Magic Seed: The Case Study of Circle of Friends in Action--A Facilitative Agricultural Cooperative

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Abstract

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The "Scramble for Africa" in 1885 had devastating effects in Sub-Saharan Arica (SSA). The near complete colonization of the entire African continent facilitated the suppression of culture, education, and economy and the theft of natural resources. As a result, Africa ended the 20th century underdeveloped. A major effect of underdevelopment in SSA is chronic food insecurity for its citizens. In this thesis post-colonial theory is used as a guide to explore the underpinning reasons for underdevelopment and the current state of food insecurity in SSA. The thesis begins with an unpacking of the socio-historical background of colonialism and how it led to underdevelopment and food insecurity in SSA. The thesis then discusses improving agricultural production and agricultural cooperatives as methods of improving crop yields and income and thereby reducing food insecurity. Finally, the thesis delves into the case study of Circle of Friends in Action (COFIA), a non-profit operating in Tacoma, WA, which demonstrates through their facilitative agricultural cooperative, that teaching agricultural best practices to a community facilitates increased food security and improved educational outcomes. COFIA has been in

operation since 2010 and began by sponsoring educational and welfare programs at St. Jude Primary school in Rubongi Village, Tororo Town, Uganda. Since then, COFIA has evolved into a facilitative agricultural cooperative that has developed a successful model for improving crop yields and generating income and subsequently reducing food insecurity and improving the lives of the residents of Tororo Town, Uganda.

Keywords: sub-Saharan Africa, food insecurity, poverty, agricultural intensification, agricultural cooperatives, non-profit

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For my Grandfather Wendell McCain

My role model as a person and as an academic…

A perch too lofty for my wings

STATEMENT OF THE PROBLEM

Food insecurity is a common fact for many poor, rural citizens in Africa who rely on subsistence farming for survival (Sibhatu & Qaim, 2017). In fact, according to the Economic Research Service (2020), 41% (425 million) of the people of Sub-Saharan Africa (SSA) are food insecure. Food insecurity can be described as an exclusion from food, the inability to pay for food, and not having access to land for growing crops (Chilton & Rose, 2009; D'Haese et al., 2013). This phenomenon is not a recent event; contemporary food insecurity in Africa began hundreds of years ago in the ideals of the Enlightenment and the subsequent underdevelopment of Africa brought on by colonialism (Irogbe, 2014; Mlambo, 2006). When Europe colonized Africa they confiscated natural and human resources, suppressed culture and economy, divided tribes and families, and withheld education (Grundy, 1966). Colonialism has had devastating, long lasting effects on the continent, even after independence from Europe was achieved in the 1960s. Since independence, many countries have continued to struggle with the formation of stable governments, settling civil disputes peacefully, forming unified national identities, and revitalizing their economies (Hoepli, 1973). Beyond colonialism and underdevelopment several other factors have led to food insecurity, such as overworked soil, drought, climate change, and rapid population growth (Anderson, 1994; Paarlberg, 1999). It is because of the summation of the above stated reasons that food insecurity is a harsh reality for millions of rural smallholder farmers in Africa.

Thus, ethical and moral concerns stipulate that research be continued monotonically so as to illuminate and refine which are the most sustainable and effective methods for alleviating food insecurity for rural African smallholder farmers. To that end this thesis is an examination of the various methods for alleviating food insecurity and the reasons thereof. This examination will be

conducted using post-colonial theory as the theoretical framework. Post-colonial theory focuses on the examination of food insecurity in sub-Saharan Africa (SSA) by analyzing the relevant literature that pertains to the economics, politics, and culture of SSA and the history of these concepts and how they are dictated and displayed to the world by the cultural hegemony of European colonial powers (Purdue OWL, 2021). Further, post-colonial theory is concerned with the production, interpretation, and evaluation of the concepts and assumptions that describe non-European peoples (Kohn & Reddy, 2017).

To begin the thesis Chapter One will review the sociohistorical context that surrounds food insecurity in sub-Saharan Africa. Interwoven within the sociohistorical review will be a glimpse into the state of agriculture in SSA prior to, during, and after colonization. The sociohistorical review will be concluded with an elaboration on the current state of agriculture and food insecurity in SSA. Next, Chapter Two will discuss the various agricultural methods for alleviating food insecurity. The primary focus of Chapter Two is the discussion of how to improve agricultural production for smallholder farmers. Such methods for improvement involve agricultural intensification, technology adoption, conservation agriculture, and climate-smart agriculture. Chapter Two will also discuss the importance of agricultural cooperatives and how they can positively affect the life of a smallholder farmer in rural SSA. Finally, Chapter Three is an in-depth case study of Circle of Friends in Action (COFIA). COFIA is a non-governmental organization (NGO) based in Tacoma, WA that serves to promote education and women's rights by alleviating poverty and food insecurity in rural villages of Uganda.

By establishing the sociohistorical background of underdevelopment and food insecurity in SSA using post-colonial theory, examining the various methods and strategies for alleviating food insecurity, and providing a case study of an agricultural cooperative currently operating in

Uganda, the ultimate purpose of this paper can be realized. That purpose is to reveal and highlight effective methods for alleviating poverty and food insecurity for the poor rural African smallholder farmer.

Of final note, this thesis is not strictly for the purpose of qualitative research but is a humanistic endeavor as well. It is the aspiration of the author to bring to light the plight of the poor rural African smallholder farmer, who relies solely on subsistence farming for survival, while simultaneously inspiring all who read this to genuinely empathize with those who toil daily and endlessly in fields growing crops to feed their families and yet still go to bed hungry.

Chapter One:

Historical context of food insecurity in sub-Saharan Africa

Chapter One serves the purpose of underscoring the state of the economy and agriculture in Africa as it was prior to colonialism (the years leading up to 1885). To emphasize the socio-historical state of Africa prior to colonialism Chapter One covers such topics as the pre-colonial state of the economy and agriculture, colonial policies towards the economy and agriculture, modern day impacts of underdevelopment on agriculture, and understanding contemporary food insecurity and the measurements of poverty in rural SSA. It is important to establish the socio-historical baseline of the African economy and state of agriculture prior to colonialism to support the case of African underdevelopment, as African underdevelopment in turn reinforces the reasons for chronic food insecurity in contemporary sub-Saharan Africa. Viewing the pre-colonial history of Africa, colonialism, and underdevelopment through a post-colonial theoretical framework is crucial for establishing legitimacy and empathy. It is this empathy that provides the inspiration to desire the alleviation of food insecurity in rural SSA and the motivation to act on it.

Pre-colonial state of economy and agriculture

It is no surprise in the postmodern world, which allows for the retrospection of history through a critical lens, that colonialism was highly detrimental to the continent of Africa. This is obviously and unanimously unfortunate because, as Wallerstein (1970) explains, prior to colonialism, between the years 1500 and 1885 (many scholars delineate 1885 as the beginning of colonialism in Africa to coincide with date of the Berlin Conference), Africa was thriving. During this time Africa was undergoing its own form of evolution and expansion, as well as experiencing social and technical modernization. According to Wallerstein (1970) there were four distinct features of

Africa prior to colonization. First, the continent was actively consolidating territory. Concurrently, an increasingly centralized bureaucracy was being formed in regions across the continent. This bureaucracy would encompass political coverage for a vast number of citizens, beyond kinship and tribes. Further, the continent was also beginning to have specialized production. This burgeoning manufacturing sector produced goods for use at home and for export abroad. The emergence of manufacturing was spawning a professional trading class that was contributing to the proliferation of evolving technologies, which included new inventions as well as borrowing and improving on old ideas (Wallerstein, 1970). Second, prior to colonization the slave trade occurred. Nation-states that participated were economically strengthened. As a byproduct of the practice a coastal trading class of middlemen developed that relied heavily, as part of their business model, on slave labor. As part of the Atlantic slave trade, slaves were not only bound for the Americas but were also enslaved to the rulers of African countries and colonies. For instance, in 1914, French surveys concluded that approximately 30% of the population of West Africa were slaves (Austin, 2009). Slavery was an important component of the burgeoning cash crop niche, which required vast amounts of human capital. Cash crops produced for export included, but were not limited to, tea, cotton, coffee, and tobacco (Ligate, 2016). Third, during the period just prior to colonization (1870-1885), the abolishment of the slave-trade was sweeping the continent. The abolishment of slavery in colonial Africa was realized and enforced mainly by Great Britain. Although, Great Britain's policy of abolition should not be seen as wholly benevolent, as colonial bureaucrats would use abolition as a political strategy for undercutting indigenous African chiefs' and noblemen's resistance against the colonial government (Austin, 2009). By 1930 slavery had essentially disappeared from the African continent (Austin, 2009). Further, according to Wallerstein (1970), the gradual

abolishment of slavery had many lasting effects, both in Africa and around the world. The most important effect was that humans were no longer subjected to slavery. As a result, a decline in trade and profits was deeply felt amongst those dependent on slave labor to run a business. Many operations, owned by Europeans and operating in Africa, failed due to the lack of manpower and profits. Denmark and Holland abandoned their colonies almost immediately upon the abolishment of slavery.

The final feature of Africa prior to colonialism, as elaborated by Wallerstein (1970), was that Great Britain became highly involved in cash crop agriculture. These highly sought-after cash crops, produced by indigenous African farmers, were needed to satisfy the appetites for such products by the growing population of the British middle class, which proliferated because of the industrial revolution. However, Britain's appetite for cash crops impacted the subsistence farmers' ability to provide food and income for themselves and their families by diverting resources away from themselves and towards colonial interests.

African agriculture prior to colonialism

Prior to the colonial period in Africa most rural citizens relied on subsistence farming (Logan, 2016; Tosh, 1980). As noted by Ligate (2016) there was evidence of terraced landscapes and rice production in West Africa. Further, there was intensive maize and cassava production using manure, irrigation, and other mixed methods. These methods were considered, at the time, advanced methods of agricultural production, which were brought to the continent by the Portuguese in as early as 1512 (Ligate, 2016). Further, to protect themselves against food insecurity during lean times, rural subsistence farmers practiced a "moral economy" (Logan,

2016). This moral economy was a preventative measure, a sort of pre-capitalist insurance where food and household items were shared and re-distributed during times of need (Logan, 2016).

But beyond what was just discussed, the literature that delves into the state of agriculture in pre-colonial Africa is limited (Logan, 2016, Tosh, 1980). Hannaford (2018) states that due to the relative absence of academic analysis surrounding pre-colonial agriculture in Africa (due to the sparseness of written history as most history at the time was passed between the generations through story) any academic analysis that was completed, based on the limited historical resources, tended to lump all geographical regions and peoples together. This lumping of geographical regions and peoples thus distorted the true nature of the abundant and distinct agricultural styles of the many and varied regions of the continent. But in the end, regarding pre-colonial agriculture in Africa, there is consensus among scholars that subsistence farming was the prevalent system of agriculture which ensured food security for rural citizens.

Colonial policies toward economy and agriculture

A specific chain of events, beginning in the Renaissance and continuing through the Enlightenment, explains Mlambo (2006), led to the industrial revolution in Europe and eventually the colonization of practically every country in SSA (only Liberia and Ethiopia remained independent) (Wallerstein, 1970, as cited by Mogolakwe, 2006). According to Young (2004) the bulk of the colonization of SSA occurred during the late Imperialist period (late 19th century) and with great speed. Furthermore, the Renaissance in western Europe was responsible for vast changes amongst the political and management ideologies of its citizens. In the mind of Mlambo (2006), these changes in political and management ideologies were rampant during the Enlightenment and the effects rippled out amongst the rest of the world. These new ideas were

the beginning of the globalization of society which acted as a gravitational force pulling the rest of the world into a new industrial, capitalist economy (Mlambo, 2006). Specifically, Great Britain, in the process of becoming an industrial giant, realized that it did not possess the ability to be completely self-sustaining. Sacks (2012) states that to provide the basic needs of its expanding citizenry, Great Britain needed to find a new source of natural resources and a foreign market with which to trade goods. These reasons were the catalyst for Great Britain developing an imperialist mindset towards Africa.

The Scramble for Africa

Nearing the end of the 19th century there was a blossoming, yet antagonistic, relationship between the African continent and Great Britain. This relationship was comprised of state authorized traders, on both sides, that were closely linked to the bureaucrats of their respective governments (Wallerstein, 1970). However, this trading system between the two distant, foreign lands eventually failed. The collapse of the trading relationship offered the opportunity for other European countries, such as France and Germany, to step in and plunder Africa for its natural resources to power their own industrial revolutions. Great Britain, wanting to maintain its industrial dominance the world over, felt they too must engage with Africa, now in a colonialist manner, to access and secure Africa's abundant natural resources. Thus, as both Wallerstein (1970) and Mogalakwe (2000) agree, any chance of a mutual relationship ended with the Berlin Conference, which occurred in 1885 in London. Gjerso (2015) explains that the Berlin Conference, or the "Scramble for Africa," divided the continent into territories for European control and, as an eventual result, subjugated millions of indigenous peoples to colonial rule. Western Europe, with their imposition of colonialism upon the near entirety of SSA, caused a

tsunami of social transformation that was highly injurious to the welfare of the indigenous population. Long lived social and political policies, Gjerso (2015) believes, were altered, or removed, uprooting the centuries old way of life for millions of indigenous people. Further, the fragmentation of pre-colonial boundaries was equally as detrimental as policy shifts. Blanton et al. (2001) notes that when colonial boundaries were established at the Berlin Conference, little or no consideration was given to the ethnic and tribal diversity of the indigenous populations' customs, values, or social space. Boundaries were redrawn to suit political needs and cultures were suppressed to maintain social control. The change for the indigenous population was quick and drastic and ethnic conflict ensued.

Blanton et al. (2001) continues by clarifying that these fragmented boundaries and ethnic conflicts, along with a lack of industry and manufacturing, erratic governments, and an economic vacuum, were all factors that contributed to political instability and underdevelopment during the colonial period and through to independence. As precisely noted by Gjerso (2015) and Ekeh (1980), even though some new economies were introduced during colonialism, such as the palm oil and coffee trade businesses, they never had the best interest of the rural subsistence farmer at heart and thus those that needed the crops and income the most never truly benefited. These lucrative cash crop farms were usually reserved for colonial settlers or the African elite (Mbapndah, 1994), although some at the time, such as the Marxist Lenin, argued that colonialism would improve the economic situation and general welfare of African citizens (Heldrig & Robinson, 2012).

This state of colonialism with its imperialistic economic tendencies created a situation in which SSA became a colonial capitalist economy dependent on foreign economies, which in fact did not create a better situation for the indigenous population. This unfair economic and trade

relationship between SSA and the developed world can be attributed to five factors: 1) African countries becoming unstable and non-hegemonic, 2) the creation of a decadent, dependent, and unproductive class of citizens, 3) dependance on a narrow range of exports (cash crops), 4) dependance on foreign aid to develop projects, and 5) peripheralization in relation to world capitalism and the thus the near total loss of political influence on the world stage (Ifeanacho et al., 2010).

The colonial era in Africa

The height of European colonial rule in Africa was between the years 1885 and 1960 (Ekeh, 1980). During this time, Great Britain, wanting to seize economic control of Africa, strategically and willfully organized nearly fifty colonies across SSA. Almost immediately the indigenous populations within these colonies were subjected to a central administration, which exercised political authority, and the formulation and implementation of colonial policy. Policy ordered that the African manufacturing economy be retooled to produce goods for an international market (Wallerstein, 1970). Similarly, raw materials were extracted from the continent and shipped to Europe where those raw materials were manufactured into goods for use by the European population, thus expanding Europe's economy (Irogbe, 2014).

Additionally, new agricultural policies dictated that productive farmland be reallocated from indigenous farmers to settler colonies (Beinart, 1989; Frankema et al., 2016). Likewise, many subsistence farmers were forced to repurpose land that was previously allocated to growing food to feed their families to growing cash crops to generate income so that they could pay head taxes to the colonial authorities (Ligate, 2016). Many men, to pay these head taxes, had

to abandon agriculture altogether so that they could work in mines to generate the income needed to pay their tax bill (Ligate, 2016).

Prior to and during early colonialism most rural Africans were subsistence farmers that grew crops for food and as a result sustained a high level of food security (Tosh, 1980). In 1959 Uganda was a country of nearly 8 million people, but the country's largest urban center and capital, Kampala, only had a population of ~92,000, a mere 1.2% of the total population (de Hass, 2017). This means that nearly 7.9 million citizens were spread about the entire rural countryside engaging in subsistence farming. Subsistence farming had provided adequate sustenance for rural families leading up to the period of colonialism but coinciding with the decline of slavery and the onset of colonial rule (around 1885) cash crop agriculture, which up until then was still in its infancy, began to flourish and intrude on subsistence farming (Austin, 2009). As Logan (2016) states, food insecurity is an event of circumstances and not a situation that always existed.

Agriculture during colonial rule

Cash crop agriculture prospered because of the newly formed European middle class, born of the Industrial Revolution, which had disposable income to afford imports that previously were a luxury only the social elite could afford. These crops included palm oil, groundnuts, coffee, bananas, tea, sugar, and cocoa (Ligate, 2016). Blanton et al. (2001) and Frankema et al. (2016) note that to feed this demand, colonial governments formed policies that forced indigenous farmers to produce cash crops through the enforcement of "head taxes" and outright mandates. Thus, the common agricultural practice of subsistence farming was eventually overtaken by the peasant-export economy (de Hass, 2017).

In the peasant-export economy urbanization was low, there were limited expatriates as landowners, and colonial revenues were dependent on the production of export crops (Austin, 2009; de Hass, 2017). This system kept African citizens as rural cash crop farmers, dedicating a large portion of their time and land to the production of export crops all the while relinquishing most of their profits to the colonial government via taxes. Thus, leaving little time, land, and capital for the indigenous subsistence farmers to provide adequate food and income for themselves and their families. Further, to meet the demand of new settler colonies, the colonial authorities redistributed portions of indigenous peasant farmers' productive land to newly established settler colonies (Frankema et al., 2016).

However, some subsistence farmers were able to operate under what de Hass (2017) described as partial commercialization. A prime example of this type of partial commercialization was centered around banana growing operations. Bananas were less labor and capital intensive than other cash crops (Mbapndah, 1994). This arrangement allowed peasant farmers to seek other income generating activities on the side to fill the gap left by the reduction in subsistence farming (de Hass, 2017).

Colonial agricultural policies reassessed

Around 1930 British colonial policy took a more intimate turn towards agricultural sustainability and assessing productive capacity into the future. The Colonial Office in London began to revisit its agricultural policies in east Africa with an eye on planning for the future. This concern was brought on by four crucial events occurring around the world: 1) the dust bowl in America, 2) widespread drought, 3) the global economic depression, and 4) population growth in developed countries (Anderson, 1984). The global depression affected both African economies and settler

economies alike. Thus, the Colonial Office then focused on measuring and establishing the productive capacity of African arable land and the preservation of natural resources, most importantly conservation of the highly fertile soil (Anderson, 1984).

Soil conservation in SSA

Colonial governments, to supply the luxurious cash crops desired by their citizenry at home, were overusing the once fertile soils of SSA. By the 1940s it was highly apparent to the Colonial Office and most African governments, both indigenous and colonial, that soil conservation was the direst issue facing agricultural production and the ability to meet food demands and cash crop production (Stocking, 1985). Soil erosion was a pressing problem for colonial governments, that had to be solved so that they could continue the extraction of natural resources at the scale they had become accustomed to.

Soil erosion, if left unabated, could have numerous detrimental effects on smallholder farmers and their food security. However, the colonial governments had an ulterior motive for addressing soil erosion, namely the desire to keep up the production and export of cash crops (Anderson, 1984). Soil conservation began in earnest in 1948 when the Inter-African Conference was held in the Congo to discuss soil conservation in SSA. This conference was then followed by the 1950 Inter-Governmental Commission for Technical Cooperation in London (consisting of the colonial governments of Belgium, France, Britain, Portugal, Southern Rhodesia, and South Africa). Out of these committee meetings came a unified awareness of the seriousness of the situation along with updated and unified polices, such as the *Soil Conservation Regulations and Plough Rules, Sukumaland, Tanganyika* (Stocking, 1985). Then, following the lead of the United States, these committees began to recommend that demonstration plots be established so that soil

erosion could be studied (Stocking, 1985; Sutton, 1989). Some colonial governments (such as Botswana) were actively addressing the issue of soil erosion by hiring day laborers and plows (and eventually tractors) to build contour banks, as well as damming gullies (Beinart, 1989).

However, the biggest discrepancy between settler and indigenous colonies regarding soil conservation, leading up to independence, was organization. Settler colonies, who thrived off the income of cash crop agriculture, were able to realize and implement remediation methods quickly through government subsidies along with free planning and technical advice. Conversely, soil conservation methods were largely out of reach for the indigenous farmers. They did not receive subsidies nor extension services for their implementation. These shortcomings were compounded by a severe manpower shortage, later noted by many nations as the greatest hindrance to implementing soil conservation techniques (Stocking, 1985). Soil erosion remains a pressing issue for SSA well past independence. As of 2007 70% of the soil of South Africa was to some degree affected by soil erosion (LeRoux et al., 2007).

Heading into independence African subsistence farmers were acutely dealing with the symptoms of underdevelopment, whether that be soil erosion, farming non-arable land, or stagnant incomes and heavy taxes. Thus, as independence approached and cash crop agriculture slowly dissipated with the departure of the colonial governments, smallholder farmers were left with the effects of underdevelopment: outdated agricultural techniques, severe soil erosion, and governments ill-prepared to govern on their own.

Underdevelopment: Economy and agriculture

For a firsthand assessment of underdevelopment, Grundy (1966) interviewed African leaders to assess their opinions as to the reasons for underdevelopment. In his article, “African

Explanations of Underdevelopment: The Theoretical Basis for Political Action," Grundy (1966) explains how the leaders of African countries, such as Guinea, felt about the state of underdevelopment. Within the article by Grundy (1966), President Sékou Touré of Guinea stated that the underdevelopment of Africa is not due to any issue of intellectual inferiority, social malfunction, or anything else of the like, but rather a systematic fragmentation and destruction of pre-colonial Africa that was thriving under its own economic and social structure. Grundy (1966) goes on to elaborate on President Tourés' comments, saying that after the indigenous economy was suppressed, a new capitalistic economy was put in place. However, this economy did not favor the indigenous community but was rather a monopolistic economy that only favored the metropolitan economy. President Touré (as cited in Grundy, 1966) was quoted as saying:

> The colonial system took our goods at a very paltry price and sold them at a very high price. The profits… did not go to the producers who were the real creators, the true owners of the product; they went through many middlemen into the cash boxes of the colonialist. This is why… no colonized country has yet attained a social level comparable with what are considered the lowest levels in Europe (p. 64)

During colonialism theft of human potential, removal of raw materials and profits, and the implementation of oppressive policies and taxes laid down by a foreign government under the threat of violence all led to Africa being underdeveloped.

Colonialism, as beneficial as it was to the British Empire, was quite prohibitive to the African economy and culture (Logan, 2016). Due to imperialist policies the indigenous population was not allowed to undertake any industrial development. Raw materials and profits were exported out of the continent to enter the capitalist endeavor of the industrial revolution in western Europe (Grundy, 1966). This fact was further elaborated upon when Munford (1978)

adamantly stated that "colonialism cold-bloodedly prevented the industrialization of Africa" (pg. 22). Further, the lack of heavy industry stifled the colonies' efforts in establishing infrastructure and becoming self-sufficient. Manufacturing and engineering were suppressed. The colonialist government even went so as far as to deny indigenous entrepreneurs patents and specialized equipment (Munford, 1978). Thus, the colonies have long since remained agrarian agricultural economies and wholly underdeveloped compared to their potential.

Theoretical underpinnings of underdevelopment

Overall, the colonialization and underdevelopment of Africa are products of the Enlightenment, science of the era, and capitalism (Mlambo, 2006). In the late 19th century, "enlightened" philosophers, such as Hegel, were hypocritical towards Africa. Hegel was a student of the concept of the Absolute Spirit. However, Hegel believed that Africa had not yet achieved the Absolute Spirit, and thus Africans were not considered to be on the same level as those who had achieved the Absolute Spirit (Oguejifor, 2007). Further, enlightened philosophers of the late 19th century judged people based on their physical characteristics. For example, Montesquieu, another philosopher of the enlightenment, bluntly stated that Africans were not sufficiently human beings because they did not look like him (Oguejifor, 2007).

Regarding science, the colonization of Africa was imperative to western Europe's quest for new knowledge. Since Africa was largely unexplored by the Europeans a whole new world of scientific exploration was opened to them. Thus, it was in the best interest of "science" to colonize Africa so that tropical medicines, biology, ecology, geography, and anthropology could be studied (Cooper, 2011).

Finally, it was the industrial revolution, spurred on by capitalism that contributed to the colonization of Africa, as the continent is abundant in natural resources. It was the convergence of these factors, the Enlightenment, science, and capitalism, that led to the ideology that western Europeans were civilized, and their values and beliefs must be spread about the world. The result of the practice of colonialism was that it stripped away potential for the continent of Africa to thrive economically and culturally. Natural resources were usurped, taxes were levied as a method of enforcing agricultural policies, and political boundaries were redrawn with little regard to ethnic and tribal concerns. Colonialism has caused the underdevelopment of an entire continent and set its citizens behind socially, economically, politically, and agriculturally for many years into the future.

Modern day impacts of underdevelopment on agriculture

It has been ~60 years since most African countries achieved independence (Cooper, 2008). However, the effects of colonialism and underdevelopment can still be felt to this day, especially in relation to agriculture. Poor agricultural production can be attributed to poor production practices, land ownership and tenure issues, poor infrastructure, political instability, natural disasters, and climate change (Ifeanacho et al., 2010). To highlight these points author Banjo (as cited in Ifeanacho et al., 2010) is quoted as saying:

> Today, black Africa, with an area of 11.7 million square miles (30. 3 million square kilometers) and amounting to a fifth (1/5) of the earth's land… is the continent which has the largest and poorest and least developed countries (30 out of 47), the lowest arable land as a proportion of total land area (6%), a debt service as a percentage of export earning amounting to 52% in 1999, and an embarrassingly excessive and humiliating

dependence on food aid and imports…

In SSA, nearly 70% of the population (~700 million) depends on agriculture as their sole source of food and income. Thus agriculture is an extremely important part of the economy and the people's livelihoods and welfare (Mwaniki, 2000). But the smallholder farmers of today face many different issues compared to their counterparts over 60 years ago. These issues include, but are not limited to, changing land use policy and land scarcity, lack of knowledge about best farming practices, and lack of inputs. All of which lend themselves to the chronic state of food insecurity that permeates SSA.

Modern day Scramble for Africa

Another contemporary issue that modern day smallholder farmers in SSA are enduring, despite the sheer size of the African land mass, is land use policies leading to land scarcity. Africa is once again being viewed as a frontier for investment and thus another "Scramble for Africa" is underway (Baglioni & Gibbon, 2013; Collins & Mitchell, 2016; Ongolo et al., 2018). This land grab that is now occurring in Africa is being carried out by both domestic and foreign actors, especially those in the agro-export business (Baglioni & Gibbon, 2013), with the largest transfer of land rights occurring between 2004 and 2009. Baglioni and Gibbon (2013) suggest that this land grab is due to a crisis within the neo-liberalist capitalism sphere, as new land is being sought for capital accumulation. The large agricultural businesses around the world are vying for new lands for investments (Ongolo et al., 2018). Some of this land grab is being pushed by the World Bank who contends that large scale agriculture will create jobs, modernize agriculture, and mechanize farming (Baglioni & Gibbon, 2013; Peters, 2013). However, and not unexpectedly,

this modern-day scramble is a consequence of land use policies that originated during colonial rule and still resonate to this day.

First, colonial policies of land use tend to favor outside interests. For instance, in the 1920s the British Privy Council noted that land was the property of the community and the village but not the individual (Peters, 2013). This policy, which was in direct contradiction to the customary land laws that many Africans had practiced for hundreds of years prior, was meant as a form of passive rule. The enactment of this policy laid the foundation for land to be allocated to new foreign investors after independence. Thus, as Peters (2013) states, the smallholder farmer is under threat of losing family land to foreign investors. Land scarcity is also a result of customary land laws. Customary land laws in many African cultures dictate that land be passed down through the generations through the male lineage. So, every generation the amount of land owned by any one family is proportioned out to all male sons. Thus, each generation has less land than the generation before (verbal communication Carolyn Othieno, Feb. 12, 2021).

Consequently, acquiring and owning enough land is a two-fold problem and is severely impeding the ability of rural farmers to farm an adequate amount of land to meet their food needs. Further, large-scale agricultural projects being pushed by outside organizations, that were intended to create jobs and modernize agriculture, did not actually help to improve agriculture but rather created conflict over land rights and ownership. Collins and Mitchell (2016) speak of a significant report by Byamugisha (2013) of the World Bank that suggests that poor land governance is a prominent reason for a lagging economy and agricultural sector.

Collins (2016) notes that Africa should go back to customary land policies, where the local leadership relies on traditional policies of ownership, rather than the titling of land by state and government authorities (as once suggested by the Word Bank). However, as noted by a case

study in Ghana in the same Byamugisha (2013) report, there is also a history of abuse by local leaders who change laws and policies to suit their own needs, so any updated policy suggestions offered by the World Bank should be critically analyzed to not create any new conflicts (Collins, 2016).

Barriers to the acquisition of farming knowledge

Along with navigating land use policy issues, modern day smallholder farmers, especially women, are suffering from lagging agricultural production due to a perceived lack of appropriate farming knowledge, whether it be indigenous (local) or external (i.e., governmental extension services) (Odini, 2014). Relevant farming knowledge that is sought out includes information on inputs, such as fertilizer and seed selection, pest and weed control, access to credit, cultivation and harvesting techniques, and soil conservation (Odini, 2014). Of the many constraints that emerging farmers face, such as lack of funding, limited access to water, and cost of electricity, lack of knowledge is an equally persistent problem (Chikozho et al., 2020).

Agricultural knowledge is not singular, it can be indigenous knowledge (IK), which is passed down through culture over time, or external knowledge, which can be best practices information introduced by external sources. These terms are not necessarily interchangeable. IK may be highly useful in some situations, but not others. For example, IK can be useful when it comes to the cultivation of medicinal plants for the purpose of producing remedies to location-specific aliments (verbal communication with Carolyn Othieno, Feb. 12, 2021). Whereas external knowledge (best practices) may reference methods and techniques of farming that are the products of academic research, testing, and modern technology and has been proven to

increase agricultural production (Lwoga et al., 2011; verbal communication with Carolyn Othieno, Feb 17, 2021).

There are several reasons why a rural farmer would not have access to appropriate farming knowledge. One of the most glaring reasons is that agriculture classes are not a focus in primary or secondary schools (Odini, 2014). As noted by Carolyn Othieno (personal communication Feb. 16, 2021) agriculture is only offered as an elective in secondary school (and as will be noted later in Chapter Three, many African students do not reach secondary school). This is surprising considering the number of people that rely on agriculture and smallholder farming for their livelihoods. Case in point, in Uganda, Burundi, Burkino Faso, and Rwanda ~90% of the population lives in rural areas, and ~50% of that population is immediately involved in agriculture (Block, 2016).

In addition, there are several other reasons that indigenous knowledge or best practice knowledge may be lacking in rural farming communities. As Llowga et al. (2011) noted, in their study to decipher how knowledge is passed on and acquired, knowledge acquisition can be stifled due to a resistance to change, lack of recorded history, lack of resource centers, lack of sharing, lack of trust, difficulty in identifying who has the knowledge, and disappearance of culture and practice. Unfortunately, this inefficiency in knowledge transfer prohibits agricultural best practices from being acquired and utilized, and thus agricultural production is not increasing, and food insecurity remains prevalent for rural smallholder farmers, especially women and children (Odini, 2014).

Additionally, information technology (IT) is not being utilized to its fullest extent to aid in the acquisition of agricultural best practice knowledge. Reasons for the limited use of IT in the dissemination of farming knowledge is due to its high cost, lack of electricity in rural villages,

lack of awareness, IT illiteracy, poor IT infrastructure, and lack of tele-centers (Odini, 2014). In the interim, agricultural best practice knowledge is sought through friends, neighbors, relatives, and local elders (Odini, 2014). This inability to easily acquire agricultural best practice knowledge is a major factor that contributes to poor crop yields and, in turn, food insecurity.

Lack of inputs on agricultural productivity

A final factor of modern-day agriculture that contributes to food insecurity is that agricultural crop yields do not reach technical efficiency due to the lack of appropriate inputs. Agricultural inputs can be categorized as fertilizers, improved seed, agro-chemicals, machinery, and irrigation. As stated by Crawford et al. (2003) quality inputs are vital to increased agricultural production and decreasing food insecurity. However, input use is quite low in SSA, especially when compared to the amount of inputs used in Asia during their Green Revolution (Sheahan & Barrett, 2014).

Some of the reasons as to why farmers would not use inputs even when they appear to be financially and agriculturally beneficial would be lack of knowledge about input use, availability of inputs, affordability, lack of available credit to purchase inputs, and difficulty in determining if inputs are the best use of limited financial resources (Kelly et al., 2003). Crawford et al. (2003) argues that input use has decreased in recent decades due to economic structural adjustments. Structural adjustments, neo-liberal programs of the World Bank, sought to regulate production of the African economy by putting more power with state governments by offering targeted low interest loans. However, these programs had highly detrimental effects on smallholder farmers. The effects included reductions in government subsidies for agricultural cooperatives, access to credit, and investments in infrastructure (Wedig & Wiegratz, 2017). And, since subsidies are

variable and inconsistent due to capricious government intervention, private investors, NGOs, and private donors are less willing to contribute funding for subsidies to increase input use (Crawford et al., 2003).

However, there are local organizations that are striving to help give smallholder farmers in SSA access to inputs. Kelly et al. (2003) mentions a program called Sustainable Community-Oriented Development Program (SCOPD), operating in Kenya, that has taken on the challenge of increasing input use among smallholder farmers. Some of their strategies include raising awareness of modern inputs, participant input testing, making inputs more affordable (such as mini packs of fertilizer), and increasing distribution and availability (Kelly et al., 2003). Their program seems successful. By 2002 (the program began in 1990) SCOPD was selling over 500 tons of fertilizer yearly to over 50,000 farmers in Kenya (Kelly et al., 2003).

Crawford et al. (2003) also speaks to methods for increasing input use through a rededication to government subsidies with NGOs filling the gaps when governments cannot afford them. Further, Crawford et al. (2003) suggests that governments should improve services surrounding inputs, such as increasing marketing, improving infrastructure, and increasing extension services and research. Increased use of inputs could have myriad of benefits, including boosting agricultural productivity, reversing the degradation of soil quality and fertility, and alleviating poverty and food insecurity by increasing production and income, thus creating pride through self-sufficiency, and decreasing reliance on government subsidies and foreign aid.

To that end Sheahan and Barrett (2017) suggest that a new comprehensive look at the state of agriculture in SSA should be considered to determine the current state of input use. In a 2014 World Bank study Sheahan and Barrett (2014) argue that this reassessment of input use is needed due to an increase in food prices and profits for commercial farmers, an increase in

access to the market, urbanization, growth of the middle class, and the proliferation of cell phones. This study showed that the overall use of inputs in SSA is cumulatively low, but in such countries as Ethiopia, Malawi, Niger, Nigeria, Tanzania, and Uganda fertilizer use is up, with maize being the crop most likely to receive fertilizer. Sheahan and Barrett (2014) note that mechanization is down, and input use varied greatly across SSA and nationally. Also, there was an inverse relationship between farm size and input use, with the application of fertilizer not varying based on soil quality. Lastly, input use varies by gender and few households use credit to purchase them. In the end, it is agreed upon by many scholars that increased input use is a vital component for increasing agricultural production and reducing food insecurity.

Understanding contemporary food insecurity and measurements of poverty

Modern-day poverty and food insecurity in SSA are inextricably linked. Poverty is defined as a lack of income and a lack of the necessities for day-to-day life (Ingutia et al., 2020). Poverty, besides being an indirect result of underdevelopment, is more specifically associated with income inequality due to lack of economic growth, unstable governments and conflict, geography, natural disasters such as drought, natural resource constraints, inefficient agriculture, disease, and the inheritance of poverty (Kabuya, 2015). Further, poverty is defined by The World Bank (2020) as anyone living under $1.90 per day. According to the World Bank 41% of SSA lives in poverty, by far the largest percentage of any area on Earth.

According to Kabuya (2015) poverty can be categorized as absolute, relative, chronic, or transient. The most severe category is absolute poverty which is the complete lack of necessities (food, shelter, clothing, healthcare, education), whereas relative poverty is a less severe form of absolute poverty. Chronic poverty is the result of poverty being passed down from generation to

generation. Finally, relative poverty is a situational state of poverty that is the result of a significant event such as complete crop failure (agriculture in SSA is highly susceptible to climate anomalies, such as drought, since most agriculture is rain-fed and thus subject to failure) (Kabuya, 2015).

Defining food insecurity

Of the many negative effects of poverty, food insecurity is the factor that needs the most attention. Food insecurity can be defined as the situation in which all people do not always have physical and economic access to food that is safe and plentiful and meets the nutritional needs of their lifestyle (Fawole et al., 2015; Mwaniki, 2006). However, and unfortunately, food insecurity is abundant in SSA (ERS, 2019). Since 1970 the percentage of food insecure people in SSA has remained around 34% (Mwaniki, 2006; Omuemu et al., 2012). According to the ERS (2019) ~335 million people in SSA in 2019 were undernourished and food insecure. The prevalence of poverty and food insecurity is not relenting in SSA while it has improved in all other areas around the world (ERS, 2019). Food insecurity must be dealt with as the condition results in malnutrition, political instability, and poor mental health (Fawole et al., 2015). Children are particularly susceptible to malnutrition, as 60% percent of childhood deaths in developing countries are due to malnutrition (Fawole et al., 2015; Ignuita, 2014).

Chronic poverty is rampant in SSA and hence so is food insecurity. However, food insecurity is not necessarily the result of poor agricultural production (although it is a significant factor and scholars argue that is imperative that it be rectified so that food insecurity may be drastically reduced) but also the lack of economic access to food due to poverty (Crush et al., 2012; Omuemu et al., 2013). As stated by Ifeanacho et al. (2010) the African continent is

abundant with natural resources that are quite capable of producing adequate food to sustain food security. Yet, due to chronic poverty, the HIV/AIDS crisis, political instability and conflicts, overpopulation, lack of conservation of natural resources, and underdeveloped agriculture, food insecurity is still an issue that afflicts the continent despite the riches of abundant and fertile land (Irogbe, 2014; Omuemu et al., 2013).

Measuring food insecurity

To adequately address food insecurity, it must be measured so that a baseline can be established to gauge future results. The use of the Household Food Insecurity Access Scale (HFIAS) is ubiquitous in the literature on food insecurity in SSA and its use is promoted by several prominent scholars in the field, such as Bogale and Shimelis (2009), Crush et al. (2012), and Omuemu at al. (2013). This assessment measures (with overall scores ranging from 0 to 27) the degree of food insecurity a household endures based on answers to questions regarding the frequency of nine household level determinants (Crush et al., 2012). The higher the total score the higher the degree of food insecurity. Questions on the assessment address such household level determinants as family size, total income, off-farm income, age of head of household, dependency ratio, credit received, education levels, and access to irrigation (Bogale & Shimelis, 2009).

As articulated by Bogale and Shimelis (2009), using the HFIAS, the larger the family is the less likely the household would be food insecure. This is since farm labor is a family job, so the larger the family the more hands there will be to help with farming responsibilities. Although, there is a threshold where the relationship inverts, as the more family members there are the more people there are that need to be fed. Further noted by Bogale and Shimelis (2009)

the older the head of the household is the less likely the household is going to become food insecure. This is because with age comes the accumulation of knowledge about agricultural best practices, weather patterns, and access to the market. Furthermore, an increase in off-farm income, education, access to credit, and access to irrigation all leads to being more food secure (Bogale & Shimelis, 2009).

To measure the levels of food insecurity at the national level other types of assessments are used, such as the International Food Security Assessment (IFSA) which is used by the United States Department of Agricultures' Economic Research Service (ERS) to model food insecurity projections for the future (ERS, 2019). For instance, the ERS completed a study for the coming years 2019 to 2029 that focused on 76 low to middle income countries (39 of which were in SSA) and their predicted levels of food insecurity (ERS, 2019). To determine the levels of future food insecurity the demand for food in each region/country is first determined by dividing food into four groups: 1) major grain eaten in country, 2) other grains, 3) root crops, and 4) all other food. The IFSA model then expresses these foods in their grain weight equivalent based on calorie density so that they can be compared across food groups. Then the grain equivalents of production are compared against projected food demand to then determine future food insecurity levels (ERS, 2019).

This 2019 assessment did show some promising results, as the ERS expects food insecurity in SSA to drop by 19% over the period 2019 to 2029, based on a modest improvement in the GDP of many African nations (ERS, 2019). In lock step with the ERS assessment of economic growth in SSA several scholars agree that food insecurity is not solely a lack of agricultural production issue but rather an economic issue, especially for the urban poor (Clover, 2003; Crush et al., 2012). However, for the rural poor it seems that an increase in agricultural

production is the key component for the reduction and alleviation of food insecurity and a lessened dependence on foreign aid (Jama & Pizarro, 2008).

Conclusion

Chapter One has been an in-depth discussion of Africa prior to colonialism, the colonial policies toward agriculture, the modern-day impacts of colonialism and underdevelopment on agriculture, and the current state of food insecurity in sub-Saharan Africa. It is this in-depth discussion that has directed the contents of Chapter Two. Chapter Two will begin with a definition of what it means to be a smallholder farmer in sub-Saharan Africa. Chapter Two will then continue with an analysis of the various methods of improving agricultural productivity and reducing food insecurity for the poor rural smallholder farmer. This analysis and subsequent discussion will be centered on improving agricultural productivity through agricultural intensification, technology adoption, conservation agriculture, and climate-smart agriculture. Next, Chapter Two will then engage in a discussion of the importance of agricultural cooperatives for the poor rural smallholder farmer. The purpose of Chapter Two is to offer an analysis and discussion of some of the most practical ways for rural smallholder farmers to efficiently improve crop yields and increase income to reduce food insecurity.

Chapter Two:

An examination of the various methods of alleviating food insecurity for smallholder farmers

As of 2020 the population of sub-Saharan Africa (SSA) was approximately 1 billion people (Felix & Beckman, 2020). Of these 1 billion people approximately 60% percent (600,000,000) live in rural areas. Further, of this 600,000,000 approximately 90% (540,000,000) are smallholder farmers with their families (Larson, 2016) spread out amongst 33 million farms (Ng'endo et al., 2015). And of these 540,000,000 approximately 335,000,000 are food insecure (Felix & Beckman, 2020). The fact that approximately 62% of all the smallholder farmers in SSA are food insecure shows that immediate action is needed. Thus, among scholars there is a consensus that the food security status of rural smallholder farmers in SSA needs to be drastically and sustainably improved (Baipheti & Jacobs, 2009; Jama & Pizarro, 2008; Leonardo et al., 2018; Zant, 2012). To reduce food insecurity in rural SSA poverty needs to be reduced and agricultural production needs to increase.

Reducing food insecurity in rural SSA can be accomplished through two means: improved agricultural productivity and increased agricultural cooperative membership. These topics are the focus of Chapter Two. The initial discussion will revolve around improving agricultural production for rural smallholder farmers through such means as agricultural intensification, technology adoption, conservation agriculture, and climate-smart agriculture. When these methods are combined with membership in an agricultural cooperative, improved crop yields and reduced poverty and food insecurity are achievable for rural smallholder farmers.

Improving agricultural production

A smallholder farmer, or subsistence farmer (the terms can be used interchangeably), is a farmer that, with respect to their food production and security, are essentially self-sufficient (Zant, 2012). However, if one is farming to produce their sole source of food, that is a sign of poverty (Aliber & Hart, 2014). Unfortunately, that definition of poverty commonly applies to the smallholder farmer. Chamberlin (2007) goes further to state that a smallholder farmer can also be recognized by their limited land availability, limited capital, and lack of access to inputs. Regarding land availability ~95 % of all farms in SSA are less the 5 hectares (Dorosh & Mellor, 2013; Larson, 2016).

But the smallholder farmer is a vital niche in local economies as most food in SSA is produced by smallholder farmers (Sibhatu & Qaim, 2017), and agriculture is responsible for ~60% of all the jobs in SSA (Larson et al., 2016). Smallholder farmers typically have mixed farms which consist of intensive production of certain tree species, shrubs, and annual crops. For instance, in the East Africa highlands most smallholder farms are a small piece of land (normally situated around the house) separated into plots: 1) annual crops, 2) cash crops, 3) vegetables, 4) tree zones, and 5) living fences (Ng'endo at al., 2015).

As discussed before, these smallholder farmers are highly susceptible to food insecurity and the international community is striving to devise achievable methods to sustainably improve their food security. Frelat et al. (2015) notes that there are two distinct strategies for improving food security: 1) improve market access and off-farm activities (to earn income), and 2) improve agricultural production. It seems that the most efficient and immediately successful process for reducing food insecurity for SSA smallholder farmers would be to increase agricultural production *in conjunction* with increasing off-farm income (Sibhatu & Qaim, 2017).

Prior to discussing the methods for improving agricultural production for the smallholder farmer it should be noted that increased agricultural production will also have positive effects on several other aspects of the smallholder farmers' life. Increased agricultural production can reduce poverty (Dorosh & Mellor, 2013), restore ecosystems by getting the most of out of limited natural resources, increase nutritional diversity (subsistence farming currently only contributes 20% of the nutritional diversity of the diet of the smallholder farmer) (Sibhatu & Qaim, 2017), increase income to purchase essential items (Jama, 2008), and stimulate the economy towards manufacturing (Dhrifi, 2013).

However, smallholder farmers are at a distinct economic disadvantage when it comes to improving agricultural productivity. They are disadvantaged because they are not able to participate in economies of scale, they have poor trade with markets due to lack of access, there is a lack of access to credit and technology, and there is a lack of investment in agricultural research and development by governments (Larson et al., 2016). For instance, in the 44 SSA countries included in a year 2000 analysis, the cumulative financial investments into agricultural research totaled only $3.8 billion. Whereas in the same year India invested 21 billion and China invested 48 billion (Larson et al., 2016). Further, agricultural production in SSA is decreasing due to both local and environmental factors. These reasons include declining soil fertility, low adoption rates for yield increasing technology, dysfunctional input and output markets, lack of extension services, and climate change (Mango et al., 2014).

Agricultural extensification/intensification

For smallholder farmers to improve their food security through increased agricultural production there are two paths: extensification and intensification. Extensification involves extending out

the amount of land area that is farmed. Essentially new land is cultivated by encroaching on forests, wetlands, hillsides, and pastures (Reardon et al., 1999). Conversely, intensification is defined by increased agricultural production on the same amount of land currently being farmed through the increased use of inputs, such as fertilizer and improved seed varieties, adoption of new technologies, natural resource conservation, and the use of climate smart agricultural techniques (Leonardo et al., 2018; Montt & Luu, 2019).

Between the two methods of increasing agricultural production, extensification and intensification, extensification has the least potential to positively affect the lives of smallholder farmers. Reardon et al. (1999) notes that even though 200 million acres in SSA could still be planted, access to 105 million of these acres would require a massive investment in infrastructure. Further, extensification would destroy fragile ecosystems such as forests, wetlands, and pastures. Extensification is not sustainable as land becomes scarcer as the population of SSA continues to grow (Reardon et al., 1999). Thus, extensification is not a subject that need be broached any further as it has the least potential to improve agricultural productivity, besides having several detrimental side effects.

Intensification is better suited for success as a method for improving agricultural production. Essentially intensification will result in greater crop yields without expanding the cultivation area (Abdalla, 2016; Larson et al., 2016). Intensification would involve the increased use of modern inputs, such as high-yield modern seed variants, adoption of new technologies, and increased labor (Abdallah, 2016; Dawson et al., 2019). Improved seed and fertilizer use is the simplest step of intensification, but the hardest for poor rural smallholder farmers to access. Most smallholder farmers cannot afford improved seed and fertilizer as they lack the upfront capital to attain these inputs. Once the smallholder farmer does have the capital for input

purchases, connecting them with retailers who offer inputs is a critical step in the intensification process. Furthermore, conservation and climate-smart agriculture have been touted as adequate methods of intensification that can improve agricultural production (Montt & Luu, 2020). These methods will be elaborated on in detail further on in the chapter.

Crop diversification

Aiding in agricultural intensification is the method of crop diversification. Put simply crop diversification is the practice of planting a wider range of crops (Ngure et al., 2020). This practice spreads out the risk associated with crop failure due to climate change or drought (Chinsinga et al., 2011). Further, crop diversification can increase income for the smallholder farmer and increase the nutritional diversity available to the community by providing a wider range of crops to market (Chinsinga et al., 2011; Madsen et al., 2021). This strategy is especially important because many farmers tend to plant in a monoculture fashion, which limits crop diversity and leaves the entire crop susceptible to drought or disease.

As noted by Madsen et al. (2021) the Agriculture Input Subsidy Program (AISP) conducted by the government of Malawi offered subsidies for the purchase of maize seed and fertilizer to smallholder farmers. However, the drawback was that many farmers began to plant only maize. Thus, the diets of the farmers became singular, and the entire farm was susceptible to failure. Therefore, crop diversification is vital to combat crop failure and nutritional singularity.

One type of crop ideal for increasing diversification is dryland legumes, with such varieties as chickpea, pigeonpea, and peanuts (Asfaw et al., 2012). Asfaw et al. (2012) lists out four significant reasons as to why the introduction of these legumes would benefit the farmer as

legumes have the potential to: 1) improve soil fertility by fixing nitrogen, 2) encourage more productive use of the current land being farmed by using residual moisture, 3) increase nutritional diversity by adding protein to the diet, and 4) be sold at the market for increased income when there is excess from harvest.

Ng'endo et al. (2015) notes that crop diversification should also include cash crops. This is because crop diversification alone is not enough to increase food security, but when coupled with cash crop sales farmers are able to generate income to purchase essential, nutritionally diverse foods not grown on the farm. Simultaneously, the production of cash crops contributes to the food security of the community by stimulating the local economy and providing a wider range of foods at market (Ng'endo et al., 2015).

Technology adoption

Another important part of intensification is the adoption of new technologies which will have the effect of lowering poverty levels for smallholder farmers by raising their incomes. The increased income will be the result of larger crop yields and ergo a crop surplus which can be sold at market. Also, the adoption of new technologies will result in lower food prices at market and increased employment (Dhrifi, 2014). The indirect impact of technology adoption, which is the creation of new jobs, has a greater effect on reducing poverty than the direct effect of increasing food security and income at the household level (Dhrifi, 2014).

Irrigation. One example of a new agricultural technology that could be adopted is improved irrigation methods. Irrigation methods can act as a stabilizing instrument for crop production (Fandazo & Ncube, 2018), as most agriculture in SSA is rain-fed and is highly

sensitive to drought and flooding (Boell et al., 2013; Dile et al., 2013). Without proper irrigation methods crops are solely dependent on rain and a large portion of rainwater is lost to either evaporation, percolation, or runoff. Thus only 15 to 30% of rainwater is available to nurture the crops (Dile et al., 2013).

One method for collecting rainwater for irrigation is water harvesting. Water harvesting encompasses several techniques. One popular method is *in-situ* micro-catchments. In a study by Barron and Okwach (2005) conducted in Kenya, rainwater was collected in an upstream reservoir. The results of the study showed that the excess water availability due to the water storage increased crop yields by 50%. Dile et al. (2013) list and discuss many options for water storage, including farm dams, open pond tanks, run-off farming systems, conservation agriculture, pitting, and stone lines as examples of water harvesting. Their paper does an excellent job of describing each method, as well its benefits, drawbacks, and social implications (Dile et al., 2013).

Realized adoption. The above-mentioned technologies, irrigation and crop diversification, both have the potential to increase agricultural intensification. But for positive results to be realized these technologies must *actually* be adopted. Pamuk et al. (2014) suggests that there needs to be a move away from extension services that are poorly configured and are not meeting the needs of the smallholder farmers they are intended to help. Pamuk et al. (2014) gives the example of the Sub-Saharan African Challenge Program (SSA-CP) as an organization that is meeting the technology adoption needs of the smallholder farmer. This program aims to search for solutions using the bottom-up approach. This bottom-up approach leans on indigenous knowledge through a participatory approach all the while seeking to utilize the input from a

range of local stakeholders to increase technology adoption (Pamuk et al., 2014). These stakeholders include farmers' associations, traders, researchers, extension workers, NGOs, and government policy makers.

Information dissemination. Another factor in the adoption of new agricultural technologies is the improvement of agricultural training for smallholder farmers. One such method for improvement of the dissemination of information among smallholder farmers is to train a small number of trainer farmers who then pass on the information through social and neighborhood networks (Lambrecht et al., 2014; Nakano et al., 2013). This method is more practical because very few smallholder farmers have access to centralized agricultural extension services. As noted by Lambrecht et al. (2014) agricultural extension services are important in the three phases of technology adoption: 1) awareness, 2) tryout, and 3) continued adoption.

In the awareness phase extension services are vital because some areas of a country may have a total grasp of the knowledge surrounding the new technology, yet in other parts of the country there may be a complete lack of knowledge surrounding that same technology. Extension services have several methods to socially disseminate their information, such as radio, discussion meetings, demonstration trials, and on-farm trials. In the tryout phase farmers must be able to utilize the technology. This phase can be the hardest to overcome as many smallholder farmers are cash constrained and many of the new technologies have a high entry fee. Further, in the tryout phase farmers are expecting positive results immediately, especially when their meager cash resources have been invested. So, any early failure of the technology can be very discouraging. Lastly, the final phase is continued adoption. This stage is dependent on on-site

knowledge, meaning at this point the farmers must have a grasp on the new technology and the reliance on extension services is lessening (Lambrecht et al., 2014).

Model farmers. Another method of information dissemination for the adoption of new technologies is the concept of model farmers. These model farmers provide an entry point into the community for the diffusion of a new technology (Taylor & Bhasme, 2018). The model farmer teaches the local farming community about new agricultural technologies by acting as a go-between for extension services and the community. The model farmer passes along knowledge, services, and support. The model farmer also becomes a knowledge repository all the while setting the example of how to be a model farmer and simultaneously accumulating political clout. Further, the more successful the model farmer is the more faith that the community has in extension services (Taylor & Bhasme, 2018).

Barriers to technology adoption. Unfortunately, there are several factors that act as barriers to technology adoption. These factors include the lack of financial or human resources, lack of institutional capacity, and lack of information and education (Senyolo et al., 2018). Furthermore, Senyolo et al. (2018) details that there are three main factors that can influence whether a technology will ultimately be adopted by the smallholder farmer. The first factor is the characteristics of the technology. Such as the state of development, its novelty and complexity, and the number of technical functions. Second, Senyolo et al. (208) noted that the farming environment into which the technology is being introduced is important. And finally, the farmer making the adoption decisions will decide if the technology is applied. Similarly, Mwalupaso et al. (2019) notes, in their study of rice intensification technology adoption in Mali, that farming

experience, training, ownership of equipment, and control of water all affect whether a technology will be adopted.

Regarding farming experience Mwalupaso et al. (2019) notes a negative correlation between age and technology adoption. As farmers get older, they are less likely to change their ways and adopt new technologies. Similarly, Asfaw et al. (2012) also notes some negative correlations to modern seed variety adoption. These detriments include the lack of awareness about seed varieties and farm distance from agricultural extension services offices, as many times smallholder farmers lack transportation to make seed purchases.

On the other hand, Asfaw et al. (2012) notes a positive correlation between technology adoption and both farm size and owning livestock. Farmers that have larger land holdings or own livestock tend to have access to credit and accordingly are more likely to be able to afford to implement new technologies. Finally, having secure markets for the sale of crop yields along with access to credit will increase the likelihood of technology adoption, (Senyolo et al., 2018).

Conservation Agriculture

Conservation agriculture (CA) has been touted as a sustainable and effective means of intensification. CA can be defined by its practice of minimal soil disturbance, maintaining a layer of organic material on top of the soil, and spatial and temporal crop rotations (Dougill et al., 2017; Nyanmangara et al., 2013; Vanlauwe et al., 2014). By practicing minimum soil disturbance, or no-till farming, the farmer can save on labor costs and fuel. Further, no-till farming combined with mulching conserves organic matter (Vanlauwe et al., 2014). Some other important tenets of CA are crop rotation, which allows for crops like legumes (which fix N_2) to be planted. Further, crop rotation helps to break pest cycles. Also important is crop cover, which

is a by-product of increased yields and is left on top of the soil to hold in moisture and increase organic matter and fertility (Vanlauwe et al., 2014).

Benefits

CA reduces labor, fuel, and machinery expenses. Furthermore, CA has three important benefits for soil quality: 1) preservation of organic soil matter, which increases soil fertility, 2) conservation of soil moisture, and 3) protection against wind erosion, due to the residual layer of organic material on the top (Nyanmangara et al., 2013). CA is important because many of the world's poor and food insecure live in areas of degraded soil quality and they depend on this lackluster soil to provide for their livelihoods by supplying crops for food and crops for sale (Khapdonou et al., 2017; Olawuyi, 2021). Any methods that can improve soil quality for the smallholder farmer is crucial for the improvement of crop yields.

Implementation

Successful CA implementation includes three components, as described by Dougill et al. (2017): 1) a renewed transparent reflection of the current knowledge gaps in implementing CA practices, 2) a negotiated knowledge of what works for whom and under what circumstances, and 3) institutional support and good policy. CA is currently being promoted by several governments in SSA including the government of Malawi. In Malawi, CA practices are being promoted alongside increased fertilizer use and the use of improved seeds to improve agricultural production through the Government Agricultural Input Subsidy Program (GAISP) (Dougill et al., 2017). Dougill et al. (2017) noted that for these CA programs to be successful there needs to be dialogue and cooperation among stakeholders at all levels. Currently most collaboration occurs

at the farm-community level with little back and forth with extension services. However, Olawuyi (2021) noted that in Nigeria very few farmers are confident enough to implement all three main strategies of CA (minimum tillage, soil surface cover, diversified crop rotation). In their study only ~16% or the farmers in the study area were implementing all three. For the maximum effect of CA to be achieved all three tenets should be applied simultaneously. And to further enhance the effectiveness of CA stakeholders must consider and incorporate indigenous knowledge for successful implementation (Dougill et al., 2017; Olawuyi, 2021).

Usefulness

A study by Theirfelder et al. (2013) set out to show the usefulness of CA. This study spanned 2004-2012 and covered nine target farm communities in Malawi that were comprised of deforested land planted with maize. The study measured the effects of different cropping systems on physical and chemical soil characteristics in relation to increased maize yields. The results showed that despite differing agro-characteristics of the different study areas, when CA techniques were applied to the maize the overall crop yields increased in all nine communities. This meant more crop for consumption and more left-over organic matter as soil cover to help increase the yields of the next crop consequently creating a positive feedback loop (Theirfelder et al., 2013).

Climate-smart agriculture

The intensification of agriculture is vital to improving the food security of smallholder farmers in SSA. However, if the effects of climate change are not accounted for then all gains in intensification could be lost. Climate change will disproportionately affect smallholder farmers,

especially since most smallholder agriculture is rain fed and thus especially vulnerable to prolonged droughts. According to Hammond et al. (2017) ~56% of SSA could be negatively affected by climate change by 2050 if no changes to worldwide global emissions are made.

Tenets of climate-smart agriculture

Agricultural production is reliant on a stable and predictable climate. If the climate becomes variable (temperature and precipitation) this could affect agricultural production by modifying soil and nutrient cycles, as well as changing the cycles of pests and diseases (Rai et al., 2018). The answer to this problem has its roots in climate-smart agriculture (CSA). According to Hammond et al. (2017) the "overall aim of CSA is to support efforts from the local to global levels for sustainably using agricultural systems to achieve food and nutrition security for all people at all times, integrating necessary adaption and capturing potential mitigation" (p. 226). CSA is recognized by its overlying tenets which are: 1) achieving food security, 2) being resilient to climate change, and 3) reducing greenhouse gases (Hammond et al., 2017). CSA can be further defined by the underlying techniques of the cultivation of drought resilient varieties of seeds, crop diversification, soil management, and water management (Branca et al., 2021; Call et al., 2019).

Farm insurance. Beyond implementing CSA farming strategies, making farm insurance accessible to smallholder farmers is a vital step to hedging losses caused by climate change (Adzawla et al., 2019). However, the strategy of insuring farms seems to be dependent on the farmers knowledge of the changing climatic conditions. Farmers that feel they can predict future weather patterns are less likely to insure their farms (Adzawla et al., 2019). Adzawla et al. (2019)

notes that part of farming with a climate-smart mindset is the idea of resilience. Farm insurance can help farmers to be resilient by overcoming crop failures and avoiding a disruption of their livelihood.

Off-farm income. A third strategy, beyond the explicit farming strategies of CSA for hedging losses to climate change and farm insurance, is the diversification of off-farm livelihood (Call et al., 2019). Call et al. (2019) notes that off-farm income generating activities could include owning a small business, engaging in unskilled or semi-skilled labor, providing transportation, or seeking other wage generating employment. Otherwise, during the lean times brought about by climate change, smallholder farmers will be forced to engage in low risk/low yield production methods, skip meals, sell assets, and take children out of school (Adzawla et al., 2017).

Agricultural cooperatives

Agricultural cooperative membership is another method that smallholder farmers can utilize to improve agricultural productivity and hence reduce food insecurity and increase income. Essentially an agricultural cooperative is a user-owned and user-controlled business that distributes benefits equally to its members based on usage (Ortmann & King, 2007). Agricultural cooperatives, in the literature, have the same general definition; an autonomous organization, that organizes voluntarily, and abides by democratic principles to create benefits for smallholder farmers that they cannot achieve individually (Abebaw & Haile, 2013; Chibanda et al., 2009; Ortmann & King, 2007). Agricultural cooperatives have as their aims creating employment, generating income, eradicating poverty, and empowering their members (Ortmann & King,

2007). Specifically, cooperatives seek to increase market participation of smallholder farmers so that they can enhance their bargaining positions through leveraging collective action in the marketplace to achieve the best price per unit for their goods (Abate, 2018). This leverage is achieved because cooperatives, as a tenet of operation, achieve economies of scale by aggregating outputs (Abate, 2018; Ortmann & King, 2007). When cooperatives increase their bargaining power in the marketplace this creates more income for the smallholder farmer and simultaneously increases their motivation to not only continue growing crops at a highly productive level but to also maintain enrollment in the cooperative (Olagunju et al., 2021).

History of agricultural cooperatives

Originally cooperatives were established due to market failures. The marketplace was failing to provide needed goods and services at affordable prices and of good quality (Ortmann & King, 2007). This was because rural smallholder farmers were not able to grow a crop of the quantity and of the quality needed in the marketplace. This is for myriad reasons, including that most rural smallholder farmers do not have access to quality inputs, such as improved seed, fertilizers, and pesticides, along with a lack of access to financial capital, insurance, and extension services. Because of these constraints rural smallholder farmers are only barely able to grow enough crops to feed themselves, let alone supply a surplus to the market.

Another reason why the marketplace has failed is because of the notorious middleman. The middleman takes advantage of both the farmer and the market, decreasing payouts to the farmer and increasing prices for the consumer. Consequently, poor quality goods, in a subpar quantity, are overpriced. Cooperatives have power over the middleman through scale, allowing farmers to grow the quality and quantity of crops needed so that they can feed their families and

supply a surplus to the market. Also, through the cooperative, the smallholder receives information; information that will allow them to sell their surplus crops at the best price possible. Cooperatives not only allow the smallholder farmer to feed their families, but they also allow them to generate income for other essentials (Ortmann & King, 2007).

Types of agricultural cooperatives

There are four main types of cooperatives: 1) consumer, 2) producer, 3) worker, and 4) service cooperatives. The types of cooperatives of focus here are the consumer and the producer cooperatives. The consumer cooperative strives to better the lives of their members. These types of cooperatives seek to improve housing, income, food security, education, and overall social welfare (Ortmann & King, 2007). And to increase access to these vital needs' cooperatives provide financial services to their members, along with the use of farming equipment and supplies, and help in marketing their product to end buyers (Ortmann & King, 2007). The producer cooperative helps overcome barriers to accessing assets, information, services, and the market. This is done because producer cooperatives achieve economies of scale, they operate at cost, have reduced transaction costs, provide protection against middlemen, seek to guide public policy, garner government support, and elicit community help (Ortmann & King, 2007).

It is imperative that smallholder farmers have access to cooperative membership because smallholders cannot access vital components of farming such as the latest technologies and high-quality inputs due to the residual impacts of colonialism and the resultant underdeveloped markets (Francesconi & Ruben, 2008). In Nigeria 70% of the jobs in rural areas are agriculturally related, yet smallholder farmers face limited access to inputs, output markets, extension services, credit facilities, and improved agricultural technologies, despite it being vital

to their survival (Olagunju et al., 2021). Enrollment in a cooperative could help the smallholder farmer overcome those obstacles. However, for rural smallholder farmers to gain the benefits of cooperative membership they must *actually* become members.

Barriers to membership. Unfortunately, as Bernard and Spielman (2009) note, in Ethiopia only 9% of rural smallholder farmers are members of a cooperative. Smallholders have limited access to credit; this is since many rural smallholders do not own their land, due to outdated property rights laws, and therefore banks will not lend to them because they are not able to provide any collateral (Ortmann & King, 2007). This is a hurdle to cooperative membership as credit is necessary to join a cooperative to pay initiation and membership fees. Another barrier to cooperative membership is a lack of education. At times, the head of the household does not have the appropriate knowledge that would drive them to seek cooperative membership. Further, studies have shown that the older the head of the household the less likely they are to join a cooperative. Also, total assets and land holdings are correlated to cooperative membership (Abebaw & Haile, 2013).

Other reasons that prohibit cooperative membership include the fact that rural smallholder farmers may exist in a disadvantaged geographic location, such that they are not close to any major infrastructure, such as improved roads, electricity, or communication infrastructure (Abate, 2018). As an example, most cooperatives in Ethiopia tend to exist near major roads and established markets, improving cooperative success. Other factors that affect cooperative membership are the scale of the operation of the smallholder; they must produce a surplus to be able to sell at market, but most rural smallholder farmers are just trying to grow enough to feed themselves and their families. Also of importance is the scale of specialization of

the farm. Farms that specialize in fewer crops are more easily able to produce a surplus for sale at market, whereas most smallholder farms tend to be mixed farms and are generally not able to produce a surplus and thus are not able to participate in the market (Abate, 2018).

Another reason affecting cooperative membership entry is the scale of human and relational capital. Is the smallholder farmers' family large enough to help on the farm so that crops are planted and harvested on time with minimal waste? Or are there few family members and the work cannot get done? When there are not enough family members to participate in labor good harvests either end up never being planted, or go to waste because the harvest could not take place in time and/or there was nowhere to store the harvest until it could make it to market. Abebaw (2013) showed that these household demographics are strongly linked to cooperative enrollment.

Cooperative capital. Furthermore, many times it is difficult for cooperatives to get off the ground and running. Cooperatives need both startup capital and long-term capital, and most banks are hesitant to lend to cooperatives. As a result, many cooperatives are dependent on foreign aid and government aid to sustain themselves (Chibanda et al., 2009). One answer to the problem of smallholder farmers accessing capital is a Savings and Credit Cooperative Organization (SACCO), provided they receive government support. For instance, the Bank of Uganda began to subsidize SACCOs so that they could lend to agricultural cooperatives at a decent interest rate (12%), thus providing smallholder farmers the access to credit they would need to gain enrollment in an agricultural cooperative (Ongolo et al., 2019). However, in the end, more access to capital is needed to keep cooperatives sustained and successful, whether that capital comes from local governments, private investments, SACCOs, or foreign aid.

Traits of a successful agricultural cooperative

If the poor rural smallholder farmer can join a cooperative the benefits can be immense. For instance, cooperative membership can facilitate the adoption of new technologies, along with improved land management and land ownership policies, and create access to credit by acquiring assets, so long as the cooperative remains viable (Olagnuju et al., 2021; Ongolo et al., 2019). The longer a cooperative can smoothly function, sustain itself, and attract new members, while maximizing benefits for the membership, the better. Thus, having guiding principles is paramount for success.

Guiding principles. To steer themselves toward success cooperatives have adopted seven guiding principles: 1) voluntary and open membership, 2) democratic member control, 3) member economic participation, 4) autonomy and independence, 5) provision of education, training, and dissemination of information, 6) cooperation among cooperatives, and 7) concern for the community (Ortmann & King, 2007). Another trait of a successful cooperative not listed above is inclusivity. For cooperatives to reach and help the people they most need to help, cooperatives must make membership available to the poorest. Further, they must make benefits available to the poor even if they are not able to participate fully. And finally, structures and processes of the cooperative must represent the interests of the poor (Bernard & Spielman, 2009).

For a cooperative to be successful they must make decisions on many factors. Cooperative leadership must decide who and how many new members to take on. They must also decide if any members are worthy of being expelled. They must also decide when to start a new activity and when to collaborate with another organization. Of further importance is how

much output to buy from its members, how much output to sell, how much output to store and which markets to sell to and when. Finally, cooperative leadership must decide on the amount of dividends to be distributed to the members and then when to keep funds and invest in infrastructure (Bernard & Spielman, 2009). All these decisions, the timing and degree, play a role in the overall success and sustainability of the cooperative.

Additionally, a successful cooperative consistently generates a net surplus for market. This is important for achieving economies of scale and generating income. Also, a successful cooperative gives access to equity and debt capital, thus enabling the smallholder farmer and the community to reduce their dependence on government funding and foreign aid. Further, successful cooperatives invest in growth assets, provide training to its members, and have good marketing arrangements (Chibanda, 2009).

Effects of government on agricultural cooperatives

The success of a cooperative can also be related to government help. In the 1980s much of Africa underwent a structural adjustment (a neo-liberal economic restructuring) (Wedig & Wiegratz, 2018). This structural adjustment, spearheaded by the World Bank and the IMF, sought to revitalize the economy of Africa by steering governments away from state-directed development and towards the free market and private investments in exchange for low interest loans (Ayittey, 1991). However, this structural adjustment adversely affected agricultural cooperatives. It severely reduced smallholders' access to financing, technology, and infrastructure.

Fortunately, since the 1990s there has been a revival of cooperatives. By pooling resources cooperatives allow themselves to compete with larger corporations, that benefited from the structural adjustment. Further, cooperatives can hedge themselves against coercive state

power by having a voice at the governmental level and they can act as a pseudo-union to protect their members rights (Wedig & Wiegratz, 2018). Further, cooperatives can help members navigate imperfect markets and opportunistic trading partners because cooperatives can address the allocation of values, uncertainties, and property rights (Abate, 2018).

As an example of positive government interactions with cooperative-type assistance, the Ethiopian government realized that agricultural cooperative-type actions could help greatly improve agricultural productivity of the smallholder farmer. Thus, the Government of Ethiopia (GoE) and the Comprehensive Africa Agricultural Development Program (CAADP), a pan-African organization that supports agricultural research and technology information dissemination, collaborated to support the smallholder farmers in their efforts to increase production.

In Ethiopia 95% of agricultural output is done by smallholder farmers, yet these smallholder farmers lack the proper access to inputs and capital and have low productivity and low technical efficiency (Abebaw, 2013). Thus, CAADP helps smallholders through the dissemination of inputs, collection and sale of outputs, business loans, and offering training to its members. And as a result, 56% of the chemical fertilizers used by smallholders in Ethiopia were provided by CAADP and GoE and the smallholders were able to receive fair prices at market for their robust harvests (Abebaw, 2013). Further, the GoE is helping cooperatives to transition smallholders to commercial farming, increasing overall agricultural development, and increasing economy wide growth (Bernard & Spielamn, 2009).

In South Africa the New Cooperatives Act was passed in 2005 because the government realized that cooperatives could help the poor rural smallholder farmer through economic and social development. The New Cooperatives Act will allow smallholders to attain self-help, self-

reliance, self-responsibility, and practice democracy (Chibanda et al., 2009). Positive government support can formulate training programs, enhance support structures, and effect legislation which prioritizes community collaboration and supports the marginalized (Ongolo et al., 2018).

Agricultural cooperatives empowering women

Cooperatives have the potential to help increase the agricultural output of smallholder farmers, but they also have the potential to empower women specifically. As Lecoutere (2017) says, "cooperatives are a promising venture to contribute to the social and economic advancement of women" (pg. 23). Women's enrollment into a cooperative would lend itself to their empowerment by enabling individual agency, allowing for joint decision making at home, promoting skill development, accessing leadership roles and training, and granting them access to inputs and credit (Lecoutere, 2017). The reality for many women in African countries is that many times they lack financial resources, have little say in daily decision making in both the home and the community, and yet carry the largest labor burdens of farming and child rearing. Further, women have little control over land rights or ownership of land and lack access to credit and information (Woldu et al., 2015). Thus, women have a hard time entering agricultural cooperatives. Yet, women play a critical role in the food security of their families and contribute to the economy.

Women's cooperative membership. To this end Woldu et al. (2015) offers that policy needs to be gender sensitive and offer a renewed and increased effort to make it easier for women to become members of cooperatives. An increased enrollment of women in cooperatives

can be accomplished by promoting cooperatives that develop out of women's groups, yet still have a gender balance in membership and leadership. Promoting farmer to farmer extension services with women in lead roles and promoting equality at home will allow for women to have more say in decisions and increase self-esteem. Finally, women in leadership roles in agricultural cooperatives can empower women by allowing the discussion of gender roles in more public spaces and giving women command over their income (Lecoutere, 2017). A great example of a cooperative that has proven to be effective in uplifting women is the Popular Knowledge Women's Initiative (PWKI) in Uganda. PWKI is centered around growing sunflowers for market and has proven highly effective in increasing women's self-esteem and confidence, providing them more input into decisions and creating a more gender balanced division at home, all the while creating income and disseminating knowledge (Lecoutere, 2017).

Problems of agricultural cooperatives

Despite the positive examples above, however and unfortunately, governments can use cooperatives to control citizens. Prior to CAADP helping smallholder farmers in Ethiopia the previous government, under the Der regime, would use cooperatives to exercise control. The regime would do this by using the cooperatives to promote socialist ideologies and enforcing compulsory participation (Abebaw & Haile, 2009). Also, as noted by Wedig and Wiegratz (2018) cooperatives struggle against state power because the government, many times, will protect the interests of big capital and state elites.

Limiting factors. Furthermore, other factors limit the success of cooperatives, such as the members not clearly understanding the purpose of the cooperative or not understanding their

own rights and obligations. Also, committee members may not fully understand how to manage a business (Chibanda et al., 2009). As noted by Francesconi and Ruben (2008), in developing countries many cooperatives are managed by village elders who often lack the necessary skills and resources to properly manage a sustainable cooperative. Not only does lack of education lead to poor management and governance of the cooperative, leading to its failure, but so do such things as how democratic elections are held within the cooperative and between the members. For instance, not using a secret ballot for votes can lead to issues. This is because some people may be afraid to vote their mind in front of certain community members (Ortmann & King, 2007).

Furthermore, a lack of leadership and management training is a factor of poor governance, along with weak marketing arrangements coupled with low market returns to the cooperative members and their investors (Chibanda et al., 2009). Conversely, good governance can lead to a successful cooperative that offers its members and the community discipline, transparency, independence, accountability, responsibility, fairness, and social responsibility (Abate, 2018; Chibanda et al., 2009).

Some other problems with traditional cooperatives are the 1) free rider problem, 2) horizon problem, 3) portfolio problem, and 4) control and influence problem (Ortmann & King, 2007). The free rider problem exists when certain members do not do their fair share of the labor but share equally in the benefits. The horizon problem has to do with the limited lifetime of an investment. Essentially, an investment into the cooperative will only yield benefits for the time the member is actively enrolled in the cooperative. Therefore, members tend to under-invest in long term investments such as research and development.

The portfolio problem is caused by investors into the cooperative having to assume more risk than preferred, due to a less diverse investment portfolio. And because of this, members may try to influence management so that they adjust the cooperatives' portfolio so that the cooperative itself takes on less risk. Yet this risk adverse strategy will cause the cooperative to have smaller returns on its' investments because they have taken on less risky investments. Finally, the control problem has to do with the divergence of interests between members and management. Due to members not being able to access the equity of their investment in the market, management has less of a chance of being evaluated for their performance and ethics, which can leave corruption undetected (Ortmann & King, 2007). Furthermore, cooperatives can fail because of poor management, lack of training for its members, conflict among the members, lack of capital, outdated property rights, poor infrastructure, and lack of access to inputs (Ortmann & King, 2007). Other challenges facing cooperatives include unaffordable fees, share capital, annual subscription fees, and retained fees (Ongolo et al., 2019).

Conclusion

Contained here within Chapter Two is an in-depth discussion and analysis of several methods that smallholder farmers in rural sub-Saharan Africa could use to increase their agricultural production and income and thus increase their food security. These methods include improving subsistence farming through agricultural intensification and agricultural cooperative membership. The next logical step is to focus on an organization that is utilizing the above concepts to make a difference for rural smallholder farmers. Chapter Three is therefore a case study of a non-profit that is using these combined methods of agricultural intensification and cooperative membership to improve the crop yields and livelihoods of the residents of Tororo

Town, Uganda. Circle of Friends in Action (COFIA) is a facilitative agricultural cooperative that has formulated a proven agroeconomic model that is vastly increasing the crop yields of local farmers and generating income for the women of their farming collective, all the while being a hub of free farming knowledge for the entire community.

Chapter Three:

CASE STUDY: CIRCLE OF FRIENDS IN ACTION (COFIA)

{All the information here in Chapter Three was obtained through extensive interviews with COFIA founder and president Ms. Carolyn Othieno over the course of several years}

Improving agricultural productivity through agricultural intensification and participation in an agricultural cooperative is an effective path. Yet, for poor rural smallholder farmers in SSA enrollment into a prosperous and sustainable agricultural cooperative can be difficult to achieve. So, the purpose of this thesis, specifically here in Chapter Three, is to highlight one such organization that helps poor smallholder farmers in rural Uganda improve agricultural productivity by overcoming the various barriers to cooperative membership and obtain membership in an agricultural cooperative and the benefits thereof.

The focus of Chapter Three is to present an in-depth case study of the non-profit Circle of Friends in Action (COFIA) and their facilitative agricultural cooperative; COFIA-Farms. By showcasing COFIA-Farms and their operational model, this chapter will offer a blueprint for any organization or individual that wishes to attempt to help alleviate food insecurity in a philanthropic manner through a facilitative agricultural cooperative model. This model will hopefully provide the inspiration for other non-profits to begin their journey of designing and implementing a non-profit operational model aimed at reducing poverty and food insecurity and empowering education. Furthermore, this case study is a recognition of the initial successes of COFIA-Farms and showcases that they are impacting the lives of smallholder farmers in rural Uganda in a meaningful way.

The case study of COFIA contained within Chapter Three will begin with an overview of their overall mission, followed by a quick review of their origin in Tacoma, WA. Next, Chapter Three will discuss the organizational structure of COFIA, which will allow for a contrast and comparison with the organizational structures of traditional agricultural cooperatives to highlight important differences. I will then discuss the various programs that COFIA facilitates, both locally in Tacoma, WA and internationally in Tororo Town, Uganda and the difficulties that COFIA has had to overcome to achieve success. Following difficulties overcome is a section that outlines the successes of COFIA. This section will highlight their accomplishments, gauged against the established metrics of success found in the associated literature, and how they achieved them. Finally, Chapter Three will conclude with a glimpse into stories of COFIA's initial successes followed by the overall conclusion of the thesis.

COFIA Mission

According to Cofiakids.org (2021) education is a human right. Yet, for many millions of children in Africa it is difficult to access. In Uganda, and many other African nations, 75% of students will drop out of primary school, never reaching secondary school. Thus, only 25% of primary students make it to secondary school. This means that 9 million African primary students will miss out on a proper education. There are many barriers that these students face when it comes to securing an adequate education, such as gender role imbalances, early marriages, unmotivated teachers (because they are inadequately paid), child labor, little to no access to healthcare, and lack of awareness by the parents (Cofiakids.org, 2021), but the main inhibitor to the access of a proper education is poverty. Many families in rural Uganda are surviving on as little as $1/day. Therefore, the ultimate mission of COFIA is promote the power of education by reducing poverty. Highlighting this mission Cofiakids.org notes (2021) that "In eastern Uganda we aim to

create an environment where learning and teaching thrive." But before the educational needs of the students can be addressed the families of these students must rise out of poverty. And the first hurdle to overcoming poverty is securing adequate and nutritional food. To address the issues of poverty and food insecurity, with the aim of improving education for rural Ugandan students, COFIA established itself as a non-profit and began diligently carrying out their mission statement.

The beginning

COFIA is a 501(c)3 non-profit that operates out of Tacoma, WA and internationally in Tororo Town, Uganda. COFIA was founded by Ms. Carolyn Othieno, a native Ugandan who endured poverty, disease, lack of access to education, and food insecurity. Due to these tribulations, Ms. Othieno has made it her life's purpose to help as many children in Uganda as possible avoid those same afflictions. This desire to help became the driving force behind the formation of COFIA. Ms. Othieno put her lifelong dream into action in 2010 and COFIA quickly became reality with the help of some fellow school parents. Ms. Othieno and 8 other women founded COFIA, with Ms. Othieno as the president and the other women as board members. The COFIA board (Cofiakids.org, 2021) then established a mission statement… "Education is a human right with immense power to transform." The initial goal of COFIA was to improve educational outcomes in rural Rubongi Village, Tororo Town, Uganda, with St. Jude Primary being the sponsor school. To guide this dedication to education, first COFIA had to help the students of St. Jude Primary and their families overcome poverty and food insecurity. And to do this COFIA strategically divided itself into two arms, COFIA-US and COFIA-Uganda.

Organizational structure

The original organizational structure of COFIA was divided between U.S. programs and Uganda programs. COFIA-US designs and oversees programs that are carried out in Washington. Further, COFIA-US is the fundraising arm with its own mission and vision. The fundraising that occurs here in Washington funds the programs that operate in Uganda. Further, COFIA-US gives people here in the U.S. a chance to participate in helping make a positive difference in the lives of poor rural Ugandan families. A prime example is a local Washington couple who gave over $50,000 for the exclusive purchase of land (35 total acres of land, an invaluable asset) for farming operations in Uganda. When they were thanked by COFIA and Ms. Othineo for their donations, the local couple replied "no, thank you for allowing us to participate in the good deeds that COFIA does" (C. Othieno, personal communication, February 20, 2021).

COFIA-Farms, the Ugandan side of the operations, consists of a farming collective, a demonstration farm, and a production farm and is registered with the Ugandan government as an operating non-profit. COFIA-Farms is managed by Ms. Othieno's family, all trusted members of COFIA and the local community. Having boots on the ground in the local villages is vital to their success. The overall operation of COFIA-Farms is managed by Ms. Otheino's brother Joseph. Prior to working for COFIA-Farms, Joseph was a schoolteacher, but when COFIA-Farms offered him twice his current salary he could not turn down the opportunity (Joesph is paid $300 per month to manage the day-to-day operations the farms). Other paid employees for COFIA-Farms include the members of the Fall Army Worm task force and the Harvest task force. These task forces are composed of seven permanent staff each and they are paid monthly.

There are also temporary farm workers that are hired by COFIA-Farms, based on the needs of the farmers at that time. COFIA-Farms, being a community partner, pays these temporary workers a wage that is uplifting. The typical pay for a day of labor in the village is

~5000 shillings ($1/day), whereas COFIA-Farms pays six times that, up to 30,000 shillings per day. This wage promotes self-confidence, self-sustainability, and a strong work ethic. Further, this living wage reduces turnover and theft as COFIA-Farms' employees are motivated to perform at a high level to maintain possession of these highly sought-after jobs.

Finally, the last piece of the organizational structure revolves around COFIA-Farms working side by side with two extension services agencies. First, COFIA-Farms contracts the services of the National Agricultural Research Organization (NARO), a Uganda government agency, for training and extension services. According to the contract between COFIA-Farms and NARO anytime a farmer has an issue that cannot be resolved NARO will send an extension worker to the village to provide guidance. COFIA-Farms is responsible for paying for transportation, lodging, and food for the extension worker. Additionally, NARO conducts trainings at COFIA-Farms on various farming topics that are geared towards the women of the collective and community members alike. Also, COFIA-Farms works with Delphy, an agricultural non-profit from Holland, that is an expert in food and flowers and specializes in knowledge dissemination and implementation (Delphy.org, 2021). More specifically, Delphy's arable farm team occasionally travels to COFIA-Farms' headquarters in Rubongi Village to host trainings in best agricultural practices, which are open to the public.

The above organizational structure did not always resemble its current state. As COFIA has grown they have expanded from their original goals and visions. The biggest change to the original version of COFIA resulted from a qualitative study designed and implemented by Ms. Othieno.

Needs-based assessment

COFIA-Uganda, also known as COFIA-Farms, is the product of a qualitative needs-based assessment that was conducted by Ms. Othieno in Tororo Town, Uganda with members of the surrounding villages. Ms. Othieno notes, citing the importance of needs-based assessments, that many times an NGO will attempt to help a community in need that is foreign to theirs, but they do not know what the community truly needs. These foreign NGOs do not seek direct input from the community members, the ones who understand what issues are directly affecting their communities and the ones who know the best ways to address those issues.

To this effect Ms. Othieno tells the story of how foreign NGOs come into an area like Tororo Town and offer small loans, on the scale of $50, to start a business. The residents will then take this $50 (and its loan terms) and go buy a commodity, such as tomatoes, from the market. They then go and sit on the street corner and attempt to sell the tomatoes. But they are not selling any tomatoes, as their customers, their fellow citizens from the village, are just as poor as they are and cannot afford to buy any of the tomatoes. At this point they are only selling one tomato a day for mere pennies. Since they were not able to sell all the tomatoes, they have gone rotten. And because they did not sell their tomatoes, they haven't made any money and are not able to make their weekly $5 loan payment. Instead of making money to buy food they now have debt that they can't afford to pay back. They are now worse off than before they took the $50 loan from the well-meaning foreign non-profit (C. Othieno, personal communication, August 30, 2020).

To avoid situations like this, where an NGO is inadvertently doing more harm than good, COFIA and Ms. Othieno conducted a needs-based assessment in Rubongi Village to determine, from the community members themselves, their most pressing needs. Even though Ms. Othieno

is a native of Tororo Town herself and has endured the same hardships experienced by the community she is trying to help, she still felt it necessary to determine the most vital and pressing needs of the community directly from the locals themselves. However, being a native Ugandan did help Ms. Othieno successfully carry out the needs-based assessment study. Being a member of the community, who could speak the local language, she was considered a trusted person, which translated into more honest and robust data.

The needs-based assessment, conducted in September of 2018, consisted of two focus groups. The first group was comprised of women farmers and key informants. The women who were chosen to be part of the focus group discussions were invited to participate based on the inclusion criteria in the Focus Group Research Protocol (Appendix A). The key informants consisted of village elders and local health officials who were chosen based on their standing in the community. The women and key informant focus group discussions were held at the homes of local elders. These focus group discussions were centered around the women's beliefs and attitudes on such topics as agriculture and food insecurity. Further, COFIA also felt that it was important to realize the hardships that children of the village were enduring. Thus, the second focus group was comprised of local children who were chosen for participation based on the inclusion criteria in the Photovoice Research Protocol (Appendix B). To gather the children's beliefs and attitude on food insecurity and hunger a phenomenological study design was utilized. A phenomenological study is preferable for children as they can answer questions by taking pictures and video. To complete the study the children were given cameras to take home with them for a week. The children then took pictures of the things that were most affecting their lives. They also recorded themselves telling stories about their situation. The conclusion of the

two focus group studies revealed that over 90% of the families in Tororo Town depend on agriculture for food and income; they are subsistence farmers.

Unfortunately, many subsistence farmers are caught in a cycle of hunger and poverty. For these smallholder farmers in Rubongi Village, based on the results of the needs-based assessment, a single harvest is only supplying enough food to last for two weeks. As subsistence farmers they are not producing a large enough crop yield to live off of due to poor inputs, such as infested, low-quality seeds, and depleted soils. Seeds eventually lose their effectiveness because farmers save seeds from the previous harvest to use for the next harvest. The more a seed is recycled, from harvest to harvest, the less effective the seed becomes. At some point the farmers need to buy fresh seed. But this proves difficult because these farmers cannot afford new seed and besides, they might lack the proper knowledge to know that if you recycle seeds the quality diminishes over time. So, they might not even know that they need to buy fresh seed (C. Othieno, personal communication, June 15, 2021).

Further, as a side effect of these low crop yields, the villagers are not producing a surplus crop to sell at market, so their income is stifled. And even if they did produce enough surplus crop to sell at market, they lack the funds to pay for storage of the crops and their transportation to the market. Tororo Town is far enough away from the capital city of Kampala that they cannot easily reach the most important and vital markets, as poor rural farmers also lack vehicles to transport goods (C. Othieno, personal communication, June 15, 2021).

Further adding to the low yield harvests in Tororo Town is the fact that the women are doing most of the farming while also being responsible for most of the domestic responsibilities. Additionally, they may not have the appropriate farming knowledge, tools, or the time needed to devote to farming that is required. The women have become responsible for farming because the

men end up getting frustrated with farming because they too lack the proper knowledge and tools to adequately farm and end up with low quantity/quality crop yields. And so, consequently, they go downtown to look for work, but there are very few jobs available (C. Othieno, personal communication, June 15, 2021).

Another factor depleting the Tororo Town crop yields is the local customs that dictate how land is owned and handed down between generations. In Uganda land is handed down through the male lineage. As a result, all the land the patriarch owns is divided equally among his sons and then distributed. Consequently, each generation the amount of land that is handed down gets smaller and smaller because it is constantly being divided among the sons of each generation. Further, this cycle of ever smaller land holdings continues because the wife cannot inherit land and contribute land to the farm. So, crop yields continue to get smaller and smaller because the amount of farmable land a family owns gets smaller and smaller each generation (C. Othieno, personal communication, August 30, 2021).

Further adding to the sub-par crop yield is the location of Tororo Town and its political standing within Uganda. Unfortunately, Tororo Town is in a geographical band of poverty that emanates out from Kampala. Tororo Town is in the eastern part of the country, far away from the more developed west. Western Uganda is more developed because the Ugandan president is from the west, so government funding and policies are mainly geared toward improving the west (Yoweri Museveni has been president since 1986; so, the east has been neglected for some time now). Thus, based on all the above factors a cycle of hunger and poverty perpetuates (C. Othieno, personal communication, August 8, 2021).

Circling back to the beginning of this section, the needs-based assessment enlightened COFIA and their partner Rotary Club to the fact that the most pressing issue that was affecting

education in rural Uganda was a lack of food and income. To capture the local community's' perspective in a qualitative study and then to act on the results to create positive change fulfills the social mission of COFIA. Moving forward, the proceeding section will dive into the various programs that COFIA has implemented in both Washington and Tororo Town, Uganda. The programs are guided by COFIA's mission of empowering education by reducing poverty and increasing food security for the students and families of St. Jude.

COFIA programs

In the beginning COFIA relied heavily on the U.S. programs to support their mission of empowering education by reducing poverty and increasing food security. As stated in Chapter One, sub-Saharan Africa, due to colonialism, is in a chronic state of underdevelopment. And due to this underdevelopment, the basic needs that the students of St. Jude Primary require, such as nutritious and adequate amounts of food, school supplies, school uniforms, and healthcare are not readily available in rural Uganda. Thus, COFIA has set out to fill these social gaps left by colonialism and underdevelopment and supply the children of St. Jude Primary with basic life necessities so that they can be healthy and happy, stay focused in the classroom, and thrive in their educational journey.

COFIA-US programs

To fill these social gaps COFIA began by designing and implementing several programs to carry out in the U.S. that would accomplish the goals of promoting education and reducing poverty and hunger for the students of St. Jude Primary. The COFIA-US programs included a pen pal program, donation drives (school, personal, and medical supplies), a COFIA club at local schools

(to inspire leaders and raise social awareness), COFIA inspired birthday parties (where rather than children receiving gifts for themselves the guests bring gifts for donation), guest speaker opportunities (Ms. Othieno would speak at local schools and businesses), and a financial donation project (to help fund the various COFIA-Uganda programs). Many of these early U.S. programs proved to be very successful.

For instance, COFIA was able to bring in enough donations (i.e., baby clothes, medical supplies, educational materials) that they shipped an entire 20 ft. freight container to Rubongi Village for distribution to the St. Jude Primary students and their families. Also, Ms. Othieno has spoken at several schools in the Tacoma area, including St. Patrick's Catholic School and Concordia Christian Academy. Further, many St. Patrick's students took part in the pen pal program and were able to meet new friends from halfway around the world. Finally, many generous Tacoma residents have given financial donations to help sponsor the various programs both in Washington and Uganda (Cofiakids.org, 2021).

COFIA-Uganda programs

The COFIA-Uganda programs include several programs, such as the Lunch to Learn program. Lunch to Learn, is a vital program because only one in six children in the poorest countries of the world have a meal at school (Cofiakids.org, 2021). This statement holds true for the students of St. Jude Primary. To fill this void, with a donation of $250 the entire St. Jude Primary student body can be fed a home-made meal of rice and beans, made with fresh ingredients from local farmers, thus benefiting the entire community. When students are fed and full of energy, they are more present, more alert, and are more likely to stay enrolled. This is evident in the fact that prior to COFIA sponsoring St. Jude Primary the enrollment was at ~200 students. Since COFIA

has implemented their Lunch to Learn program the enrollment has skyrocketed to over 700 students. When parents hear of a school that provides lunches at all, not to mention being free to the students, it is a no brainer to send their children to that school.

Next, the Academic Success program is important because many children at St. Jude Primary lack the resources necessary to study for the crucial Primary Leaving Exam (PLE). The PLE is required for all 7th graders for acceptance into high school, and their success on the exam determines their educational future. If students do not pass the PLE their education is over forever. According to COFIA, for girls that could mean marriage at 14 and for boys a job digging ditches (Cofiakids.org, 2021). Thus, the Academic Success program provides the indispensable educational materials that St. Jude Primary students need to study for and pass the PLE, allowing them to shape their own destiny.

Another program that COFIA sponsored at St. Jude Primary is the Teacher Support program. As Cofiakids.org (2021) states, nowhere else in the world do teachers deal with more challenging circumstances then in rural Africa, where children and families are mired in poverty. Additionally, the teachers lack the appropriate resources to teach adequately, while also lacking the appropriate pay to keep them motivated and sustained. The Teacher Support program provides teaching materials and supplemental income to St. Jude Primary teachers so that they can teach to their fullest capabilities.

Another crucial program that lends itself to the self-esteem and overall wellbeing of the students of St. Jude Primary is the Uniforms for Dignity program. As parents are mired in poverty and can barely afford to pay school tuition and feed their children adequate meals, uniforms become an out of reach burden that is not prioritized. This is where COFIA has stepped in and has provided many St. Jude Primary students with brand new uniforms tailored to fit.

Having a uniform raises a student's sense of pride and dignity and promotes increased attention and achievement in the classroom.

Finally, COFIA sponsors a Health and Wellness program; COFIA believes that healthy students are better learners. With the support of several U.S. business partners, COFIA conducted Operation Wellness in the spring of 2015. Operation Wellness, with the volunteer services of a local Ugandan doctor, Dr. Abraham Walusimbi, carried out over 600 checkups for the students of St. Jude Primary. For many of these students this was the first time they had ever seen a doctor. From this health and wellness checkup, COFIA discovered that the most pertinent health issues facing the students of St. Jude Primary were malnutrition, lack of access to feminine hygiene products, lack of footwear, and skin conditions (Cofiakids.org, 2021). Overall, these programs have made a huge difference in the lives of the St. Jude Primary students. In fact, word has gotten around Rubongi Village, as all parents want to send their children to St. Jude Primary because of the goodwill of COFIA.

Lessons learned from the health and wellness checkup

After the health and wellness check it was undoubtedly verified that malnutrition was the number one inhibitor to St. Jude Primary students attaining a quality education. As a result, COFIA changed their operational strategy. COFIA went from sponsoring these short-term solution programs, however noble and imperative, to a strategy of long-term solutions. COFIA was now acutely aware that the situation in Rubongi Village was quite dire as 80% of the St. Jude Primary students were coming to school hungry. For these children the hunger pains can be so intense that they cannot focus on what is being taught. Not to mention the teacher may be hungry as well. The Lunch to Learn program proved successful in reducing hunger and keeping students at

their desks, because they did not have to leave school to find food. But the program, however noble and helpful, is limited in its scope. It is limited because it is dependent on a constant stream of financial donations, that isn't always available. Besides, with the enrollment of St. Jude Primary up to over 700 students there were now too many students to feed. The situation had become unsustainable. And not being able to consistently feed school children is a major hurdle to education.

COFIA-Farms

To enhance the educational outcome for St. Jude Primary students by reducing poverty and increasing food security COFIA devised a long-term solution of improving agricultural productivity in Tororo Town. Improving agricultural yields, as part of COFIA's plan, would improve educational outcomes for the students at St. Jude Primary because families would then have adequate, nutritional food to eat at least twice a day, thus reducing hunger. And by reducing their hunger St. Jude Primary students will be able stay in school, at their desks, alert and focused. Improved crop yields would also lead to an income stream for the families by selling excess crops at market.

To put their plan together COFIA reassessed their situation and steered their philanthropic compass in a different direction by establishing itself as an agricultural cooperative, of sorts. As stated in the previous chapter an agricultural cooperative is, as defined by Chibanda et al. (2009), a group of people who meet voluntarily to fulfill their economic and social needs by managing a democratically organized enterprise in such a manner that the benefits received by each member is greater than the benefits that would have been realized individually. However, COFIA has since reinvented itself not as a traditional agricultural

cooperative, but rather more as a hybrid between a non-governmental organization (NGO) and a traditional consumer agricultural cooperative: a facilitative agricultural cooperative.

Comparing COFIA-Farms to a traditional agricultural cooperative

COFIA-Farms, as it operates now in Uganda, is not a collection of individual farmers that manages themselves democratically such as a traditional agricultural cooperative would. But rather COFIA-Farms is a facilitative agricultural cooperative that has a centralized farm management team, which is hired and supervised by the COFIA-Farms board. There are several other distinctions that set COFIA-Farms apart as a facilitative agricultural cooperative when compared to traditional agricultural cooperatives.

The first difference is that COFIA-Farms is a collaboration with the Rotary Club of Tacoma, WA. Rotary Club is responsible for fundraising. Rotary International (2021), founded in 1905, describes itself as an organization that seeks to bring together businesses and professionals so that they can provide humanitarian goodwill around the world while promoting peace. The COFIA-Farms board, which includes the Rotary Club representative Michael McGavock, oversees the decision making; to include hiring, financial, agricultural, and collaborative decisions. The COFIA-Farms/Rotary Club collaboration has blossomed tremendously in the six years (2015-2021) that they have been working together.

Conversely, a traditional agricultural cooperative would not be a collaboration between organizations but rather would be a collection of individual farmers, that may have governmental support but not necessarily governed by an outside organization. Second, COFIA-Farms is different from a traditional agricultural cooperative in that it operates internationally in both the U.S. and Uganda. This aspect of the overall COFIA-Farms operational model is possible because

Ms. Othieno operates COFIA-US based out of Washington State, while COFIA-Farms is based in Uganda, with the day-to-day operations of the farms being overseen by the Othieno family.

This is the biggest reason that the COFIA-Farms/Rotary Club collaboration works so well. Because it is the Othieno family managing the farms and carrying out the projects precisely and ethically Rotary Club trusts that the donated money is being properly used. This allows Rotary Club to solicit donations at higher rate because they can guarantee future donors that their money will be used exactly according to their wishes. Both the donors and the Rotary Club members can see tangible results from Ms. Othieno through pictures and video provided by the COFIA-Farms employees.

Further, Rotary Club is in intimate communication with the farm managers and extension services representatives through weekly meetings arranged end emceed by Ms. Othieno. Even Mr. McGavock has been able to visit the farms in Uganda and see the progress and effectiveness of the COFIA-Farms' programs firsthand. This was possible because he and his guests were hosted by the Othineo family in their home. This organizational structure is beneficial because COFIA-Farms can be promoted by the Rotary Club to American businesses and the public in a country that prioritizes philanthropic giving as a way of promoting goodwill around the world. COFIA has been able to fundraise and solicit donations here in Washington State at a much larger scale than possible in Uganda.

The final difference in the COFIA-Farms operational model that separates them from a traditional agricultural cooperative is that COFIA-Farms is solely managed by COFIA itself. There is a COFIA-US and a COFIA-Uganda board that makes decisions on behalf of the betterment of COFIA-Farms and the smallholder farmers they sponsor. In this sense COFIA-Farms is not a democratically controlled organization like a traditional agricultural cooperative.

The above section highlighted the operational and managerial differences between COFIA-Farms' facilitative agriculture model and the models of traditional agricultural cooperatives. Even though COFIA-Farms is a facilitative agricultural cooperative, they do share many of the same goals as a traditional agricultural cooperative. Traditional cooperatives seek to empower their members by creating employment, generating income, and eradicating poverty (Ortmann & King, 2007). COFIA-Farms have these fundamental goals at the core of their mission as well. COFIA-Farms, however, goes about achieving these goals in a different manner than a traditional cooperative would.

COFIA's facilitative cooperative vs. a traditional cooperative

This section will delve into another set of differences and similarities that COFIA-Farms, as a facilitative agricultural cooperative, has when viewed against a traditional agricultural cooperative. This comparison of the two agricultural cooperative models will be based on the International Co-operative Alliance (ICA) (as cited in Ortmann & King, 2007) and their seven principles that define an agricultural cooperative.

Compare and contrast

The first principle that will be compared is voluntary and open membership. COFIA-Farms membership is voluntary but not necessarily open. Women that participate in the farming collective are chosen via Focus Group Protocols. Further, there are a limited number of spaces in the collective (as of this writing there are 60 spots between three towns), so women who are not initially chosen are placed on a waiting list. Most traditional agricultural cooperatives are always accepting new members and collecting their initiation fees. Second, the ICA states that

cooperatives are democratically controlled. In this facet COFIA-Farms is different from traditional cooperatives in that members are not active in decision making processes. COFIA-Farms is centrally managed by the board of directors and the farm managers. In a traditional cooperative members would be given a chance to vote on various issues, such as the business direction of the cooperative and its financial decisions (Chibanda, 2009). Most traditional agricultural cooperatives promote one person-one vote, whereas some collectives voting rights are based on the financial investments of each individual members (Ortmann & King, 2007). For COFIA-Farms, the women of the collective do not vote.

Third, the ICA (as cited in Ortmann & King, 2007) notes that cooperatives have members that participate economically. Once again, COFIA-Farms is different from a traditional cooperative in this sense. Members of the collective do not have to put their own capital up front to join and participate. Capital for operations has been raised by COFIA-US and Rotary Club. All the financial decisions are handled by the COFIA-Farms board. Yet in the end, the women of the collective are still able to generate income for themselves through the sale of excess crops. Conversely, in a traditional agricultural cooperative, members would have to have their memberships fees paid upfront, pay yearly subscription fees, deal with retained earnings by the cooperative, and would be expected to continually invest in the cooperative's future success (i.e., reinvesting their profits back into the cooperative for the purchase of inputs, equipment, etc.). The inability of the members of a traditional agricultural cooperative to garner fees and investments is a significant challenge that most rural SSA cooperatives face, many times leading to their downfalls (Onyilo, 2019). COFIA-Farms avoids this downfall through the collaboration with Rotary Club and their fundraising abilities. Fourth, according to the ICA (as cited in Ortmann & King, 2007), a traditional agricultural cooperative should have autonomy and

independence. In this sense, COFIA-Farms is similar to a traditional cooperative. COFIA-Farms is not a government agency and operates independently of investors and shareholders, although they are registered with the Ugandan government as a non-profit.

Fifth, a cooperative should prioritize education and training. Again, in this sense, COFIA-Farms is similar to a traditional cooperative. For instance, COFIA-Farms requires and hosts orientation trainings as part of the acceptance into the farming collective. Also, COFIA-Farms contracts with NARO and Delphy to offer continual and free extension services to the women of the collective and the community. Further, COFIA-Farms has established a demonstration farm as a hub of free farming knowledge for the entire Tororo Town community. Sixth, the ICA (as cited in Ortmann & King, 2007) states that cooperatives should cooperate among each other. COFIA-Farms does not necessarily collaborate with other cooperatives, but they do collaborate with other government and non-governmental agencies, such as the above-mentioned NARO and Delphy, as well as Makerere University (the preeminent research university in Uganda).

Seventh and finally, the ICA mentions that a cooperative should have concern for the community. Here, COFIA-Farms is not exactly like a traditional cooperative. The entire operation of COFIA-Farms is geared toward helping the entire Tororo Town community. COFIA-Farms not only wants to improve the educational outcomes of the students of St. Jude Primary by decreasing their poverty levels and increasing their food security status, but they also want to lift the self-esteem and pride of the entire community. While on the contrary it seems that traditional agricultural cooperatives have the best interest of the investors and the wealthiest individual members at the forefront of their decision-making processes (Chibanda, 2009). This is not necessarily bad on the part of traditional agricultural cooperatives for maintaining longevity, but COFIA-Farms have no investors or shareholders to answer to or be swayed by. As a result,

COFIA-Farms is free to pursue only the goals and programs that are in the best interest of Tororo Town and the students of St. Jude Primary.

One final difference between COFIA-Farms and a traditional cooperative, aside from the seven principles listed out by the ICA (as cited by Ortmann & King, 2007) above, is that according to Bernard (2009) the poorest of the poor tend to be left out of cooperative membership. But in the COFIA-Farms model, capital is raised not from the incoming members but rather from outside donors, thus women joining the collective do not need startup capital or membership fees to join. Therefore, COFIA-Farms is free to seek out the rural poor first and foremost for membership. This might be the most outstanding facet of the COFIA-Farms model; those that need help the most are getting it. Consequently, the rural poor have a chance to break out of poverty with a life changing opportunity.

"The Farms"

The farming collective (which will be discussed further below) was the first major endeavor of COFIA-Farms. Spawning from the success of the farming collective, COFIA-Farms established the demonstration farm in Peta and the production farm in Magola.

The demonstration farm

What has become the centerpiece of COFIA-Farms, the demonstration farm is designed to be a hub of farming knowledge for the community, not just for the women of the collective. In fact, any member of the community may come to the demonstration farm to receive knowledge about farming. The demonstration farm is non-profit and provides free access to training and knowledge for the entire community. The demonstration farm is geared toward showcasing best

agricultural practices of crop production. This is accomplished by growing crops for display and for hands on interaction, through a diverse range of crops spread out over 15 acres owned by COFIA (the land was originally owned by the Othieno family, but it was sitting idle and was subsequently made available for use by COFIA). Of these 15 acres, two acres are solely dedicated to growing corn. The other 13 acres are currently growing collard greens, onions, tomatoes, eggplants, asparagus, yams, and cassava, along with mangos, oranges, and soursop. In the future COFIA-Farms hopes to add aquaponics, poultry, and bee keeping to the demonstration farm. The demonstration farm helps fulfill the social mission of COFIA-Farms.

The production farm

The production farm is comprised of twenty acres in Magola. The land for the farm was purchased using a donation from a local Tacoma, WA couple through Rotary Club. The purpose of the production farm is to fulfill the profit mission of COFIA-Farms. Cash crops are grown on the production specifically for sale at the market. The proceeds from the sale at market are used to fund the farming collective and the demonstration farm as well as various other programs.

The farming collective

The farming collective is a group of women farmers who are taught the skill of farming through best agricultural practices and given the necessary supplies needed to farm successfully. The collective is divided among three villages in Torroro Town: Rubongi, Peta, and Magola. Each collective is composed of twenty women each. Initially there were forty women who were part of the first collective harvest in Rubongi Village and Peta. These women were selected based on them meeting the criteria in the Focus Group Protocol. To be chosen for the collective the

women must be a parent of a primary school child, and must exhibit high personal character (i.e., reliable, committed, interested in farming). They must be able to attend all meetings and trainings and they must have a reference from a community leader (village elder).

COFIA-Farms also works closely with village leadership to seek out prospective candidates for the collective, as some women are recommended by village leadership. Once someone has been recommended COFIA-Farms will then conduct a home visit and interview. Since the first collective harvest was so successful women are now chosen to participate in the collective via lottery. The lottery has become necessary because as the farming collective has grown and has been shown to produce great results many women from Tororo Town want to be a part of the collective, but there are just not that many spots available. As of now there is a perpetual waiting list.

Farming kits. Once the women are selected for each collective, they are given farming kits two days prior to planting. These farming kits are property of COFIA-Farms (funded by Rotary Club donations and the production farm) and are crop specific, for instance there are corn kits and there are maize kits. These kits, which have a total cost of about ~$130 each, are comprised of access to one acre of land (leased and paid for by COFIA-Farms), quality seed for one acre, appropriate tools, to include a hoe and a shovel, fertilizer, plow help, pesticides (to include Fall Army Worm task force access), and access to extension services (NARO and Delphy). The money for these kits is not put into the women's hands for them to go purchase, but rather the kits are pre-assembled and are lent to the women for each planting season.

Active participation. To promote participation in the entire farming collective process, from acquiring land to harvest, the women of the collective are first encouraged to go out and find their own one acre of land. Then, once the women have found their land the one acre parcel is inspected and approved by a COFIA-Farms extension officer for use. Once the approval is given COFIA-Farms then secures the lease of the one acre parcel for a set amount of time on behalf of the women of the collective. The idea of lending the farming kits to the women is sustainable because at harvest the women of the collective sell their harvest back to COFIA-Farms, who then sells the pooled harvests at market. From the profits COFIA-Farms keeps $130 (per farming kit) to recoup their investment (and so that they can supply the farming kits for the next planting season). With the remaining funds the women are then paid, by check, based on their crop yield. For the women, these checks may be the most money they have ever seen at once. The check amounts are on the order of $100, which is three times what the average income per month is for a typical farmer. These women are now making a living wage that they can use to buy soap, oil, food, and improve their homes. All out of reach luxuries prior to their participation in the farming collective. With paydays of $100 per harvest it is no wonder there is such a long waiting list to participate in the collective (C. Othieno, personal communication, August 8, 2020).

Agricultural best practices training. However, before the women are lent the farming kits and begin planting, they must attend a three-day training conducted by NARO. The training takes place at the demonstration farm in Peta. COFIA-Farms, through the generous donations of the Rotary Club sponsors, has built a beautiful building in Peta that hosts trainings and meetings. The women are ferried from the neighboring villages in Rubongi and Magola to the

demonstration farm in Peta, at the expense of COFIA-Farms. To begin the training, NARO trainers want to know what the women already know about farming. For instance, NARO asked the women how they attack the Fall Army Worm. Some of the answers that the women gave included praying, picking up by hand, throwing ash on top of them, and dousing them with a cup of urine. These answers lend to the reasons why farmers in this area are achieving sub-optimal crop yields. Further, these questions give the trainers a baseline of the women's knowledge. Once the training begins in earnest it is very detailed and most of this knowledge is new to the women.

The topics that NARO covers in the trainings are quite detailed and include information on agricultural best practices that are crop specific, such as maize agronomy. Maize agronomy training covers soil prep, seed selection, planting techniques to include spacing (10 kg of maize seed should fit into one acre of land with the right spacing), crop monitoring (when weeding should take place and when fertilizer should be applied), identifying seasonal climate patterns, early detection of and how to spot disease, when to harvest, how to harvest, how to prepare crops for storage, and the best way to store the crop. Further, COFIA-Farms and NARO have branched out and are now offering training in best agricultural practices for vegetables, such as eggplant, kale, and tomatoes. In the future they will offer best agricultural practices training in peanuts and sorghum. These agricultural best practices trainings are vital to the mission and success of COFIA-Farms as this knowledge is geared towards empowering the women of the farming collectives and uplifting the community through improved agricultural production.

Extension services. Once the three-day training is complete and the women have chosen their land, and it has been approved and leased, the women are then given their kits and they

begin planting seeds. During and after planting if the women have any questions, they can utilize one of the most powerful tools that they are given in their farming kits, access to extension services. The extension service officers from COFIA-Farms and NARO "holds the women's hands" through the entire process from planting to harvesting. If the women ever have any issues, they contact management and tell them their concerns and management will then dispatch the appropriate extension service officer or task force. As a result of the training the women have acquired a vast collection of new farming knowledge and they have gained community support and admiration for their efforts. Because of this the women of the collective have been found to be very enthusiastic and engaged, eager to keep learning, and are asking lots of questions. They have become local rock stars.

The first harvest. The first harvest for the farming collective took place in the spring of 2018. Quite quickly lessons were learned. The first challenge encountered by COFIA-Farms was how to combat the Fall Army Worm. At first COFIA-Farms strategized as a plan to teach each woman the appropriate pesticide to kill the worm and how to apply it. But this strategy did not work very well because the women did not correctly apply the pesticide. As pesticide was being improperly applied the crops continued to be damaged by the worm. This initial strategy wasted pesticides, time, and crops. COFIA-Farms' response was to create a Fall Army Worm task force. The task force consisted of three paid employees of COFIA-Farms; young men recruited from the village. These young men of the task force were trained by NARO about the biological characteristics of the worm, the pesticide used to kill it, and how and when to properly apply the pesticide. COFIA-Farms determined that there should be three automatic sprays per season. But if the women were still having issues with the worm despite the schedule sprayings, they could

contact management at any time and the task force would be deployed to their farm. This tactic of training and dedicating a trained team that can deploy to any farm at any time has proven successful, as evidenced by the second harvest when there were zero Fall Army Worm incidences.

The second harvest. The challenges brought on by the second planting season of the collective were both instances of growth and instances of hope. The challenges that required COFIA-Farms to grow came about when they needed to learn how to deal with theft. Theft of crops was occurring due to admiration. The locals were becoming jealous of the quality of corn that the women of the collective were now able to grow. As a result, corn was being stolen so that the villagers could get good quality seed that they could then go plant on their land and in turn grow an equally quality crop. In another example, some of the landowners that leased land to COFIA-Farms wanted their land back, or wouldn't renew leases, because they didn't know that such high-quality crops could be grown on their land. Another challenge encountered by COFIA-Farms after the second harvest was that the women were overwhelmed by the thought of how they were going to harvest that much corn and where it would be stored.

Prior to being part of the collective, these women were harvesting ~50 lbs. of corn per acre. But by the first harvest the women of the collective were producing on average ~1,500 lbs. of corn per acre. A 2,900% increase (a testament to the COFIA-Farms operational model).

The Harvest task force. To address the problem of harvesting and storing such a large crop yield COFIA-Farms formed a Harvest task force. This task force also consisted of young men recruited from the village who were then trained in the specific tasks of harvesting and

storing. The Harvest task force members are also paid employees of COFIA-Farms (everyone in the village wants to work for COFIA-Farms—this speaks to COFIA-Farms being a job creator that pays a living wage). The Harvest task force's job is to go farm to farm, on a set schedule, and harvest the crops and then transport them to the storage facility. Both the headquarters in Rubongi Village and the demonstration farm in Peta have secure storage facilities. These storage facilities were constructed by COFIA-Farms with donations solicited by the Rotary Club.

The Harvest task force has also proven to be quite successful as no crops are wasted because all farms are harvested in time. As a result of the success of the Harvest task force none of the bountiful harvests go to waste because they are stored properly in secure facilities until they can be taken to market for sale. Once the crops are at the storage facility they are prepped for storage, this is when the shelling occurs. The corn shelling is done by the Harvest task force using a corn shelling machine that COFIA-Farms owns. The corn shelling machine is kept at the headquarters in Rubongi Village.

Farming engagement. However, during the entire process, from planting to harvest and beyond, the women remain engaged as they assist in the various farming activities as they work alongside the task forces as they carry out their duties. This engagement is extremely important for the sense of pride and increased self-esteem that it brings. Producing such a bountiful harvest not only provides food for themselves and the community but also produces an income that they can use to provide for their families, which is the goal of the farming collective.

Selling to market. Once the crops from the entire collective (now 60 acres total, with twenty new acres in Magola) have been harvested, collected, and shelled, COFIA-Farms pools

the crops together for sale at market. By pooling all the harvests of the collective COFIA-Farms can achieve an economy of scale, thus receiving the bulk rate for their crops at market. Through the sale of the crops at market COFIA-Farms is accomplishing several tenets of their overall operational model. First, they are providing a surplus crop of quality food to the market. This benefits the entire community. COFIA-Farms sells to markets in Kampala, the capital city, but COFIA-Farms is always on the hunt for diverse markets both locally and regionally (i.e. Kenya). Kampala, unlike the rural areas that surround it, is made up of middle-class professionals who do not engage in farming. Thus they, along with the urban poor, are reliant on the villages that surround the city to provide fresh produce for sale at the markets. So, there is a vibrant marketplace in Kampala that welcomes the harvest of COFIA-Farms.

The farming collective, demonstration farm, and production farm are all successful operations that have brought a sense of hope and pride to the villages that surround Tororo Town.

Avoiding pitfalls

Chibanda (2009) notes that are several hinderances that can keep a cooperative from being successful. In this section it will be shown that COFIA-Farms has avoided these obstacles to be a successful cooperative. First, a cooperative can be stifled when the members do not have a clear understanding of the purpose of the cooperative. COFIA-Farms has avoided this pitfall as the members of the collective are not responsible for management and decision making. COFIA-Farms management, who are paid fulltime employees, have a thorough understanding of their operating model and they "hold the hands" of the women of the collective all the way through the farming process, from planting to harvest. Second, when members do not understand their

obligations and rights this can hinder the success of a cooperative. But with COFIA-Farms this is avoided as the women of the collective are chosen based on criteria from the Focus Group Protocol. So only women who are motivated and committed are invited to participate. This rigid selection process ensures that the women who are selected for the farming collective possess the skill sets which allows both COFIA-Farms and the women of the collective to succeed.

Third, a cooperative can be unsuccessful when the leadership does not understand business strategies. Once again, this hinderance is avoided because the burden of running the business side of the cooperative is not placed on the women of the collective but rather a designated management team. The management team, based in Rubongi Village, is overseen and vetted by the COFIA-Farms board. Finally, traditional cooperatives have a difficult time raising capital for long-term projects. But the COFIA-Farms/Rotary Club fundraising strategy allows for the funding of long-term projects. Thus, COFIA-Farms does not have to rely on lending from banks to sponsor such projects as the wells, greenhouses, or buildings. Further, COFIA-Farms owns the land used for the demonstration and productions farms outright.

A downside of a cooperative, as noted by Abebaw (2013), is that they tend to be exclusive and tend towards an uneven distribution of benefits. COFIA-Farms once again overcomes these downfalls of a traditional cooperative in that they seek out those who need the help the most, the rural poor. Enrollment into the COFIA-Farms collective is not based on how much capital someone brings to the table but rather the desire and dedication they exhibit for becoming a great farmer. Also, the distribution of the benefits is spread out among the members of the collective based on their crop yields. After harvest, when the crops are pooled and sold at market each woman of the collective is paid based on the portion of the crop they contributed. In

this way each woman is fairly compensated based on their effort and adherence to the agriculture best practices being taught.

External obstacles to success

There are also obstacles to the success of a cooperative that are external to the cooperative itself. For instance, Wedig (2018) states that there has been a decline of rural financial services in recent years. This negatively affects cooperatives as their sources of capital are dwindling. But for COFIA-Farms, since they can raise their own capital through targeted fundraising led by Rotary Club, this lack of rural financial services does not affect them. Second, Wedig (2018) points out that high transportation and storage costs can hold back the success of a cooperative. To combat this COFIA-Farms has built storage facilities at both the headquarters in Rubongi Village and the demonstration farm in Peta. Then, COFIA-Farms contracts out transportation to move the surplus crops to market in bulk. They can avoid the high costs of transportation because of economies of scale and because management are themselves members of the community and know where to find the best deals.

Third, low levels of public investment in infrastructure can hold back the success of a cooperative. This is an issue that is out of the hands of any cooperatives' management, but fortunately for COFIA-Farms they have electricity at the headquarters, and the demonstration and production farms. And the roads from Tororo Town to Kampala are adequate for getting crops to market. Finally, the members of traditional cooperatives who invest their own capital into memberships take on a certain amount of risk, mainly due to price fluctuations in the commodity markets. But with the COFIA-Farms model the women of the collective do not need to take on any risk. Since they have no initial investment, they have nothing to lose. And the

COFIA-Farms strategy reduces risk by adhering to agricultural best practices so that the harvests are bountiful enough to sell at market.

Any successful business operation knows there will be early setbacks. However, those that are truly driven to succeed will use those setbacks as learning moments and grow from them. And COFIA-Farms has shown that they have done just that, as the next section will demonstrate that their success can be measured and quantified against established metrics.

Metrics of success

According to Chibanda (2009) there are six metrics that determine if a cooperative is successful, and these metrics will be used to gauge the success of COFIA-Farms. First, does the cooperative generate a net crop surplus? COFIA-Farms achieves this as the women of the collective are producing enough crop yield to have crops for consumption at home and enough to sell at the market and receive income from the sale of the crops. The second metric that gauges the success of a cooperative is the ability of a cooperative to access equity and debt capital. Again, COFIA-Farms is successful in this manner as they have access to capital through fundraising. Since COFIA-Farms was established through donations, no loans have been taken out and they have no debt. Further, as part of their operational model they have established a production farm which grows crops for sale at market, from which the proceeds are used to pay salaries and fund the collective, demonstration farm, and the production farm itself.

Third, a successful cooperative has little reliance on government support. Here COFIA-Farms is successful as well. Since they have collaborated with Rotary Club of Tacoma, they are able to raise their own funds and not depend on government assistance. Fourth, a successful cooperative will invest in growth assets. Once again COFIA-Farms is successful in this manner

as they have invested in the demonstration farm, the production farm, purchase of land, greenhouses, wells, storage facilities, buildings, and machinery.

Fifth, a successful cooperative prioritizes skills training. This is a definite priority for COFIA-Farms. As part of the orientation for being part of the collective a three-day training session is required. Further COFIA-Farms regularly collaborates with NARO and Delphy to provide in-house trainings on agricultural best practices and farm management. These trainings, free to those who attend, are geared toward the women of the collective, farm management, the task force teams, and the community. Finally, a successful cooperative will locate markets for their products and receive fair market prices. COFIA-Farms has established working relationships with markets in Kampala and are always on the lookout for new markets both locally and regionally.

The comparison of COFIA-Farms as a facilitative agricultural cooperative against Chibanda's (2009) metrics of success shows that COFIA-Farms is excelling in many facets of their consummately managed facilitative cooperative. In fact, they seem to be carving their own niche in how they operative as a facilitative agricultural cooperative. Their initial successes vividly display that COFIA-Farms has competent leadership and a strong operational model that will contribute to their longevity and effectiveness as a sustainable non-profit.

The next section will now cover how COFIA-Farms is able to achieve their successes on the ground, agriculturally. Remembering Chapter Two, a discussion surrounding agricultural intensification, technology adoption, and conservation agriculture and how COFIA-Farms parlays these techniques into success as a farm will take place.

COIFIA-Farms: Improving agricultural productivity

Uganda is no different than any other African nation in that their soils have been overused and their crop yields are susceptible to climate change and the resultant decreased agricultural productivity. Further, declines in agricultural productivity can be attributed to declining soil fertility, low adoption rates of inputs and technology, and lack of extension services (Mango, 2014). Consequentially, COFIA-Farms has formulated their agricultural best practices and farming philosophies around mitigating these barriers to increased agricultural productivity. The first method that COFIA-Farms utilizes to achieve technically efficient crop yields is agricultural intensification.

Agricultural intensification

Agricultural intensification, as defined by Dawson (2019) and Larson (2016), is the increased use of inputs such as modern seed variants and fertilizer. COFIA-Farms utilizes both these inputs. Modern seed variants of maize and corn are purchased from NARO. These seeds are then disbursed in the farming kits that are used as part of the collective, and they are also planted at the demonstration and production farms. The types of seeds that are purchased from NARO are precisely the modern variants that will thrive in the specific climate of eastern Uganda. They are chosen for their likelihood of producing a high yield harvest, thriving in the specific soils of Tororo Town, and being resistant to drought. Further, high quality fertilizer and pesticides are also purchased, in bulk, from NARO. The fertilizer and pesticides are similarly proportioned among the sixty acres of the collective (as part of the farming kit) and the demonstration and production farms.

Beyond the basic definition of intensification articulated by Dawson (2019) and Larson (2016), Ngendo (2015) notes that crop diversification is also a form of intensification. And this is a strategy that COFIA-Farms is using to increase agricultural productivity and knowledge dissemination. Crop diversification is mainly used on the demonstration farm where COFIA-Farms grows a wide range of crops, to include cereals and vegetables. By COFIA-Farms utilizing crop diversification it allows community members to learn how to grow a wider variety of foods for subsistence and thus will have a more well-rounded, nutritious diet. Further, COFIA-Farms is able to improve agricultural production by the use of irrigation. As part of their mission COFIA-Farms has installed two wells, both for irrigation and domestic use, that are both open to the public. One well is in Peta at the demonstration farm, and the other well is in Rubongi, home of St. Jude Primary and twenty acres of the collective.

Market-oriented agricultural intensification

Additionally, Dawson (2019) goes on to note four ways that agricultural intensification can also be achieved through a market-oriented approach. These four methods include selling cash crops to increase incomes, moving away from subsistence farming, buying more food, and educating children. COFIA-Farms utilizes all of these strategies of intensification as well. As a result of COFIA-Farms operational model women of the collective can produce enough excess crop to be sold at market, for which they receive payment. The women are then able pay for inputs for the next season creating a positive feedback loop. Further, the women of the collective can use the income they earned to buy more diverse foods for their families and pay tuition for their children to go to school. COFIA-Farms offers all these benefits to the sixty women of the collective due to the effective use of these proven agricultural intensification techniques.

Technology adoption

COFIA-Farms also engages in the adoption of appropriate technologies to improve the agricultural production of the collective, as well as improving the production of the demonstration and production farms. Besides adopting the use of improved inputs, crop diversification, and irrigation, COFIA-Farms has also adopted the concept of the model farmer. Model farmers act as conduit for agricultural best practices knowledge into the community (Taylor, 2018). Model farmers transfer knowledge to the community by acting as a go-between between extension services and the individual farmer. Essentially the women of the collective are model farmers. They have learned agricultural best practices by attending the numerous trainings hosted by COFIA-Farms, NARO, and Delphy. Subsequently the women of the collective go back to their villages and pass on their new knowledge to others.

COFIA-Farms has utilized several other technologies in the operations of their various farms. These technologies include using a drone to survey and film their farms for monitoring productivity and marketing. They also hire engineers to survey any land that is being purchased to ensure the square acreage is accurate. This may seem commonplace elsewhere, but in Uganda land is often surveyed only by sight and memory of the boundaries. COFIA-Farms also leans on NARO to conduct soil testing. The soil testing determines the types of soil at the farms so that the proper seeds to plant can be purchased. Additionally, COFIA-Farms will soon begin planting legumes on the production farm. This technology is important for nitrogen fixation, protecting against soil erosion, and increasing soil fertility (Asfaw, 2012).

Conservation agriculture

Finally, COFIA-Farms, from the beginning, has implemented the basic strategies of conservation agriculture. COFIA-Farms, as a tenet of their best agricultural practices, strives to maintain minimal soil disturbance, a layer of organic material, and spatial/temporal crop rotations (Dougill, 2017; Nyamangara, 2012; Vanlauwe, 2013). COFIA-Farms has already seen the benefits of conservation agriculture in that the fertility of the soil on the farms have increased (based on soil testing by NARO). Further, their agricultural techniques result in minimal water use and the soil is being protected against erosion (Nyanmangara, 2012).

Stories of success

The farming collective program run by COFIA-Farms is achieving many goals. First, they are teaching women in the village how to properly farm. Because of the intensive training these women have gone through they can now grow enough crops to feed their families, and because of this their children have enough food so that they do not have to go to school hungry. They even have enough food so that they can bring food with them to school so that they do not have to rely on the Lunch to Learn Program, or leave the classroom to seek out food. Also, since the women are now producing a surplus crop for sale to the market, they are earning an income. This income allows them to pay tuition for their child at St. Jude Primary. This income also allows them to buy household goods and other foods, such as fruits and vegetables that round out their diet.

As a byproduct of the positive results of the collective these women are not only improving their own lives, but they are also contributing to their community by creating jobs and stimulating economic activity. And because of the food they provide to their families and their

community, along with the income they earn, these women have boosted their self-esteem and confidence as a family provider. Finally, the women of the collective have learned a very useful skill in farming. These skills not only increase their own quality of life, but they are providing nutritious food for their families and the community at the same time. The goals of the collective, and the women who participate in it, are at the heart of COFIA-Farms mission. Ultimately, the collective is helping improve the educational outcomes of rural Ugandan children by empowering their families to provide food and income for themselves in a sustainable manner so that their children can remain focused in the classroom.

Thesis Conclusion

This thesis has established, by an exploration of the appropriate literature, that the Scramble for Africa directly led to the economic underdevelopment of sub-Saharan Africa. In turn, it was underdevelopment that is responsible for the contemporary chronic food insecurity of millions of people in sub-Saharan Africa. Chapter One of this thesis laid out these correlations. Once the facts of food insecurity in sub-Saharan Africa were revealed, this thesis, within Chapter Two, then began to discuss practical methods for poor rural smallholder farmers in rural sub-Saharan Africa to improve agricultural productivity. An improvement of agricultural productivity would have the effects of reducing poverty and increasing food security. Methods for improving agricultural productivity include intensification, technology adoption, conservation agriculture, climate-smart agriculture, and agricultural cooperative membership. Finally, Chapter Three was a case study of Circle of Friends in Action, a facilitative agricultural cooperative that is actively reducing poverty and increasing food security for families in Rubongi Village, Tororo Town, Uganda.

There are several important reasons for the writing of this thesis. First, the rural smallholder farmers of sub-Saharan Africa are in a dire situation, but they are not the creators of this undesirable situation. Rural smallholder farmers in sub-Saharan Africa were handed poverty and chronic food insecurity by fate and circumstance, and to get out of this situation assistance is needed and that helping hand can take many forms. One can help just by learning about the situation and having empathy. One can help by donating money to a charity that pledges to help, or one can get to the heart of the problem and address the underlying problem. COFIA chose to go the heart of the problem and tackle the issues directly.

It is important to highlight COFIA because they are a successful facilitative agricultural cooperative. The facilitative model has proven to be successful in bringing the rural poor into an agricultural cooperative in a sustainable manner. Further, they are making a difference in the Tororo Town community by bringing agricultural best practice knowledge to the community members free of charge. They are also generating income for the women of the collective, who are paid, by COFIA, for their harvests. Also, they are generating income for the farm managers, the task force teams, and local businesses who contract with COFIA for such services as transportation and construction. Finally, COFIA has brought a sense of pride and hope to Tororo Town in that the women of the collective have become empowered with their new sense of farming knowledge and the pride they feel from providing for their families.

But most importantly the ultimate goal of COFIA is being realized. When COFIA began their initial goal was to improve the educational outcomes of the students of St. Jude Primary, so that they could pass the PLE and go on to secondary school and have a fulfilling, enriching educational experience. Now the parents of the St. Jude Primary students have learned agricultural best practices and they are growing the essential crops needed so that their children are being fed adequate meals and not going to school hungry. When children come to school fed, they can pay attention and learn. Thus, the ultimate plan is coming together: teach the community agricultural best practices, so that they can grow abundant, nutritious crops so that their children and are fed a well-rounded, adequate diet, so that they can achieve in school, pass the PLE and attain a secondary education, go to college, and earn income so that they can live fulfilling lives.

To put it succinctly, the COFIA/Rotary Club strategy of improving crop yields of poor rural smallholder farmers is proving to be successful and a model for others to follow. The

women of the COFIA-Farms farming collective have been able to increase their crop yields exponentially by following COFIA-Farms agricultural best practices, and that is why the local villagers think that COFIA has the Magic Seed.

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Appendix A

FOCUS GROUP
RESEARCH PROTOCOL

A Focus group is a form of qualitative research in which a group of people are asked about their perceptions, opinions, beliefs, and attitudes about a selected topic or subject.

Research design:
Qualitative study design using focus group as the primary research tool.

Focus Group Objectives:
- To draw upon participants' attitudes, feelings, beliefs, experiences and reactions about a range of topics, including agriculture, food security, and highlight the differences in perspective between groups of women.
- To foster dialogue and knowledge sharing through group discussion.
- To enable us as a changemaker better understand the experiences of women small holder farmers and take appropriate action.

Focus Group location:
Focus Group 1: Margaret Othieno' s Residence, Rubongi village.
Focus Group 2: Peta Primary School, Peta village.

Research participants:
Focus Group 1: 8-10 Women (SH Farmers) and parents at St. Jude Primary School.
Focus Group 2: 8-10 Women (SH Farmers) living in Peta village.

Sampling methodology:
Purposive sampling, non-probability sampling where participant selection is based on the researcher' s judgement. It is an appropriate method since we are interested in the patterns and experiences of study participants.

Inclusion Criteria (Focus Group 1):
- Reside in Rubongi village.
- 18 years of age and above
- Parent/Guardian of child attending Primary School.
- Female Smallholder Farmer (farming is a main means of livelihood).
- Willing and able to express themselves in the local language.
- Willing and able to attend all Focus group session.

Appendix B

Photo Voice

RESEARCH PROTOCOL

"A picture is worth a thousand words." Seeing what someone else sees is more powerful that being told about it.

Photovoice is a participatory research tool that entrusts people, especially those with limited power with the opportunity to use photo images to capture aspects of their environment and experiences and share them with others.

Research design:
Phenomenological study design using photovoice as the primary research tool.

Focus Group Objectives:

- To enable children to articulate, record and reflect their experiences of hunger and food insecurity.
- To promote critical dialogue and knowledge sharing through group discussion of the photographs.
- To enable changemakers to better understand the lived experiences of children and to take appropriate action.

Research location:
Photovoice 1: St. Jude Primary School, Rubongi village.
Photovoice 2: Peta Primary School, Peta village.

Research participants:
Photovoice 1: 8-10 students attending St. Jude Primary School.
Photovoice 2: 8-10 children living in Peta village.

Sampling methodology:
Purposive sampling, non-probability sampling where participant selection is based on the researcher's judgement. It is an appropriate method since we are interested in the patterns and experiences of study participants.

Inclusion Criteria (Photovoice 1):

- Reside in Rubongi village.
- Student of St. Jude Primary School.
- Grades 4 - 7.
- Below 18 years of age.
- Willing and able to express themselves in the local language.
- Willing and able to attend all photovoice sessions.