability, and the social integrity of local communities. These negative changes in land use generated pressures on the Andean natural resources; this resulted in more developed countries producing quinoa in the hope to relieve these pressures, as well as highly competitive producers moving to the coastal areas of the Andes.

These new producers have created unbalanced competition for the local smallholder farmers. Their access to new and improved technologies have yet to reach the small-scale farmers in the Andean highlands, and these are still characterized by low input technology and small-scale plots (Alandia et al., 2020). The lack of access to new technologies coupled with the inequitable distribution of benefits creates major challenges for the smallholder farmers as they cannot compete against highly skilled and developed producers (Alandia et al., 2020).

Newly engineered varieties of quinoa allow for the grain to be grown outside of the high-altitudes of the Andes, promoting its production around the world. The sharp increase in
production led to a production surplus with 206,000 tons being produced versus 66,000 tons exported in 2014 (Alandia et al., 2020). This production surplus led to markets closing and a price collapse which adversely impacted smallholder farmers. The new competitors, price collapse, and closing markets resulted in farmers in Peru and Bolivia facing prices as low as $0.6 kg and $0.8 kg\(^1\), respectively, by the end of 2015 (Alandia et al., 2020). Although quinoa’s popularity and high prices are fueling a billion-dollar ‘superfood’ industry, Bolivia, the second largest exporter of quinoa, remains the poorest country in the Andes, with 80% of the rural population still living under the poverty line (Jacobsen, 2011). In Peru, 72% of quinoa growers still own small farms of less than 5 hectares. Being members of farmers’ associations and cooperatives has helped them with their bargaining power and the fluctuating prices (Alandia et al., 2020).

The commercialization of ‘superfoods’ and NUS is being promoted by the United Nations (IFAD-NUS project, NUS for Zero Hunger) as a culturally sensitive and sustainable agricultural development approach (Biodiversity International, 2019; FAO, 2018). In the case of quinoa, its initial commercialization did indeed increase farmers’ incomes, improve nutrition, and fostered overall economic empowerment. However, there is a lack of intellectual protection tools in place, and there is no traceability of genetic resources. Hence, once the price became attractive to non-Andean farmers, there were no institutional mechanisms to ensure that the local farmers could still reap benefits from the grain while sharing it with the rest of the world (Alandia et al., 2020).

3.3 Teff

Background of Teff

Teff (\textit{Eragrostis tef}), closely related to millet, has existed for more than 6,000 years and originates from Ethiopia, where more than six million farmers grow it today and is a source of
livelihood for nearly 43% of the population (Cheng, 2018; IFPRI, 2018). By value, teff is the most important staple value chain in Ethiopia; however, the grain is still considered an orphan crop and is still lacking in government support (Minten et al., 2016). It is important to note that unlike quinoa, which makes up only a small portion of Andean household diets, teff is a staple food in Ethiopia and provides more than 10% of total calories consumed by the population (Wang & Çakır, 2021). Teff is considered a ‘superfood’ due to its high nutritional value, and its demand and price have increased in recent years (Wang & Çakır, 2021).

Teff is a popular crop for farmers as its cultivation is low-risk; it thrives in warm climates and is particularly resistant to drought and heat. It can also survive without applications of fertilizers and pesticides and is resistant to post-harvest stresses such as insects and pests due to its small size (Barretto et al., 2020). It is very efficient with one pound of grain covering one acre in 45 days, and once harvested, it can last years in warehouses without spoiling. It is considered a highly nutritional grain with high iron, vitamin B, calcium, and protein levels and is gluten-free (Gebreselassie & Sharp, 2007). Teff is an ally to food security and can be used as an emergency crop as it is resistant to abrupt climate changes and suitable for environmental sustainability (Gebreselassie & Sharp, 2007).

Teff is also important for smallholder commercialization as it thrives as a cash crop and food crop. Most farmers in Ethiopia grow teff and sell it to purchase less expensive, less nutritious foods. However, as they become more prosperous, farmers retain more for their own consumption. Studies find that farmers with higher levels of commercialization (those who sell more than 65% of their production) spend more on education and healthcare than those with lower commercialization levels. This research has also shown that the higher the commercialization levels, the higher the farmers’ welfare (Gebreselassie & Sharp, 2007).
Teff is grown entirely by smallholder farmers and until recently had a sole domestic market. The increasing demand for nutritious foods in more developed countries has created an export market for teff in Europe and North America (Gebreselassie & Sharp, 2007). In 2006, the Ethiopian government placed an export ban on all teff products to ensure supply within the domestic market. At the same time, the government increased supportive teff policies, and teff production doubled. Seeing as there was a sufficient domestic supply, the government partially lifted the ban in 2015, and teff retail prices were 10% higher in 2016 and 2017 than they were in 2014. This price increase can benefit Ethiopian producers’ incomes but can also adversely impact consumers since teff is a staple food product in Ethiopia (Wang & Çakır, 2021).

Commercialization Implications of Teff

Teff is widely enjoyed by local consumers in Ethiopia and is primarily commercialized for the domestic market. Women perform up to 75% of farm labor, with studies showing that women contribute more to the production of teff than men (Bekele et al., 2020; USAID, 2017). This is an ongoing challenge as women produce up to 35% less than men due to their restricted access to critical resources such as inputs, credit, and extension services (USAID, 2017). Teff is considered the most important cash crop of the country as the value generated by teff farmers is higher than the income generated by coffee farmers (Bachewe et al., 2019). With the commercialization of teff being an important focus to increase farmers’ welfare, its value chain is quickly transforming.

However, the value chain is still unsophisticated and short. In recent years, there has been improvement in domestic marketing due to Ethiopia’s gradual improvement in roads and increased access to information and markets through the use of mobile phones (Bachewe et al.,
There are two or fewer trade nodes between farmers and retailers, with farmers obtaining about 80% of the final retail price (Minten et al., 2016). The largest portion of the final retail price comes from the farming costs due to inefficient farming methods and a lack of available technologies. There is very little value-addition in teff, apart from enjera, a key aspect of the national dish. The most significant distinguishing factor within the value chain is the color of the teff grains. The brown and red grains are considered cheaper and are in low demand, whereas the white teff grain is on the rise and is mainly consumed by the urban population.

Although teff holds vast importance in Ethiopia’s agricultural and food economy, knowledge regarding teff production is still limited (Barretto et al., 2020). There is a growing demand to increase investment into teff production and a change in Ethiopian policy on teff exports. The crop’s production and marketing face numerous challenges, including a lack of modern technologies for planting and harvesting, and hence very few farmers use improved seeds (Bachewe et al., 2019). Between 1990 and 2010, the production of teff increased by 85%. This growth can be attributed to the increasing population, expansion of land, and surge in labor. Only 12% of the rise in production was attributed to improved crops (Gebreselassie & Sharp, 2007). Mechanization and labor force management are absent, and there is also a great need to improve the distribution system for inputs (IFPRI, 2018). There is little vertical integration within the value chain and little coordination between stakeholders. Quantity and quality checks are done at the time of transactions, and there is a lack of clear standardization or grading for the grains (Minten et al., 2016). There is also little evidence of modern retail or branding practices for teff within Ethiopia (Bachewe et al., 2019).
Another ongoing challenge for teff producers is the immature final product distribution markets, resulting from the lack of competition in distributors. As the ban lifts, the rise in global demand will further increase the domestic prices; however, Sankaranarayanan et al. (2020) posit that this price increase will not filter down the value chain and will not reach the smallholder producers due to the poor transportation and immature distribution markets. Unless a crop producer is large enough to do their own distribution within the market, their profit will be marginal if the demand increases. Therefore, improved distribution markets are critical for rural producers as the demand for teff increases (Sankaranarayanan et al., 2020). Minten et al. (2016) also argue that the inefficiencies in transportation and roads significantly impact the geographical price of teff.

Because of the challenges faced by smallholder farmers, teff production has low yields and high prices. Teff is seen as an economically superior food which has led to a disproportionate consumption of teff and will continue to be purchased by the rich and not the poor (Bachewe et al., 2019). The welfare, nutritional and social benefits generated by the commercialization of teff do not reach the poorest in the country. This low productivity further discourages policymakers from focusing on teff to ensure food security for the rapidly growing Ethiopian population (IFPRI, 2018).
Chapter 4: Economic, Political, and Social Environment of Senegal

4.1 Economic Context

Senegal is situated in West Africa and is bordered by Mauritania, Mali, Guinea, and Guinea-Bissau. It surrounds The Gambia. The country has a population of 16.7 million and enjoys a tropical dry climate (World Bank, 2021). It has been one of the fastest-growing economies in SSA, with its economy expanding at more than 6% annually since 2015 (World Bank, 2021). Senegal has experienced strong economic growth, driven by public investments and reforms. These reforms started in the early 1990s intending to restore macroeconomic stability, open the economy to private investment, and adjust exchange rate imbalances. In 2012, the administration focused on infrastructure investments and reforms aimed at engaging overall economic governance and improving specific sectors’ business performance and environment. Although Senegal experienced significant improvements between 2012 and 2015, economic progress is still fragile (World Bank, 2018).

Investments and exports are the main drivers of growth on the demand side. The services sector is the main engine of GDP growth, and the agricultural industry is the most dynamic engine of growth. Since the pandemic, The World Bank estimates that growth fell by -0.7% in 2020 (World Bank, 2021). Senegal has responded by implementing an Economic and Social Resilience Plan (Programme de Résilience Économique et Sociale: PRES) (World Bank, 2021). The agricultural sector employs about 75% of the population and represents 15% of the GDP. The primary food crops are maize, rice, corn, and sorghum, and the main cash crops are groundnuts, cotton, gum arabic, and sugarcane (ITA, 2020). Senegal has a diverse environment, lying at an ecological boundary where tropical rainforests, oceanfront, and semiarid land converge leading to a wide variety of plant and animal life. However, since the country primarily falls in the drought-prone Sahel region with generally poor soils and irregular
rainfall, the country relies heavily on imports which account for approximately 70% of food needs (ITA, 2020).

4.2 Political Context

Senegal is one of the most stable countries in Africa and has been spared the violence convulsing the region. Nonetheless, it is surrounded by unstable neighboring countries, which risk fuelling instability. President Macky Sall has been in power since 2012 and was elected to his second five-year term in February 2019. President Sall’s economic program focuses on agriculture as an engine for growth and development and plans to invest $4 billion in the sector (ITA, 2020a). “The agricultural plan calls for massive investments in irrigation and rural roads, access to finance through the creation of a Guarantee Fund, the construction of storage facilities, the development of the fishing sector, and the creation of an agricultural stock exchange market” (ITA, 2020, para. 2). In addition, Senegal is a member of the Economic Community of West African States (ECOWAS), which aims to create a free trade zone with about 300 million people. In 2018, Senegal also signed the African Continental Free Trade Area Agreement (AfCFTA) – “this agreement is a step towards a continent-wide liberalized market for goods and services” (ITA, 2020b, para. 1).

4.3 Social Context

Senegal holds a rich cultural heritage with country symbols of the baobab tree and the lion (Britannica, 2021). It was once part of the ancient Ghana and Djolof kingdoms and was an important part of the trans-Saharan caravan routes. It came under French control in the late 19th century and remained a colony of France until 1960. Traditionally, Senegal was dependent on its famous ‘gierte chaff’ (groundnuts), but the government put efforts into diversifying its economy. About two-fifths of Senegal’s population is of the Wolof ethnic group, with other groups including the Fulani, Serer, the Diola, Bassari, and the Malinke. The Wolof ethnic group
is predominate in matters of commerce and state, and Wolof is the national language of Senegal (Britannica, 2021). Religion and religious beliefs play an integral part of everyday life in Senegal. Nearly 96% of the population is Muslim, most adhering to the Sufi brotherhoods of Tijanism, Mouridism, Qadiriyya, and Layenism. Christianity represents the other 5% of the population and is primarily found in the south of Senegal. Dakar is Senegal’s capital and is one of the most important economic and cultural harbors of West Africa (Britannica, 2021).

4.4 Women in Senegal

Women represent 52% of Senegal’s population and 40.5% of the labor force (World Bank, 2021). Senegal is seen as a leader in women’s political participation as women hold 43% of seats in parliament (UN WOMEN, 2021). However, there is still much to be done to achieve gender equality in Senegal, with 23% of women being married between the age of 15 and 18, and more than 40% of women between 15-24 years not in education, employment or training (UNFPA, 2021). Only 8% of women attend tertiary level school whereas 87% are enrolled in primary level and 49% in secondary level (UNFPA, 2021). Keeping girls in school is a significant challenge in Senegal, reasons including ongoing poverty and cultural norms. These cultural norms, such as early pregnancy and household jobs, have led to unequal access to education and opportunities. Women are also confronted with many barriers, such as their unequal access to land and land tenure, financial mechanisms, production inputs, and extension services and markets (UN WOMEN, 2021). Nonetheless, women remain the backbone of the Senegalese economy and contribute significantly to socio-economic growth, representing 70% of the agricultural workforce (UN WOMEN, 2021).

Formal and informal networks are important tools that foster empowerment in Senegal, particularly for women. Increasing women’s status and autonomy have been a focus for
Senegal since the 1970s. Leading and influential women associations were formed such as the
*Federation des Associations Feminines du Senegal* (FAFS) and the *Association des Femmes
Africaines pour la Recherche et le Developpement* (AFARD) (Kane & Kane, 2018).

The Senegalese government has also supported the promotion of women’s empowerment, and
in 1982, a government-sponsored program called *Promotion Feminine* was put in place
(Purkayastha & Subramaniam, 2004). Studies have shown that “group membership reinforces
the modernization impacts of receiving an education and living in an urban area” ”
(Purkayastha & Subramaniam, 2004, p.70). Women who are members of a women’s group are
significantly more likely than women who do not belong to a women’s group to believe they
should not be discriminated against and understand they should have equal rights to work
(Purkayastha & Subramaniam, 2004). Women’s groups significantly impact women, and these
groups vary from cooperative groups to income-generating groups and mutual saving and
credit groups.

Most women in Senegal are part of the informal saving and credit groups, called tontines. Tontines offer women rapid, flexible, and liquid cash and a sense of community and solidarity with other women. A study in 1991 found that 80% of women in urban areas were part of a tontine and at least 35% in rural areas (Purkayastha & Subramaniam, 2004). These systems are most commonly women-only based and rely on trust and personal acquaintances and relationships. Tontines are a solution to women’s lack of access to financial resources, and they are just one of the many ways women demonstrate resilience and powerful community engagement. These mutual credit groups offer resources and opportunities to women that they would not have otherwise. They foster women’s economic activities, and hence their empowerment.
Chapter 5: A Case Study on Fonio

5.1 Background of Fonio

Coming from the Wolof name foño, fonio is a West African ancient grain that dates back to 5000 BC (Cruz et al., 2016). There are two cultivated species of fonio, *Digitaria exilis*, known as white fonio, and *Digitaria iburua*, black fonio. *Digitaria exilis* grows in the most Western African countries and this paper will focus on white fonio.

Fonio is the world’s fastest maturing crop, is considered an NUS, and is rich in sulfur amino acids and gluten-free proteins. It contains methionine and cysteine -- two essential amino acids for human nutrition, but these are lacking in wheat, rice, corn, and sorghum (Jideani, 1990; Cruz et al., 2016). It grows on a range of soils, including drought-prone and nutrient-poor soils. It is an ally to food security and is well-adapted to climate change.

Locals widely enjoy the grain in West Africa. In recent years, fonio has been gaining popularity in Europe and North America due to increasing consumer preferences for healthy, organic, vegan, and fair trade products, and with the media calling it “the new quinoa” (Greenwald, 2020; Levy, 2020; Roberts, 2014). Fonio’s ascension to the spotlight was also accelerated by the famous Senegalese Chef, Pierre Thiam, who promotes the grain in his restaurants, cookbooks, and the newly founded Yolele Foods company. Currently, Yolele foods, Terra Ingredients and FaraFene are the three largest fonio-related organizations in North America. All three companies have a shared social mission of empowering the local smallholder farmers (FaraFene, 2021; Terra Ingredients, 2021; Yolélé, 2021). This important mission has not been observed during the global rise of other ‘superfoods.’
Fonio plays a vital role in West African culture: in the cosmogony of the Dogon people in Mali, to its important societal value to the Bassari in Senegal and the Coniagui in Guinea (Cruz et al., 2016). Fonio is often referred to as the “hungry rice,” a misconceived term originating from Europeans as they believed communities were growing it solely to feed themselves in times of hunger. However, it is considered exotic and widely enjoyed; it has a nutty and earthy flavor and is usually reserved for special occasions, for chiefs and royalty. It is also used as part of the traditional bride price, and some communities still use it in ancestor worship (The National Academic Press, 1996). Fonio is cultivated from Senegal to Lake Chad on an estimated 380,000 hectares for a production of around 250,000 tons with a yield average of 660 kg/ha (USAID, 2008). Fonio is above all the staple crop in the mountainous regions of Fouta-Djalon in Guinea (Cruz et al., 2016). Guinea produces 70% of fonio globally, compared to Senegal, which produces less than 20% (USAID, 2008). It is also grown in Mali, Cote d’Ivoire, Burkina Faso, Ghana, Togo, Benin, and Nigeria. In the 15th century, it was introduced to the Dominican Republic, the only country that grows it outside of Africa. The export market is dominated by Malian traders who have built small businesses and have become globally credible (USAID, 2008).

Fonio can grow on semi-arid soils, and requires very little water to grow; hence it uses less irrigation and creates less water waste (The National Academic Press, 1996). The grain is gluten-free, has a low glycemic index, and its nutritional benefits lie in its amino acid composition (Cruz et al., 2016). Fonio seeds are small and fragile and are of oblong shape: 1.5 to 2.0 mm in length and 1.0 mm or less in width. The husked grain contains about 8% protein and 1% fat. Compared to a whole-egg protein, the amino acids are high (except for the low 46% lysine), with 72 for isoleucine, 90-100 for valine, tryptophan, threonine, and phenylalanine, 127 for leucine, 175 for total sulfur, and 189% for methionine (Alercia, 2013).
Its fast-growing, highly nutritional, and drought-resistant characteristics make the grain an attractive and important crop for food security. Fonio’s harvest, threshing, post-harvest, and processing operations are mainly dominated by women and are difficult, painful, and timely activities using traditional farming methods (USAID, 2008).

5.2 Harvest, Threshing, and Post-Harvest Operations of Fonio:

The harvesting process of fonio is one area that must be mechanized if large-scale commercialization is to happen. Depending on the variety, the full cycle of fonio varies between 60 and 120 days. Although fonio is cultivated and processed mainly by women, the harvest and threshing are men-operated due to their labor intensity (USAID, 2008). Harvest is an exclusively manual task carried out with a sickle in the direction of the lodging. Generally, reaping requires essential know-how as the mature fonio plants are generally highly lodged, and the stems lie on the soil. The reapers must lift the stems before cutting them, assembled by women and children into piles of 1 – 3 kg (Cruz et al., 2016). It is stored on sheltered platforms and is left to dry for several weeks.

The drying process is an important operation in the conservation of fonio, and the dehulling of fonio cannot happen if the fonio is humid. Similar to the harvesting processes, threshing needs to be mechanized to be produced at a large scale and be commercialized. Threshing is done usually one or two weeks post-drying, and is carried out either in the field or at home. Threshing consists of separating the grains from the stems and can be carried out by village groups that work in rotation for the owners of the field or their family members. There must be a solid threshing floor set up, which is usually made of cow manure, cement, or mixtures of clay and is traditionally constructed with care to avoid contamination (USAID, 2008). The activity is
carried out with rigid rods or flexible sticks, commonly by the men or youth of the community. Once threshed, the straws are collected and often used for livestock feed.

The women are responsible for separating the impurities and good grains using winnowing baskets or sieves (Cruz et al., 2016). To ensure good preservation, the drying process of the grains, once again, is crucial. The grains must be dried in a storage area with a moisture content of 11% or less to prevent risks of alternation by mold. This is commonly carried out by spreading the grains on drying areas and left to be dried by the sun for several days. Natural sun-drying cannot always dry the grains efficiently during rainy seasons, which is a challenge for fonio farmers (Cruz et al., 2016). Like most cereals, fonio is stored in bulk. Similar to teff, it suffers from few pest infestations due to its small size. Before cooking, it must be hulled and sometimes whitened (Cruz et al., 2016).

5.3 Analysis of Fonio’s Commercialization in Senegal

In Senegal, fonio is a regional crop affiliated with the ethnic groups Bassari, Malinke, and Jolas and is predominantly cultivated in the Southern regions of Tambacounda, Kedougou, Sedhiou, and Kolda. The national promotion of fonio has been slow due to its zonal and ethnic affiliations coupled with its delicate harvest and difficult post-harvest activities, with a lack of appropriate technologies (USAID, 2008). Nevertheless, despite the little government attention given to the grain, fonio remains highly appreciated by the Senegalese population for its digestibility, taste, and nutritional qualities (Members of Chamber of Commerce, Personal Communication, 2021).

In Senegal, fonio producers start their harvest from the first rains which does not require in-depth soil preparation. Farmers still use traditional plowing farming techniques, which involve scraping the surface a few centimetres (about 10 cm deep) with the hoe or daba (Cruz et al.,
In large areas, farmers will use a plow that is hitched to oxen, and if possible, they will use tractors given the speed of the work compared to manual plowing. The commercialization of fonio in Senegal is recent, dating back to the 1990s when micro and small enterprises (MSEs) started to process fonio as a pre-cooked product. This was accelerated by the invention of the first fonio huller in 1993; yet, the production of added-value fonio products did not take off and most fonio is sold as semi-finished products, including fonio shelled, blanched unwashed, and blanched washed (USAID, 2008).

Fonio farming is dominated by smallholder farmers on small plots of land and the total area cultivated is still low in the country; however, it has grown rapidly since 2006. Between 2006 and 2007, 1450 hectares of fonio were grown versus an average of 4445 hectares between 2015 - 2020, with the majority cultivated in Sedhiou – 3689 hectares in 2019 and 4000 hectares in 2020. The production is still low, with only an approximate 3388 tons produced in 2019 (Members of Chamber of Commerce, Personal Communication, 2021).

Fonio farming is still characterized as subsistence agriculture and is individualistic. Hence, the area cultivated by each producer is quite small (between 0.3 and 0.45 ha for smallholder farmers, between 1 and 2 ha for medium farms, and 3 ha for larger farms). Women are the primary producers of fonio and they only cultivate in the smallest plots of land, ranging from 0.12 to 0.5 ha. They grow fonio alongside other crops such as rice, corn, and peanuts. Fonio is traditionally shelled and ground by tedious work using a pestle and mortar (Members of Chamber of Commerce, Personal Communication, 2021; USAID, 2008).

In most towns, the fonio markets are maintained by Women Producer Groups, who clean, process, and package it, and then sell it to the local markets and small stores. The main fonio
product marketed in Senegal is dried, precooked fonio. Fonio is enjoyed by the Senegalese population and is considered to have medicinal and healing properties. It holds great cultural significance, with many still believing the Dogon myth that the universe was created from a single grain of fonio. However, it is expensive ($1.8 p/500g) compared to other grains (rice $0.55 p/kg) and is not eaten regularly. It is commonly recommended for breastfeeding women and diabetics, and health care providers often recommend it to their patients. It plays an essential role in food security during national food shortages, and during times household food reserves are depleted (Members of Chamber of Commerce, Personal Communication, 2021; USAID, 2008).

There are typically two types of fonio producers in Senegal: “non-supervised” and “supervised” (USAID, 2008). The “non-supervised” are often women smallholders who cultivate fonio intended primarily for consumption and small quantities (1 – 5 kg) sold at the weekly market. They commonly sell the fonio husked or unwashed and bleached (USAID, 2008). However, when fonio is intended for consumption, the fonio is shelled, blanched, and washed before the women cook it. The “non-supervised” women produce about 49% of the local commercialized fonio. The other 51% of locally marketed fonio comes from “supervised” producers who are part of informal and formal women’s groups, often supported by capacity-building programs. The local producers form Groupement de Producteurs (GP) and Groupement de Transformatrices (GT), who group and have created networks amongst villages in Senegal. These local producters (GP and GT) have pooled their resources, and each has a president who will sign production contracts with potential companies (USAID, 2008).

There are increasing Non-Governmental Organizations (NGOs), projects, and programs (such as the USAID Wulu Nafaa program) to improve fonio’s value chain. They focus on value-
addition, strengthening the distribution and access to inputs, and improving the organization within the fonio sector. Capacity-building programs have helped women increase quality standards, and these “supervised” producers are more likely to sell their fonio to regional distribution companies located in Dakar (Members of Chamber of Commerce, Personal Communication, 2021; USAID, 2008).

Fonio’s local and global commercialization is still very recent, and because farmers still lack many of the needed inputs, these contracts are still rare and short lived. Nonetheless, these local producers are important networks for fonio farmers in Senegal and support women through improved bargaining power and market access. Recently, Terra Ingredients, a U.S. leading supplier of organic products, constructed the first fonio manufacturing plant in Dakar. The organization collaborated with the Peace Corps and the Chamber of Commerce in Sedhiou to improve local fonio producers’ empowerment through its sustainable commercialization. Terra Ingredients has distributed high-quality seeds to the farmers and plans to pursue a long-term partnership with a mission to use the profits to increase local capacities and build local manufacturing plants (Members of Chamber of Commerce, Personal Communication, 2021).

The main challenges faced by fonio producers are its labor intensity, limited processing plants, lack of certified seeds (the government provides very few), lack of producer cooperatives, and lack of organization and supervision within the sector. There is also a lack of Research and Development (R&D) in the cultivation process and little access to financial resources, particularly because women dominate the industry. According to the Chamber of Commerce in Sedhiou, the most pressing focus should be R&D into high-quality seeds, an increase in supply, and improved distribution of these certified seeds. In addition, there must be initiatives to involve the other regions in the cultivation of fonio because currently, only the South-Eastern
zone of the country partake in fonio production. Furthermore, the domestic population must be encouraged to increase their fonio consumption instead of the imported products such as rice. Finally, investments into appropriate harvest and post-harvest equipment must be invested to increase yields sustainably. There are many national opportunities for fonio’s cultivation because Senegal has suitable climate conditions and growing local demand for the product (Members of Chamber of Commerce, Personal Communication, 2021).
Chapter 6: Empowerment Framework

Fonio, once a subsistence crop, is gradually becoming commercialized in Senegal. However, this commercialization is very recent compared to quinoa and teff in the Andes and Ethiopia. Fonio’s commercialization was initiated to boost the cereal’s added value, generate wealth, and enable smallholder farmers to become economically independent (Cruz, 2007). As the grain increases in popularity, it is important to understand whether its commercialization will benefit the smallholder farmers and enable them to “make independent decisions and take action on these decisions to make changes in their lives” (Hennink et al., 2012, p.206).

With fonio’s commercialization being so recent and in the first stages, there is yet evidence of individual economic empowerment. Through the analysis of quinoa and teff, and adapted to Senegal’s socioeconomic and cultural context, the paper explores how the grain might foster economic empowerment for smallholder farmers following the Hennink et al. (2012) framework. Hennink et al. (2012) identified the mechanisms for individual empowerment as agency, knowledge, and enabling environment (opportunity structure). Because informal women’s groups dominate fonio’s production, this analysis focuses on women’s economic empowerment and whether cultivating fonio at a larger scale will benefit them. Therefore, the smallholder farmers, in this case, are considered as predominately smallholder women farmers. It is valuable to understand the role of women’s networks in Senegal and their role in fostering empowerment.

Following Hennink et al. (2012) framework, the paper looks at self-identity, decision-making capacity, and ability to effect change as the components that comprise agency.

(i) Self-identity: The development of quinoa and teff demonstrated that increased production and prices in the grains resulted in increased productivity. An improved farmers’
sense of accomplishment, self-efficacy, and self-identity followed the increase in productivity (FAO, 2013; Stevens, 2017). Moving from subsistence farming to the commercial farming of fonio offers opportunities for women to combine their cultural and traditional know-how with modern knowledge. With this combined knowledge, fonio productivity will increase, fostering smallholder farmers’ sense of self-identity, through their recognition of their potential.

(ii) **Decision-making capacity:** Studies show that women might not want total independence from men; however, they want to have more significant roles in decision-making. Women want to make choices and decide how to spend their incomes (Purkayastha & Subramaniam, 2004). As women earn an income through the commercialization of fonio, this increase in autonomy can result in greater opportunities to have a say in the decision-making of their families and communities. For example, improved decision-making was seen during quinoa’s commercialization, as incomes increased by 22% (Ehlers, 2021).

(iii) **Ability to effect change:** Large-scale cultivation of fonio offers great promise for future climate-smart agricultural development. Women tend to be more sensitive and proactive in development initiatives. Therefore, if women are the first movers in the sustainable commercialization of fonio, there is high evidence that they will share the new cultivation practices with the community and effect community-wide change (UN WOMEN, 2021). Additionally, when women’s income increases and they can contribute more to the household, their authority and power increase. According to the FAO (2013), since the quinoa boom, 81% of farmers’ interviewed in Bolivia said that quinoa has been their primary source of income and has increased their access to credit. An increase in authority, finances, and power can lead to a stronger ability to effect change: this has been seen in the Andes and Ethiopia (Bachewe et al., 2019; FAO, 2013). Similarly, an improved ability to effect change has also been seen for women who participate in MSEs in Senegal and elsewhere in West Africa (Purkayastha & Subramaniam, 2004). The quinoa boom also showed that an increase in farmers’ income
offered new access to previously inaccessible foods like fruit and vegetables, leading to more food secure, varied diets (FAO, 2013). Through the commercialization of fonio, women can have increased access to nutritional foods and an enhanced ability to change their households’ and communities’ diets.

Furthermore, formal and informal networks have the opportunity to increase women’s status and enable them to exercise rights as citizens. They create linkages among women across different ethnic groups and classes (Purkayastha & Subramaniam, 2004). Officializing women’s groups in Senegal and creating links between fonio producers can foster women’s sense of self-identity, decision-making capacity, and ability to effect change, and therefore empower their sense of agency.

This sense of agency is only valuable for women if they have the appropriate knowledge to make informed decisions and have the self-confidence “to recognize problems, understand potential solutions and identify sources for assistance” (Hennink et al., 2012, p.206). Women’s education drop out-rate in Senegal remains high, giving most rural women little access to the education and knowledge they need (UN WOMEN, 2021). The formation of women’s groups has offered women opportunities to publicly formulate their demands, improve their access to equal rights and improve their living conditions (Kane & Kane, 2018). Being a member of a fonio producer group similarly can encourage women to knowledge-share between themselves.

The commercialization of indigenous grains will provide farmers with new knowledge in mechanization and improved farming techniques; however, it might incentivize the farmers to forget their traditional farming methods. Quinoa’s commercialization taught us that it is
important for the farmer groups to continue to share and use their traditional farming knowledge and techniques for its production to conserve the agrobiodiversity and genetic diversity of the land and grains. A significant challenge in the Andes is that the rapid quinoa intensification has decreased the knowledge in traditional techniques and seed varieties (FAO, 2013). However, an increase in commercialization may also lead to families choosing to spend more on non-farm education for their households. Studies show that teff producers spend significantly more on education and healthcare than farmers with lower commercialization levels (Gebreselassie & Sharp, 2007). Higher levels of educated farmers and household members can offer new non-farm opportunities and generate creative ideas for fonio value-added products. Fonio’s commercialization can foster an ability to make more informed decisions; however, this must be balanced with traditional farming techniques and knowledge.

The third mechanism identified for individual empowerment is an enabling environment of social norms and institutional structures (Hennink et al., 2012). As seen in the Women in Senegal portion of this paper, there is still much to be done to achieve gender equity in Senegal. Also there is still a lack of an enabling environment for women to reach their full potential. With child marriage and youth pregnancy still prevalent, there is a high dropout rate after primary school (38%) and secondary school (41%), and women are solely responsible for household chores and activities (UNFPA, 2021). Women have shown resilience by forming women’s groups to have informal access to financial resources and know-how, otherwise unavailable to them. Stevens (2015) argues that women who are in cooperatives have higher levels of empowerment as these offer an enabling environment through the provision and access to resources for production. Quinoa is predominantly produced by men in Peru, with women representing 31% of agricultural labor (ILO, 2017). Therefore, most quinoa producers were met with a more enabling environment than women producers in Ethiopia and Senegal,
allowing for higher immediate levels of empowerment for quinoa farmers. That being said, when the quinoa boom happened, women who would have been doing unpaid caregiving and household jobs were now offered employment on the farms. Therefore, this afforded women improved chances to increase their autonomy and incomes.

In Senegal, institutional policies are still lacking to foster women’s empowerment, particularly when it comes to land tenure. Although the Senegalese government states that men and women should have equal control and ownership of land, land governance is highly decentralized. The decisions are made at the local level by village chiefs. These are in line with traditional and customary practices where women rarely inherit land (Pronat, 2018). Teff producers in Ethiopia are also predominantly women who are not met with high opportunity structures as the country still faces deficient levels of gender equity (UN WOMEN, 2013).

Gender equity is at the forefront of the SDGs and the Senegalese government promotes women’s rights and the commercialization of fonio offers opportunities for women through increased incomes, autonomy, and individual empowerment. However, the current institutional policies and traditional thinking need to be addressed. Improved opportunity structures will directly impact women’s agency and knowledge, and as women’s agency and knowledge increase, local authorities and national governments will be under increased pressure to further improve policies that foster women’s empowerment. Fonio producers’ empowerment can be drastically increased through a more enabling environment.
Chapter 7: Implications and Conclusions

7.1 Implications for Policy, Theory, and Practice

Until recently, fonio has received scant attention from international or local policymakers and development agencies. As its popularity increases, its local and global commercialization must happen sustainably with support from public and private institutions. Globalization can offer great opportunities for economic growth and development. However, it is multifaceted and complex, and the outcomes are heavily influenced by national policies (Pinstrup-Andersen & Watson, 2011). Nevertheless, the sustainable development of fonio’s value chain is possible, and below are three primary areas of intervention recommended for policy and decision-makers:

(1) Increasing the domestic market of fonio. The demand for fonio in Senegal remains low because of its high price and consumer preferences for other staple crops, particularly rice. Fonio’s rich cultural significance offers promising opportunities to promote the grain in the domestic market. That being said, fonio’s ethnic affiliations is a challenge. In order for domestic consumption to increase, there must be an increase in demand from the Wolof ethnic group, which make up the majority of the country’s population. Grassroots initiatives promoting the grain locally by local leaders and local influencers is one solution to address this challenge. Additionally, recommended areas of intervention include an increase in public meal programs, extension programs (educating communities about fonio’s health benefits), and improved roads to enable market access. Finally, as urbanization increases and people become more affluent, this will also generate demand for higher value, processed fonio products. This will require policies to support modern processing plants for higher quality fonio products and policies to support a modern retail environment.

(2) Efforts to increase productivity: Fonio in Senegal is predominantly grown for household consumption and minimal sales at the local market. This low productivity is a result
of farmers’ lack of improved and high-quality seeds and mechanization. Fonio production in Senegal also lacks R&D and effective extension services. Productivity can be increased through i) investments into fonio’s research and extension, ii) improved market institutions and infrastructure, and iii) grassroots local initiatives.

i) Investments into effective extension services, improved seeds, and affordable, modern multipurpose machinery is necessary. Improved fonio farming can have incredible impacts on reducing land degradation and desertification; therefore, governments must incentivize smallholder farmers to produce fonio. An increase in investment into research and extension can improve the adoption rates for high-performing seed varieties, increasing yield growth and delivering large payoffs for farmers. Additionally, monitoring and evaluation of the uptake of these new technologies can facilitate in fine-tuning future extension packages. However, making the better inputs widely available and getting smallholder farmers to adopt them requires adequate access to these.

Therefore, ii) improvements in market institutions and infrastructure are also necessary. Public and private institutions need to channel information about markets, prices, and goods to the most rural people; this includes public investments in roads, connectivity, and financial services (Pinstrup-Andersen & Watson, 2011). These are all essential parts of agricultural production. In Ethiopia, the use of mobile phones and improved roads has increased access to information and markets. This has increased teff productivity (Bachewe et al., 2019). Currently, Senegal uses a mobile money technology company called Orange Money, which has recently launched Orange Bank Africa to foster financial inclusion. However, microcredit and private microfinance institutions cannot tackle the financial barriers faced by smallholder farmers alone, and this is where government policies must support.

iii) Changes at the grassroots level can improve the productivity of fonio producers. For example, Senegalese law states that women are owed equal land rights; however, these
equal rights are often not enforced at the local level, because of traditional and customary practices where women rarely inherit land. The national government can invest in grassroots initiatives such as educational programs for the local leaders, and ‘training of trainers’ programs. These initiatives can ensue better defined and enforced property and land rights at the local level. Refined land and property rights can result in increased credit, accountability, and productivity for women.

(3) Efforts to protect smallholders’ benefits: If fonio receives international hype, leading to a sharp increase in production and prices, there must be national policies put in place to protect the smallholder farmers. The Ethiopian government placed the teff export ban to insulate domestic prices from the global price fluctuations. Studies show that the ban has kept the prices of teff affordable for the consumers; however, as the ban is being lifted, the increase in prices might not reach the producers due to the immature distribution systems (Sankaranarayanan et al., 2020; Gebreselassie & Sharp, 2007). The teff-export ban was significant for Ethiopian consumers because teff is their staple food. Because fonio is not a staple, there is less risk in consumers not being able to afford the grain if prices increase.

Smallholder farmers in the Andes were not protected from the rapid globalization of quinoa because of a lack of institutional structures protecting the genetic rights of the grain. As the quinoa boom happened, the high prices resulted in highly skilled competitors producing quinoa in Peru, Bolivia, and non-Andean countries. Although the Andean farmers initially benefitted from the high prices, they received no benefits as they shared the grain with the rest of the world. In Senegal, there must be policies in place that protect the intellectual property of fonio and that ensure traceability of genetic resources. One way to ensure traceability and transparency is through the adoption of the digital record-keeping technology, blockchain. Blockchain is a decentralized and distributed digital ledger that records transactions among
multiple parties in a tamperproof way and it “can greatly improve supply chains by enabling faster and more cost-efficient delivery of products, enhancing products’ traceability, improving coordination between partners, and adding access to financing” (Gaur & Gaiha, 2020, para 1). This will permit fonio farmers to still reap benefits from the grain while they share it with the rest of the world.

From a theoretical perspective, women’s economic empowerment can be drastically increased through initiatives focused on creating a more enabling environment for fonio smallholder farmers. This empowerment analysis focused on *individual economic empowerment*. However, since all domains and mechanisms of the framework are closely interconnected and interdependent, the lack of empowerment in one domain can disrupt empowerment in a different domain. Therefore, although this paper focuses on the economical domain, development agencies or policymakers working on the commercialization of fonio should consider working with various organizations on empowerment initiatives that effect change across all domains (health, political, natural resources, spiritual, and economical).

Women’s empowerment is key to achieving sustainable economic growth and development and is at the heart of the 2030 Agenda for Sustainable Development. Economies grow as women become empowered: they boost productivity, increase income equality and increase economic diversification (UN WOMEN, 2021). However, there remain high levels of income inequality, particularly in developing countries: women contribute 2.5 times more to unpaid domestic work and care than men and are more likely to be self-employed than men (UN WOMEN, 2021). In agriculture, planting, weeding, collecting water, applying fertilizers, harvesting, processing, transporting, and marketing food products are dominated by women, whereas men are deemed responsible for threshing and raising large livestock. Improved
production methods and increased gender equity will reduce women’s time spent on their paid and unpaid activities and relax their time constraints. An enabling environment will have direct impacts on women’s sense of agency and knowledge. Therefore, it can be argued that through a more enabling environment, the commercialization of fonio can foster overall growth and development for the local communities.

From a practical perspective, evidence shows that smallholder farmers’ economic empowerment and reduced poverty are directly linked to increased agricultural productivity (Pinstrup-Andersen & Watson, 2011). In the case of fonio, its value chain in Senegal is gradually developing and shows a lot of promise for food security, climate change, and smallholder empowerment. This local and indigenous grain requires less input for farmers and is already adapted to grow in the Sahel soils. However, because of its current small yields, the cost remains high and the process complex. The production of fonio needs improvements at all levels of its value chain. Input distribution channels must be improved, producers need supportive policies to reduce the labor intensity of fonio’s production, extension services and shared information must increase, fonio production must expand to other parts of the country, and more attention must be given to its value-addition. There are very few processing plants or initiatives promoting the processing of fonio within Senegal. All added value, which is currently limited to cleaning and packaging, is done manually by women. This time-consuming process often results in sand residue in the pre-cooked fonio packages, which are more than double the price of 1 kg of rice. There are numerous opportunities for value added products, such as flours, breads, cereals and snacks. As the grain globalizes, there should be a balance between the new farming techniques and traditional practices so that the social integrity, cultural and ecological biodiversity of local communities are not threatened.
6.2 Conclusions

Agriculture employs 75% of the population, representing only 15% of the GDP, and is the predominant source of income and industry for the poorest in Senegal (ITA, 2020). Improved agricultural productivity should be at the forefront of Senegal’s policies; the sustainable development of fonio can foster employment and national economic growth. Fonio’s commercialization offers promising opportunities to address the youth bulge, empower women, and improve food security. Senegal also provides significant trade opportunities for fonio. It is one of the fastest-growing economies in SSA, has the most important economic harbor of West Africa, and has a stable political environment.

The analyses of quinoa and teff demonstrate the crucial role of an enabling environment and supportive institutional policies regarding the local and global commercialization of indigenous crops. Since fonio is not a staple crop in Senegal, its globalization offers less risk of adversely impacting consumers. Nonetheless, there needs to be interaction between national policies and globalization to ensure a sustainable distribution of benefits to smallholder farmers. The Senegalese government has promoted economic development reforms and women’s empowerment programs in the past, and increasing fonio’s productivity is directly linked to improving women’s economic empowerment, as it is a women-dominated industry. Women encourage higher levels of sustainable and climate-smart activities, and therefore their economic empowerment can foster community-wide improvements.

Additionally, higher income levels, agency, and knowledge can result in healthier food choices and more diversified diets. Fonio is a climate-resistant, highly nutritional grain; however, as long as fonio yields are low, policymakers won’t feel encouraged to invest in the grain to ensure food security in Senegal and globally. Interventions in research and extension services,
grassroots initiatives, infrastructure investments, and public-private partnerships are necessary to foster fonio’s sustainable commercialization.

This paper sought to provide an understanding of the ancient grain, and new ‘superfood,’ fonio. It demonstrated how a sustainable development of its value chain can foster women’s empowerment and increase food security. Fonio’s value chain is still young and there is abundant room for improvements, investments, and potential.
References


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