Bachelor's in development studies
Department of Economic History
Course: EKHK18, 15 hp
Supervisor: Ellen Hillbom

# The gender gap in agricultural productivity

~

# A case study of rice farming in the River Delta Valley in Senegal

Matilda Strand
Bachelor's Thesis
August 2019


LUND UNIVERSITY

# Abstract

In Senegal, rice plays a crucial role in combatting food insecurity since it is one of the most consumed staple crops. Despite this, national rice-production is insufficient in relation to the domestic demand, making Senegal one of West Africa's most import-dependent countries in rice. To combat this issue, the Senegalese government aim to reach national self-sufficiency in rice production, primarily focused on the irrigated agricultural sector called the River Delta Valley. Previous research has highlighted that to increase agricultural productivity; it is essential to close the gender gap and to empower female farmers. This thesis has investigated how gendered differences in smallholder rice production in the River Delta Valley impacts agricultural productivity levels, agricultural management, and female farmers socio-economic situation. The study applied a mixed-methods data collection, involving a micro-survey, individual and group interviews and participating observations with both male and female farmers, guided by the methodology and analytical framework called Women's Empowerment in Agriculture Index (A-WEAI). It was found that while both male and female farmers have increased their rice production in comparison to the last ten years and the preceding generation, gendered differences which limit females' potential in agricultural productivity remains. Some of these are inheritance and ownership of land, constraints in time and workload, and limited financial resources. Finally, it was observed that while female farmers had enjoyed increased economic opportunities in comparison to the preceding generation, this had resulted in the transfer of economic responsibilities from males to females. Ultimately, females were left with a heavier financial burden than before managing their individual economy. It was concluded that female empowerment is not a linear process since the improvement in one dimension of the concept might result in negative consequences in another dimension.



*Keywords:*

*Agricultural productivity, agricultural development, gender gap, empowerment, rice cultivation, food insecurity, Senegal.*

# Acknowledgments

To start, I would like to extend my gratitude to my supervisor Ellen Hillbom, for her helpful directions and our inspiring discussions. Continuing, I would also like to express my sincerest gratitude to all the warmhearted and helpful key informants and participant rice farmers in the River Delta Valley, Senegal without whom this thesis would not be laying in your hands. You all made me feel at home throughout the field study leading up to this thesis. Thank you Mame Fama Seye for your big heart, open arms, kindness, and support. Thank you Mme Fatou Dieng Ndiaye for welcoming me into your home as one of your own children. Thank you Thierno Ngamb who helped me with valuable contacts and information. A big thank you to Allison and Alexis, for my luxurious weekends in your apartment including hot showers, cozy dinners, and breakfasts on the balcony. To all of you and everyone else who participated and helped me throughout this process, I am forever grateful.

# Table of contents

# List of Figures



# List of Tables

# List of Abbreviations

| | |
|---|---|
| **ACSA** | Sécurité alimentaire et Adaptation au Changement Climatique dans les Systèmes Agricoles des Petits Producteurs du Delta du Fleuve<br>*Food security and climate change adaptation of smallholders' agricultural systems in the River Delta Valley* |
| **FEPRODES** | Federation de Groupements et Associations des Femmes Productrices de la region de Saint-Louis<br>*The Federation of female producers' farmers' collectives and associations in the region of Saint-Louis* |
| **SAED** | Société National d'Aménagement et d'Exploitation des Terres du Delta du fleuve Sénégal et des vallées du fleuve Sénégal et de la Falémé<br>*The national institution of construction and land-improvements of the River Delta Valley and the Falémé in Senegal* |
| **UFP-Ross Bethio** | Union des Femmes Productrices de Ross Bethio<br>*The union of female producers in Ross Bethio* |

# 1. Introduction

West Africa is largely characterized by agriculture-based economies whose small-scale low-productivity result in insufficient agricultural yields and food insecurity (AGRA, 2017; FAO and AfDB, 2015). While at the macro level, GDP growth in African economies has been rapid with some signs of structural transformation, the inclusivity of growth processes can be questioned on several grounds. The prospects for leaving the agricultural sector altogether are small, as shown by income data that demonstrate the persistent role of agriculture in rural livelihoods across Africa as well as the poor opportunities for diversifying into high-return activities outside agriculture (Andersson-Djurfeldt et al. 2018:1-2). This has led to food import dependency and high exposure to international market shocks constraining countries' food security and political stability (Agarwal, 2015; Seck et al. 2010; Nasrin et al. 2015; Saito et al. 2015). This is the case for the West-African staple food rice (Dawe, 2010). One of the region's most rice import-dependent countries is Senegal, ranking among the world's top-ten rice importers due to the growing population and urbanization resulting in consumers increasing demand for rice (Dawe, 2010:149; Diagne et al. 2013; Seck et al. 2010; Ministère de l'Agriculture, 2009). This is problematic since the global rice market is highly unstable and may be magnified by the effects of global climate change, such as the increasing risk of extreme weather events. This is what happened during the economic crisis in 2007–08, when food prices spiraled including both rice types 'Thai 100%' and 'Thai 25' who tripled in price (Senegal's most imported rice varieties) (Dawe, 2010; Ministère de l'Agriculture, 2009; Ministère de l'Agriculture et de l'Equipement Rural, 2014:77). Although the 2007–08 price spike was especially dramatic, global food prices continue in an upward trend while price volatility risks remain (Agarwal, 2015). In response to this, the Senegalese government enforced the 'National Program of Rice Self-Sufficiency' (PNAR), part of Senegal's grandiose national development plan 'Plan Senegal Emergent' (PSE) (République du Senegal, 2014; FAO, 2015; Ministère de l'Agriculture, 2009). The vision and goal of PNAR is to intensify the domestic rice sector through various investments in order to increase rice harvests and quality to eventually reach self-sufficiency in rice production (République du Senegal, 2014). These endeavors comply well with both academics and international organizations stating that increasing productivity and efficiency in developing countries' agricultural sectors is key to agricultural transformation, resilience to fluctuating food prices on the global market, food security and ultimately to a nation's development (FAO, 2011; Timmer in Eicher and Staatz, 1998:113-135; The World Bank, 2007:3,95).

So, what then is needed to increase the agricultural productivity? While this question has a multitude of answers and solutions, one of them did for a long time remain in the dark. This solution concerns the utility of all farmers' labor force, regardless of their gender. International organizations and academic researchers agree that to realize increased agricultural productivity, it is essential to close the gender gap and empower female farmers. Doing so would generate development opportunities both for women in agriculture and spill-over benefits for their households and communities (FAO, 2011; Quisumbing et al. 2014). If women had the same access to productive resources as men, they could increase agricultural yields on their farms by 20–30%, which could raise the total agricultural output with 2,5-4% which in turn could reduce the number of hungry people with 12-17% globally (FAO, 2011).

In addition, this can lead to more sustainable farming systems which can meet future demands for food and reduce financial costs of gender inequalities generating win-win opportunities for all stakeholders involved (FAO, 2011; AfDB, 2015; Quisumbing et al. 2014; The World Bank, 2007; The World Bank et al. 2009; Maertens and Swinnen, 2012; Lopez-Carlos and Zahidi, 2005). Unfortunately, 'closing the gender gap' is often mentioned on paper but not always achieved on the ground. This is the case in Senegal's northern rice sector the River Delta Valley where female farmers lack the same opportunities as males, while the government's goal of reaching national self-sufficiency in rice production is not yet within sight (Ministère de l'Agriculture et de l'Equipement Rural, 2014:25-28, 47-50, 58; Ministère de Femme, de la Famille et de l'Enfance, 2016). Given the important role of rice production for Senegal's agricultural development, this thesis takes its departure in the statement that closing the gender gap in the agricultural sector has the potential to improve productivity and efficiency in agricultural production (Quisumbing et al. 2014; FAO, 2011).

## 1.1 Aim and research questions

This thesis aims to explore what gendered differences exist between male and female smallholders in Senegal's irrigated rice region called the River Delta Valley, and how the differences impact agricultural productivity, management, and female farmers socio-economic situation. As agricultural development is a slow process, the research has collected participants' insights from three points in time; present day, 10 years back and the preceding generation. The insights concerning the preceding generation were gathered by interviewing participants about their parents and grandparents. These three points in time were chosen to account for slow changes and not solely to provide the readers with a snapshot of the present-day situation. The data was collected using a micro-survey, individual, and group interviews guided by the methodology and analytical framework called Women's Empowerment in Agriculture Index (A-WEAI). This empirical study connects to the academic discussion on the impacts of the gendered division of labor onto agricultural productivity. This aim will be fulfilled through the research questions below.

**Research question 1**

> *What gender differences in productivity levels can be observed in Senegal's smallholder family rice productions in the River Delta Valley over the last 10 years and the preceding generation?*

**Research question 2**

> *What gender differences in agricultural management can be observed in Senegal's smallholder family rice productions in the River Delta Valley over the last 10 years and the preceding generation?*

**Research question 3**

> *What effects have the previous developments in the River Delta Valley's rice agriculture had on female farmers' socio-economic situation?*

## 1.2 Relevance

Aside from gender equality which holds intrinsic value as it is a fundamental human right, this thesis applies its relevance to the statement that closing the gender gap has the potential to improve productivity and efficiency in agricultural production. As promoted by the FAO

and academic research in the field of pro-poor agricultural development; increasing the understanding of women's role in agriculture is important for social development, agricultural productivity and food security purposes (Quisumbing et al. 2014; FAO, 2011). These motivations are mutually reinforcing as one can help to reinforce the other (Quisumbing et al. 2014:6-7).

In addition, this thesis is also relevant as it adds new perspectives to the role of female farmers in the River Delta Valley's rice cultivations by using the A-WEAI framework in a qualitative/mixed method-approach. In contrast to previous research, which has utilized quantitative methods to calculate present levels of female empowerment in agriculture, this thesis provides qualitative insights of female empowerment over time through a mixed-methods data collection. The thesis also adds a new perspective by connecting gender differentials in rice cultivation with their effects on smallholders' agricultural productivity-levels over time. Qualitative data on gender differences in rice productivity may be useful to overcome Senegal's pertaining problems of poverty, food insecurity, inefficient agricultural productivity, subsistence farming, and persisting gender gaps. In combatting these problems, the thesis may prove valuable to both the Senegalese government, state employees, and civil society or organizations addressing gender issues and endeavors of reaching self-sufficiency in rice production. Ultimately, these issues amount to the SDG's; 1- No Poverty, 2-Zero Hunger, and 5- Gender Equality, which are vital to address in order to assist in developmental processes.

### 1.3 Outline of the thesis

The thesis is structured according to the following order. While the first section introduced the thesis topic, aim, research questions, and its relevance, the second section gives some background information to the topic, including the role of rice in West Africa and Senegal as well as an overview to Senegal's economy and labor force composition. The third section discusses the previous literature relevant to the thesis topic. This includes the gender gap in agriculture, academic debates on African agriculture, and empowerment of Senegalese female farmers. The fourth section discusses the thesis analytical framework based on Timmer's theory of the agricultural transformation, pro-poor agriculture, women's empowerment, and the operationalization through the A-WEAI framework. The fifth section concerns the thesis methodology, divided into several subsections including, the research design, quantitative and qualitative methods, sampling and analytical strategies, biases and ethical considerations and delimitations. The sixth section contains the analytical results and analysis, divided into five sub-sections, including, an overview of the data collection location, the results according to the A-WEAI framework, and theoretical reflections. The final sections include the conclusion, bibliography, and appendix.

## 2 Background

### 2.1 The role of rice in West Africa and Senegal

Rice is an important staple in West Africa as it is one of the most important sources of calories (Grow Africa, 2019:3). Unfortunately, many West African countries are struggling with increasing rice consumption, in combination with insufficient production levels. Therefore, countries have turned to rice imports, to compensate for these divergent trends.

West Africa is by far the largest African region of rice imports, accounting for 60 percent of sub-Saharan Africa's imports in 2005 (Dawe, 2010:175). Looking at rice consumption per capita, West African countries consume the most rice in all of Sub-Saharan Africa. The top five rice-consuming countries in the region from 2000–2003 were Guinea Bissau (86kg/person), Sierra Leone (83kg/person), Guinea (76kg/person), Senegal (74kg/person), and Côte d'Ivoire (60kg/person) (Dawe, 2010:169). As shown in figures 1 and 2 just below, while the most prominent country in the West African rice trade is Nigeria with the highest numbers of both production and imports, Senegal is not far behind. Despite Senegal being amongst the highest rice-consuming countries, their national self-sufficiency ratio in rice is meager in comparison to their neighboring countries. Self-sufficiency ratio, which summarizes the production, consumption, and trade data, has declined in Senegal from about 25 percent in the 1960s to nearly 15 percent by 2006 (Dawe, 2010:146). Instead, it is Mali, Guinea, and Sierra Leone, which were in the top of West African rice self-sufficiency in 2016 (Grow Africa, 2019**:**5).

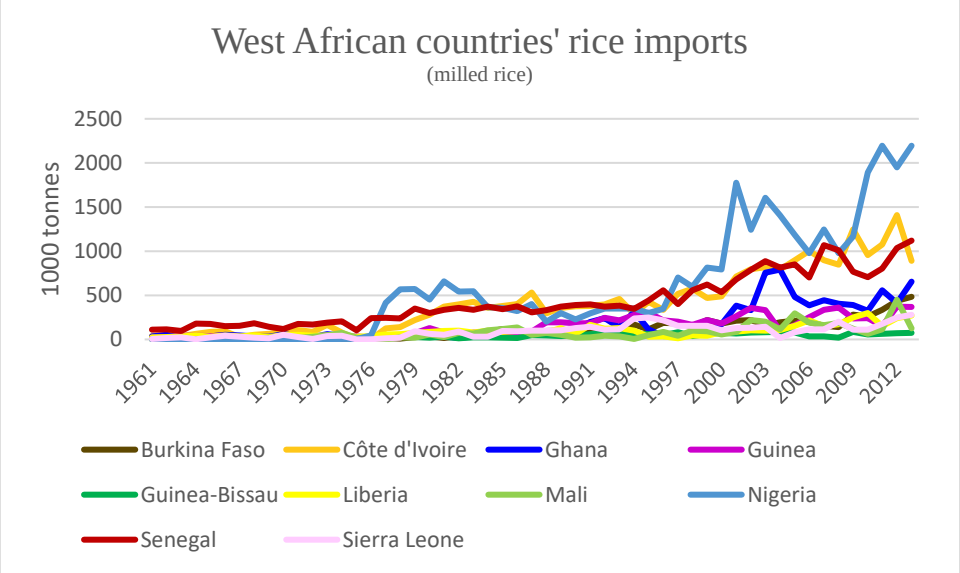



***Figure 1**: West African countries' rice imports (FAO-STAT, 2019a)*

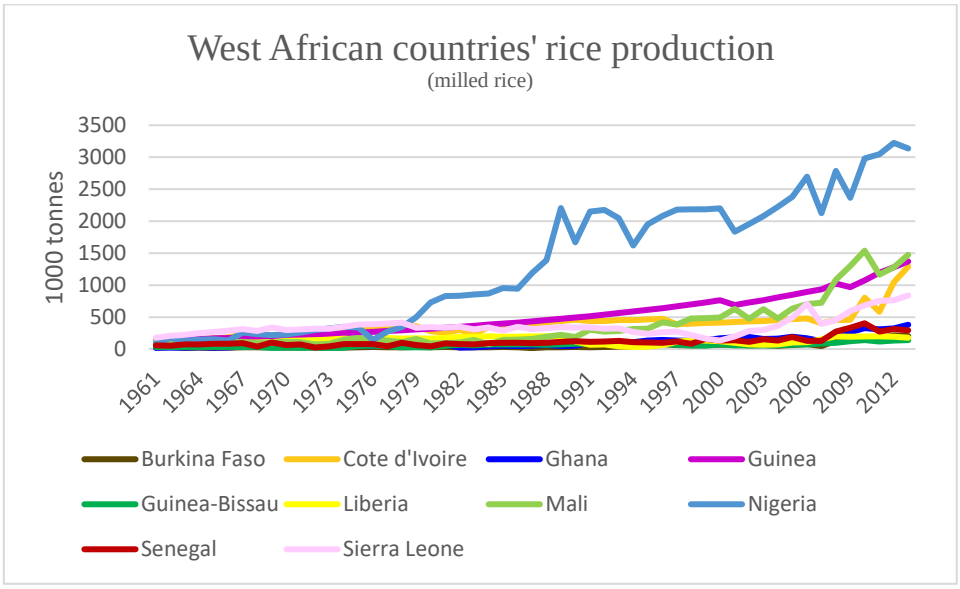


***Figure 2**: West African countries' rice production (FAO-STAT, 2019b)*

The risks accompanied with the West African nations' high dependence on rice imports become apparent, given the volatile prices on the global market. Although the price spike in 2007/2008, has not yet been surpassed, international prices for all rice types are steadily rising and are now at their highest since 2014 (FAO, 2018a:22-23). Globally, the largest rice exporting countries are situated in Asia, which on average exported 35.8 million tons of rice out of the global production of 43.6 million tons, between the years 2013-2015 (FAO, 2018a:33). The major rice export countries include India, Thailand, Vietnam, Pakistan, but also the USA (FAO, 2018a:17,33). These are also the countries who are the major exporters to the Senegalese rice market, with India as the largest exporter, followed by Thailand, Brazil, and Pakistan (in descending order) in the year of 2016 (The Observatory of Economic Complexity, 2019). While most of the West African governments have taken action to decrease dependency on rice imports by enrolling agricultural development plans to expand national rice production, imports still dominate consumption (Dawe, 2010:144).

Looking at the role of rice in Senegal, this has become more prominent over the last decades. In response to the increasing demands for rice, the domestic supply has also increased. However, this consists predominantly of imports instead of domestically produced rice, as shown in figure 3, below.

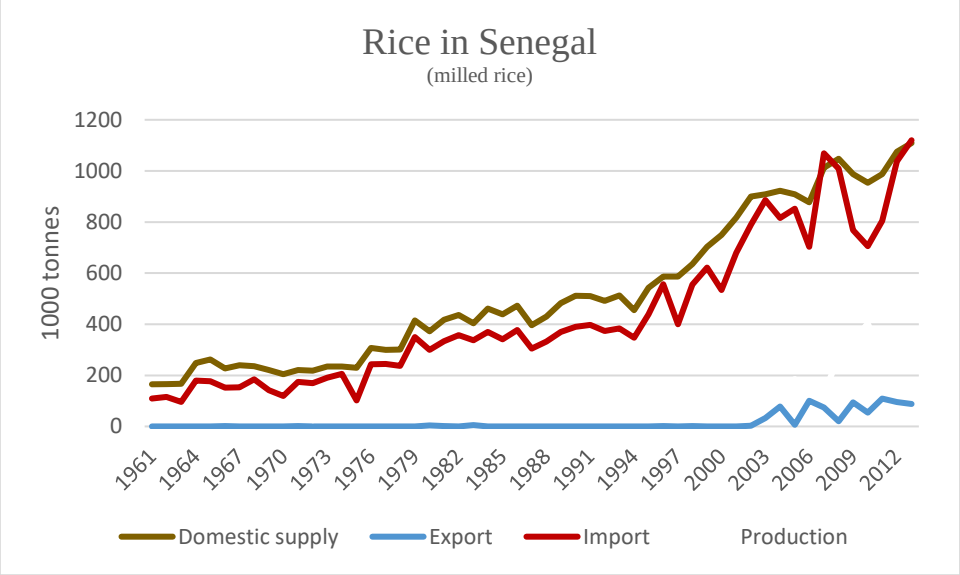



***Figure 3**: The role of Rice in Senegal (FAO-STAT, 2019c)*

Senegal's rice cultivation is mainly located to the River Delta Valley in the north, in addition to the Casamance region in the south. While Casamance relies on rain-fed rice due to its tropical climate, the River Delta Valley is today characterized by more advanced forms of agriculture including irrigation systems which were introduced not long after Senegal's independence from France in 1960 (Devey, 2000). Some decades after that, conventional high-intensive farming techniques were also adopted, including fertilizer, pesticides, improved seed varieties, better infrastructure and formalizations of land rights (Koopman, 2009; République du Senegal, 2014). The study focus on the River Delta Valley due to its agricultural developments, and its many efforts to increase rice productivity (from both the Senegalese government's, private-public partnerships, private investments and many NGO's)

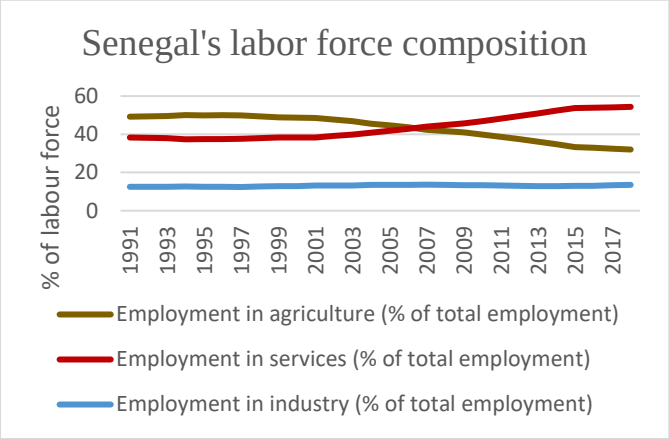
in comparison to the Casamance region (Koopman, 2009; République du Senegal, 2014). The Valley region is characterized by its semi-arid climate, which is typical for the Sahel (semi-desert) environment. The region has two cultivation season per year, which is the 'hivernage' (wet season) and the 'contre saison chaud' (dry season) (Devey, 2000:14).

Historically, rice cultivation in Senegal was characterized by a gendered division of access to irrigation technologies, as women traditionally cultivated rice for domestic consumption being dependent on rain downfall while men cultivate rice for sales on the local market (Ministère de Femme, de la Famille et de l'Enfance, 2016:76). Due to the patriarchal society, men had a monopoly over productive resources (Niang et al. 2017). The beginning of 1965 witnessed the creation of the Société d'Aménagements et d'Éxploitation des terres du Delta du fleuve (SAED), a governmental institution which over time transformed the region's rice cultivation from using rain-fed agricultural practices to using irrigated ones (Devey, 2000:42). This development was further motivated by a severe drought in the 1970s, bringing famine to the Valley since food production largely depended on rainfall or floods (Connor et al. 2008; Devey, 2000:44). In the 1990s, the IMF's and WB's Structural Adjustment Programs released the state's monopoly of the Senegalese rice sector in addition to devaluating the national currency (CFA). This imposed a significant economic shock on the River Delta Valley's rice sector (SAED, 2001**).** Today, Senegal's rice sector face many problems such as; drought, soil salinity, unpredictable weather, overall increasing rice consumption due to population growth and urbanization, popularity, availability and low price of imported rice in combination with bad quality and value chain imbalances of domestically produced rice (Ministère de l'Agriculture, 2009:1, 5; Ministère de l'Agriculture et de l'Equipement Rural, 2014:28). Access to agricultural lands is also a significant problem in Senegal due to renewed interest in agriculture by various stakeholders, land saturation and fragmentation resulting in a decreasing number of smallholder farms. These problems seem to be caused by various factors, most notably demographic growth, climate change, large-scale land acquisitions, state agricultural projects, and the emergence and expansion of local land markets. Land governance is problematic because local producers are caught between three systems: the legal system; customary norms; and actual practices on the ground (Niang et al. 2017).

Looking to gender differentials in Senegal's agricultural sector, rural women are among the groups that find it hardest to access land. Rural women are constrained because of sociocultural factors that deny them control over land resources, but also because the land legislation that does support them is not enforced. Rural women are victims of an inequitable and highly patriarchal social structure that prevents them from accessing and controlling their means of production (Niang et al. 2017:9). For example, the inheritance of land still functions according to customary land rights and is dependent on women's marital status, meaning that women risk losing their land if they get divorced or widowed (Koopman, 2009). Looking at gender disparity statistics, Senegal's ranking in the gender inequality index has not witnessed any improvements in women's rights. The score of 2018 was set to 0.682, in comparison to 0.6923 in 2013 (World Economic Forum, 2013;2018). The ranking index states that the higher the score, the more gender-equal the society is. This means that Senegal's level of gender equality has decreased by 1.49 percent from 2013 to 2018.

## 2.2 Senegal's economy and labor force composition

To better understand the role of rice in Senegal, we will now look at Senegal's economy at large, and its labor force composition, which indicates a growing service sector. While figure 4 indicates that the majority of the labor force have transferred from the agricultural sector to the service sector, this corresponds to figure 5 indicating that the economic value of service sector has increased significantly in comparison to the agricultural sector. However, it should be highlighted that the informal sector in Senegal is significantly larger than the formal, meaning that important information may be hidden from official records (World Bank (2019).



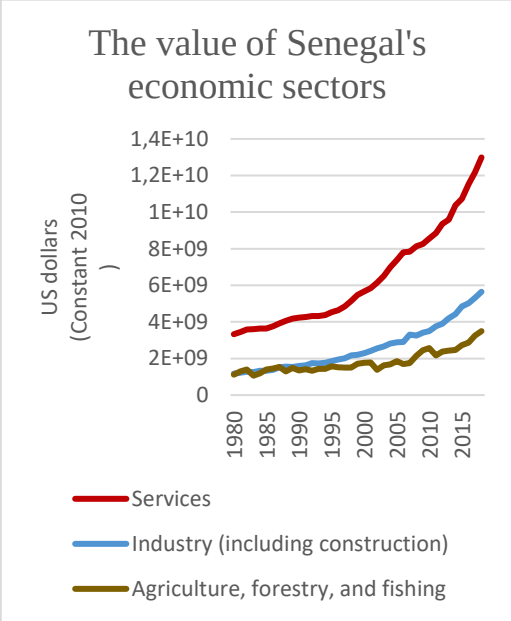




***Figure 4**: Senegal's labor force composition according to the sectors (The World Bank Data, 2019a)*

***Figure 5**: The value of Senegal's economic sectors (The World Bank Data, 2019b)*

The World Bank has appointed input intensification as the main driver to Senegal's agricultural growth and not increasing productivity (The World Bank, 2018:27). Other obstacles to the advancement of the Senegalese economy includes; the large informal sector and the limited impact of recent improvements in agricultural output and job creation, and stagnation in the expansion of the formal sector (République du Senegal, 2014:25-26; The World Bank, 2018:xi). To come to terms with the many obstacles Senegal's agricultural sector face, the government has initiated a number of development initiatives. The Senegalese government adopted the grand national development strategy called the Emerging Senegal Plan (PSE) in November 2012. PSE aims to make Senegal an emerging economy by 2035 through specific development strategies for each economic sector (République du Senegal, 2014). The agricultural development plan is called PRACAS, which includes the government's solution of mono-cropping and production specialization to reach self-sufficiency in rice consumption (called PNAR- the 'National Program of Rice Self-Sufficiency'). This contrast sharply with the River Delta Valley's smallholders' farming techniques which opt for crop diversification to better manage climate-risks and hunger during the difficult seasons (Niang et al. 2017). On the bright side, the government has a clear focus to improve the role of females in the development process. As an example, the government has established an institution targeting gender equality and the promotion and

reinforcement of females' role in Senegal. This is in charge of gender development goals published in the latest report called the SNEEG, covering the period of 2016-2026 (FAO, 2018b:25; Ministère de Femme, de la Famille et de l'Enfance, 2016). Within the agricultural sector, the emphasis is made to minimize the gender-gap by improving female farmers inclusion, access to the factors of production such as land, inputs, finances, credit, agricultural infrastructure, and equipment as well as reinforcement of female leadership (FAO, 2018b:20,73). This is mentioned in PRACAS.

# 3 Literature review

This section of the thesis will in three subsections discuss the previous research and academic debates regarding gender differences in agriculture and their impact on productivity. The first will give an overview of the gender gap in agriculture as well as some academic disparities in the field. The second subsection will discuss academic debates regarding the main tenants in agricultural developmental research and the issue of agricultural productivity. The third subsection will touch upon how female empowerment is regarded as a solution to productivity deficiencies in agriculture, set in the context of Senegal. The literature review has limited its focus to studies in predominantly the West African but also the African context at large.

## 3.1 The gender gap in agriculture

Esther Boserup was one of the first and pathbreaking researchers on the issue of gender gaps in developmental processes and the field of agricultural development. In her research, Boserup has drawn explicit attention to the gendered division of labor which arises in both 'traditional' and 'modern' agricultural systems meaning that men and women experience the transition to modernity in different ways (Boserup, 1970). Boserup argued that economic development could not be fully evaluated without the recognition of the multitude of 'hidden contributions' of women throughout the world, particularly in the form of unpaid work. She discussed the gendered economy by highlighting women's economic marginalization since they earn less than men in their roles as wage workers, farmers, and traders. She also highlighted that the mechanization of agriculture, which is generally equated with economic development, has resulted in the separation of women's labor from waged agricultural labor, which in turn undermines their social status (Visvanathan et al. 2011:29). While the complexities of women's work had previously been ignored or downplayed, Boserup brought them into the academic limelight (Quisumbing et al. 2014:8). Building on Boserup's work, the liberal feminist researchers called 'Women In Development' (WID), have emphasized the importance of women in the development process, both for the benefits of women but also for the efficiency of the development. While the WID approach was criticized for overlooking the importance of social and political structures, it made an important correlation between work and status which previously had been ignored (Visvanathan et al. 2011:29-30).

Today, most scholars agree that the many constraints faced by women in agriculture hamper their agricultural productivity (Quisumbing et al. 2014; Croppenstedth et al. 2013; Udry, 1996; Udry et al. 1995; Goldstein and Udry, 2008; Diiro et al. 2018). The well-cited report from FAO called "The state of food and agriculture – Women in agriculture, closing the gender gap for development" made it clear that agriculture is underperforming because half

of its farmers-women- do not have equal access to the resources and opportunities in order to reach full productivity (FAO, 2011). The consensus states that women in agriculture face an array of gender-specific constraints based on norms and institutions on all levels of society and which are engrained in the social structure. Such constraints are; limited access and rights to land, credit, production inputs (fertilizer, irrigation, pesticides etc), markets, technology, other agricultural assets, lower access to male labor, oxen, and extension services; and difficulties in ensuring timely ploughing, weeding, or transportation etc. Women often work as unpaid laborers on family farms or other fields under insecure tenure arrangements which hampers investment incentives. Further, women face social restrictions in public participation and mobility, which restricts their ability to function fully as farmers. Women tend to face heavier workloads, while men control the generated cash. While trends differ in relation to age, marital status, access to credit and extension services etc, women are overall less likely to adopt yield-enhancing and soil-restoring strategies such as high yielding crop varieties, improved management systems and agricultural technology (Quisumbing et al. 2014; Andersson-Djurfeldt et al. 2018:2; Agarwal, 2015; World Bank 2009; FAO 2011; Doss, 2001; Theriault et al. 2017). These systemic productivity gaps act in favor of male-headed households, while women face dual exclusions, not only because of lacking agricultural assets but also because of their limited access to alternative livelihood sources outside of agriculture (Andersson-Djurfeldt et al. 2018:4, 6). Another important dimension to the gendered differences, throughout all sectors of women's everyday life is called 'women's double burden' (Hochschild and Machung, 1990). 'Women's double burden' refers to the hidden and unpaid work that women do in comparison to men who only have their paid job. The hidden and unpaid burden which most often is assigned to women revolves around housework and the care of children which occupies their time in addition to their paid work. Due to the 'double burden,' women end up having two jobs while men only have one (Hochschild and Machung, 1990). Thus, bridging productivity differentials between male and female farmers, by helping women overcome production constraints is vital as this could significantly increase agricultural output (Agarwal, 2015).

Although most academics agree that women in general, occupy a disfavored role in agriculture and society at large, several debates exist on the subject. Some scholars have criticized both the academic research and the field at large for spreading 'stylized facts' about women's role in agriculture, especially in the context of Sub-Saharan Africa. Recent research states that commonly cited 'facts' about women in agriculture are exaggerated, suggesting that (1) 70% of the worlds poor are women, (2) women produce 60-80% of the world's food, (3) women own 1% of the world's land and that (4) women are better stewards for the environment (Doss et al. 2018). Palacios-Lopez et al. (2017) found that the average female labor share in crop production is approximately 40%, by using individual, plot-level labor input data from nationally representative household surveys across six Sub-Saharan African countries. Other 'stylized facts' which have been refuted are that; women provide the bulk of labor in African agriculture, agricultural commercialization always enhances nutrition, and that labor in the agricultural sector is much less productive than other sectors (Christiansen, 2017). The so-called 'facts' are founded on the premise that women control too few resources to fulfill their responsibilities to ensure food and nutrition security for themselves and their families. However, critics are concerned that this promotes stereotypes of women as either victims or saviors, that they treat women as a monolithic group, ignore the role of men,

communities, and institutions, and that they provide a simplistic and even misleading basis for the design, implementation, and evaluation of policies and programs to promote food security and advance gender equality (Doss et al. 2018; Christiansen, 2017). The confusion that these debates and conflicting information create can be harmful to the continued confidence in reports, publications, and campaigns by NGO's and IO's on the issue of the gender gap in agriculture.

## 3.2 Academic debates on African agriculture

The academic field of agricultural development has been characterized by many debates, resulting in shifting paradigms and new consensus on the debated topic. Three of these debates will be discussed below.

The first academic debate concerns which factors that are causing the most substantial productivity deficiencies in agriculture. This is complicated by the fact that it is difficult to isolate social, cultural, environmental, and economic factors from one another to know which one has the greatest effect on agricultural productivity. Previous research has had differing results on how the social organization in agriculture, such as the gendered division of labor affects agricultural productivity. Both Quisumbing (1996) and Peterman et al. (2011) criticizes previous research by not accounting for gender-specific constraints when estimating agricultural productivity levels, leading to distorted analytical findings stating that males are more productive than females. They argue that when men and women are given the same opportunities, they are equally as efficient farmers. Previous research has excluded measurements on males' and females' differences in agricultural inputs and outputs, controls for individual characteristics, such as education and physical assets, and ignoring other gendered context-specific constraints. Instead, it has often been assumed that female farmers are less productive due to the fact of being women and not because they had fewer resources. These methodological issues have led to gender-biased research (ibid.).

The second academic debate concerns the previous main tenant of agricultural economics called the 'Pareto efficiency.' Since this assumes that farming households share the factors of production in an equal distribution (called the co-operative model), gender-specific constraints remain hidden. 'Pareto efficiency' is based on the neoclassical theory, which assumes that people behave according to the most logical reasoning and thus make choices which maximize output. In the case of agricultural production, this means that intrahousehold resources would be equally allocated since it would maximize its' efficiency. This implies that yields should be the same on all plots within a household in a given year (of course controlling for plot characteristics) since each plot would contain one crop (Quisumbing et al. 2014; Croppenstedth et al. 2013; Udry et al. 1995; Udry, 1996; Goldstein and Udry, 2008; Diiro et al. 2018). However, the assumption of 'Pareto efficiency,' has been proven wrong as in much of Sub-Saharan Africa since different members of the household simultaneously cultivate the same crop on different plots while gaining different sized harvests and incomes (Udry et al. 1995; Udry, 1996; Quisumbing, 2003:58-62). Further on, the management of African farming households is very complex, including gendered divisions of labor, which more resembles split economies rather than the pooling of resources (called the non-co-operative model). In the non-co-operative model, resources are unequally allocated within the household which poses negative effects on the household productivity (Udry et al. 1995; Quisumbing, 2003:58-62; Quisumbing et al. 2014). Economists have come to view

households as domains of difference, where multiple decision-makers may have different preferences and, in many cases, control separate sets of resources. The distribution of power and resources depends on the bargaining power within the household, which almost always favors men (Quisumbing, 2003:12). The rejection of the 'Pareto efficiency' thesis has greatly improved the understanding of household resource allocation behavior. It has demonstrated that heterogeneity among members affects a variety of individual, household, and economywide outcomes (Quisumbing, 2003:11,19,67). However, the debate of the 'Pareto efficiency' thesis, continues as some scholars argue that the refusal of 'Pareto efficiency' and the emphasis on the 'non-co-operative model' of agricultural management has led to an academic tendency to assume that households are only characterized by competing gender interests. Such criticism has been raised by Kabeer (Kabeer in SIDA, 2001), arguing that while intrahousehold gender inequalities about work and crop disposal may be affecting levels of productivity, it cannot be used as the general explanation for low productivity. This is because households consist of joint and competing gender interests (co-operative and non-co-operative models) depending on the context and setting. Therefore, Kabeer argues that the focus should lie with the wider economic environment of poor rural households and gender differences in relations to this.

The third academic debate concerns the assumption that crops are divided according to gender, where cash and export crops are "male crops" while subsistence crops are "female crops." This is because women primarily are responsible for feeding the family while males are responsible for providing the family with cash income. When agricultural tools and techniques are introduced in the production process, in addition to the commercialization of a crop, this transfers the crop from being a "female crop" to a "male crop." This assumption was supported by Braun and Webb (1989), who found that rice is becoming more of a male crop since technology and production efficiency tools are incorporated into the production. While this research is now becoming outdated, their findings are interesting to this thesis as Braun and Webb studied rice production in the Gambia, a country which shares many characteristics with Senegal as it is located within Senegal's borders. Thus, technology inputs can have the impact of moving production out of female into male responsibilities. This assumption was also supported by Smith and Chavas (1997) who found that the commercialization of agricultural productions in West African households was normally done by increasing the production on male managed communal lands, meaning that husbands controlled the increased income. Ultimately this had a negative effect on women because West African households' functions according to the non-co-operative model of non-pooling meaning that husbands and wives do not share their incomes but have fixed roles and obligations. On the other side of the debate, Doss (2001) problematizes Smith and Chavas (1997) conclusion by arguing that the gendered division of labor cannot simply be explained as the 'non-sharing of income' and 'fixed roles and obligations.' Doss argues that because African households are complex, heterogeneous, and gender roles change in response to new economic opportunities such as technology insertions, it cannot easily be summarized. Ultimately, gender roles are dependent upon context-specific attributes, which may result in different results.

## 3.3 Empowerment of Senegalese female farmers

While previous research has appointed various issues and solutions to insufficient agricultural yields, the reader is reminded that the focus of this thesis is the gender gap in the form of the gendered division of labor and its negative effects on agricultural productivity. With this focus in mind, scholars and International Organizations argue that to solve the lack of women's inclusion in the agricultural field, it is essential to close the gender gap by raising women's empowerment (Agarwal, 2015;Diiro et al. 2018; FAO, 2011; The World Bank/IFAD/FAO, 2009). Several empirical findings have revealed a positive relationship between women's empowerment and agricultural productivity. First, the study by Koopman (2009), aims to explain why food insecurity and poverty is so prevailing in the River Delta Valley in northern Senegal despite impressive investments in modernizing the agricultural sector. Part of Koopman's conclusion is that it is critical to improve women's access to land and technology in order to improve farm productivity and food security. A similar conclusion is drawn from the study by Bernard et al. (2018), researching female empowerment in decision-making and the relation between decision maker-identity and milk productivity in Senegal's dairy farming. The study revealed that households in which husbands or wives decide because they are 'most informed' produce the most milk (Bernard et al. 2018). Thus, by empowering women through increased knowledge and education, milk productivity has the potential to increase since decisions are made consciously.

Looking at the most recent evaluation of female empowerment in agriculture set to the River Delta Valley, it was found that women were relatively empowered with an overall score of 0.783 out of possible 1.0. However, the main constraints to female farmers empowerment as identified by respondents included a lack of participation in household decision-making on production, lack of involvement in community groups, and inadequate access to and management of agricultural credit (IPAR and RTI International, 2018:1). The data suggested that workload was not a major constraint to empowerment, though it had a greater burden on women in the rainy season when agricultural activities are more time-consuming. While land ownership was not found to be a major contribution to women's disempowerment based on the quantitative data, women reported in interviews and focus groups that access to land was a major constraint. Not surprisingly, the empowerment score for men was, on average, higher than the score for women (IPAR and RTI International, 2018:1). Finally, these results are supported when looking at an earlier study by Grigsby (2004), researching the gendered nature of subsistence farming and its effect on customary land tenure in Senegal. Grigsby found that men considered women's contributions to the subsistence enterprise as secondary to their own responsibilities when organizing communal grain production. In addition, when looking into the various measurements of females' roles in agriculture, Grigsby found that females were worse off in nearly every aspect.

# 4 Analytical framework

This section, which presents the analytical framework of the thesis, is divided into three parts. The first part will discuss the importance of agricultural transformation and the path of smallholder pro-poor agriculture to create national development. The second part will discuss women's empowerment and its insertion in the field of agriculture. The third part will present

the A-WEAI, and its five domains, which, will serve as the analytical framework in the thesis operationalization.

## 4.1 Agricultural transformation & the smallholder pro-poor approach

The thesis is based on the theoretical premise of agricultural transformation, which states that for a nation to develop, it needs to go through four phases resulting in increased agricultural productivity. In the first phase, agricultural productivity per worker increases which in the second phase means that excess labor and financial surplus gets transferred from the agricultural into other sectors, normally the industrial or service sectors in urban areas. In the third phase, the agricultural sector gets progressively integrated into the macro-economy via improved infrastructure and market-equilibrium linkages. When the third phase is conducted successfully, the fourth phase is barely noticeable as the role of the agricultural sector in industrialized economies is not so different from the industry, housing, or insurance sectors. Finally, agriculture declines in its relative share of total gross domestic product (GDP) over time, even as the absolute value of farm output continues to grow. However, upholding agricultural protection through policies is critical in assuring a thriving agricultural sector as foreign competition from the global market otherwise risk undermining its function (Timmer, 1998:116). The theoretical concept of agricultural transformation appoints the factor endowments; land, labor, and capital as the necessary preconditions for economic progress and development pathways (Timmer, 1998).

The theoretical concept of the agricultural transformation will be used to contextualize Senegal's rice cultivation in the sense of agricultural development and the importance of increased agricultural productivity. According to this concept, Senegal has to make its agricultural sector more efficient in order to embark on the 'agricultural transformation'-journey. However, two opposite solutions to do so can be distinguished. On the one hand, the smallholder-based approach under the title of pro-poor agricultural growth stands in opposition to the approach of large-scale farming. The first approach draws inspiration from the empirical example of the Asian Green Revolution, which subscribe to two interconnected theoretical assumptions: that small-scale farmers are efficient producers and that increased commercialization among them can encourage broad-based poverty reduction and growth. Thus, raising smallholder productivity, enhancing commercialization, and dealing with weak producer incentives for food staples are seen as the vehicles for achieving broad-based agricultural growth and reducing poverty (Andersson-Djurfeldt et al. 2018). Encouraging smallholder inclusion in agricultural value chains at different scales is in this respect crucial. Diversification within agriculture towards higher-value crops and a gradual movement into the non-farm sector in this way presages a gradual exit out of agriculture as the economy moves through the process of structural transformation (Andersson-Djurfeldt et al. 2018:3). In opposition, the proponents of large-scale farming question the efficiency of small-scale producers since modern technologies, and procurement systems have undermined the inverse relationship between productivity and land size that underpins the notion of superior smallholder efficiency. Other criticisms are the poor fit of an Asian-inspired smallholder model to African conditions and the market optimism of the pro-poor agricultural growth model as the insertion of smallholders into local, and sometimes global value chains encourage polarization of assets and incomes, as accumulation among the more well-positioned leads to the marginalization of the poor. As such, both food security and poverty

reduction are better achieved through large-scale agriculture (Andersson-Djurfeldt et al. 2018:4).

## 4.2 Women's empowerment in agriculture

The thesis analytical framework is also founded on the premise that to reach increased agricultural productivity; it is necessary to decrease the gender gap in the agricultural labor force. Scholars argue that 'closing the gender gap has the potential to improve productivity and efficiency in agricultural production' (Quisumbing et al. 2014; FAO, 2011). In addition, increasing the resources controlled by women and their decision-making power may have several benefits. This is because women tend to reallocate their resources to improve children's health, nutrition and education as well as other family needs, instead of focusing on their individual needs (Quisumbing, 2003:11,13). Thus, reducing inequalities in human capital, physical capital, and current inputs between male and female farmers in addition to increasing the understanding of women's role in agriculture are important factors to open up doors for social development, agricultural productivity and food security purposes (Quisumbing et al. 2014; FAO, 2011; Quisumbing, 2003:13).

While many academics have aimed to conceptualize women's empowerment in agriculture, this thesis will utilize the 'external dimension' of empowerment. The external dimension of empowerment concerns everything which is not connected to an individual or a group's understanding of their own entitlements and power as it exists in their life-situation. External dimensions which are important to strengthen women's empowerment and to increase their agricultural productivity have been appointed to; land ownership (Lastarria-Cornhiel, Behrman, Meinzen-Dick and Quisumbing in Quisumbing et al. 2014:117-144), the access to credit and savings (Fletschner and Kenney in Quisumbing et al. 2014:187-208), non-land agricultural inputs including technological, natural and human resources such as the implementation of mechanization, extension workers, seed varieties, inorganic fertilizer etc (Peterman, Behrman, Quisumbing in Quisumbing et al. 2014:145-186), group memberships and social networks (Meinzen-Dick, Behrman, Pandolfelli, Peterman, Quisumbing in Quisumbing et al. 2014:235-266). While this thesis will focus on the dimensions as mentioned above, 'empowerment' can also be conceptualized through its 'internal dimensions.' Internal empowerment has been discussed by both Batliwala and Kabeer as 'the power within', also conceptualized as 'processes' which engage people in making sense of their worlds, their relationships, their assumptions, beliefs, practices and values, and in questioning what they have come to take for granted, with potentially transformative effects (Cornwall and Edwards, 2014:6). Kabeer (1994:245-246) describes this as "strategies of empowerment from within providing women with new perspectives", and as "new forms of consciousness arising out of women's newly acquired access to the intangible resources of analytical skills, social networks, organizational strength, solidarity and sense of not being alone". Batliwala generated an understanding of power as the control over material assets, intellectual resources, and ideology (Batliwala, 1994:129). Kabeer (Kabeer in SIDA, 2001:19) refers to empowerment as 'the expansion in people's ability to make strategic life choices in a context where this ability was previously denied to them.'

However, when discussing empowerment, it is important to highlight that it is a contested concept, criticized as one of the most loosely used terms in the development lexicon, meaning different things to different people or, more dangerously, all things to all people' (Batliwala,

1994: 1). What is considered as empowerment for one woman in one specific context might be something entirely different for another woman in another context; thus, empowerment is context-specific (Cornwall and Edwards, 2014:17). There are also political disagreements as to the content and political application of the notion of 'empowerment' as a goal and strategy for women's liberation (Fergusson, 2004). However, academics seem to agree on three statements on empowerment. These are that empowerment ; (1) is fundamentally about changing power relations, (2) is relational, in two senses as it both concerns relations of power in which people are located and the changing empowerment in one's relation to oneself, (3) it is a process (Cornwall and Edwards, 2014:7). Despite this, empowerment is neither a 'linear process' nor a 'destination,' meaning that a person who is empowered today might be disempowered tomorrow by changes in their circumstances (Tsikata and Darkwah, 2014). Likewise, a person is not necessarily empowered in all aspects of its life at once. A person could be economically empowered but have some social disempowerment and vice versa (ibid.). Thus, social, economic, and political empowerment are not mutually exclusive (Eyben et al. 2008). Although both the internal and external dimensions of empowerment are essential in order to fully comprehend the concept, this thesis will mainly focus on the external dimension. Finally, it is the lack of women's empowerment, which constitutes the gender gap in the agricultural sector. So by closing the gender gap, we can improve productivity and efficiency in agricultural production' (Quisumbing et al. 2014; FAO, 2011).

## 4.3 A-WEAI and operationalization

To conceptualize women's empowerment in agriculture, the thesis has been inspired by the analytical tool called the 'Abbreviated- Women's Empowerment in Agriculture Index' (A-WEAI) which was first developed in 2011 by USAID, the International Food Policy Research Institute, and the Oxford Poverty and Human Development Initiative (OPHI). A-WEAI aims to increase the understanding between women's empowerment, food security and agricultural growth by measuring the roles and extent of women's engagement in the agricultural sector's five domains; 'production- input in productive decisions', 'resources- ownership and access to productive assets', 'income- control of use of income', 'leadership- group membership', 'time- workload' (Alkire et al. 2013; Malapit et al. 2015:3, 2017; IFPRI, 2012). The A-WEAI stands out today as the only standardized tool to measure women's empowerment and gender parity in the agricultural development sector (Alkire et al. 2013). It is a quantitative method for conducting large-scale surveys of female farmers impact in all areas of agriculture, and which incorporates econometric calculations, gender parity indexes, the measuring and categorization of results into the binary categories 'empowered' and 'not empowered' etc.

While the A-WEAI has been utilized as the foundation in this thesis analytical framework, several adaptations have been made. First, the thesis has utilized questions with a time perspective of 5-10-years in addition to the preceding generation. This stands in contrast to the original version of the A-WEAI survey, which only asks about the present situation. To capture changes over time is vital in this thesis as it focuses on agricultural processes and developments. Second, the original A-WEAI domains have been somewhat simplified and changed. For example, to correlate with the thesis aim, domain no. 1 was added since no original A-WEAI specifically investigated the gendered differences in agricultural productivity levels. The five analytical domains which will be utilized in this thesis are; *1. Agricultural productivity, 2. Ownership or renting of resources, 3. Access and control of*

*income and credit*, *4. Time and workload*, and *5. Group membership*. The purpose of the analytical domains is to function as indicators of the agricultural sector's gender gap and as guiding principles for the data collection methods (presented in the methodology section). The five analytical domains will be utilized to answer the thesis three research questions in the following way. The first research question will be answered by the first domain, the second research question by the second to fifth domains, and the third research question through a more in-depth analysis of the effects of all five domains. This is illustrated in the model of the analytical framework below.

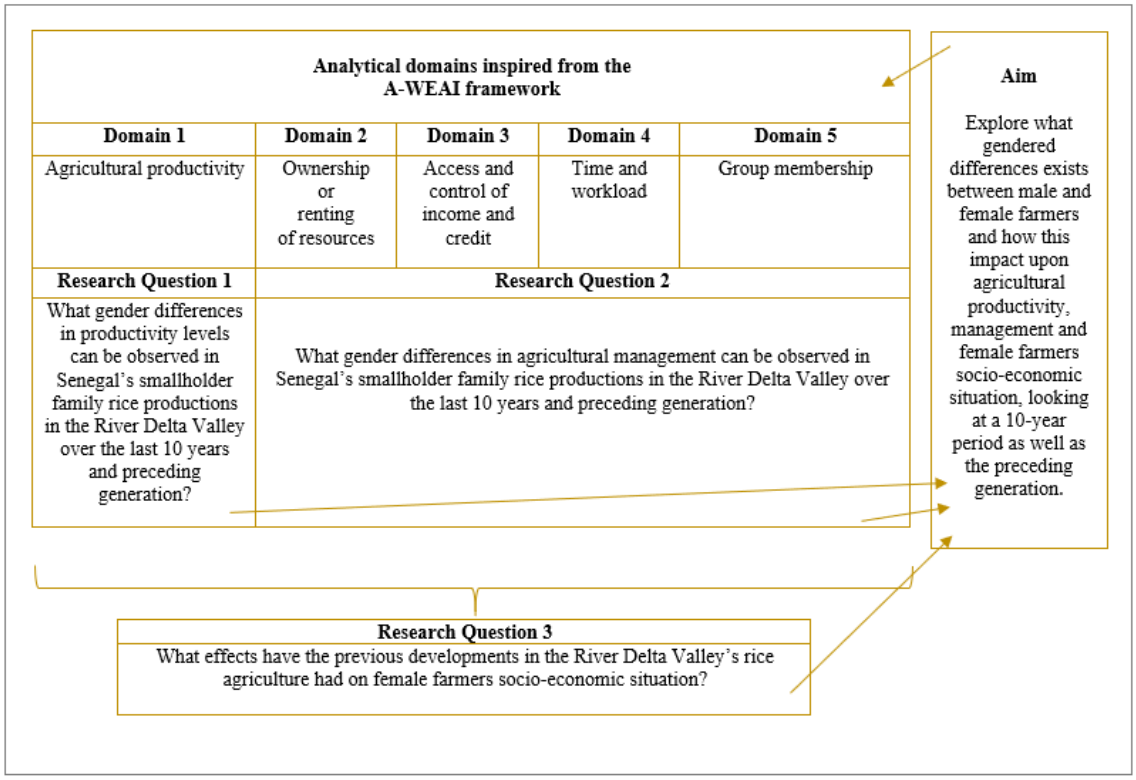



***Table 1**: Analytical framework (inspired from the A-WEAI framework)*

# 5 Methodology

This section will present the thesis methodology, beginning with the research design in the form of a mixed-methods approach guided by a positivist epistemology. This will be followed by the quantitative and qualitative methods, the sampling and deductive data analysis strategies, a short discussion on biases and ethical considerations, and end with a section on the thesis delimitations.

## 5.1 Research design

To answer the research questions and aim, this thesis has utilized a mixed methods-research design including both quantitative (*survey)* and qualitative (*group and individual interviews)*, with both male and female farmers, in addition to *participatory observation*, and *key informant interviews* (Bryman, 2012:68; Nagy Hesse-Biber, 2014:366). The mixed-methods complement each other by combining fixed-choice and open-ended questions, allowing a

flexible, personal, and less hierarchical data collection device. In addition, it minimizes the risk of 'reducing people to simple numbers' and building oppressing power-structure relationships between the interviewer and respondent (Bryman, 2012:228; Nagy Hesse-Biber, 2014:301-302; Sheyvens, 2014:253). Although this thesis does not have an explicit feminist theoretical foundation with emancipatory objectives, it has drawn inspiration from the feminist emphasis on using qualitative methods which are more compatible with gender sensitivity, women's voices and emancipatory goals (Bryman, 2012:410-411). Looking to the research's epistemological orientation, this is guided by a positivist approach including both deductive (the analytical framework called A-WEAI and its five domains) and inductive (connection to the theoretical concept of empowerment) elements (Bryman, 2012:26, 27). The ontological orientation is primarily guided by objectivism by viewing social reality as an external objective reality (Bryman, 2012:35,36).

## 5.2 Quantitative methods and sampling- Survey

### 5.2.1 Micro-survey with male and female farmers

The data collection process was initiated by a small-scale survey (henceforth called the micro-survey), giving an overview of farmers status regarding the five analytical domains. The respondents were 18 male and female rice farmers, aged between 35-74 years old and married in both mono-, polygamous, male- and female-headed households. The micro-survey was designed as a structured interview, based on the A-WEAI framework incorporating fixed-choice questions which enabled respondents' replies to be aggregated and measured (Bryman, 2012:210). Prior to the survey, key informant interviews, participant observations, and two pilot-surveys were conducted in order to ensure its' quality and context-specific relevance. The time frame of the preceding 10 years was decided upon as many of the changes in female farming conditions started to emerge some 9 years ago and in addition, one of the female farmer association was created roughly 9 years ago.

The survey was administered by the researcher, by reading the questions out loud to the respondents in a predetermined order upon which they answered by choosing from a fixed set of options. Consequences with researcher-administered surveys include respondents' lack of being anonymous and researcher-respondent's misunderstandings. However, reading the questions out loud was deemed necessary since most participants were analphabetic. The English version of the micro-survey questionnaire (the survey exists in both English and French versions), is to be found in the appendix section 9.1. There is also a compilation of the micro-survey respondents' answers in the appendix section 9.5.

## 5.3 Qualitative methods and sampling- Interviews and participant observation

### 5.3.1 Individual and group interviews with male and female farmers

Since the initial plan of conducting semi-structured group interviews with both male and females separately was not possible, male farmers were interviewed individually and female farmers in groups. The *Oral History* interviewing format was used as inspiration for both the individual and group interviews (Bryman, 2012:491). These included 'interview guides' asking the respondents to recall events from their past concerning rice agriculture, its gendered differences, female farmer's role in agriculture over several generations as well as the mechanisms behind these developments. Both academic and key informants were consulted to make the questions in the 'interview-guides' relevant to both the local context

and the academic literature (Nagy Hesse-Biber, 2014:193; Smith, 2010; Rubin and Rubin, 2012; Bryman, 2012:213, 465-482). The interview-guides can be found in the appendix sections 9.2- Female group interviews, 9.3- Male individual interviews in addition to appendix section 9.4- Summary of the data collection. Participants for the group interviews were selected according to the same sex, similar ages, and socio-economic situation, in order to avoid biases and to make everyone feel comfortable. The interviews complemented the micro-survey responses by collecting 'unexpected' answers, exploring new areas of limited knowledge, and to allow respondents to answer in their own terms (Nagy Hesse-Biber, 2014:186; Bryman, 2012: 246-249).

### 5.3.2 Interviews with key informants

Key informant interviews were conducted throughout the fieldwork period. The key informants were working in or were highly knowledgeable on the Valley's rice cultivation. They held professions such as; the regional officer of SAED, agronomy professor in the University of Gaston-Berger, consultant in agricultural development projects in the River Delta Valley, the president and secretary of FEPRODES, the president and extension worker of UFP-Ross Bethio and extension worker at ACSA (see the list of abbreviations on page vii). All of the key informant interviews assisted in the triangulation of the collected data as well as improving and adapting the designs of the other data collection methods, such as the micro-survey questionnaires and oral history interviews (Nagy Hesse-Biber, 2014:312). For a summary of the data collection, see the appendix section 9.4.

### 5.3.3 Participant observation

Participant observations were also conducted throughout the data collection process, meaning that the researcher immersed herself in a group for an extended period of time, observing behavior, listening to conversations, asking questions, gather further data through interviews and the collection of documents (Bryman, 2012:432). As the key informant interviews, this method was indispensable in the collection of background and contextual information and to complement and triangulate the above-mentioned data collection methods. Doing so can help to understand why survey-respondents answered the way they did and provide insight into the complexity of the local context.

## 5.4 Sampling

Overall, the sampling process, which was conducted until theoretical saturation, followed the *typical case approach* (Bryman, 2012:419,421), given the focus on villages and farmers who could provide a general idea of the area's gender differences in rice cultivation. The strategies of *Purposive* and *Convenience sampling* have intermingled throughout the various stages in the research process. While purposive sampling implies to strategically choose cases or participants relevant to the research questions, convenience sampling simply designates what is available to the researcher (Bryman, 2012:201,418). The strategies were applied by searching for villages and farmers whose main occupation was rice cultivation. However, instead of a fully purposive sampling where the villages and farmers would have been chosen prior to the field-study, these were selected when in the field through convenience sampling since they were available to the researcher through the key informants (Bryman, 2012:418). While the survey participants were accessed, mainly by using convenience sampling, the interview participants were accessed by applying a more purposive sampling strategy as the answers from the surveys helped guiding the sampling process. For the interviews, the goal

was to find older farmers in order to ask questions about the preceding generation as this would make it easier to acquire relevant information concerning the research questions. It is important not to generalize the thesis analytical findings (Nagy Hesse-Biber, 2014:192). This is because of the inherently selective strategy of both purposive and convenience sampling, and since we do not know if the sample is representative for other villages and farmers in the region due to the small sample size.

## 5.5 Data analysis

The thesis data analysis procedure can be described as a deductive strategy implying that the interviews and surveys were coded and reviewed continuously throughout the data collection process making it easy to discover potential lack of data and to plan for the continued data collection. On the other hand, having pre-determined analytical categories or codes (the five domains of A-WEAI) easily excludes additional data to be observed. Triangulation was a major part of the data analysis process as the codes were revisited and connected to the theoretical framework and literature review. This allowed to theoretically reflect upon the analytical results and to make conclusions.

## 5.6 Biases and ethical considerations

This section will begin with a discussion on four important biases; thereafter, there will be a short discussion on ethical considerations such as researcher-respondent's relationship and participant compensations. First, to account for seasonal biases, differences in factors of production, years of especially bad or good harvest, and gender gaps during the various seasons were discussed with the respondents according to which the survey and interview-questions were adapted. Secondly, this cross-cultural empowerment research may have resulted in missing information when translating the concept of 'empowerment.' Measuring 'empowerment' across cultural contexts is difficult since the concept has different meanings to the researcher and the respondents. The same factor can reflect empowerment in the eyes of the researcher but not to the respondent, and vice versa. Besides, there are risks of intrusion of normative indicators reflecting the researcher's values rather than the respondents (Ohara and Clement, 2018). The triangulation of the various data collection methods helped to minimize the risk of this bias by better understanding what empowerment implies in the context of the River Delta Valley. Third, linguistic bias may have resulted in missing information since the researcher and respondents did not speak the same mother tongue but communicated in French with the help of translation. While professional interpreters proved difficult to find, key informants and individuals who had gone through high school were easily located and could, therefore, assist with translation. An issue with this was the lacking patience of one of the key informant's when surveys took longer than expected. This was solved by conducting additional surveys with another key informant, and the triangulation of answers. Fourth, *Oral History interviews* are especially vulnerable to the intrusion of biases since respondents' memories may be lacking (Bryman, 2012:491). To avoid this bias in this research looking at the past 10 years and the preceding generation, efforts were made to maximize the sample size, in addition to triangulating respondents' answers with key informant interviews and background research.

Continuing with ethical considerations in fieldwork studies, there are risks of an unbalanced researcher-respondent's relationship (Bryman, 2012:39; Nagy Hesse-Biber, 2014:199). This is particularly relevant in this thesis due to its qualitative approach implementing participant

observation and in-depth interviewing. Answers may be influenced with what the respondent thinks the researcher wants to hear, or be constrained due to females many responsibilities, mistrust or low self-esteem, conflicting values or interests, loyalty to male community/household members or shame of their disadvantages (Sheyvens, 2014:193-194,253). Knowledge of respondents' perceptions and social status differences according to gender, race, ethnicity, class, culture, age, religion, language, and other factors will help to minimize researcher's unawareness of biased answers (Matthews and Ross, 2010; Nagy Hesse-Biber, 2014:213, 215). Triangulation among the data collection methods, in addition to the provision of gifts after the surveys and interviews in preference of payments to participants, were done to minimize risks. In addition, the researcher took the stance of a 'friendly stranger' by being polite, kind, showing interest in their lives and language, generous but upfront with the researcher's limited resources, in order to keep a respectful researcher-respondents relationship (Sheyvens, 2014). To increase the sense of participants comfort and to comply with ethical considerations, participants were able to suggest the interview location, and discuss an information sheet regarding their informed consent etc (see the 'introduction box' in appendix sections 9.1, 9.2, 9.3) (Creswell, 2009; Padgett, 1998; Bryman, 2012:217-218). Naturally, all participants were above the age of 18.

### 5.7 Delimitations

As with all fieldworks and qualitative case studies in general, the generalizability and external validity of this thesis is highly limited due to its specific socio-political and geographical context (Bryman, 2012:69-70). An important limitation stems from the thesis aim, which is guided by the neoclassical economic objective of increasing agricultural productivity. This unavoidably limits the thesis theoretical perspective and analytical results. Another theoretical limitation of the thesis stems from its application of the complex and debated concept of 'empowerment' which can be defined and discussed in a multitude of ways. Since this thesis has adopted analytical domains from the A-WEAI framework, this unavoidably limits the thesis analysis to the 'external dimensions' of empowerment. In effect, the thesis will not cover the internal dimensions of empowerment such as patriarchal, sexist, capitalist, and neo-colonial structures of economic political and social domination. Therefore, the thesis will not analyze empowerment in its totality.

## 6 Analytical results

This section will both present and analytically discuss the data collection results drawing on the content of the literature review (section 3) and the analytical framework (section 4). It will do so in four sections, organized according to the research questions and under them the analytical domains from the A-WEAI framework. The first sub-section will give an overview of the setting of the data collection. The second sub-section will answer the first research question using the first analytical domain. The third sub-section will answer the second research question using the second to fifth analytical domains. Finally, the fourth sub-section will answer the third research question by analytically discuss all the five domains.

*Note: In sub-sections 2, 3 and 4, the information which describes the situation 5-10 years back in time was retrieved from the micro-survey while the information describing the previous generation was retrieved from the interviews. Information regarding the current situation was retrieved from both the micro-survey and the interviews.*

## 6.1 The setting of data collection

In the River Delta Valley, stretching 106 km from the cities of St Louis to Richard Toll (Devey, 2000), rice is cultivated for both domestic needs (food crop) and market sales (cash crop). Since most farmers now predominantly cultivate rice during the 'Contre Saison Chaud' season (January-March) as it is more profitable than the previous high season called 'Hivernage' (May-July), the thesis has chosen to focus on the 'Contre Saison Chaud.' The data was collected from four different locations, including the three villages; Colonat, Souloul, Ndonba, and the small town of Ross Bethio, all of which are indicated on the map below.

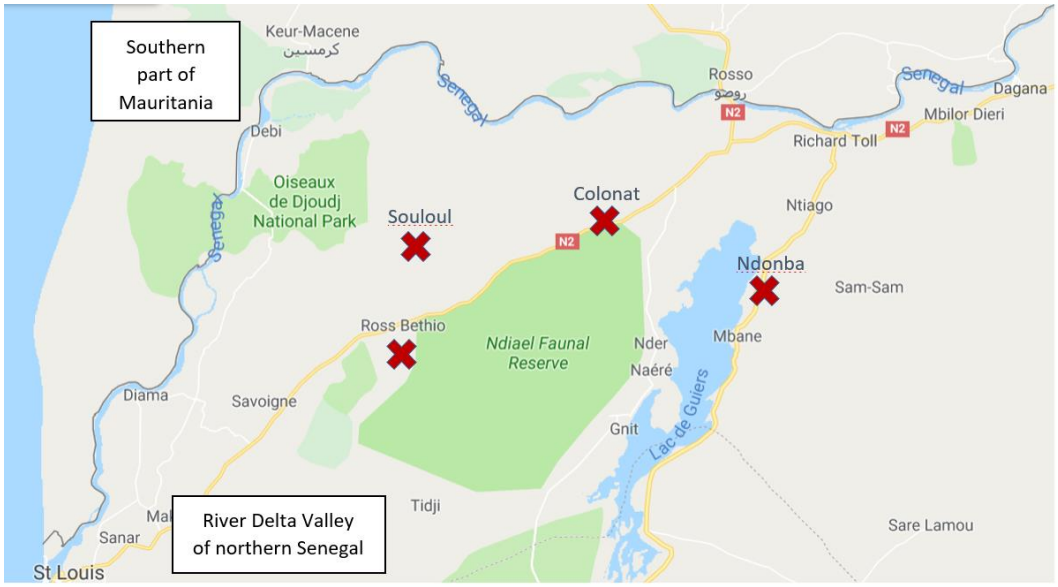



***Figure 6**: Map of locations of data collection. The map was retrieved from Google (2019) and adapted by the researcher*

While the village of Colonat has been characterized by rice cultivation since 1957, its two major issues are the limited access to both water and land. Water scarcity and farmers irrigation problems are due to low and irregular water levels in the nearby canal as it is owned by a massive sugar plantation which only fills up the canal a few times a month. Land scarcity is due to both soil salination (the accumulation of salt in the soil) and the increasing population. Both of these issues have consequences for female farmers whose only option is to help out on their husbands' rice plots, as they lack their own land and women's farming collectives is difficult to manage. In effect, this deprives the women of having their own economy and financial means (which cultivating their own plots would provide them with). While the village of Souloul is inhabited by the ethnic minority called Mhor who traditionally worked as herdsmen, the main occupation today is rice cultivation. Souloul has neither land nor water scarcity, and to irrigate the plots, it suffices to access a shared water pump which runs on gas. In addition, there are several female farming collectives. Like Souloul, the village of Ndonba has sufficient access to water, land, irrigation equipment and female farming collectives. Rice cultivation in Ndonba dates back some 20 years, while also engaging in more diversified agriculture in comparison to the other two villages. The small town of Ross Bethio is the center of the region's rice production and the access to water,

land, irrigation equipment varies a great deal depending on the rice fields exact location. However, the city has a female farming collective.

These four locations were chosen since both agricultural development projects, and two women's farming collectives were present there. This provided insights into how female farmers' rice productivity levels and agricultural management had been affected by becoming a member of a female farming collective. It also provided insight into differences in female farmers empowerment before and after being a member of a farmer's collective. The first collective is called *UGP-RB*, situated in Ross Bethio and has 1 821 female members. It started with a microfinance activity in 1987 and were provided with plots from the Senegalese government through the Ross Bethio commune in 2009 (Key informant interview, Mme Gaye). The second collective is called *FEPRODES*, situated in the entire River Delta Valley and has 49 886 female members. Founded in 1997, *FEPRODES* has helped female farmers with financial support of agricultural inputs, and workshops on a range of subjects such as; rice farming techniques, financial management, leadership, formal legislation regarding land rights, and climate change, etc (Key informant interview, Mme Dieng Ndiaye).

## 6.2 Gender differences in rice productivity levels

This section answers the first research question regarding gender differences in agricultural productivity levels in the River Delta Valley. In doing so, the same questions were asked to both male and female participants. A compilation of the answers is found in the appendix section 9.5.

### 6.2.1 Domain 1- Agricultural productivity

While both similarities and differences were discovered according to the participating small-scale farmers' genders, we will begin with the similarities. The findings from the micro-survey, including all four locations, indicated that both males and females had increased their rice production in comparison to the previous 10 years. While the preceding generation depended on subsistence farming and little market purchases, today, both male and female farmers apply high-intensive rice production techniques, including irrigation systems, better infrastructure, mechanized tools such as tillers, tractors, threshing machine, and harvest machines, pesticides, fertilizer, and improved seed varieties. Over the last 10 years, male and females have used the same inputs with the same quantity and frequency (see micro-survey results, points 1.5, and 1.6). The interviews found that the main factors determining the use of inputs were location, environmental, and financial factors, and not farmers' gender per see. The micro-survey and in-depth interviews could not distinguish any gender differences in terms of soil qualities such as salinity, nutrient depletion, and drought (see micro-survey results, points 1.7). Instead, this was dependent on the particular village and specific plots. The results could not support that females were provided with particularly bad plots. During the interviews, both male and female respondents answered that rice cultivation had become more manageable in comparison to the preceding generation, who spent more time on the fields, and everything was done by hand, and nothing was mechanized.

The productive factors which differentiate the genders in the Valley's rice productivity can be summarized as; harvest quantity, area of production, number of laborers, and time of labor (see micro-survey results, points 1.1-1.4). The micro-survey concluded that males, in general,

produce more rice than their female counterparts due to the unequal gendered access to the factors of production; land, labor, and capital. Regarding land, while male respondents most commonly cultivated 2-5 ha, female respondents only cultivated 0.5-1 ha. This is displayed in the figure below. Even though many women had expanded their areas of rice cultivation over the last 10 years, men's rice plots remained larger than those of females.

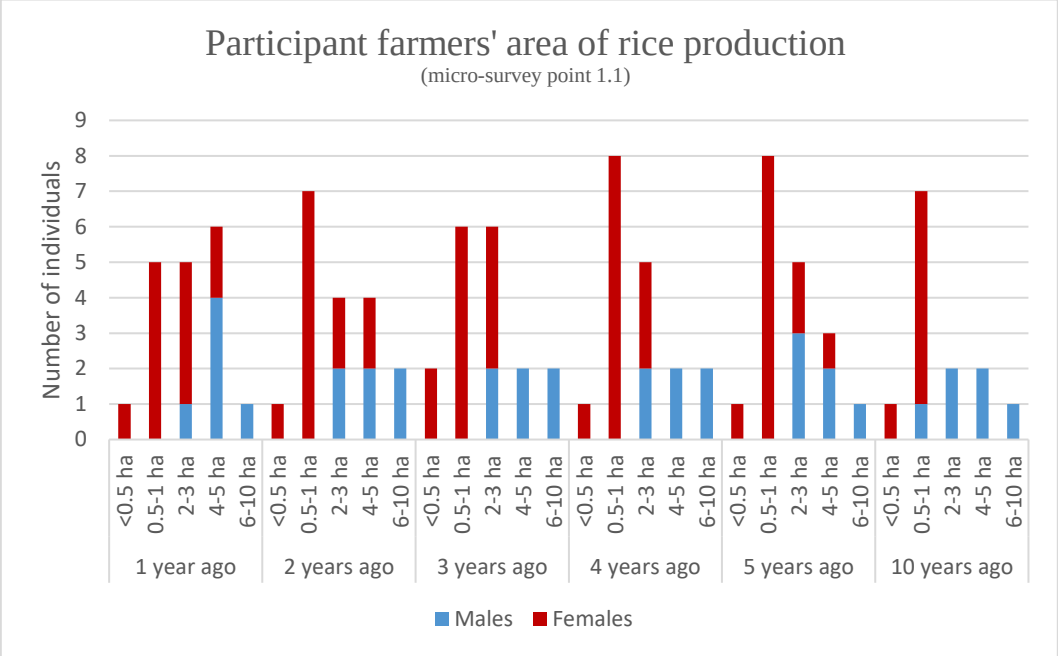



***Figure 7**: Participant farmers' area of rice production*

Over the last 10 years, most male and female respondents estimated their harvest to be between 71-100 bags of rice per ha, depending on the year and environmental situation. However, among the rest of the female respondents, it seemed more common to harvest less than 50 bags of rice per ha, in comparison to male farmers who answered 51-70 bags per ha. The micro-survey observed one exception to males' more abundant harvests with a married couple in the village of Ndonba. While both the husband and wife had cultivated approximately 3 ha over the last 10 years, the husband had harvested between 60-80 bags of rice per season and the wife between 60-100 bags of rice over the same period.

Regarding the gendered differences of labor, the micro-survey found that females had less access to extension services and time of labor. While the men were able to spend their entire day on the fields, this was not the case for women who had many household obligations to take care of. According to the Oral history group interviews, females agricultural work is limited due to both their housework and the lack of energy as their bodies would get too tired. To cover their loss of working hours on the fields, female farmers would hire extensions workers. The need for extension workers has also increased due to the individualization and expansion of land plots, in opposition to the preceding generation. Extension services are always performed by private companies and their male staff who are paid by the smallholder farmer per day or per performed agricultural task. Since neither male nor female farmers have enough financial means to buy tillers, tractors, threshing machine, or harvest machines for their own plantations, they are obliged to hire extension services to complete labor-intensive tasks.

Recalling the literature review and the concept of 'women's double burden,' the findings reflect this since women are obligated to perform both the housework and the remunerative agricultural work. Thus, female farmers in the River Delta Valley are negatively impacted by the prevailing gender gap in agriculture, decreasing their opportunities for productivity. This finding supports the thesis premise that to reach increased agricultural productivity; it is necessary to decrease the gender gap in the agricultural labor force

## 6.3 Gender differences in agricultural management

This section will answer the second research question, discussing gender differences in agricultural management. First, there will be a description of how the overall organization of rice agriculture in the River Delta Valley has developed from the previous generation until today. Secondly, there will be a description and an in-depth analysis of each analytical domain.

The results from both female group-, male individual- and key informant interviews revealed that household's agricultural plots had become individually instead managed of collectively. During the preceding generation, all household members worked on the family plot, resulting in one shared income, which was managed by the husband. This type of management is called the 'co-operative model' since resources are pooled, and harvests are shared instead of splitting up into several units amongst the family members. Today, the household's husband and wife manage and cultivate their own plots individually. This type of management is called the 'non-cooperative model' since resources are not shared amongst family members, and the husband and the wife work separately on their respective fields which is their own responsibility (Quisumbing et al. 2014; Croppenstedth et al. 2013; Udry et al. 1995; Udry, 1996; Goldstein and Udry, 2008; Diiro et al. 2018). Recalling Section 3.2. in the literature review, the preceding generation's agricultural management fit into the tenant of 'Pareto efficiency.' This assumes that farming households would share the factors of production in an equal distribution (the co-operative model), making it more likely to maximize agricultural efficiency. In the current individualized management system, this is not the case. To exemplify this, one of the female farmers from one of the oral history group interviews said the following.

**"The husbands give nothing to their wives. The wives do not even know how much rice their husbands are harvesting and what they do with their revenues. The husbands only "give" to their wives during the night."**

*(Female farmer from Oral history group interview no. 2, in Ross Bethio)*

### 6.3.1 Domain 2- Ownership or renting of resources

The thesis has observed both similarities and differences in genders ownership or renting of productive factors such as land and resources, over the last 10 years and preceding generation.

Starting with the similarities between the genders regarding the owning or renting of resources. Neither male nor female farmers can afford to buy farming equipment such as tractor, transportation, tools, plow, tiller or irrigation system, which is therefore rented by all farmers (see micro-survey results, point 2.4). Despite this, one exception was noted from a female farmer in the Souloul village as her female farmer collective had previously owned a tractor. However, most farmers cannot afford collective ownership either. Continuing with

the differences between the genders in regard to the owning or renting of resources. The micro-survey showed that over the previous 10 years, men had owned their plots to a larger extent than females, meaning that females more often had to rent their land of rice production (see micro-survey results, point 2.2). This is displayed in the figure below.

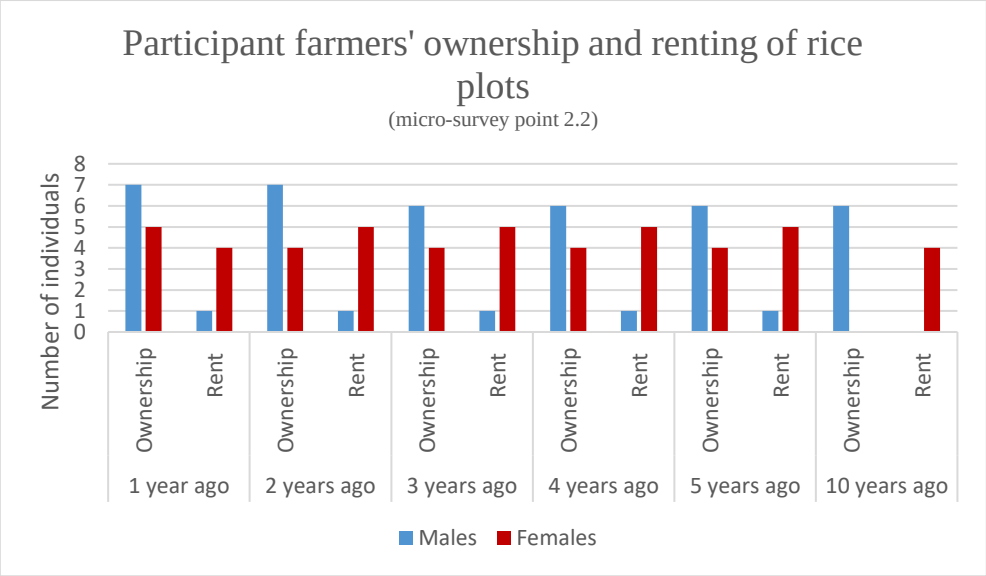



***Figure 8**: Participant farmers' ownership and renting of rice plots*

Part of this issue can be appointed to the rules regarding inheritance since females rarely have the opportunity to inherit land from their parents or another relative, whereas men do (see micro-survey results, point 2.5). Even though females and males have equal rights to land and inheritance according to Senegal's official legislation, this right is often not enforced due to pertaining Senegalese traditions which only allows men to inherit land. The micro-survey revealed that among the respondents, 2 out of 11 female farmers in comparison to 4 out of 7 male farmers had inherited land. However, the female group and key informant interviews revealed that while some women today do inherit land, this remains rare. In addition, when females do inherit land, the plots are much smaller than those that men get to inherit. While females restricted access to land dates back to previous generations, it has gotten somewhat better.

The gender difference regarding land access supports previous research made by IPAR and RTI International (2018) in the River Delta Valley, stating that female farmers limited land access is a major constraint to their agricultural productivity. Another previous study by Grigsby (2004), contains both supportive and contradictory findings in comparison to this thesis. The supportive findings include that; (1) women today have greater economic autonomy than the preceding generation, (2) women's access to important commons resources was a function of prevailing land use rather than any structure of tenure rights, (3) farmers have an increasing need for cash which has placed a greater emphasis on non-farm sources of income. The contradictory findings include that; tenure formalization and the 'individualization' of land, including greater equity in terms of statutory land rights, often had adverse effects on women's rights in agriculture. Grigsby listed several reasons for this including that; land-rights institutions are more accessible to men who have personal contacts and capital, and that women, in general, have insufficient levels of literacy and less

administrative knowledge. Continuing, women have fewer personal contacts with local officials, fewer opportunities to use transportation systems and vehicles, less income to settle bribes or pay for travel and lodging, and less traditional rights. He also found that women could use the land, but not control it or manage its resources, and they were also subject to eviction and relegated to less fertile areas. While all of these reasons could not be controlled for in this thesis, it was found that the 'individualization' of land had rendered in several females expanded economy. Thus, Grigsby's conclusion could not be supported. To conclude, Senegal's gendered land distribution results in the fact that women have less capability to produce as much rice as men, due to their restricted financial capacities. Females' weaker economic position in comparison to men contributes to their economic marginalization and disempowerment.

### 6.3.2 Domain 3- Access and control of income and credit

Moving on to the third analytical domain, there are several gender differences in farmers access and control of income and credit. Overall, while both male and females have low incomes, and limited opportunities to borrow money, they all hold individual control of the income and credit that they acquire.

Looking at the opportunities of borrowing money for their agricultural production, the micro-survey and in-depth interviews revealed that while women had equal rights to borrow money, their limited finances prevented them from doing so. Over the last 10 years, both genders had borrowed money from a variety of actors in order to conduct their rice production as this was necessary to cover all their costs (see micro-survey results, point 3.4). Males tended to borrow money from the bank, while females were more prone to borrow money from family and friends. While it was difficult for women to borrow from the bank since they cultivated too small plots to make it profitable enough, most banks actually preferred lending money to females (as long as they have sufficient financial security) since males rarely paid off their depths (according to both male and female interviews). Regarding decision-making, both males and females had individual control over the money that they borrowed (see micro-survey results, point 3.5).

Looking at the premises of decision-making in the River Delta Valley, this has evolved significantly from the preceding generation. Today, both males and females make their own agricultural and financial decisions concerning their individual plots, as they are their business alone (see micro-survey results, point 3.1-3.3). While decisions on a general basis are made individually, one of the micro-survey female respondents in the Colonat village diverted from this as all decisions regarding both the household and agriculture were taken collectively between her and her co-wives. In contrast, during the preceding generation, all decisions were taken by the husband. While females' responsibilities revolved around the housework and family plots, males' responsibilities covered all financial costs of the household, and work and decision-making on the family plots (according to several key informant and female group interviews). The husband had the authority over all productive resources and the financial responsibility concerning all costs related to the household expenditures. The wife did not have any financial or decision-making responsibilities since she was not considered knowledgeable enough and no personal income.

The thesis findings are both supporting and contradictory to the previous research on the same topic. In the study by IPAR and RTI International (2018), it was found that female

farmers in the River Delta Valley lack the opportunity to participate in household decisions regarding agricultural production. This finding is supported by this thesis when looking to the preceding generation's 'one family plot' agricultural organization as females during that time had no power in household decisions. However, when looking to the current individualized agricultural organization, the IPAR and RTI International's findings are not supported by this thesis as women have sole decision-making power over their own rice plots. In this sense, female farmers today are very empowered. Looking at the economic aspect, despite females having fewer financial means than males, males also have economic issues. First of all, it has become more problematic for males to borrow money from banks and in addition, NGO's and organizations tend to favor supporting women instead of males since females, in general, are more economically disempowered than males. Therefore, in comparison to the study by IPAR and RTI International (2018) which found that female farmers had inadequate access to and management of agricultural credit, the thesis results are both supportive and conflictual.

The thesis findings support the claim that when females are provided with the opportunity to manage financial assets, the whole family, and in particular, the children benefit. This stands in stark contrast to when males manage the financial assets as it is more often spent on the male's personal interest (Quisumbing, 2003:11,13). The data retrieved from the female group, key informant and participant observations mainly collected from the town of Ross Bethio and the village Colonat suggested that when the developments from the rice agriculture resulted in extra income for female farmers they would use the money to invest in their children's education, build or renovate the house, or expand their businesses. When asked about their husband, all interviewed women both in group and individually responded that their husbands would probably contribute to some household costs but that he would prioritize his own need such as taking another wife for example (*writer's note: males in Senegal has the right to marry up to four women*). When the males were asked about this reply, the subject of marrying another wife was not mentioned. However, when verified and triangulated with information from several of the key informants and informal conversations, the male practice of taking another wife when the finances allow doing so is a standard practice with social and religious support in the entire country. When males were asked the same question, they answered that they would prioritize the needs of the household such as adding more food, paying for children's school and clothes, etc. When asked about their wives, they stated that they would also prioritize the household needs, just like themselves.

### 6.3.3 Domain 4- Time and workload

The fourth analytical domain regarding time allocation and workload, revealed significant gender differences since an individual's gender decides what work and for how long time this is to be done. Looking at female's workload, the individual, group and key informant interviews revealed that while domestic work is only performed by women, the extent and types of activities seemed to be decided by their age, social status and role in the household. For example, cleaning tends to be done by the older children and young wives, whereas the feeding of the younger children seems to a larger extent be done by older women. At the age of retirement, both men and women tend to work less in general. However, in the case of women, this depends on how many younger female household members are available to replace them and the work that they would typically do. Thus, at the time of retirement (approximately from the age of 70), the division of labor both in terms of income generation

and domestic activities seem to a larger extent fall on the responsibility of women. While older men spend most of their time at the mosque, with friends or resting, their wives were left with both the financial and domestic responsibility of the household. The situation can quickly become dire if the retired couple has no children or grandchildren who can care for them. Looking at this situation from an empowerment perspective, this can be slightly conflictual as retired women, on the one hand, are economically empowered, but on the other hand, are disempowered in terms of time. This is because women are left with the responsibility to make ends meet for the household's needs. It can be concluded that the concept of 'women's double burden' (Hochschild and Machung, 1990), generally applies in the context of rice agriculture in the River Delta Valley. While men's responsibility remains to provide rice and finances for the family until the age of retirement, women engage in the same tasks, in addition to taking care of the household and children, even after the age of retirement. Women's double burden is a major obstacle to increasing their agricultural productivity. This finding stands in contrast to IPAR and RTI International's study (2018), which found that workload is not a major constraint to female farmers empowerment, though it had a greater burden on women in the rainy season when agricultural activities are more time-consuming.

Looking at gender differences in time allocation, the results from the micro-survey, concluded that middle-aged men spend most of their time on their rice fields although this was sometimes combined with other economic activities such as growing other crops both for domestic consumption and market sales as well as fishing. The results looking at females' time allocation varied a lot more as certain spent most of their time on the local market, vending various produce, whereas others spent most of their time in the fields. In general, women seemed more prone than men to engage in several economic activities, combining rice and other crops cultivation and market sales (see micro-survey results, point 4.1). This is displayed in the figure below.

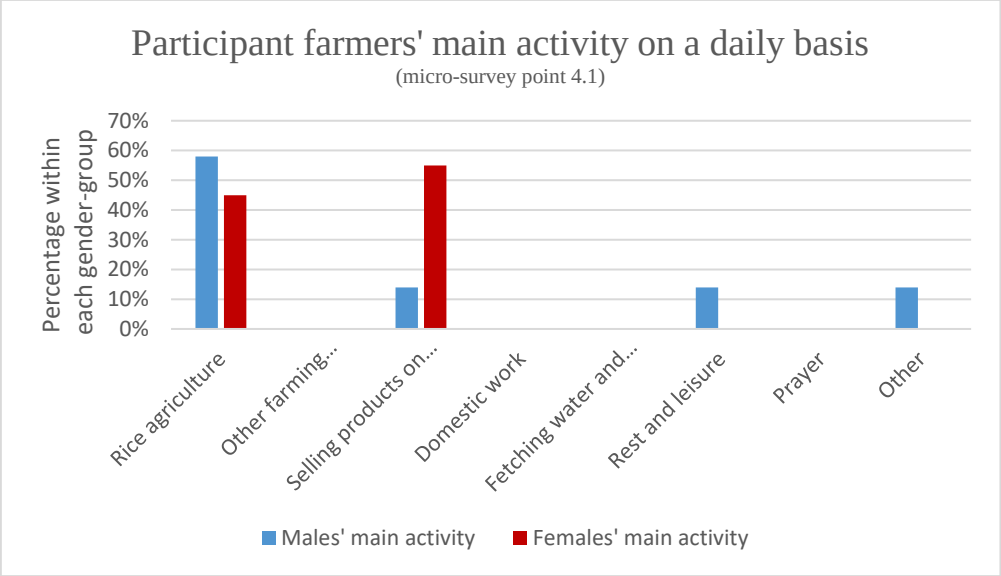



***Figure 9**: Participant farmers' main activity on a daily basis*

In a sense, this disputes the analytical results from Smith and Chavas (1997) who found that the commercialization of agricultural productions in West African households was typically

done by increasing the production on male managed communal lands, meaning that husbands controlled the increased income. This is not the case for the participants in this study as women were more prone than men to engage in commercial activities. Due to the households 'non-co-operative model' in which husbands and wives do not share their incomes, women's increased revenues were not controlled by their husbands. Thus, the commercialization of agricultural productions had, in fact, a positive effect on women's empowerment. However, it is true that the land in the Valley which is managed by males is a lot larger than that of females, meaning that males have larger possibilities and economic benefits to reap from expanded commercialization of their production.

Looking at the gender's workload and tasks within agriculture, this has evolved from the preceding generation until today. During the preceding generation, women's agricultural work covered tasks such as seeding, weeding, threshing and harvesting. Male tasks included soil and plots preparation, plants breeding ground, surveillance of the fields to avoid the loss of crops to feeding wild animals, transportations, physical and heavy tasks, in addition to threshing and harvesting which was conducted by the entire family (key informants and in-depth interviews). Today, many of the gendered work tasks from the preceding generation remain the same, although this division is becoming more and more blurred as both males and females now have their individual plots which each person manages by themselves. The interviews found that the current division of agricultural tasks including the handling of machines and technical equipment is generally done by males. These include pesticide and herbicide treatment, which traditionally was done by hand by women and without chemicals. This finding is interesting to compare to the previous study by Braun and Webb (1989) who found that when agricultural tools and techniques are introduced in the production process, this transfers the crop from being a "female crop" to a "male crop." In support of Braun and Webb, one may argue that the nowadays mechanized tasks in rice cultivation are primarily assigned to male extension workers, handling the machines such as tillers, tractors, threshing machine, harvest machine, etc. Thus, the technologization of either a part of an agricultural process or the entire production process of a specific crop may cause the process to become a domain only for males. However, it is unfair to say that the mechanization of rice production in the River Delta Valley has a disempowering effect on female farmers since it has many benefits for them. In addition, rice production in the Valley has not transferred rice-crops from the female to the male domain. On the contrary, female farmers produce much more rice than before. In fact, the mechanized rice cultivation has provided women with the opportunity to create their own finances, resulting in economic empowerment. Therefore, the findings from Braun and Webb (1989), cannot be entirely supported by this thesis.

### 6.3.4 Domain 5- Group membership

Looking to the fifth and final analytical domain regarding group membership, all female respondents were part of one of the farmers collective; FEPRODES or UGP-RB, which provided them with approximately 0.5 ha per individual. Most of the women had joined the farmers collective about 10 years previously. During the group interviews, female respondents answered that being part of a female farmers association had improved their lives in a variety of ways. It had allowed them to expand their rice production since they now had the opportunity to borrow money through microfinance activities in the farmers collective (although borrowing money from family and friends remained more common). The farmers

collective had provided them with economic support as it financed their agricultural inputs and the power to decide upon purchases. Thus, being part of a farmer's collective gave females economic empowerment (external form of empowerment). In addition, the farmer's collective had provided female farmers with training and workshops of various types. To the question of whether male or female farmers were the most knowledgeable rice producers one female answered that;

**"Our husbands are more knowledgeable since they started with rice production before us, but with the farmers collective and the workshops they hold, we have gotten more knowledgeable than before."**

*(Female farmer from Oral history group interview no. 2, in Ross Bethio)*

Female respondents also answered that the farmer's collective had given them moral support, close friends, extra motivation, and encouragement. Another female farmer said that;

**"Being part of the female farmers collective has given me a second family."**

*(Female farmer from Oral history group interview no. 5, in Ross Bethio)*

Thus, being part of a farmer's collective gave females internal empowerment since the collective helped to change the female's mindset to what they were capable of doing. In comparison, the male respondents were not part of any farmers collective. While most of the men were positive to the fact that their wives had financial support for their agricultural production, several of them questioned why they could not get the same financial support.

The thesis results stand in contrast to previous research from IPAR and RTI International (2018), who found that female farmers had a lack of involvement in community groups. However, since this thesis selectively has chosen women who are members of a female farmers collective, this finding cannot be considered as representative for this region.

## 6.4 Female farmers socio-economic situation as a result of agricultural developments

The past agricultural developments in the River Delta Valley has had many and various impacts upon female farmers in the region. Looking at the socio-economic situation, rice production in the River Delta Valley today is more profitable both for male and females as a result of the agricultural intensification. However, the high-intensive form of agriculture demands significant investments since inputs are costly. When asked whether they thought they were economically better off today than 10 years previously, both male and female respondents from all four data collection locations were quite unsure. Most respondents answered that although they now had a more substantial income from their rice production, their agricultural expenses had increased significantly as well. So ultimately, they were left with close to nothing at the end of the day.

Looking at female farmers economic situation in general, they have less capital than males, which is due to several factors. First, females cannot work as many hours as men on the rice fields due to the housework they are assigned to do. Second, since females do not have enough time to work on their rice fields, they need to hire extension workers to perform the tasks they cannot do themselves. Third, women cultivate less ha than male farmers. This results in higher farming expenditures for women than men. When situating these three issues

in the socio-economic context of Senegal, it should be highlighted that they are mere results from underlying disempowering social structures and institutions which have economically disempowering effects for females. Some of these are the unequal practice of inheritance, engrained patriarchal systems, limiting norms about what each gender should be engaged in doing, etc.

The group interviews found that female farmers today take a larger economic responsibility for household expenses, in comparison to the preceding generation when all costs had been covered by the husband. In addition to females' traditional responsibilities of housework and children, they now also cover the financial costs related to these housework tasks. For example, paying for children's clothes, school fees, detergent, certain foods, etc is now generally the females' financial responsibility. While females of the preceding generation had no individual money, they now manage and cultivate their individual plots enabling them to have their own economies. Today, Senegalese households tend to have split economies in comparison to the preceding generation, which had one shared economy governed by the husband and utilized to cover the household's expenditures. The family plots cover family needs and expenditures while governed by the husbands. The husbands have the primary responsibility and power in household-decisions; however, they do not have any responsibility for domestic work or the children-related financial costs and work. Thus, while women's domestic and children-related work has remained the same in comparison to the preceding generation, they now have a larger financial responsibility. Simultaneously, men's work has remained more or less constant while their financial responsibility has decreased. The reason for the transfer of the financial responsibility from the husband to the wife can be connected to several explanations. During the Oral history group interview no 3, it was said that the reason to why females had started to cultivate individual plots for rice production was because of the ever-increasing droughts which meant that the harvest was bad and thus they started cultivating their own plots in order to help cover the family needs. The transfer of the financial responsibilities from the husband to the wife can also be connected to women's expanded economic liberty as they nowadays manage their own individual income. These findings support the previous research by Doss (2001), stating that African households are complex and heterogeneous, and gender roles are not static but change in response to new economic opportunities. In the case of the River Delta Valley, it is a combination of external impacts and new economic opportunities which have rendered in changes in the gendered division of labor and responsibilities.

Among the interviewed households, it was common to divide the rice production into three parts; female plots, male plots and family plots. The revenues from females' individual plots cover the household needs and expenditures. In comparison, the revenues from males' individual plots would also cover parts of the household needs and expenditures in addition to males' personal needs. This, although male plots tend to be larger than those of women. To reflect this, one female farmer stated that;

**"Our husbands put their money in their pockets. They divide their income into three parts; one part for their personal needs, one part of marrying a second wife and another part to marry a third wife. It is, therefore, up to us the wives to care for the household's needs."**

*(Female farmer from Oral history group interview no. 2, in Ross Bethio)*

The current division of financial responsibilities and household work has put a more substantial burden on women compared to the preceding generation. This provides a clear example of women's double burden where Senegalese wives are in constant lack of financial resources and time in opposition to their husbands. This suggests that although some of the external dimensions of empowerment which are part of the A-WEAI analytical framework shows that female farmers have become more empowered today in comparison to the previous 10 years and preceding generation, the situation seems more complicated than that. This is especially apparent when looking at the limited access to land as women have smaller plots sizes than men (domain 2), limited opportunities to inherit land as women seldom own their land of production (domain 2), women's limited finances (domain 3), and women's heavier workload and limited time in comparison to men (domain 4). When looking at these domains, it is clear that female farmers socio-economic situations are different from those of males. In conclusion, the previous developments in the River Delta Valley's rice cultivation have had significant differences in both genders, leaving females with more limited opportunities in agricultural productivity than males.

## 6.5 Theoretical reflections

### 6.5.1 Agricultural transformation and the smallholder-based approach

While Senegal's economic development as outlined in the background section through the figures 4 and 5, initially suggests that the Agricultural Transformation (according to Timmer, 1998) has been initiated, a more in-depth analysis reveals that this is not the case. As mentioned in that section, the productivity of Senegal's agricultural sector has not increased but remained low since the main driver to Senegal's agricultural growth is input intensification and not increasing productivity (The World Bank, 2018:27). While agricultural transformations are characterized by an intensification of grain production, commercial diversification from grains into non-staple crops and income diversification out of agriculture into the non-farm economy leading to increasing land and labor productivity etc (Andersson-Djurfeldt et al. 2018:3), this evolutionary agricultural process seems to be lacking in Senegal and the River Delta Valley.

The previous decade's agricultural developments in the region have not only resulted in highly intensive farming for smallholders but also the installation of large-scale agribusinesses. Previous research on foreign investments in agribusinesses in the River Delta Valley has highlighted both its' positive and negative effects on smallholders. On the positive side, agribusinesses can create welfare impacts through employment creation and labor market participation, resulting in higher household income leading to reduced poverty and inequality, especially for the previously poorest households (Van den Broeck et al. 2017; Van den Broeck and Maertens, 2017; Maertens et al. 2011). On the negative side, foreign-financed investments in dams and irrigation schemes in conjunction with Northern-influenced (or imposed) policies have had severe adverse effects on the livelihoods and welfare of family farmers, fishers, and pastoralists in the Senegal River Valley (Koopman, 2009). The importation of food crops can weaken the region's food security by driving down local producers' prices and incentives for production, causing severe consequences in the event of spiking global food prices, as it did in 2008 (Koopman, 2009). In this thesis, key informant interviews, group and individual interviews, as well as participant observations, also found diverging effects of agribusiness investments onto the smallholder participants. On the

positive side, the agribusinesses provided the surrounding communities with employment opportunities (although only temporary), transferring workers from the informal to the formal employment sector. On the negative side, many of the agribusinesses do not supply the local market as the products are shipped to Europe, some resources such as land became more difficult for smallholders to access, and many smallholders found it challenging to make their voices heard in comparison to the agribusinesses. The collected data could not support any specific gender differences in terms of agribusinesses consequences onto smallholder farmers.

### 6.5.2 Females empowerment

Recalling the analytical findings in section 6.4, it was found that many of the household's economic responsibilities had been transferred from males to females when comparing female farmers socio-economic situation today in comparison to the preceding generation. When situating this finding into an empowerment analytical perspective, one can argue that female farmers in the River Delta Valley today, are both more and less empowered. The factors indicating that female farmers are more empowered are, group membership and females' individual economies, which have strengthened female farmers 'internal dimension' of empowerment. The following statement was supported by the thesis findings "empowerment involves shifts in the way in which we perceive the world and our place within it (…) it expands our horizons of possibility and shifts our consciousness, making other kinds of changes possible" (Cornwall and Edwards, 2014:xi). The group interviews revealed that females saw a clear difference between themselves and the preceding generation, as they had much more power over their lives, larger capabilities to create and expand their businesses and were less dependent on their husbands. This contrasted to the preceding generation whose females were considered as submissive, powerless, and without much knowledge or capabilities to create new opportunities in their lives. These opinions were shared with the responses from the individual male interviews. In this sense, female farmers had a somewhat empowered consciousness about themselves and their roles in both agricultural development and their life situation at large. Through the female farmers' associations, they shared different forms of collective action, activism for their rights and gave mutual support for individual struggles. The factor is indicating that female farmers are equally as disempowered today as the preceding generation is the patriarchal structure, which still remains as males hold the most power in decision-making. Women's decision-making power is mostly limited to her own agricultural plot and not household decisions. To increase empowerment, it is vital to initiate a structural change in favor of greater equality (Batliwala, 1994; Kabeer,1994; Kabeer in SIDA, 2001). Unfortunately, this has not happened in the River Delta Valley, since more or less the same power-relation between males and females still exist.

However, in support of the thesis theoretical framework, it can be concluded that empowerment is a highly dynamic process since "a person is not necessarily empowered in all aspects of its life at once" (Tsikata and Darkwah, 2014). The thesis revealed that while the gender differences in some of the analytical domains were large (ie; domains 2, 3 and 4), they were nearly absent in other domains (ie; domain 1). In addition, a person who is empowered today might be disempowered tomorrow by changes in their circumstances and vice versa (Tsikata and Darkwah, 2014). This is especially relevant for people living on subsistence

farming, just like many of the thesis respondents do since small changes from one day to another can have terrible consequences. Also, some developments might result in increased empowerment in one domain but disempowerment in another. An example of this can be observed in the relationship between the domains 3 and 4 where females overall larger access and decision-making over capital has not resulted in them having more money to spend on themselves or more time, but the opposite (see section 6.4.).

# 7 Conclusion

This thesis aimed to explore the gendered differences between male and female farmers' smallholder rice production and its impact upon agricultural productivity, management, and female farmers' socio-economic situation, in the River Delta Valley in Senegal. This is important since previous research has shown that agricultural productivity levels have been hampered due to female farmers marginalization and lack of opportunities in the agricultural sector. The solution to this issue has been appointed to increasing female farmers empowerment. To investigate females empowerment in the case of rice cultivation in the River Delta Valley, the thesis theoretical framework was based on Timmer's model of the Agricultural Transformation, pro-poor agricultural growth, and the concept of empowerment, which was operationalized through the analytical framework called the 'Women's Empowerment in Agriculture Index' (A-WEAI). This consisted of five analytical domains; *1. Agricultural productivity, 2. Ownership or renting of resources, 3. Access and control of income and credit, 4. Time and workload,* and *5. Group membership,* which was used to locate gender gaps and to guide the data collection process. The data collection applied a mixed-methods approach involving a micro-survey, individual and group interviews and participating observations with both male and female farmers. To fulfill the aim of the thesis, this was divided into the following three research questions.

The first question asking about gender differences in productivity levels found both differences and similarities between male and female farmers. The similarities included high-intensive rice production techniques, applied by both male and female farmers. The differences included the area of production, number of laborers, and time of labor, resulting in more abundant harvests for males in comparison to females. Contextualized to the model of Timmer's Agricultural Transformation, these findings are positive since both genders have increased their rice production through high-intensive agriculture while both the labor force and GDP has increased in the service sector. However, when discussed with the help of previous research, Senegal is not on the path of the Agricultural Transformation, partly due to input intensification instead of increasing productivity as the main driver to Senegal's agricultural growth.

The second question asking about gender differences in agricultural management also found both similarities and differences depending on the analytical domain. The major gender differences in agricultural management were the limited access to land as women have smaller plots sizes than men (domain 2), limited opportunities to inherit land as women seldom own their land of production (domain 2), women's limited finances (domain 3), women's heavier workload and limited time in comparison to men (domain 4) and women's membership in farmers' collectives (domain 5). The similarities in agricultural management

among the genders included the use of intensified agricultural techniques and inputs such as fertilizer, machines, pesticides, etc (domain 1 and 2). Although many gender differences remain within the rice production in the River Delta Valley, today female farmers produce much more rice than they did only 5-10 years ago or even in the preceding generation when they worked for their husbands. This is because women now cultivate their own individual plots over which they have decision-making power, their own economy, access to credit, in addition to organizing themselves into farming collectives including microfinance. These findings revealed that female farmers in the River Delta Valley today are both more and less empowered, depending on which analytical domain one analyzes and how it is analyzed. The factors indicating female's empowerment are group memberships in farming collectives, females' decision-making power over their own rice plantations and their individual economies, by strengthening both the 'external' and the 'internal' dimensions of empowerment. On the other side, the factors indicating female's lesser empowerment are their marginalized rights concerning inheritance and ownership of land, constraints in time and workload, and limited financial resources in comparison to male farmers.

The third question asking about the previous rice agriculture developments' effects on female farmers' socio-economic situation, found that women's increased income had transferred financial responsibilities within household's, from the husband to the wife. This had resulted in a more substantial financial burden for women today in comparison to the preceding generation. Therefore, women's increased economic empowerment had brought with it a more substantial 'double burden' for the women as both their domestic and professional responsibilities had increased due to their expanded financial freedom. This finding serves as an example of the complexity of empowerment, since estimating the level of female farmers empowerment is not as clear cut as we might think. Therefore, this finding confirmed what was stated in the theoretical framework, being that female empowerment is not a linear process as the improvement in one aspect might result in negative consequences in another.

Part of the thesis findings was that, in opposition to men, female farmers extra incomes were invested in their children's education, build or renovate the house, or expand their businesses. This confirms the previous research from Quisumbing, (2003), discussed in the literature review, which stated that when females (in opposition to males) are provided with the opportunity to manage financial assets, the whole family and in particular the children benefit. Another finding which refuted previous research was that the female participants seemed more prone than men to engage in several economic activities, including market sales. Due to the households 'non-co-operative model' in which husbands and wives do not share their incomes, women's increased revenues were not controlled by their husbands. Thus, women's commercialization of agricultural productions had, in fact, a positive effect on their empowerment. In a sense, this disputes the analytical results from Smith and Chavas (1997) who found that the commercialization of agricultural productions in West African households was typically done by increasing the production on male managed communal lands, meaning that husbands controlled the increased income.

The persisting gender gap among rice farmers in the River Delta Valley can be traced to the patriarchal structures, appointing the elderly males as the person in charge of the household's decision-making. This stands in contrast to women's decision-making power, which is mostly limited to her own agricultural plot and individual economy, and not the household and

family decisions. Thus, more or less the same gendered power-structure from the preceding generation still exist today, meaning that women's individual rice cultivation rendering in their own economy has not been able to alter patriarchal social structures. In order for female farmers to be more empowered and to close the gender gap, these patriarchal structures need to change. This can be framed through Batliwala's definition of empowerment as "the process of challenging existing power relations, and of gaining greater control over the sources of power" (Batliwala, 1994:130). In effect, the persistent gender gap in Senegal's agricultural sector will continue to impose consequences for the Senegalese government's goal of reaching rice self-sufficiency and its overall developmental path. In addition, it is unclear how large-scale agribusiness will affect smallholder's possibilities of reaching agricultural growth and gender equality in agricultural management.

A suggestion for future research on this topic is to investigate how the smallholder-based agricultural growth, in opposition to the large-scale farming approach differs in terms of female empowerment potentials. For example, what indications can be found in the River Delta Valley, supporting that the smallholder-based, in comparison to the large-scale farming approach, have positive effects on female farmers empowerment? Another suggestion is to investigate whether the trend of transferring economic responsibilities from male to females will continue in correlation with females increased individual economies. If this trend does continue, what responsibilities will be transferred to women? Will they only end up with the household's economic responsibilities, or may this also lead to female's increasing decision-making power? Ultimately, the question remains whether females increased economic empowerment in the form of individual economies hold the potential to decrease the gender gap and assist in taking Senegal forward on the developmental path.

# 8 Bibliography

## 8.1. Printed sources

AfDB (2015) Autonomiser les femmes africaines : Plan d'action. Indice de l'égalité du genre en Afrique 2015. Abidjan

Agarwal, B. (2015) Food Security, Productivity, and Gender Equality. In Herring, J. The Oxford handbook of food, politics, and society. Oxford: Oxford University Press.

AGRA (2017) Africa Agriculture Status Report- The business of Smallholder Agriculture in Sub-Saharan Africa (Issue 5). Nairobi, Kenya: Alliance for a green revolution in Africa (AGRA)

Alkire, S. Meinzen-Dick, R. Peterman, A. Quisumbing, A. Seymour, G. Vaz, A. (2013) The women's Empowerment in Agriculture Index. *OPHI Working Papers 58*. University of Oxford

Andersson-Djurfeldt, A. and Djurfeldt, G. (2013) Structural Transformation and African Smallholders: Drivers of Mobility within and between the Farm and Non-farm Sectors for eight countries. Oxford Development Studies (41:3). PP: 281-306.

Andersson-Djurfeldt, A. Mawunyo-Dzanku, F. and Cuthbert-Isinika, A. (2018) Agriculture, Diversification, and Gender in Rural Africa- Longitudinal Perspectives from Six Countries. Oxford: Oxford University Press

Batliwala, S. (1994) 'The Meaning of Women's Empowerment: New Concepts from Action', in G. Sen, A. Germain, and L.C. Chen (eds), Population Policies Reconsidered: Health, Empowerment, and Rights, Boston: Harvard University Press

Bernard, T. Doss, C. Hidrobo, M. Hoel, J. Kieran, C. (2018) Ask me why- Using vignettes to understand patterns of intrahousehold decision making in rural Senegal. IFPRI Discussion paper 01784. International Food Policy Research Institute.

Boserup, E. (1970) Women's Role in Economic Development. New York, NY, St. Martin's Press.

Braun, J. and Webb, P.J.R. (1989) The Impact of New Crop Technology on the Agricultural Division of Labor in a West African Setting. *Economic Development and Cultural Change*, The University of Chicago. PP: 513-534.

Bryman, A. (2012) *Social Research Methods* (4th ed.). Oxford: Oxford University Press

Connor, D. Comas, J. Macpherson, M.G., Mateos, L. (2008) Impact of smallholder irrigation on the agricultural production, food supply, and economic prosperity of a representative village beside the Senegal River, Mauritania. *Agricultural Systems* (96). PP:1-15

Christiansen, L. (2017) Agriculture in Africa- Telling myths from facts- A synthesis. *Food Policy* (67). PP:1-11.

Cornwall, A. and Edwards, J. (2014) *Feminisms, Empowerment, and Development- Changing Women's lives*. London and New York: Zed Books

Creswell, W.J. (2009) *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.) United Kingdom: SAGE Publications Ltd.

Croppenstedth, A. Goldstein, M. Rosas, N. (2013) Gender and Agriculture- Inefficiencies, Segregation, and Low Productivity Traps. *The World Bank Research Observer (28:1).* PP: 79-109

Dawe, D. (2010) The Rice Crisis- Markets, policies, and food security. London and Washington D.C: The Food and Agriculture Organization of the United Nations and Earthscan

Devey, M. (2000) Le Sénégal. Éditions KARTHALA: Paris

Diagne, M. Demont, M. Abdoulaye Seck, P. Diaw, A. (2013) Self Sufficiency policy and irrigated rice productivity in the Senegal River Valley. Springer Science+ Business Media Dordrecht and International Society for Plant pathology. Food Sec. (5), PP:55-68.

Diiro, GM. Seymour, G. Kassie, M. Muricho, G. Muriithi BW. (2018) Women's empowerment in agriculture and agricultural productivity- evidence from rural maize farmer households in western Kenya. *PLoS ONE* (13:5).

Doss, C.R. (2001) Designing Agricultural Technology for African Women Farmers- Lessons from 25 years of experience. *World Development* (29:12). PP: 2075-2092.

Doss, C. Meinzen-Dick, R. Quisumbing, A. Theis, S. (2018) Women in Agriculture- Four myths. *Global Food Security* (16). PP:69-74.

Eyben, R. Kabeer,N. and Cornwall, A. (2008) Conceptualizing empowerment and the implications for pro poor growth- A paper for the DAC Poverty Network. *IDS Institute of Development Studies.*

FAO (2011) La situation mondiale de l'alimentation et de l'agriculture. Organisation des Nations Unies pour l'alimentation et l'agriculture. Rome

FAO (2015) Senegal-Country fact sheet on food and agriculture policy trends. The Food and Agriculture Policy Decision Analysis team (FAPDA). Paper no: I4841E/1/07.15

FAO, (2018a). *FAO Rice Market Monitor*. Volume XXI, Issue No.1. Trade and Markets Division- Food and Agriculture Organization of the United Nations.

FAO, (2018b) *Profil national genre des secteurs de l'agriculture et du développement rural-Senegal*. Série des évaluations Genre des Pays. Organisation des Nations Unies pour l'alimentation et l'agriculture: Dakar.

FAO and AfDB (2015) Agricultural Growth in West Africa- Market and policy drivers. Rome: Food and Agriculture Organization of the United Nations (FAO).

Goldstein, M. and Udry, C. (2008) The Profits of Power: Land Rights and Agricultural Investment in Ghana. *Journal of Political Economy* (116:6). PP: 981-1022.

Grigsby, W.J. (2004) The Gendered Nature of Subsistence and Its Effect on Customary Land Tenure. *Society and Natural Resources* (17:3). PP: 207-222.

Grow Africa (2019) *ECOWAS Rice Factbook*. Grow Africa and Alliance for a Green Revolution in Africa (AGRA). Online: http://www.nepad.org/publication/ecowas-rice-factbook (last accessed: 25.07.2019)

Hochschild, A. and Machung, A. (1990) *The Second Shift*. New York: Avon Books

IFPRI (2012) *Women's Empowerment in Agriculture Index*. USAID (United States Agency International Development), IFPRI (International Food Policy Research Institute), OPHI (Oxford Poverty & Human Development Initiative). Feed the Future.

IPAR (Initiative Prospective Agricole et Rurale) and RTI International (2018) Women's Empowerment In Agriculture Study- Feed The Future Senegal- Naatal Mbaye. Contract Aid-685-C-15-00001.

Kabeer, N. (2005) Gender equality and women's empowerment- a critical analysis of the millennium development goal 1. *Gender & Development* (13:1). PP: 13-24

Kabeer, N. (1994) Reversed Realities- Gender hierarchies in development thought. Verso

Kabeer, N. (2001). Resources, Agency, Achievements: Reflections on the Measurement of Women's Empowerment. In Swedish International Development Cooperation Agency

(SIDA). *Discussing Women's Empowerment-Theory and Practice*. (page: 17-54). SIDA Studies No. 3. Stockholm.

Koopman, J. (2009) Globalization, Gender, and Poverty in The Senegal River Valley. Feminist Economics (15:3). PP: 253-285.

Lopez-Carlos, A. and Zahidi, S. (2005) *Women's Empowerment: Measuring the Global Gender Gap.* World Economic Forum, Geneva.

Malapit, H. Pinkstaff, C. Sproule, K. Kovarik, C. Quisumbing, A. Meinzen-Dick, R. (2017) The abbreviated women's empowerment in agriculture index (A-WEAI). IFPRI Discussion paper 01647. Online: http://www.ifpri.org/publication/abbreviated-womens-empowerment-inagriculture-index-weai (last accessed: 09.03.2019)

Malapit, H. Kovarik, C. Sproule, K. Meinzen-Dick, R. Quisumbing, A. (2015) Instructional guide on the abbreviated women's empowerment in agriculture index (A-WEAI). IFPRI. Online: https://www.ifpri.org/sites/default/files/a-weai_instructional_guide_final.pdf (last accessed: 09.03.2019)

Maertens, M. Colen, L. Swinnen, J.F.M. (2011) Globalisation and poverty in Senegal- A worst-case scenario? *European Review of Agricultural Economics* (38:1). PP:31-54.

Maertens, M., and J. F. M. Swinnen. (2012) Gender and modern supply chains in developing countries. *Journal of Development Studies (*48:10). PP:1412-1430.

Matthews, B. and Ross, L. (2010) *Research Methods: A practical Guide for the social sciences:* Pearson Education Limited

Ministère de l'Agriculture et de l'Equipement Rural (MAER) (2014) Programme d'Accélération de la Cadence de l'Agriculture Sénégalaise – PRACAS, Volet agricole du Plan Sénégal Emergent (PSE) : Dakar.

Ministère de l'Agriculture (2009) Programme national d'autosuffisance en riz (PNAR). République du Sénégal. Online : www.ipar.sn (last accessed 21.12.2018

Ministère de Femme, de la Famille et de l'Enfance (2016) *Stratégie Nationale pour l'Equité et l'égalité de genre 2016-2026 (SNEEG)*. République du Sénégal. Dakar. Online : http://www.directiongenre.com/docs/SNEEG%202.pdf (last accessed: 15.01.2019).

Nasrin, S. Bergman Lodin, J. Jirström, M. Holmquist, B. Andersson Djurfeldt, A. Djurfeldt, G. (2015) Drivers of rice production- evidence from five sub-Saharan African countries. Agriculture and Food Security (4:12). PP: 1-19.

Niang, A. Mbenda Sarr, N.F. Hathie, I. Diouf, N.C. Oumar Ba, C. Ka, I. Gagné, M. (2017) Understanding changing land access and use by the rural poor in Senegal. London: International Institute for Environment and Development.

Nagy Hesse-Biber, S. (2014) *Feminist Research Practice- A primer*. SAGE Publications Inc.

Ohara, O. and Clement, F. (2018) Power as agency- A critical reflection on the measurement of women's empowerment in the development sector. *World Development* (106). PP:111-123

Padgett, D. (1998) *Qualitative methods in social work research: Challenges and rewards.* USA: SAGE Publications

Palacios-Lopez, A. Christiansen, L. Kilic, T. (2017) How much of the labor in African agriculture is provided by women. *Food Policy* (67). PP: 52-63.

Peterman, A. Quisumbing, A. Behrman, J. Nkonya, E. (2011) Understanding the complexities surrounding Gender Differences in Agricultural Productivity in Nigeria and Uganda. Journal of Development Studies (47:10). PP: 1482-1509.

Quisumbing, A.R. (1996) Male-Female Differences in Agricultural Productivity: Methodological Issues and Empirical Evidence. World Development (24:10). PP: 1579-1595.

Quisumbing, A.R. (2003) *Household decisions, Gender, and Development- A recent Synthesis of recent research*. Washington DC: International Food and Policy Research Institute.

Quisumbing, A. Meinzen-Dick, R. Raney, T. Croppenstedth, A. Behrman, J. Peterman, A. (2014) *Gender in Agriculture- Closing the Knowledge Gap.* Dordrecht: FAO

République du Sénégal (2014) Plan Sénégal Emergent. Sénégal Emergent- Liguey nguir ëlëk. Online: https://www.sec.gouv.sn/dossiers/plan-s%C3%A9n%C3%A9gal-emergent-pse (last accessed: 25.07.2019).

Rubin, H.J. and Rubin, I.S. (2012) Designing Main Questions and Probes. In Qualitative Interviewing (2nd ed.) The art of Hearing data. Thousand Oaks: SAGE Publications Inc.

SAED, (2001) *Intensification de la riziculture irriguée dans la Vallée du Fleuve Sénégal : Acquis et Perspectives*. Société nationale d'Aménagements et d'exploitation des terres du Delta du Fleuve Sénégal et des Vallées du Fleuve Sénégal et de la Falémé (SAED). République du Sénégal- Ministère de l'agriculture et de l'élevage.

Saito, K. Dieng, I. Toure, A.A. Somado, E. Wopereis, M.C.S (2015) Rice yield growth analysis for 24 African countries over 1960-2012. Global Food Security (5). PP: 62-69.

Seck, P.A. Tollens, E. Wopereis, M.C.S. Diagne, A. Bamba, I. (2010) Rising trends and variability of rice prices- Threats and opportunities for sub-Saharan Africa. Food Policy (35). PP:403-411.

Sheyvens, R. (2014) Development fieldwork- A practical guide. Los Angeles and London: SAGE Publications Ltd.

Smith, G. (2010) History insights- Focus on Research-Oral History. Coventry: University of Warwick.

Smith, L.C. and Chavas, J.P. (1997) Commercialization and the Balance of Women's Dual roles in Non-Income pooling West African Households. American Journal of Agricultural Economics (79). PP: 589-594.

Timmer, C.P. (1998) *The Agricultural Transformation*. In Eicher, C.K. and Staatz, J.M. (3rd ed.*)* International Agricultural Development. Baltimore and London: The John Hopkins University Press

The Observatory of Economic Complexity, (2019) Where does Senegal import Milled Rice from (1962-2017). Online: https://oec.world/en/visualize/line/sitc/import/sen/show/0422/1962.2017/ (last accessed: 24.07.2019)

The World Bank (2007) *Agriculture for Development*. World Development Report 2008. Washington.

The World Bank/IFAD/FAO (International Fund for Agricultural Development/Food and Agriculture Organization for the United Nations) (2009) *Gender in Agriculture Sourcebook.* World Bank, Washington DC.

The World Bank, (2018) *Senegal Economic Update- Recent Growth Drivers in Senegal, and the Role of Agriculture in Developing a Resilient and Inclusive Economy*. The World Bank's Macro-Fiscal Management-MFM and Agriculture Global Practices.

Theriault, V. Smale, M. Haider, H. (2017) How does gender affect sustainable intensification of cereal production in the West African Sahel- Evidence from Burkina Faso. *World Development* (92). PP: 177-191.

Tsikata, D. and Darkwah, A.K. (2014) Researching empowerment- On methodological innovations, pitfalls, and challenges. *Women's Studies International Forum* (45). PP:81-89.

Udry, C. (1996) Gender, Agricultural Production, and the theory of the household. Journal of Political Economy (104:5). PP:1010-1046

Udry, C. Hoddinott, J. Alderman, H. Haddad, L. (1995) Gender differentials in farm productivity: implications for household efficiency and agricultural policy. *Food Policy* (20:5) PP: 407-423.

Van den Broeck, G. Swinnen, J. Maertens, M. (2017) Global value chains, large-scale farming, and poverty: Long-term effects in Senegal. *Food Policy* (66). PP: 97-107.

Van den Broeck, G. and Maertens, M. (2017) Moving Up or Moving Out? Insights into Rural Development and Poverty Reduction in Senegal. *World Development* (99). PP: 95-109.

Visvanathan, N. Duggan, L. Nisonoff, L. Wiegersma, N. (2011) *The Women, Gender, and Development Reader.* London: Zed Books

World Economic Forum (2013) The Global Gender Gap Report 2013- Insight Report. The World Economic Forum: Geneva

World Economic Forum (2018) The Global Gender Gap Report 2018- Insight Report. The World Economic Forum: Geneva

## 8.2. Figures

FAO-STAT, (2019a) *Figure 1: West African countries rice imports.* Indicators: Import Quantity; Western Africa List. Online: http://www.fao.org/faostat/en/#data/FBS (last accessed: 24.07.2019).

FAO-STAT, (2019b) *Figure 2: West African countries rice production.* Indicators: Production Quantity; Western Africa List. Online: http://www.fao.org/faostat/en/#data/FBS (last accessed: 24.07.2019).

FAO-STAT, (2019c) *Figure 3: The role of Rice in Senegal.* Indicators: Domestic supply quantity ; Import Quantity ; Export Quantity ; Production Quantity. Online: http://www.fao.org/faostat/en/#data/FBS (last accessed: 24.07.2019).

Google (2019) *Figure 6: Google Maps- Map data*. Online: https://www.google.com/maps/@16.3417586,-16.0565189,10z (last accessed: 27.06.2019)

The World Bank Data, (2019a) *Figure 4: Senegal's labor force composition according to the sectors.* Indicators: Employment in Agriculture; Employment in Services; Employment in Industry (% of total employment). Online: https://databank.worldbank.org/reports.aspx?source=2&country=SEN# (last accessed: 24.07.2019).

The World Bank Data, (2019b) *Figure 5: The value of Senegal's economic sectors.* Indicators: Agriculture, forestry and fishing; Services; Industry (including construction); (Constant 2010 in US dollars). Online: https://databank.worldbank.org/reports.aspx?source=2&country=SEN# (last accessed: 24.07.2019).

## 8.3. Participant interviews

Oral history group interview no. 2. Conducted in Ross Bethio with four female farmers, aged 39-99 years old and members of the UFP-Ross Bethio. 4th of May 2019.

Oral history group interview no. 3. Conducted in Ross Bethio with two female farmers, aged 39 and 60 years old and members of the UFP- Ross Bethio. 4th of May 2019.

Oral history group interview no. 5. Conducted in Ross Bethio with three female farmers, aged 60-69 years old and members of the UFP- Ross Bethio. 5th of May 2019.

## 8.4. Key informant interviews

Key informant interview. Conducted in Richard Toll with Mme Dieng Ndiaye- The president of FEPRODES. 9th of April 2019.

Key informant interview. Conducted in Ross Bethio with Mme Gaye- The president of UFP-Ross Bethio. 23rd of April 2019.

# 9 Appendix

## 9.1 Micro-survey (English version)

**Requirements: all participants should be above the age of 18 and married, all participants have the right to suggest the interview location*

**Researcher's note: Explain to the participant how to respond (the different years of interrogation), help the participant by using 'probes' when needed*

| **Respondent's Number** | **Date** | **Location** | **Translator** |
|---|---|---|---|
| | | | |
| **Introduction of survey** | | | |
| 1. Give thanks to participant<br>2. Explain the conduct of the micro-survey<br>3. Introduce myself | | | |

4. The thesis objective
5. The survey objective
6. Justify the selection of participants
7. Respondent rights to withdrawal, their confidentiality, and anonymity
8. Participants informed consent
   ➔ Ask participant if he/she is okay with the above

| **Analytical domain 1- Agricultural Productivity** (Status of the factors of production) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Number** | **Question**<br>**All questions below concern the season called 'contre saison chaude' (January-March), since it results in the best harvest and is the most common season of production* | | **Answer** | | | | | |
| | | | **1 years ago** | **2 Years ago** | **3 years ago** | **4 years ago** | **5 years ago** | **10 years ago** |
| **1.1** | How many hectares (ha) do you cultivate for your rice production? | | | | | | | |
| **1.2** | How many kilo/bags of rice do you harvest from this land? | | | | | | | |
| **1.3** | How many laborers work on this land? | | | | | | | |
| **1.4** | How many hours per day do these laborer's work on this land? | | | | | | | |
| **1.5** | With what frequency do you irrigate your rice plots? | | | | | | | |
| **1.6** | What types of inputs do you use on your rice plots? | **Inputs** | **Tick the box (if you made such inputs)** | | | | | |
| | | Fertilizer (Non-Bio) | | | | | | |
| | | Pesticide | | | | | | |
| | | Improved rice seeds | | | | | | |
| | | Tools and machines | | | | | | |
| | | Animals | | | | | | |
| | | Other | | | | | | |
| **1.7** | Which of the following effects have you observed on your rice plots? | **Factor** | **Tick the box (if you have observed this factor** | | | | | |
| | | Soil salinity | | | | | | |
| | | Soil nutrient depletion | | | | | | |
| | | Drought | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Other | | | | | | |

| **Analytical domain 2- Resources** (Ownership or renting of non-financial resources) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Number** | **Question**<br>**Highlight the difference between property and access* | **Answer** | | | | | |
| | | **1 years ago** | **2 years ago** | **3 years ago** | **4 years ago** | **5 years ago** | **10 years ago** |
| **2.1** | Do you cultivate **individual** or **collective** rice plots? | Individual<br>Collective<br>Both | Individual<br>Collective<br>Both | Individual<br>Collective<br>Both | Individual<br>Collective<br>Both | Individual<br>Collective<br>Both | Individual<br>Collective<br>Both |
| **2.2** | If you have individual rice plots, do you **own** this land, or do you **rent** it? | Own<br>Rent | Own<br>Rent | Own<br>Rent | Own<br>Rent | Own<br>Rent | Own<br>Rent |
| **2.3** | If you cultivate collective land/plots, how have the **terms of usage** altered over the years? | | | | | | |
| **2.4** | Do you **own** or do you have **access** to any farming equipment?<br>(tractor, transportation, tools, plow, tiller, irrigation system) | Ownership<br>Access | Ownership<br>Access | Ownership<br>Access | Ownership<br>Access | Ownership<br>Access | Ownership<br>Access |
| **2.5** | Have you **inherited** the **land** or parts of the land that you cultivate for your rice production? | | | | | | |

| Analytical domain 3- Access and control of income and credit | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Number** | **Question** | **Answer** | | | | | |
| | | **1 years ago** | **2 years ago** | **3 years ago** | **4 years ago** | **5 years ago** | **10 years ago** |
| **3.1** | On all the rice plots that you cultivate (individual and collective), is the harvest used for the **household**, **market** sales, or both? | Household<br>Market<br>Both | Household<br>Market<br>Both | Household<br>Market<br>Both | Household<br>Market<br>Both | Household<br>Market<br>Both | Household<br>Market<br>Both |
| **3.2** | On all the rice plots that you cultivate (individual and collective), who take the **decisions** concerning the rice and rice production **destined for market** sales? | You<br>Your Spouse<br>Other | You<br>Your Spouse<br>Other | You<br>Your Spouse<br>Other | You<br>Your Spouse<br>Other | You<br>Your Spouse<br>Other | You<br>Your Spouse<br>Other |
| **3.3** | Who take the decisions on how to use the **revenues** from the rice sold at the market (harvested from your plots)? | You<br>Your Spouse<br>Other | You<br>Your Spouse<br>Other | You<br>Your Spouse<br>Other | You<br>Your Spouse<br>Other | You<br>Your Spouse<br>Other | You<br>Your Spouse<br>Other |

| **Number** | **Question** | **Answer** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1 year ago** | **2 years ago** | **3 years ago** | **4 years ago** | **5 years ago** | **10 years ago** |
| **3.4** | Do you have the opportunity to borrow money for your rice cultivation? | Yes<br>No | Yes<br>No | Yes<br>No | Yes<br>No | Yes<br>No | Yes<br>No |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | If yes, which one of the following actors have you borrowed money from? | | | | | | |
| | Governmental institution | | | | | | |
| | Bank | | | | | | |
| | NGO | | | | | | |
| | Farming collective | | | | | | |
| | Credit or microfinance group | | | | | | |
| | Mutual help or insurance group | | | | | | |
| | Religious group | | | | | | |
| | Family and friends | | | | | | |
| | Other | | | | | | |
| **3.5** | Who controls the money you have borrowed? | You<br>Your spouse<br>Other | You<br>Your spouse<br>Other | You<br>Your spouse<br>Other | You<br>Your spouse<br>Other | You<br>Your spouse<br>Other | You<br>Your spouse<br>Other |

| **4.1** | **Analytical domain 4- Time and Workload** | |
|---|---|---|
| | **Question** | Rank the following activities according to how much time you spend on doing them. The higher the number the more time you spend on doing the chore. |

| | Males and Females ranking | |
|---|---|---|
| | Male farmer no 1-7<br>Female farmer no 1-11 | **Main activity** |
| Rice agriculture | | |
| Other farming activities | | |
| Selling products on the market | | |
| Domestic work | | |
| Fetching water and wood | | |
| Rest and leisure | | |
| Prayer | | |
| Other | | |

*Note**:** The analytical domain 5 Leadership- group membership is indirectly included and tested for as all female respondents are part of one of the following farming associations; FEPRODES or UFP-Ross Bethio*

**Respondent information**

| | |
|---|---|
| Respondent's official status | |
| Name | |
| Age | |

| | |
|---|---|
| Relationship status | single/ married/ divorced/ separated/ widow |
| If married, are you a Polygamous or Monogamous household?<br>If polygamous, how many wives are there?<br>If you are one of the wives, which number (1-4) are you? | Polygamous Monogamous<br>1 2 3 4<br>1 2 3 4 |
| What type of household? Female or male-headed household? | Male-headed Female-headed |
| Do you have children? If yes, how many do you have? | |
| Can you read and write? | |
| If it was possible for you, would you be interested in adopting or buying new and unknown agricultural techniques (which could potentially be bad for the harvest)?<br>Eg: new machines, fertilizer, pesticides, etc. | |

## 9.2 Female Group Interviews- Interview guide (English version)

**Description: Oral history group interviews with 4-5 senior women. Preferably, all participants should be above the age of 55 and married.*

**interviewer note: If needed, help respondents with 'probes' and follow-up questions. After the interview is finished, write down additional notes regarding the respondent. Eg prompts: Can you please tell me more about that?' or 'That is interesting, could you say more about that?'. Encourage responses reflecting over a long time, not only their own but also their mother and grandmother's lives.*

| **Respondent's Number** | **Date** | **Location** | **Translator** |
|---|---|---|---|
| | | | |
| **Introduction of interview** | | | |
| 1 Give thanks to participant<br>2 Explain the conduct of the micro-survey<br>3 Introduce myself<br>4 The thesis objective<br>5 The survey objective<br>6 Justify the selection of participants<br>7 Respondent rights to withdrawal, their confidentiality, and anonymity<br>8 Participants informed consent<br>➔ Ask participant if he/she is okay with the above | | | |

| **Number** | **Interview questions** | **Corresponding domain in the analytical framework** |
|---|---|---|
| **1** | Do you think that rice production in the River Delta Valley today is more productive and profitable than 5-10 years back as well as in comparison to the previous generation? If yes, then why? | *Domain 1* |

| | | |
|---|---|---|
| **2** | How do you think that your lives have changed in comparison to those of your mothers and grandmothers? Looking at both agricultural and economic aspects. | *Domain 2-5* |
| **3** | What do you think are the major differences between male and female farmers? Looking at both your generation, 5-10 years back as well as in comparison to the previous generation? | *Domain 1-5* |
| **4** | Do you think that males are more productive and efficient rice farmers than females? For example; do males hire more extension workers, use more machines and inputs, etc? Has this changed over time? | *Domain 1-3* |
| **5** | Do you think that males are more talented at rice farming than females? Also, do you and your husband share your knowledge on rice agriculture and has this changed over time? | *Domain 1-3* |
| **6** | How have your lives changed after becoming a member of the female farming association (FEPRODES, UFP-Ross Bethio)? For example, rice production and economy. | *Domain 4* |
| **7** | If you would have a much larger harvest, how would you spend your additional income? In comparison, if it would have been your husband who would have had a larger harvest, what would he have done with the additional income? | *Domain 3* |
| **8** | What has been the best happening in your life so far? | *To end on a good note* |
| **9** | What is your dream for the future? | *To end on a good note* |

## 9.3 Male Individual Interview- Interview guide (English version)

**Description: Oral history individual interviews with senior men. Preferably, all participants should be above the age of 55 and married.*

**interviewer note: If needed, help respondents with 'probes' and follow-up questions. After the interview is finished, write down additional notes regarding the respondent. Eg prompts: Can you please tell me more about that?' or 'That is interesting, could you say more about that?'. Encourage responses reflecting over a long time, not only their own but also their mother and grandmother's lives.*

| **Respondent's Number** | **Date** | **Location** | **Translator** |
|---|---|---|---|
| | | | |
| **Introduction of interview** | | | |
| 1 Give thanks to participant<br>2 Explain the conduct of the micro-survey<br>3 Introduce myself<br>4 The thesis objective<br>5 The survey objective<br>6 Justify the selection of participants<br>7 Respondent rights to withdrawal, their confidentiality and anonymity<br>8 Participants informed consent<br>➔ Ask participant if he/she is okay with the above | | | |

| **Number** | **Interview questions** | **Corresponding domain in the analytical framework** |
|---|---|---|

| | | |
|---|---|---|
| **1** | Do you think that rice production in the River Delta Valley today is more productive and profitable than 5-10 years back as well as in comparison to the previous generation? If yes, then why? | *Domain 1* |
| **2** | Do you work more hours on your rice production today than 5-10 years back as well as in comparison to the previous generation? If yes, then why? | *Domain 5* |
| **3** | Do you hire more extension workers for your rice production today than 5-10 years back as well as in comparison to the previous generation? If yes, then why? | *Domain 2 and 5* |
| **4** | Is your family richer today than 5-10 years back as well as in comparison to the previous generation? If yes, then why? | *Domain 3* |
| **5** | How do you divide the household's financial responsibilities between you and your wife (wives)? How has this changed over the last 5-10 years? | *Domain 3 and 5* |
| **6** | How is your household's division of financial responsibilities different in comparison to previous generations? | *Domain 3 and 5* |
| **7** | What do you think are the major differences between male and female farmers? Looking at both your generation, 5-10 years back as well as in comparison to the previous generation? | *Domain 1-5* |
| **8** | If you would have a much larger harvest, how would you spend your additional income? In comparison, if it would have been your wife (wives) who would have had a larger harvest, what would she have done with the additional income? | *Domain 3* |
| **9** | If your wife (wives) could no longer work and bring a financial<br>contribution to the household expenses, what would you do?<br>For example; pay for all household expenses yourself, lend money, make your wife (wives) solve the problem… | *Domain 3 and 5* |
| **10** | What has been the best happening in your life so far? | *End on a good note* |
| **11** | What is your dream for the future? | *End on a good note* |

## 9.4 Summary of the data collection

| **Summary of the data collection** | | | |
|---|---|---|---|
| **Data collection method** | **Respondents** | | **Number of interviews/surveys** |
| **Micro-surveys** | **Male (in total)** | | **7** |
| | Location of farmers | Ross Bethio | 0 |
| | | Ndonba | 2 |
| | | Colonat | 3 |
| | | Souloul | 2 |
| | **Female (in total)** | | **11** |
| | Location of farmers | Ross Bethio | 4 |
| | | Ndonba | 2 |
| | | Colonat | 3 |

| | | | |
|---|---|---|---|
| | | Souloul | 2 |
| **Individual female interviews** | Colonat | | **2** |
| **Individual male interviews** | Ross Bethio | | **6** |
| **Female group interviews** | Ross Bethio | | **5** |
| **Couple interview** | Ross Bethio | | **1** |
| **Key informant interviews** | Agronomy professor in the University of Gaston-Berger<br>SAED regional officer in the zone of Podor<br>Consultant in agricultural development projects in the River Delta Valley region<br>The president of FEPRODES<br>The secretary of FEPRODES<br>The president of UFP-Ross Bethio<br>Extension worker of UFP-Ross Bethio<br>Extension worker at ACSA | | **1**<br>**3**<br>**1**<br>**2**<br>**1**<br>**1**<br>**1**<br>**1**<br>**1** |
| **Total number of interviews and surveys** | | | **44** |

## 9.5 Compilation of the micro-survey respondent's answers

*Note: the number of male and female survey respondents are not the same. Female respondents were 11 while the male respondents were only 7. In addition, some answers for specific years are inconclusive as respondents could not always answer the question asked due to bad memory and for not farming rice during the particular year which was asked for.*

**Analytical domain 1- Agricultural Productivity**

| **1.1** | **How many hectares (ha) do you cultivate for your rice production?** | | |
|---|---|---|---|
| | | Males' plots | Females' plots |
| 1 year ago | <0.5 ha | | 1 |
| | 0.5-1 ha | | 5 |
| | 2-3 ha | 1 | 4 |
| | 4-5 ha | 4 | 2 |
| | 6-10 ha | 1 | |
| 2 years ago | <0.5 ha | | 1 |
| | 0.5-1 ha | | 7 |
| | 2-3 ha | 2 | 2 |
| | 4-5 ha | 2 | 2 |
| | 6-10 ha | 2 | |

| | | | |
|---|---|---|---|
| 3 years ago | <0.5 ha | | 2 |
| | 0.5-1 ha | | 6 |
| | 2-3 ha | 2 | 4 |
| | 4-5 ha | 2 | |
| | 6-10 ha | 2 | |
| 4 years ago | <0.5 ha | | 1 |
| | 0.5-1 ha | | 8 |
| | 2-3 ha | 2 | 3 |
| | 4-5 ha | 2 | |
| | 6-10 ha | 2 | |
| 5 years ago | <0.5 ha | | 1 |
| | 0.5-1 ha | | 8 |
| | 2-3 ha | 3 | 2 |
| | 4-5 ha | 2 | 1 |
| | 6-10 ha | 1 | |
| 10 years ago | <0.5 ha | | 1 |
| | 0.5-1 ha | 1 | 6 |
| | 2-3 ha | 2 | |
| | 4-5 ha | 2 | |
| | 6-10 ha | 1 | |
| Most common choice **within** each gender-group | | 2-3 ha and 4-5 ha | 0.5-1 ha |

| **1.2** | **How many bags of rice do you harvest from this land?**<br>*Note: 1 bag of paddy rice is the equivalent to 60 kilos of eatable rice according to key informant interviews.* | | |
|---|---|---|---|
| | | Males' plots | Females' plots |
| 1 year ago | <50 bags/ ha | 1 | 3 |
| | 51-70 bags/ ha | | 4 |
| | 71-100 bags/ ha | 5 | 4 |
| | >100 bags/ ha | | |
| 2 years ago | <50 bags/ ha | 1 | 4 |
| | 51-70 bags/ ha | 1 | |
| | 71-100 bags/ ha | 4 | 7 |
| | >100 bags/ ha | | |
| 3 years ago | <50 bags/ ha | 1 | 3 |
| | 51-70 bags/ ha | 1 | 3 |

| | | | |
|---|---|---|---|
| | 71-100 bags/ ha | 3 | 5 |
| | >100 bags/ ha | 1 | |
| 4 years ago | <50 bags/ ha | 1 | 5 |
| | 51-70 bags/ ha | 2 | 1 |
| | 71-100 bags/ ha | 1 | 4 |
| | >100 bags/ ha | 1 | |
| 5 years ago | <50 bags/ ha | 1 | 4 |
| | 51-70 bags/ ha | 3 | 2 |
| | 71-100 bags/ ha | 2 | 5 |
| | >100 bags/ ha | | |
| 10 years ago | <50 bags/ ha | 1 | 4 |
| | 51-70 bags/ ha | 2 | |
| | 71-100 bags/ ha | 3 | 3 |
| | >100 bags/ ha | | 1 |
| Most common choice **within** each gender-group | | 51-70 bags/ ha and 71-100 bags/ ha | <50 bags/ ha and 71-100 bags/ ha |

| **1.3** | **How many laborers work on this land during the less labor-intensive season?**<br>*Note: extension workers are always hired for harvest and other labor-intensive seasons, thus asking about the* less labor-intensive season indicates how high the workload is on the individual of an everyday basis. In addition, all respondents answering this question had different sizes of plots. | | |
|---|---|---|---|
| | | Males | Females |
| 1 year ago | 1 person | 1 | 5 |
| | 2 persons | 1 | 2 |
| | 3 persons | 1 | 4 |
| | >3 persons | 4 | |
| 2 years ago | 1 person | 1 | 5 |
| | 2 persons | 1 | 2 |
| | 3 persons | 1 | 4 |
| | >3 persons | 4 | |
| 3 years ago | 1 person | 1 | 6 |
| | 2 persons | 1 | 2 |
| | 3 persons | 1 | 3 |
| | >3 persons | 2 | |
| 4 years ago | 1 person | 1 | 6 |
| | 2 persons | 2 | 4 |
| | 3 persons | 1 | 1 |

| | | | |
|---|---|---|---|
| | >3 persons | 3 | |
| 5 years ago | 1 person | 3 | 6 |
| | 2 persons | | 4 |
| | 3 persons | 1 | 1 |
| | >3 persons | 3 | |
| 10 years ago | 1 person | 3 | 7 |
| | 2 persons | | 2 |
| | 3 persons | 1 | 1 |
| | >3 persons | 3 | |
| Most common choice **within** each gender-group | | >3 persons | 1 person |

| **1.4** | **How many hours per day do you work on you land during the less labor-intensive season?** | | |
|---|---|---|---|
| | | Males | Females |
| 1 year ago | >2 hours | | |
| | 2-4 hours | 1 | 2 |
| | 5-7 hours | 2 | 5 |
| | 8-10 hours | 2 | 4 |
| | >10 hours | 2 | |
| 2 years ago | >2 hours | | |
| | 2-4 hours | 1 | 2 |
| | 5-7 hours | 2 | 5 |
| | 8-10 hours | 2 | 4 |
| | >10 hours | 2 | |
| 3 years ago | >2 hours | | |
| | 2-4 hours | 1 | 2 |
| | 5-7 hours | 2 | 5 |
| | 8-10 hours | 2 | 4 |
| | >10 hours | 2 | |
| 4 years ago | >2 hours | | |
| | 2-4 hours | 1 | 1 |
| | 5-7 hours | 2 | 6 |
| | 8-10 hours | 2 | 4 |
| | >10 hours | 2 | |
| 5 years ago | >2 hours | | |
| | 2-4 hours | 1 | 1 |
| | 5-7 hours | 2 | 6 |

| | | | |
|---|---|---|---|
| | 8-10 hours | 2 | 4 |
| | >10 hours | 2 | |
| 10 years ago | >2 hours | | |
| | 2-4 hours | 1 | 1 |
| | 5-7 hours | 2 | 6 |
| | 8-10 hours | 2 | 4 |
| | >10 hours | 2 | |
| Most common choice **within** each gender-group | | 2-4, 5-7, 8-10 and >10 hours | 5-7 hours |

| **1.5** | **With what frequency do you irrigate your rice plots?** | | |
|---|---|---|---|
| | | Number of males | Number of females |
| 1 year ago | <1 time/ week | 2 | 1 |
| | 1-2 times/ week | 4 | 10 |
| | 3-4 times/ week | 1 | |
| 2 years ago | <1 time/ week | 2 | 1 |
| | 1-2 times/ week | 4 | 10 |
| | 3-4 times/ week | 1 | |
| 3 years ago | <1 time/ week | 2 | 1 |
| | 1-2 times/ week | 4 | 10 |
| | 3-4 times/ week | 1 | |
| 4 years ago | <1 time/ week | 2 | 1 |
| | 1-2 times/ week | 4 | 10 |
| | 3-4 times/ week | 1 | |
| 5 years ago | <1 time/ week | 2 | 1 |
| | 1-2 times/ week | 4 | 10 |
| | 3-4 times/ week | 1 | |
| 10 years ago | <1 time/ week | 2 | 1 |
| | 1-2 times/ week | 4 | 10 |
| | 3-4 times/ week | | |
| Most common choice **within** each gender-group | | 1-2 times/ week | 1-2 times/ week |

| **1.6** | **What types of inputs do you use on your rice plots?**<br>*Note: multiple choice question* | | |
|---|---|---|---|
| | | Number of males | Number of females |
| 1 year ago | Fertilizer (Non-Bio) | 7 | 11 |
| | Pesticide | 7 | 11 |

| | | | |
|---|---|---|---|
| | Improved rice seeds | 7 | 11 |
| | Tools and machines | 7 | 11 |
| | Animals | 1 | 1 |
| 2 years ago | Fertilizer (Non-Bio) | 7 | 11 |
| | Pesticide | 7 | 11 |
| | Improved rice seeds | 7 | 11 |
| | Tools and machines | 7 | 11 |
| | Animals | 1 | 1 |
| 3 years ago | Fertilizer (Non-Bio) | 7 | 11 |
| | Pesticide | 7 | 11 |
| | Improved rice seeds | 7 | 11 |
| | Tools and machines | 7 | 11 |
| | Animals | 1 | 1 |
| 4 years ago | Fertilizer (Non-Bio) | 7 | 11 |
| | Pesticide | 7 | 11 |
| | Improved rice seeds | 7 | 11 |
| | Tools and machines | 7 | 11 |
| | Animals | 1 | 1 |
| 5 years ago | Fertilizer (Non-Bio) | 7 | 11 |
| | Pesticide | 7 | 11 |
| | Improved rice seeds | 7 | 11 |
| | Tools and machines | 7 | 11 |
| | Animals | 1 | 1 |
| 10 years ago | Fertilizer (Non-Bio) | 7 | 11 |
| | Pesticide | 7 | 11 |
| | Improved rice seeds | 7 | 11 |
| | Tools and machines | 7 | 11 |
| | Animals | 1 | 1 |

| **1.7** | **Which of the following effects have you observed on your rice plots?**<br>*Note: multiple choice question* | | |
|---|---|---|---|
| | | Number of male participants observations | Number of female participants observations |
| 1 year ago | Soil salinity | 4 | 7 |
| | Soil nutrient depletion | | 4 |
| | Drought | 3 | 7 |

| | | | |
|---|---|---|---|
| 2 years ago | Soil salinity | 4 | 7 |
| | Soil nutrient depletion | 1 | 4 |
| | Drought | 3 | 7 |
| 3 years ago | Soil salinity | 3 | 6 |
| | Soil nutrient depletion | 2 | 4 |
| | Drought | 2 | 7 |
| 4 years ago | Soil salinity | 3 | 6 |
| | Soil nutrient depletion | 2 | 4 |
| | Drought | 2 | 7 |
| 5 years ago | Soil salinity | 3 | 6 |
| | Soil nutrient depletion | 3 | 5 |
| | Drought | 2 | 7 |
| 10 years ago | Soil salinity | 3 | 6 |
| | Soil nutrient depletion | 2 | 3 |
| | Drought | 1 | 7 |

**Analytical domain 2- Resources (Ownership or renting of non-financial resources)**

| **2.1** | **Do you cultivate individual or/and collective rice plots?** | | |
|---|---|---|---|
| | | Number of males | Number of females |
| 1 year ago | Individual plots | 7 | 7 |
| | Collective plots | 2 | 8 |
| 2 years ago | Individual plots | 7 | 7 |
| | Collective plots | 2 | 8 |
| 3 years ago | Individual plots | 6 | 7 |
| | Collective plots | 2 | 8 |
| 4 years ago | Individual plots | 6 | 7 |
| | Collective plots | 2 | 8 |
| 5 years ago | Individual plots | 6 | 7 |
| | Collective plots | 2 | 8 |
| 10 years ago | Individual plots | 5 | 4 |
| | Collective plots | 1 | 7 |

| **2.2** | **If you have individual rice plots, do you own this land, or/and do you rent it?**<br>Note: this question does not apply to those who only access to collective lands as these are neither owned nor rented but used and shared as a collective. Therefore, not all respondents have replied to this question. |
|---|---|

| | | Number of males | Number of females |
|---|---|---|---|
| 1 year ago | Ownership | 7 | 5 |
| | Rent | 1 | 4 |
| 2 years ago | Ownership | 7 | 4 |
| | Rent | 1 | 5 |
| 3 years ago | Ownership | 6 | 4 |
| | Rent | 1 | 5 |
| 4 years ago | Ownership | 6 | 4 |
| | Rent | 1 | 5 |
| 5 years ago | Ownership | 6 | 4 |
| | Rent | 1 | 5 |
| 10 years ago | Ownership | 6 | |
| | Rent | | 4 |

| **2.3** | **If you cultivate collective land/plots, has the terms of usage altered over the years?**<br>Note: this question only apply to those who cultivate collective lands, therefore have not all respondents replied to this question. | | |
|---|---|---|---|
| | | Number of males | Number of females |
| 1 year ago | Yes | | |
| | No | 2 | 8 |
| 2 years ago | Yes | | |
| | No | 2 | 8 |
| 3 years ago | Yes | | |
| | No | 2 | 8 |
| 4 years ago | Yes | | |
| | No | 2 | 8 |
| 5 years ago | Yes | | |
| | No | 2 | 8 |
| 10 years ago | Yes | | |
| | No | 2 | 8 |

| **2.4** | **Do you own or do you have access to any larger form of farming equipment?**<br>(Ex. tractor, transportation, tools, plow, tiller, irrigation system) | | |
|---|---|---|---|
| | | Number of males | Number of females |
| 1 year ago | Ownership | | 1 (collective ownership) |
| | Access | 7 | 10 |

| | | | |
|---|---|---|---|
| 2 years ago | Ownership | | 1 (collective ownership) |
| | Access | 7 | 10 |
| 3 years ago | Ownership | | 1 (collective ownership) |
| | Access | 7 | 10 |
| 4 years ago | Ownership | | 1 (collective ownership) |
| | Access | 7 | 10 |
| 5 years ago | Ownership | | |
| | Access | 7 | 11 |
| 10 years ago | Ownership | | |
| | Access | 7 | 8 |

| **2.5** | **Have you inherited the land or parts of the land that you cultivate for your rice production?**<br>Note: Inherited from family or friends | |
|---|---|---|
| Number of males | | Number of females |
| Yes | 4 | 2 |
| No | 3 | 9 |

**Analytical domain 3- Access and control of income and credit**

| **3.1** | **On all the rice plots that you cultivate (individual and collective), is the harvest used for the household, market sales, or both?** | | |
|---|---|---|---|
| | | Number of males | Number of females |
| 1 year ago | Household | | 1 |
| | Market sales | | |
| | Both | 7 | 10 |
| 2 years ago | Household | | 1 |
| | Market sales | | |
| | Both | 7 | 10 |
| 3 years ago | Household | | 1 |
| | Market sales | | |
| | Both | 7 | 10 |
| 4 years ago | Household | | 1 |
| | Market sales | | |
| | Both | 7 | 10 |
| 5 years ago | Household | | 1 |
| | Market sales | | |

| | | | |
|---|---|---|---|
| | Both | 7 | 10 |
| 10 years ago | Household | | 1 |
| | Market sales | | |
| | Both | 6 | 9 |

| **3.2** | **On all the rice plots that you cultivate (individual and collective), who make the decisions concerning the rice and rice production destined for market sales?** | | |
|---|---|---|---|
| | | Number of males | Number of females |
| 1 year ago | You | 7 | 9 |
| | Your spouse | | |
| | Other | | 1 (collective decision) |
| 2 years ago | You | 7 | 9 |
| | Your spouse | | |
| | Other | | 1 (collective decision) |
| 3 years ago | You | 7 | 9 |
| | Your spouse | | |
| | Other | | 1 (collective decision) |
| 4 years ago | You | 7 | 9 |
| | Your spouse | | |
| | Other | | 1 (collective decision) |
| 5 years ago | You | 7 | 9 |
| | Your spouse | | |
| | Other | | 1 (collective decision) |
| 10 years ago | You | 7 | 8 |
| | Your spouse | | |
| | Other | | 1 (collective decision) |

| **3.3** | **Who make the decisions on how to use the revenues from the rice sold at the market (harvested from your plots)?**<br>Note: Since not all respondents sold their rice on the market, all respondents have not answered this question. | | |
|---|---|---|---|
| | | Number of males | Number of females |
| 1 year ago | You | 7 | 9 |
| | Your spouse | | |
| | Other | | 1 (collective decision) |
| 2 years ago | You | 7 | 9 |
| | Your spouse | | |

| | | | |
|---|---|---|---|
| | Other | | 1 (collective decision) |
| 3 years ago | You | 7 | 9 |
| | Your spouse | | |
| | Other | | 1 (collective decision) |
| 4 years ago | You | 7 | 9 |
| | Your spouse | | |
| | Other | | 1 (collective decision) |
| 5 years ago | You | 7 | 9 |
| | Your spouse | | |
| | Other | | 1 (collective decision) |
| 10 years ago | You | 7 | 8 |
| | Your spouse | | |
| | Other | | |

| **3.4** | **Do you have the opportunity to borrow money for your rice cultivation? If yes, which ones of the following actors have you borrowed money from and what year?** | | |
|---|---|---|---|
| | | Number of males | Number of females |
| 1 year ago | Governmental institution | | |
| | Bank | 4 | 2 |
| | NGO | | |
| | Farming collective | 1 | 3 |
| | Credit or microfinance group | | |
| | Mutual help or insurance group | | |
| | Religious group | | |
| | Family and friends | 4 | 7 |
| | Other | | |
| 2 years ago | Governmental institution | | |
| | Bank | 4 | 3 |
| | NGO | | |
| | Farming collective | 1 | 3 |
| | Credit or microfinance group | | |
| | Mutual help or insurance group | | |
| | Religious group | | |
| | Family and friends | 4 | 8 |
| | Other | | |

| | | | |
|---|---|---|---|
| 3 years ago | Governmental institution | | |
| | Bank | 4 | 3 |
| | NGO | | |
| | Farming collective | 1 | 3 |
| | Credit or microfinance group | | |
| | Mutual help or insurance group | | |
| | Religious group | | |
| | Family and friends | 4 | 8 |
| | Other | | |
| 4 years ago | Governmental institution | | |
| | Bank | 4 | 2 |
| | NGO | | |
| | Farming collective | 1 | 3 |
| | Credit or microfinance group | | |
| | Mutual help or insurance group | | |
| | Religious group | | |
| | Family and friends | 4 | 8 |
| | Other | | |
| 5 years ago | Governmental institution | 1 | |
| | Bank | 4 | 2 |
| | NGO | | |
| | Farming collective | | 3 |
| | Credit or microfinance group | | |
| | Mutual help or insurance group | | |
| | Religious group | | |
| | Family and friends | 2 | 8 |
| | Other | | |
| 10 years ago | Governmental institution | | |
| | Bank | 4 | 2 |
| | NGO | | |
| | Farming collective | | 2 |
| | Credit or microfinance group | | |
| | Mutual help or insurance group | | |

| | | | |
|---|---|---|---|
| | Religious group | | |
| | Family and friends | 2 | 7 |
| | Other | | |

| **3.5** | **Who controls the money you have borrowed?** | | |
|---|---|---|---|
| | | Number of males | Number of females |
| 1 year ago | You | 7 | 11 |
| | Your spouse | | |
| | Other | | |
| 2 years ago | You | 7 | 11 |
| | Your spouse | | |
| | Other | | |
| 3 years ago | You | 7 | 11 |
| | Your spouse | | |
| | Other | | |
| 4 years ago | You | 7 | 11 |
| | Your spouse | | |
| | Other | | |
| 5 years ago | You | 7 | 11 |
| | Your spouse | | |
| | Other | | |
| 10 years ago | You | 7 | 11 |
| | Your spouse | | |
| | Other | | |

**Analytical Domain 4- Time and Workload**

| **4.1** | **Rank the following activities according to how much time you spend on doing them. The higher the number, the more time you spend on doing the chore.**<br>Note: the focus of this question is to get an estimation of farmers main activity, meaning the activity which they classified as no 1. |
|---|---|

| | **Males ranking** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Male 1 | Male 2 | Male 3 | Male 4 | Male 5 | Male 6 | Male 7 | **Main activity** |
| Rice agriculture | 2 | 2 | 1 | 3 | 1 | 1 | 1 | **4/7 (≈58%)** |
| Other farming activities | | 3 | 2 | | | 2 | 3 | |
| Selling products on the market | | 1 | | | | 3 | 4 | **1/7** |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | **(≈14%)** |
| Domestic work | | | | | | | | |
| Fetching water and wood | | 4 | | | | | | |
| Rest and leisure | 1 | 5 | | 2 | 2 | | 2 | **1/7 (≈14%)** |
| Prayer | | | | | | | | |
| Other | | | | 1 | | | | **1/7 (≈14%)** |

| | **Females ranking** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Female 1 | Female 2 | Female 3 | Female 4 | Female 5 | Female 6 | Female 7 | Female 8 | Female 9 | Female 10 | Female 11 | **Main activity** |
| Rice agriculture | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | **5/11 (≈45 %)** |
| Other farming activities | 2 | | | | | | | | | | 3 | |
| Selling products on the market | 3 | 3 | 3 | 1 | | 2 | 1 | 1 | 1 | 1 | 1 | **6/11 (≈55 %)** |
| Domestic work | | 4 | 2 | | 2 | | 3 | | | | | |
| Fetching water and wood | | 2 | 4 | | | | | | | | | |
| Rest and leisure | 4 | | 5 | | 3 | 3 | 4 | 3 | | | | |
| Prayer | | | | | | | | | | | | |
| Other | | | | | | | | | | | | |