

DOCTOR OF PHILOSOPHY

"Once a peasant, always a peasant"

socio-ecological resilience of Ndiémame's food system in Senegal (West Africa)

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**“Once a Peasant, Always a Peasant”:
Socio-Ecological Resilience of
Ndiémane’s Food System in Senegal (West Africa)**

by

Carla Sarrouy Kay

PhD

March 2021



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Carla Sarrouy Kay

March 2021



*A thesis submitted in partial fulfilment of the University’s requirements
for the Degree of Doctor of Philosophy*

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Certificate of Ethical Approval

Applicant:

Carla Kay

Project Title:

Smallholder adaptation to climate change in West Africa: Pathways to social and environmental resilience

This is to certify that the above named applicant has completed the Coventry University Ethical Approval process and their project has been confirmed and approved as Medium Risk.

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Abstract

Climate change research remains focused on the perception of and adaptation to geoclimatic phenomena, oversimplifying livelihood decision-making processes. To address this gap, I explore the relevance of broadening research to the notion of socio-ecological resilience of food systems. This research aims to provide insights into the understanding and construction of socio-ecological resilience as a dynamic and holistic process affecting all spheres of everyday life.

For this analysis, the *Sustainable Livelihoods Framework* was adapted into a *Resilient Food Systems Framework*. This structures and presents the historical context of the food system, the community resources' control, access and use, and the intended and achieved outcomes toward socio-ecological resilience. Through a *Feminist Political Ecology* analysis, this thesis demonstrates that distinct intersectionalities – I focus here on gender and age – lead to challenges being perceived and acted on differently. Moreover, the emphasis given to *Traditional Ecological Knowledges* enables the consideration of endogenous knowledges, mainly vehiculated by elders, and their relevance in the construction of a community's identity.

The village of Ndiémame in Senegal, West Africa, was the case study for this research because of its colonial and postcolonial link to the emblematic production of peanuts and its nationally renowned peasant-to-peasant agroecological training centre. Five field experiences were conducted between February 2017 and March 2020 for durations ranging from two to twelve weeks. *Participatory Action Research* with female and male, young and elderly peasants provided new empirical data to co-construct the concept of resilience. Data was collected through mixed methods, including archival research, interviews, focus group discussions, participatory video and participant observation. Data was analysed participatively and using NVivo.

The analysis reveals that climate, social and environmental changes have led to the gradual commodification of the food system, the disempowerment of peasants and to tradition loss. However, villagers, female and male, young and old, consider that their resilience revolves above all around ethnic identity and its preservation and contestation. It is through their enduring connection to the land (and, to varying degrees, the activity of farming) that all villagers feel they continue to belong to the Seereer Siin ethnic group and therefore believe in their socio-ecological resilience.

These findings show that to better understand and address climate change perception and adaptation, research must embrace the complexity and interconnectedness of food systems and livelihoods. Far from being ignorant or dismissive of the climate change phenomenon, peasants consider it as but one of the challenges they face in their daily struggle for resilience enhancement and identity permanence.

Keywords: food system, socio-ecological resilience, intersectionality, knowledges, identity, Senegal.

Résumé (Français)

Titre : “Une Fois Paysan, Paysan Pour Toujours” : Résilience Socio-Ecologique du Système Alimentaire de Ndiémane au Sénégal (Afrique de l’Ouest)

La recherche sur les changements climatiques reste centrée sur la perception de phénomènes géoclimatiques, et l’adaptation nécessaire, simplifiant à l’excès les processus de prise de décision concernant les moyens de subsistance. Afin de combler cette insuffisance, j’explore la pertinence d’ouvrir la recherche à la notion de résilience socio-écologique des systèmes alimentaires. Cette recherche vise à éclairer la compréhension et la construction de la résilience socio-écologique comme processus dynamique et holistique qui impacte toutes les sphères de la vie quotidienne.

Pour cette analyse, le *Cadre de Vies Durables* devient le *Cadre de Systèmes Alimentaires Résilients*, qui structure et présente le contexte historique du système alimentaire ; le contrôle, l’accès et l’utilisation de ressources par la communauté, et les résultats prévus et atteints envers la résilience socio-écologique. A travers une analyse de *Politique Ecologique Féministe*, cette thèse démontre que des intersectionnalités distinctes – je me concentre ici sur le genre et l’âge – mènent à percevoir et à agir différemment sur des défis. De plus, l’accent sur les *Savoirs Ecologiques Traditionnels* rend possible la prise en compte de savoirs endogènes, principalement véhiculés par les aînés, et leur pertinence dans la construction de l’identité communautaire.

Le village de Ndiémane au Sénégal (Afrique de l’Ouest) a été choisi comme cas d’étude pour cette recherche à cause de son lien colonial et postcolonial à la production emblématique d’arachide, et de son centre de formation en agroécologie de paysan-à-paysan à renommée nationale. Cinq expériences de terrain ont été menées entre février 2017 et mars 2020, d’une durée de deux à douze semaines. La *Recherche Action Participative* avec des paysans femmes et hommes, jeunes et âgés, a apporté de nouvelles données empiriques pour co-construire le concept de résilience. Les données ont été collectées avec des méthodes mixtes, dont la recherche d’archives, des entretiens, des groupes de discussion, des vidéos participatives et une observation participative. Les données ont été analysées de façon participative et en utilisant NVivo.

L’analyse révèle que les changements climatiques, sociaux et environnementaux ont mené à une marchandisation graduelle du système alimentaire, à la perte de traditions et d’autonomie des paysans. Toutefois, les paysans, femmes et hommes, jeunes et âgés, considèrent que leur résilience est centrée avant tout sur leur identité ethnique, sa préservation et sa contestation. C’est à travers leur lien soutenu à la terre (et, à des degrés variables, à l’agriculture) que les villageois se sentent appartenir au groupe ethnique Seereer Siin, et continuent donc à croire en leur résilience socio-écologique.

Ces résultats démontrent que pour mieux comprendre la perception et l’adaptation aux changements climatiques, la recherche doit embrasser la complexité et les interconnexions des systèmes alimentaires et modes de vie. Loin d’ignorer les changements climatiques ou d’y être indifférents, les paysans les considèrent comme l’un des multiples défis auxquels ils font face dans leurs épreuves quotidiennes pour le renforcement de leur résilience et la permanence de leur identité.

Mots-clés : système alimentaire, résilience socio-écologique, intersectionnalité, savoirs, identité, Sénégal.

Resumo (Português)

Título: “Uma Vez Camponês, Camponês Para Sempre”: Resiliência Socioecológica do Sistema Alimentar de Ndiémame no Senegal (África Ocidental)

A pesquisa sobre mudanças climáticas continua focalizada na percepção de fenômenos geoclimáticos e na adaptação necessária, simplificando excessivamente os processos de tomada de decisão de subsistência. Para preencher esta lacuna, exploro a relevância de alargar a pesquisa à noção de resiliência socioecológica de sistemas alimentares. Esta pesquisa visa aclarar a compreensão e a construção da resiliência socioecológica como processo dinâmico e holístico que afeta todas as esferas da vida quotidiana.

Para esta análise, o *Quadro de Vida Sustentável* torna-se *Quadro de Sistemas Alimentares Resilientes*, permitindo estruturar e apresentar: o contexto histórico do sistema alimentar; o controlo, o acesso e a utilização de recursos pela comunidade; e os resultados previstos e atingidos para a resiliência socioecológica. Através de uma análise de *Política Ecológica Feminista*, esta tese demonstra que interseccionalidades distintas – concentro-me aqui no género e na idade – levam a perceber e a agir de modo diferente sobre os desafios. Além do mais, a ênfase dada aos *Saberes Tradicionais Ecológicos* torna possível a consideração de saberes endógenos, principalmente veiculados pelos mais velhos, e a sua relevância na construção da identidade comunitária.

A aldeia de Ndiémame, no Senegal (África Ocidental), foi escolhida como caso de estudo pela sua ligação colonial e pós-colonial à produção emblemática de amendoim, e pelo seu centro de formação em agroecologia de camponês-a-camponês, de renome nacional. Cinco experiências de terreno foram levadas a cabo entre fevereiro de 2017 e março de 2020, com uma duração de duas a doze semanas. A *Pesquisa Ação Participativa* com os camponeses, mulheres e homens, jovens e idosos, forneceu novos dados empíricos para co-construir o conceito de resiliência. Os dados foram recolhidos com métodos mistos, incluindo a pesquisa de arquivos, entrevistas, grupos de discussão, vídeos participativos e observação participativa. Os dados foram analisados de modo participativo e utilizando NVivo.

A análise revela que as mudanças climáticas, sociais e ambientais têm levado à mercantilização do sistema alimentar, à perda de tradições e de autonomia dos camponeses. Todavia, os camponeses, mulheres e homens, jovens e idosos, consideram que a sua resiliência está centrada, antes de mais, na sua identidade étnica, na sua preservação e contestação. É através da ligação contínua à terra (e, de graus variáveis, à agricultura) que os aldeões sentem que continuam a pertencer ao grupo étnico Seereer Siin, e continuam a acreditar na sua resiliência socioecológica.

Estes resultados demonstram que, para melhor compreender a percepção e a adaptação às mudanças climáticas, a pesquisa deve abraçar a complexidade e as interconexões dos sistemas alimentares e modos de vida. Longe de ignorar as mudanças climáticas ou de lhes ser indiferentes, os camponeses consideram-nas como um dos múltiplos desafios aos quais fazem face nas suas provas quotidianas para reforçar a sua resiliência e a permanência da sua identidade.

Palavras-chave : sistema alimentar, resiliência socioecológica, interseccionalidade, saberes, identidade, Senegal.

Acronyms

AFAFA	Aide aux Forces Vives Africaines par la Formation en Agroécologie
ASPSP	Association Sénégalaise des Producteurs de Semences Paysannes
FGD	Focus Group Discussion
FPE	Feminist Political Ecology
GCSE	General Certificate of Secondary Education
HYV	High-Yielding Varieties
ICT	Information and Communications Technology
IPE	Intersectional Political Ecology
NFS	Ndiémane Food System
NGO	Non-Governmental Organisation
PAR	Participatory Action Research
PIPs	Policies, Institutions and Processes
PSE	Plan Sénégal Emergent (Emerging Senegal Plan)
PV	Participatory Video
QR code	Quick Response code
RFSF	Resilient Food Systems Framework
RQ	Research Question
SLF	Sustainable Livelihoods Framework
SWOT	Strengths Weaknesses Opportunities Threats
TEK	Traditional Ecological Knowledges
UCT	Union des Collectivités de Tattaguine
UGPM	Union des Groupements de Paysans de Mékhé
UK	United Kingdom
VIPP	Visualisation in Participatory Programmes
WHO	World Health Organisation

1. Introduction

1.1. Climate Change Research, Gender and Indigenous Knowledges

Hunger and malnutrition remain global concerns, especially in the Majority World¹. Every day, there are almost one in nine people in the world who go to bed hungry (FAO et al. 2019). Climate change is affecting agricultural production, due to its impact on temperatures, rainfall and sea level rise, thus presenting new challenges to feeding humanity (IPCC 2013). Undernourishment and climate change have each their own paradox: (1) the main producers of food in the world are the first victims of hunger, especially women farmers, and (2) the countries most affected by climate change are the ones that least contributed to it. It was these two observations that led me to study gendered smallholder adaptation to climate change in the Majority World.

Climate change research encompasses the analysis of its physical phenomena, how these are perceived and understood by peoples all around the world and, finally, how peoples are mitigating impacts and/or adapting to them. Yet, despite concerted efforts to understand phenomena and mitigation and adaptation approaches, the perception and understanding of climate change from the point of view of different peoples – especially female indigenous peasants – remains largely overlooked². In this research I aim to address this gap.

Indigenous peasants have very strong physical and spiritual ties to their lands and they hold knowledge passed on from generation to generation that enables them to deal with nature and life's unpredictability³. Their goal is to ensure food for the community's subsistence, minimising risk rather than maximising profit. Female peasants traditionally have diverse and interconnected responsibilities: agriculture and animal rearing, household keeping and child and elderly care. All peasants – female and male, young and old – have different sets of skills and knowledge and all contribute to the community's livelihoods and resilience.

Peasants' adaptation to ever changing circumstances has been valuable in the adaptation to climate change too. A phenomenon to which they are far from being oblivious to, but that they often observe and interpret according to their own cosmovisions. Climate change is not interpreted in isolation; it is understood as a phenomenon with wide ranging causes and consequences that affect all aspects of peasants' interconnected lives, and especially their food systems. Moreover, climate change perception and adaptation vary according

¹ The notions of Majority World and Minority World were chosen here to surpass the inadequate and limiting notions of Developed and Developing Countries. These terms are controversial but the goal here is to challenge the current, largely Eurocentric categories that overemphasise economic development.

² See chapter 2 (p. 10) for a review of the literature on climate change perception and adaptation.

³ See subchapter 3.3. (p. 40) dedicated to the Traditional Ecological Knowledges Theoretical Framework.

to the different lived experiences within the peasantry world. In this research I focus on female and/or young peasants, considering that the female sex and young age are often factors for marginalisation, both in patriarchal societies and in research typically focused on male heads of households⁴.

All peasants hold invaluable knowledges that are often transmitted by oral tradition and practical peasant-to-peasant demonstrations. Their co-created knowledges hold wisdom on how to adapt to changes and shocks such as climate change, build strength in environmental systems and societies, and ultimately build socio-ecological resilience. I argue that taking seriously these knowledges can strengthen indigenous peasant communities, support expertise sharing between peasants and even address important blind-spots in global climate change research. This endeavour though requires a shift in approach: from more positivist and extractive research, to participatory co-creative research. In this thesis I have adopted Participatory Action Research and innovative mixed methods – including Participatory Video – to connect with a group of local indigenous peasants in Senegal⁵. We co-created research relevant to this thesis and to the community itself, keen to share knowledges and experiences internally but also widely, with other peasant and non-peasant communities.

1.2. Motivation for the Study and Rationale

The analysis of the literature revealed important gaps expressed in the following three considerations:

1.2.1. Beyond Climate Change: Broadening to Food Systems

The literature review highlighted the need to do more research on the issue of climate change, especially if exploring the social perception, interpretation, mitigation, and adaptation to climate change. Yet, research conducted in the field has clearly highlighted that peasants do not consider climate change as their main concern, but rather as *one* of the factors that increase their vulnerability. This research addresses the gap that balances the global reach of climate change with a local approach. Although climate change is a global geophysical phenomenon, its impact at the local level can be felt very strongly. It is essential to consider and value local people, their practices, knowledges, and traditions to ensure that their views and priorities are taken into consideration and that the approaches adopted are sustainable. Climate change needs to be understood here as a constant interaction and evolution of climate change factors, environmental impacts,

⁴ See subchapter 3.2. (p. 37) dedicated to the Feminist Political Ecology Theoretical Framework.

⁵ See chapter 4 (p. 47) for a detailed description of the Methodology, including subchapters dedicated to Participatory Action Research (p. 51) and Participatory Video (p. 59).

and smallholder perceptions and adaptation strategies; all inscribed in specific livelihoods and food systems. These key considerations encouraged the research to embrace complexity and holism, and thus led the shift from the central concept of *climate change* to the one of *food systems*⁶. Analysing food systems – impacted by and impacting on climate change – invites in equal parts a practical, technical, and natural analysis along with a social, ethical, and even mythical approach to food. The notion of *food systems* was chosen by the research team because local participants considered it more relevant to their daily lives, closer to their culture. They felt they were both the fruit and the creators of their food system and that analysing it critically as a group would reinforce their knowledges and help rethink their socio-ecological resilience.

1.2.2. Beyond Gender: Embracing Intersectionality

Gender cannot simply be an add-on to research. Assuming that research conducted without considering gender is gender-neutral has proven to be a mistake, generating processes and outcomes that have been deeply biased towards patriarchal systems of oppression. Research typically conducted on heads of household has left unheard the voices of many more food system actors, the excluded voices of people marginalised due to their gender, ethnicity, age, or race. In the same way that it is not possible to rely on the neo-liberal belief that wealth will trickle down to the poor, it is not possible to rely on patriarchal systems to spread knowledge and resources from male heads of household to women and the youth. More democratic and inclusive ways of encompassing all actors must be developed to ensure that all actors participate in the decision-making process, with their voices heard, and empowered to take in charge their lives and futures. This endeavour led to the attentive consideration of *intersectionalities* in this research, focussing especially on gender and age. This sensitivity opened the research to important social and natural factors that affect peasants and add subtlety to the understanding of their construction of food systems and ultimately their perception and adaptation to climate change. Beyond the simple binary of female/male peasants, individuals are understood here as embodying multiple identities and embedded in interconnected communities.

1.2.3. Beyond Disciplines: Integrating Indigenous Knowledges

If looking at the resilience of food systems, a transdisciplinary approach is called for, to ally the knowledge from the natural sciences, the social sciences but also the arts and, very importantly, indigenous knowledges. *Indigenous knowledges* and experiences have been accumulated over generations and they offer reality interpretation and action orientation to its peoples. These knowledges are in constant evolution and

⁶ See subchapter 3.1. (p. 31) dedicated to the Sustainable Livelihoods Framework for a detailed explanation of the shift in focus toward the concepts of food system (subchapter 3.1.2., p. 33) and resilience (subchapter 3.1.3., p. 34).

reassessment; they are often transmitted orally or by actions, and they tend to encompass a vast complexity of parameters that create links between the socio-political, environmental, cultural, and cosmological aspects of life. Indigenous knowledges are often underestimated in research and even in location-specific research, these knowledges are commonly belittled. At times, local indigenous knowledges may be misunderstood because they do not fit the frame of understanding or the chain of values of researchers themselves, or because the research has simply not explored far enough the reach of the meanings of indigenous knowledges. Unfortunately, it is also commonplace to see that indigenous knowledges are purely and simply dismissed, because they are deemed “archaic” or “underdeveloped”, hence seen as a hindrance to quality scientific – read positivist – research. The participatory approach applied in this thesis opened the research to transdisciplinarity and the construction and assessment of knowledges and experiences. These were encompassed in natural and social sciences, local indigenous knowledges, and expressed through audio-visual and artistic means such as Participatory Video and storytelling.

1.3. Research Scope and Aims

The research was based in Senegal (West Africa), in the village of Ndiémane. Its population is mainly of the Seereer Siin ethnic group, known traditionally for their peasantry knowledges and skills. The village was chosen because it had an agroecology training centre (Centre AFAFA) nationally renowned for its pioneering work in peasant-to-peasant knowledge sharing.

I worked with a group of young and elderly, female and male peasants, directly involved – albeit in different ways – in their village’s food system. During an exploratory trip in 2017, I met the group and presented the results of my literature review which resonated with their views and frustrations with single-minded, overly tailored, and even alienating development projects they had come across (Groupe Mbogayife 17/02/2017). The group was interested in conducting co-creative research on food system resilience, with a broad, iterative approach, beyond (but still addressing) climate change.

This thesis is about how this specific group, essential in the constitution and running of the Ndiémane Food System, identify, reflect on and act upon their own food system to make it resilient.

The research has three key boundaries that limit its scope:

Firstly, a geographic boundary: the research is restricted to the area of the village and its adjacent fields, acknowledging the flexible and evolving shape of the village itself and the constant flow of people and resources that travel from and to the village.

Secondly, a temporal boundary: the Ndiémane Food System is studied from the elders' living memory or the country's independence (1960) to its current form in 2020. This time scale is wide enough to include climate change (and not just simple seasonal oscillations).

Finally, an actor boundary: the analysis of Ndiémane's food system is centred on the point of view of the research team. All participants were born in the village or married into the village and they know its dynamics intimately. Special emphasis was given to women and youth, social groups who are commonly marginalised and whose voices are seldom heard and valued. The focus on these actors aims to bring new insights on their specific perspectives and activities, which tend to be different yet complementary to mainstream approaches of the traditionally older, male heads of household.

It is important nonetheless to clarify that the research team does not represent a single, homogenous voice. The group is composed of different subjectivities and this research endeavours to expose, explore, and understand the distinct roles and views that coexist in the group and around it. A distinction is made in the analysis between genders and between generations, but also considering other relevant social characteristics related for example to inter- and intrahousehold hierarchical positions due to farming experience, co-wifery, formal education, and land ownership.

The aim of the research is to support the sharing and enhancement of local knowledges on food system resilience, which local co-researchers feel are progressively being lost or incur that risk. Echoing Meleiza Figueroa's (2015) work and its influence by Henri Lefebvre's "critique of everyday life" (1947), this research has a people-centred approach to food, based on everyday life and daily chores and wisdoms (Willis 1990). Understanding local knowledges, skills and practices brings new insights to the peoples on their strengths and gaps and, I argue, can bring new insights onto global climate change and food systems research.

Thus, the aims of this research are twofold:

- 1. To assess the socio-ecological resilience of Ndiémane's food system, through the valorisation of local knowledges, skills, and practices.** Local co-researchers expressed the drive to promote the exchange of knowledges in the village, between different genders and generations of peasants. This research will assess to what extent this has been achieved so far and what are the key factors defining, reinforcing or hindering food system resilience.
- 2. To explore the potential of Participatory Action Research and associated mixed methods when conducting research with oft-marginalised female and/or young peasants.** The methodology selected defends the importance of transparency, research ownership and knowledge plurality. Participatory Video was especially co-selected both for its empowerment potential and for its ability to help achieve the knowledge exchange aim mentioned above.

1.4. Research Questions

1.4.1. Research Question 1. What is the Ndiémame Food System's context?

Research question one aims to situate the Ndiémame Food System in time and space. What is Senegal's history? The analysis starts with a look at the country's past, including pre-colonisation, and highlights key political, economic, demographic and geoclimatic traits. This analysis considers the historical evolution of the village and the structures and processes that have had an impact on the Ndiémame Food System.

Sub-questions include: Which laws and policies have affected the dynamics of the food system? Which key institutions (from the public, private and civil sectors) have been active in Ndiémame in the past decades? How, when and by whom was the village created? Who are its key entities and how have they evolved? How were fields organized at the village inception? How were they managed? How have resources evolved over time, especially since Independence? How has the village coped with times of difficulty and how have diets adapted?

1.4.2. Research Question 2. How is the Ndiémame Food System defined and organised?

The second step is to analyse the Ndiémame Food System itself. The system has various resources that contribute to create its identity and potential, and it is impacted by social and biophysical factors, both positively and negatively. The Ndiémame Food System is studied according to six key resource areas: environmental, physical, financial, human, socio-cultural and spiritual. These are complementary and interconnected.

Sub-questions include: How does the research group define "food system" and which components does it consider paramount? What does the group understand by "resilient food system"? What resources does Ndiémame have and who has access and controls them? What knowledge is valued? What knowledge is considered relevant to share? What do villagers eat and where does the food come from? What foods are grown, foraged, or purchased? Who decides the diet, prepares food and eats which food?

1.4.3. Research Question 3. How is the Ndiémame Food System acted upon?

This question is about choice and action, about what villagers do to act on their food system. This research question assesses what choices are being made and acted upon, daily or over time, considering the current context, to enhance resource management, transform structures and processes and thus work to make the Ndiémame Food System resilient.

Key sub-questions include: What resource management approaches are being adopted? Which intersectionalities are adopting certain approaches and which are not, and why? To what extent approaches are interconnected and in cooperation or competition?

1.4.4. Research Question 4. How socio-ecologically resilient is the Ndiémane Food System?

Once there is a good understanding of the Ndiémane Food System, past and present, the question is whether the system is in fact contributing to its resilience in the long term. This fourth research question assesses the impact of the management approaches adopted by the different intersectionalities of the Ndiémane Food System using the diverse resources they have access to and/or control over. The analysis includes a projection into the future, with the exploration of how the assessed food system could be improved to enhance its resilience. With the deep understanding of the Ndiémane Food System and its intended and real socio-ecological resilience outcomes, this step consists of an analysis of the most impactful and feasible outcomes that build the food system's resilience.

The guiding sub-questions are: What are the socio-ecological outcomes of the approaches adopted in the village? To what extent the impacts are predicted, planned, controlled, or simply succumbed to? Who has benefitted most and least from the outcomes? To what extent do villagers consider their food system socio-ecologically resilient?

1.5. Thesis Structure

Chapter 1 (p. 1) is the *Introduction* to the study of climate change, peasant studies and knowledge sharing. I expose the need to do research on lived experiences and subjective realities, considering different intersectionalities such as gender and age, and different methodological approaches. I outline the key considerations and aims that guide this research, and the associated research questions.

Figure 1 (p. 9) presents the overall thesis structure, organised around its key theoretical framework (the Resilient Food Systems Framework, adapted to the context of Ndiémane). The four research questions are placed in relation to the skeleton of the theoretical framework. The scope, time frame and spatial levels are presented for each section of the thesis.

Chapter 2 (p. 10) delves into the literature on *Climate Change Perception and Adaptation*. The positivist research on climate change impacts is complemented by the analysis of climate change perceptions, often from real-life, on the ground, experiences both from living memory and from ancestral knowledges mainly

shared through oral (hi)stories. The most reported mitigation and adaptation strategies are presented, both in agriculture and beyond. I then present a critical analysis of the barriers and limitations of the literature and how this research addresses them.

Chapter 3 (p. 31) outlines the *Key Theoretical and Conceptual Frameworks* that guide the research. The Sustainable Livelihoods, Feminist Political Ecology, and Traditional Ecological Knowledges theoretical frameworks are explained along with their guiding concepts. A final section outlines how the chosen frameworks were interwoven to create the Resilient Food Systems Framework.

Chapter 4 (p. 47) presents the *Methodology*. I start by introducing the hybrid methodology and transdisciplinarity that guide the overall research. Participatory Action Research is presented in detail, giving emphasis to ethics, the cycles of inquiry and the five mixed methods used. Data collection and analysis are explained with real examples to facilitate understanding and transparency.

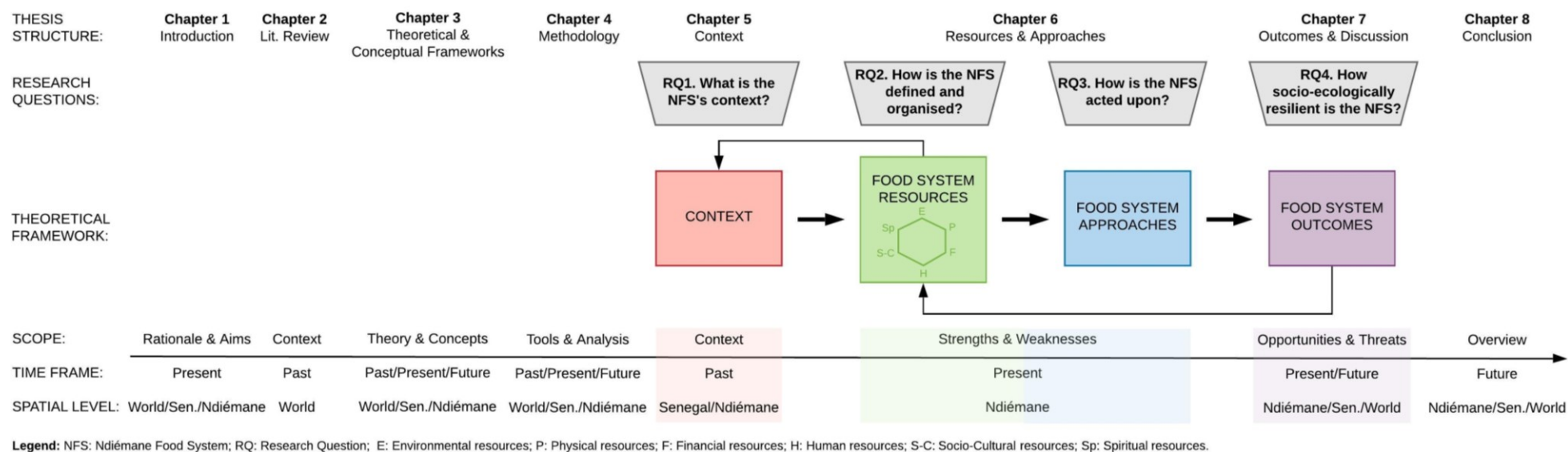
Chapter 5 (p. 84) consists of the *Presentation of Senegal and Ndiémane's Context*. I explore the case study's context, travelling in time looking at its political history through empires, colonisation and independence, its economic and political profile and demographic growth. A deeper analysis of the village history is presented too. Ndiémane's natural context is presented through the lens of climate change and imperialism.

Chapter 6 (p. 130) presents *The Ndiémane Food System* as analysed and understood by villagers engaged in participatory knowledge creation. Six resources are described in detail looking at access, control and quality for female and male, young and elderly peasants: environmental, physical, financial, human, socio-cultural, and spiritual resources. The different resource management approaches adopted by villagers to address their context are presented for each of the six resources analysed.

Chapter 7 (p. 218) is dedicated to the *Discussion*. Firstly, I analyse critically the strengths and challenges of the frameworks and methodology selected, reflecting on how they have informed the research outcomes. Secondly, a critical reflection on the meaning of socio-ecological resilience is developed, considering the pivotal notion of identity. The analysis ends with a note on time, faith and life as the comforting sails guiding peoples into unknown futures.

Chapter 8 (p. 241) is the *Conclusion*. It offers a final overview of the research, its achievements, challenges, future steps, and take-home message.

Resilient Food Systems Framework: Ndiémane Food System (NFS)



Legend: NFS: Ndiémane Food System; RQ: Research Question; E: Environmental resources; P: Physical resources; F: Financial resources; H: Human resources; S-C: Socio-Cultural resources; Sp: Spiritual resources.

Figure 1. The Resilient Food Systems Framework presented with the thesis structure, its research questions, theoretical framework, scope, time frames and spatial levels (freely adapted by the author from DFID 1999)

2. Climate Change Perception and Adaptation: A Gap Still Needing Further Understanding

2.1. Introduction to the Review of the Literature

This chapter is a critical literature review focusing on the impact climate change has had on smallholders, how they have perceived it, adapted to it and which were the main barriers encountered. It is a global analysis and it adopts the broad definition of smallholders as “farmers, pastoralists and forest dwellers relying on their land to feed their families as well as to earn an income” (Pettengell 2015: 20). There is however a strong emphasis on smallholder farmers, i.e., farmers that have less than two hectares of land (Conway 2011). There are 400 to 500 million small farms (under 2 ha) in the world and approximately 2 billion people depend on smallholding for their livelihoods (Conway 2011). Most smallholders are rural dwellers in the Majority World, situated on a continuum between subsistence- and market-oriented production (Burnham and Ma 2015). Smallholders’ practices are typically technology- and capital-poor, yet knowledge- and (family) labour-intensive (Altieri 2002); they are directly dependent on the climate and the natural environment and thus heavily impacted by climate change. Although the definition given is broad, it is important to highlight that smallholders are a heterogeneous group, with diverse sets of practices and priorities (Reid et al. 2015a). In this review, the term agriculture is used in its general meaning, encompassing all terrestrial food production activities growing crops, trees and livestock.

This critical literature review focuses on the scientific and grey literature published on the subject of smallholder adaptation to climate change. The search was conducted in four languages using the keywords “smallholder”, “adaptation” and “climate change” (Table 1) on Science Direct, Google and Google Scholar. A total of fifty articles and reports were selected, dating from 2008 to 2020, addressing smallholder climate change adaptation in the world at different levels and scales. Authors range from all over the world and results were reported from Africa, Asia, (North, Central and South) America, and Oceania. All articles were read and critically analysed; the information gathered was organised between climate change impacts, perceptions, adaptation strategies, barriers, and recommendations.

Table 1. Search keywords according to the language used

Language	Keywords
English	smallholder adaptation climate change
French	paysan(ne) adaptation changement climatique
Spanish	campesino(a) adaptación cambio climático
Portuguese	camponês(a) or agricultor(a) adaptação mudanças climáticas

There was a conscious effort to include both scientific and grey literature and literature written in four different languages to test whether there were variations in approaches between different literature types, between languages and cultures. This effort to transcend the barriers of disciplines and approaches stemmed from the conviction that smallholder adaptation to climate change is a complex issue, with differing yet complementary drivers and impacts, that would benefit from being jointly assessed using an open and critical approach. Moreover, reports from Non-Governmental Organisations (hereinafter NGOs) have the potential to be a bridge between smallholders and funding and policy bodies, especially if they are smallholder-led organisations. Though not peer-reviewed, NGO reports can sometimes be a more direct expression of smallholders' voices, with issues expressed according to how smallholders perceive and conceive them.

This review has attempted to overcome several limitations, both in scope and method. Firstly, in spite of an effort to open the search to non-peer-reviewed scientific literature and to other languages but English, the final selection of articles is only a portion of the literature available on the subject and only four languages were included (English, French, Portuguese and Spanish). The final selection however was carefully chosen for its pertinence and rigour and is considered to be a relevant insight on the work conducted on the subject under analysis.

Secondly, categorising the information gathered may give a false sense of homogeneity. As mentioned by Burnham and Ma (2015) in their literature review, articles and approaches are different and although organising information in categories is helpful for its analysis, it also overlooks important differences that make each setting and each research project and methodology unique. Moreover, not all articles fit easily in categories. For example, many articles do not specify the time length of their research or the timeframe they consider when studying climate change. Also, some distinctions are harder to make in the field such as the difference between climate variability and climate change impacts or people's capacity to cope or adapt to weather events. These aspects are discussed in more detail further in the chapter.

2.2. Climate Change Impacts and Perceptions

2.2.1. Climate Change Impacts

Climate change is having a global impact and across the diversity of selected literature sources and research locations, the four main impacts of climate change are consistent: increased temperatures, change in rainfall patterns, increase in extreme weather events and sea level rise.

The consequences of these changes are strongly felt in agriculture. Droughts and floods, added to deforestation and desertification, have a self-perpetuating effect and together create a less favourable environment for agriculture (Rogé et al. 2014, Yu et al. 2014). Land degradation is of special concern in Africa; the decrease in vegetation and soil quality (Claessens et al. 2012, Mapfumo et al. 2013, Mbow et al. 2008, Dieye and Roy 2012, Mertz et al. 2008) has led to the decreased quality of grazing (Dieye and Roy 2012), overgrazing (Armah et al. 2011) and the decreased access to water (Dieye and Roy 2012). However, Mertz et al. (2008) and Mbow et al. (2008) do register an improvement in soil quality at places due to the increased number of fallow land that has been left uncultivated for long enough to allow it to regenerate. The increase in rain and wind intensity has caused water and wind erosion (Altieri and Koohafkan 2008, Feola et al. 2015, Mbow et al. 2008, Ouédraogo, Dembélé, and Somé 2010, Claessens et al. 2012), which in turn is affecting negatively the quality of soils by taking away the most fertile layers of topsoil.

The impact on crop yields has been mostly negative. Authors report an increase in parasitic weeds (Dieye and Roy 2012), in pest attacks (Dieye and Roy 2012, Lasco et al. 2014, Loko et al. 2013) and/or in plant diseases (Dieye and Roy 2012, Lasco et al. 2014); and a lack of water for irrigation (Kuehne 2014); which all contribute to lower yields in agriculture. Animal rearing has also paid a heavy toll with a decrease in quality of animal products (Dieye and Roy 2012) and animal health (Mertz et al. 2008). Changes in temperature and rainfall bring conditions that can also be more favourable for certain crops, as reported by Yu et al. (2014) with increased yields per hectare for rice, maize and soybean in China.

According to the IPCC⁷ (2014), shifts in climate patterns may improve conditions for certain regions and crops – especially if their natural pests and diseases do not shift as quickly – but these occurrences are seen as exceptional. The IPCC (2014: 6) explains that “species have shifted their geographical ranges, seasonal activities, migration patterns, abundance and species interactions”. This shift is expressed in the literature by a loss of biodiversity (Feola et al. 2015, Loko et al. 2013, Mbow et al. 2008, Mertz et al. 2008, Ouédraogo, Dembélé, and Somé 2010).

⁷ Intergovernmental Panel on Climate Change

2.2.2. Climate Change Perceptions

The body of research on climate change mitigation and adaptation worldwide has grown steadily in the past decades, yet the analysis of people's perception of climate change is still a young field of research. I aim to address this gap. The top-down, technocratic approach to global climate change impacts has to be complemented with bottom-up approaches that look at how these impacts are being perceived on the ground (Yu et al. 2014). This will help better understand smallholders' attitudes and behaviour toward climate change and build policy that is balanced and empowering for all actors.

The importance of studying climate change perception along with adaptation ties in with the importance of distinguishing between perception of climate change and action on climate change. Smallholders need to perceive climate change to then act on it, yet perception does not systematically lead to action (Burnham and Ma 2017, 2018). As Loko et al. (2013) demonstrate, only a portion of smallholders who perceive changes in the climate will pursue strategies to cope and adapt in consequence. Farmers may or may not perceive climate change, in the same way that they may or may not act on it. Inaction is also relevant in the study of climate change perception and adaptation as demonstrated by Kuehne's (2014) analysis of farmers' denial of climate change and their reasons for inaction.

The most reported impact perceived and mentioned by smallholders consulted within this literature review was the decrease in rainfall. The second most mentioned impacts were the increase in temperature and the increase in wind intensity. Finally, smallholders also perceived changes on the onset and offset of seasons and their duration.

These changes are perceived to have a strong and clear impact on agriculture. Depending on the region under analysis, extreme weather events have been opposite yet at times concomitant, with droughts and floods occurring in close succession. Some participants perceived an increase in the number and intensity of floods (Jin, Wang, and Gao 2015, Mapfumo et al. 2013, Yu et al. 2014), sometimes also causing hail and cold damage to plants (Yu et al. 2014). Droughts were also strongly felt (Gnangle et al. 2012, Jin, Wang, and Gao 2015, Dieye and Roy 2012, Mapfumo et al. 2013, Rogé et al. 2014, Yu et al. 2014) and they had a direct impact on surface water sources, affecting both water quality (Mbow et al. 2008) and quantity (Gnangle et al. 2012, Mbow et al. 2008, Othniel Yila and Resurreccion 2013).

In Senegal, participants shared their concerns regarding the decline in wildlife and the degradation of vegetation due to abusive vegetation use, droughts, and fires. Participants in Senegal also highlighted improvements for wildlife due to reforestation, and vegetation use control and prevention, which have enabled the recovery of certain plants (especially shrubs) and wildlife species (Mbow et al. 2008).

Increases in insect attacks and plant diseases were mentioned by two sources (Jin, Wang, and Gao 2015, Yu et al. 2014). The perceived decline in seed and produce quality (Jin, Wang, and Gao 2015, Mapfumo et al. 2013) was due to plant growth and storage conditions being hindered by the new climatic conditions.

When asked whether and how they perceive climate change, smallholders gave answers that went beyond the agro-climatic realm. This highlights the importance of analysing multiple criteria to understand smallholder perception and adaptation to climate change. However, little research is done on the difference between what climatic changes smallholders perceive, how they perceive these and how they explain them. A singular example in the literature comes from Othniel Yila and Resurreccion (2013) who explain how smallholders observe the speed at which plant leaves wilt after rainfall as an indicator of rainfall quantity and distribution.

From a social point of view, Gnangle et al. (2012) refer to research conducted in the Ivory Coast showcasing that local farmers perceive changes in the climate through the disrespect of divine law, manifested by the desecration of sacred places and the practice of sexual intercourse, away from the public eye, in bush land (Brou et al. 2005 in Gnangle et al. 2012). According to Gnangle et al. (2012), smallholders perceive the same phenomena in Benin through the occurrence of incestuous practices. These perceptions of climate change through the disruption of social behaviour are still largely unknown or misunderstood in research and would need more work allying social and natural sciences and local knowledges to better understand them.

Only some authors explored the smallholders' explanation of climate change. Geoff Kuehne (2014) reports that the Australian farmers he spoke to are situated in a spectrum from complete denial of climate change to acceptance of it. The majority's belief that climate change is not human-induced (but rather the result of natural cycles) means that farmers feel less obliged to adopt adaptation responses. Mertz et al. (2008) and Dieye and Roy (2012) both mention the strong religious beliefs and the power of ancestral traditions in Senegal; which lead farmers to have a fatalistic approach toward climate change, perceived as God's will and therefore immutable. Research conducted in Senegal and The Gambia showed that smallholders that received training from local NGOs on agroecological methods to adapt to climate change gained a better understanding of what climate change is, which helped them make sense of the changes they were already perceiving, although the geophysical causes of global climate change had often only been quickly addressed (Sarrouy Kay et al. 2015).

Several papers analysed triangulate the information they gathered from scientific sources and data collected locally on peoples' perception of climate change (Dieye and Roy 2012, Gnangle et al. 2012, Jin, Wang, and Gao 2015, Kuehne 2014, Loko et al. 2013, Mapfumo et al. 2013, Mbow et al. 2008, Menike and Arachchi 2016, Mertz et al. 2008, Ouédraogo, Dembélé, and Somé 2010, Rogé et al. 2014, Othniel Yila and Resurreccion 2013, Yu et al. 2014). In every single case of data triangulation reported in this literature review, the information from both sources matched. However, it would be a misjudgement to think that if data sources did not match,

it would be because smallholders do not perceive accurately the changes that are effectively happening. It is also possible that scientific data may be incomplete or even inaccurate.

For example, both Claessens et al. (2012) and Yu et al. (2014) organise data in a binary way, which could lead to believe that respondents who choose the answer that does not match the climate records used by the researchers, are actually giving a “wrong” answer. This is not necessarily the case because researchers may be basing their knowledge on information that is not sufficiently location-specific. A common complaint from smallholders is that weather forecasts and climate information are not accurate enough, especially in remote areas. Weather stations are placed too far apart and they miss important local temperature and rainfall variations, thus providing data that does not reflect smallholders’ reality, or at least not as accurately as they have experienced and remembered it (Sarrouy Kay et al. 2015).

Also, the geophysical data might be inaccurate for the simple reason that some of it depends on human action (such as daily checking of water gauges) and could therefore be misplaced, misread, or even made up. As mentioned by Rogé et al. (2014), this triangulation exercise is often done to validate smallholders’ knowledge and experiences to scholars and policymakers whom otherwise would doubt the relevance and accuracy of the data. This reveals how the process of research and policymaking is still very much bureaucratic and elite-led. A top-down approach that doubts too often local, accumulated, tested knowledges in favour of global, generalised, modelized information.

A clear reflection that climate change impacts and perceptions go beyond the geophysical analysis is expressed by Ouédraogo et al.'s (2010) link between climate change perception and population density. The research team found that climate change was perceived to be more severe in areas with higher population density: because of increased pressures on land, smallholders had fewer opportunities for agricultural extension and fallowing and thus felt that their practice was harder hit by climate change than smallholders situated in less dense areas.

Whilst Gnangle et al. (2012) claim that climate change perceptions in their field study in Benin depended more on natural factors (88%) than on social factors (12%), other researchers defend that socio-economic and political stressors have a much bigger impact on human perceptions and behaviour than climatic ones (Burnham and Ma 2016, Mbow et al. 2008).

It is often difficult to distinguish between social or natural factors, or to clearly distinguish between a climate change driver and a negative consequence because some factors will create vicious cycles that self-perpetuate exposure and vulnerability to climate change. Still, more research needs to be done on the link between climatic and non-climatic factors, acknowledging the plethora of factors that affect climate change perception and adaptation.

Several papers selected in this review organised segregated group discussions or gathered the data collected in distinct social groups to assess the differences in perceptions and behaviour towards climate change. Several projects used a gender-sensitive approach and conducted separate female and male farmer discussions and interviews. Women and men did not differ significantly in their knowledge and perceptions of climate change in research conducted in China, Senegal and Nigeria (Jin, Wang, and Gao 2015, Mertz et al. 2008, Othniel Yila and Resurreccion 2013). However, whilst Loko et al. (2013) report that male farmers in Benin perceived climate change better than their female counterparts, Jin et al. (2015: 947) specify that differences between male and female farmers may occur due to the “major differences between them in terms of education, access to assets and other services”. For example, male farmers adopt more innovative water conservation technologies and they invest more on irrigation infrastructure, because they tend to have more access to financial capital, labour and credit (Jin, Wang, and Gao 2015).

Age also appears to be an important differentiating factor with older farmers being best placed to express climate change because of their accrued experience (Gnangle et al. 2012, Loko et al. 2013). Regarding wealth, two projects have found that poor people express better climate change because they practice rainfed agriculture as their main activity and therefore they are strongly impacted by weather-related phenomena (Gnangle et al. 2012, Menike and Arachchi 2016). Menike and Arachchi (2016) found that the other factors positively related to better expressing climate change and acting upon it are: education, access to information and loans, and memberships of agricultural organisations.

2.3. Climate Change Adaptation

Climate change adaptation strategies include both coping strategies (short-term) and adaptive strategies (long-term) (Smit and Wandel 2006 *in* Mertz et al. 2009). The practices gathered from the literature have here been separated between agriculture-related and complementary to agriculture.

2.3.1. Adaptation Strategies Related to Agriculture

I. Land and Soil Management

The practice of fallowing (leaving land intact for natural regeneration) is often abandoned when farmers have land limitations. Reductions in fallow land are often explained by the saturation of land tenure and the need to intensify production (Othniel Yila and Resurreccion 2013, Mertz et al. 2008). Loko et al. (2013) explain that farmers increase the surfaces cultivated, they move fields to ensure the use of the best soils, and this may sometimes allow for more fallow land in Benin. Land management practices vary according to the annual weather: in favourable years, farmers choose to grow their usual crops, but they often expand their cultivated land or they put more effort and investment into it. In less favourable years, farmers tend to focus on fewer crops in smaller areas and pastoralists often focus more attention on their crops, expecting to gain less from their livestock activities (Dieye and Roy 2012). Home gardening and foraging are also important in ensuring the nutrition of the household as well as access to medicinal plants (Altieri and Koohafkan 2008, Othniel Yila and Resurreccion 2013).

Soil improvement techniques are essential to ensure generous and healthy harvests. Farmers work to enhance the soil organic matter by ploughing plants back in the soil, burning crop residues (Loko et al. 2013), by using crop rotation (Loko et al. 2013, Mugi-Ngenga et al. 2016) and using mulches (Altieri and Koohafkan 2008, Loko et al. 2013, Ouédraogo, Dembélé, and Somé 2010).

II. Crop Selection

Crop choices have also been influenced by the effort to adapt to climate change. Several authors report the decline of traditional crops and the adoption of new, hybrid varieties (Bhattarai, Beilin, and Ford 2015, Menike and Arachchi 2016, Loko et al. 2013, Ouédraogo, Dembélé, and Somé 2010, Rogé et al. 2014, Paul et al. 2016, Othniel Yila and Resurreccion 2013, Yu et al. 2014). The choice of new crop varieties depends on the local climatic variations with some smallholders seeking water-tolerant crops (Loko et al. 2013) and many others seeking drought-tolerant crops (Altieri and Koohafkan 2008, Jin, Wang, and Gao 2015, Menike and Arachchi 2016, Elum, Modise, and Marr 2017). Another adaptation strategy commonly adopted is the introduction of

new crop types, such as watermelon, sesame and hibiscus in West Africa, for example (Mbow et al. 2008, Mertz et al. 2008, Ouédraogo, Dembélé, and Somé 2010).

Growing seasons have become shorter and more uncertain so many farmers have replaced a vast array of traditional crops by a select number of short-cycle crops, thus decreasing considerably the nutritional diversity of their production. On the contrary, in China, Yu et al. (2014) report the use of longer season hybrids to adapt to prolonged growing days. Not all farmers have easy access to new varieties with shorter cycles and, in Senegal, these are often only considered if there is government support (Dieye and Roy 2012).

High-yielding varieties (hereinafter HYV) are chosen to enable yield per hectare increases in a context of acute land pressures. Despite potential yield increases, these varieties may have a negative wider impact on agricultural practices and social organisations. HYV tend to be dwarf varieties and therefore they give less straw, which is needed to feed livestock. Smallholders adapt to the decrease in straw yields by reducing the number of animals they have and, in turn, having fewer animals means less manure, typically used to fertilise soils. Plants grown in less fertile soils give lower yields, thus bringing less income to smallholders and making their families more vulnerable and food insecure (Bhattarai, Beilin, and Ford 2015). This succession of consequences highlights the importance of assessing the wider consequences to agricultural activities and social life when adopting new coping strategies.

Finally, another key strategy to adapt to the unpredictable climate is polyculture systems, in which plants with a wider intra- and interspecific diversity are grown to avoid diseases and ensure harvests (Burnham and Ma 2016, Altieri and Koohafkan 2008, Loko et al. 2013, Mbow et al. 2008, Paul et al. 2016). Polyculture systems may include both traditional and hybrid varieties and different crop types in the hope that some will respond positively to the pedoclimatic conditions and yield enough to ensure food security.

To adapt to the climate variations, many smallholders reported changing their cultivation dates (Gnangle et al. 2012, Menike and Arachchi 2016, Mugi-Ngenga et al. 2016), i.e., changing sowing times (Ouédraogo, Dembélé, and Somé 2010, Paul et al. 2016, Rogé et al. 2014, Othniel Yila and Resurreccion 2013) (and even re-sowing if the first run was unsuccessful (Gnangle et al. 2012)) and changing harvest times (Paul et al. 2016, Othniel Yila and Resurreccion 2013).

III. Water and Wind Management

Farmers use several techniques to best manage water access. The most mentioned techniques for water management were: increased investment in irrigation (Jin, Wang, and Gao 2015, Ouédraogo, Dembélé, and Somé 2010, Othniel Yila and Resurreccion 2013), for those who could afford it or had subsidies; water harvesting techniques (Altieri and Koohafkan 2008, Othniel Yila and Resurreccion 2013) such as boreholes and water pans (Mugi-Ngenga et al. 2016); infiltration pits (Altieri and Koohafkan 2008); and *zaï's* and half-moons (Ouédraogo, Dembélé, and Somé 2010) depending on the region under analysis.

Wind and water erosion are an important challenge faced by smallholders. Different constructions are built to protect crops such as green belts around fields; field fences and windbreaks to reduce wind erosion; mounds of soil, dykes, stone paths, and contour bunds to manage water flows (Mbow et al. 2008, Rogé et al. 2014, Loko et al. 2013, Ouédraogo, Dembélé, and Somé 2010).

IV. Livestock Management

Due to climate change, farmers in Nigeria diversified the type and variety of livestock (Othniel Yila and Resurreccion 2013), whilst farmers in Ethiopia reduced the number of livestock (Paul et al. 2016), and farmers in Senegal replaced draft horses with cattle (Mertz et al. 2008). Other changes in livestock management reveal changes in agricultural practices as a whole such as the replacement of oxen by tractors in Mexico (Rogé et al. 2014) for higher efficiency and yields, and keeping animals in stables (Mertz et al. 2008) due to the poor quality of grazing grounds and the increased reliance on farming, even for pastoralist communities.

V. Inputs and Equipment

Whilst animal manure is still widely used by smallholders (Mertz et al. 2008, Ouédraogo, Dembélé, and Somé 2010), chemical inputs are also an important source of soil fertilisation and pest control, especially for market gardening and for cash crop cultivation (Mertz et al. 2008, Gnangle et al. 2012).

In Mexico, animal manure was progressively replaced by chemical fertilisers, yet now there is a return toward green manures and composting because of their lower cost and their positive impact on soil quality (Rogé et al. 2014). The use of natural alternatives is also favoured in other countries, in part due to the prohibitive cost of chemical inputs (Mbow et al. 2008, Mugi-Ngenga et al. 2016).

Adaptation strategies also include the development of access and use of new equipment and appropriate production technologies though these were not specified in the literature (Mapfumo et al. 2013, Paul et al. 2016, Mbow et al. 2008).

VI. Indigenous Knowledges

Indigenous knowledges directly applied to agricultural practices were mentioned by Dieye and Roy (2012). The use of the lunar calendar and of established dates of religious and social events was used to decide on key agricultural activities such as sowing and harvesting times. Indigenous knowledges were also used to observe changes in the natural environment such as tree foliage, this helped better understand changes happening and how to best respond and adapt to these. Not much emphasis or detail was given about these techniques in the article though.

VII. Agroforestry

Agroforestry systems were mentioned by multiple sources (Altieri and Koohafkan 2008, Mbow et al. 2008, Menike and Arachchi 2016, Mugi-Ngenga et al. 2016, Ouédraogo, Dembélé, and Somé 2010, Othniel Yila and

Resurreccion 2013, Lasco et al. 2014) because of their capacity to help buffer against climate change, sequester carbon, make food systems more resilient and address food security. Legume tree species like *Faidherbia albida* and *Cordyla pinnata*, whilst reducing erosion, also improve soil fertility thanks to their high nitrogen fixation capacities (Mbow et al. 2008). Planting trees has the added advantage of providing fuel and construction materials, which would otherwise be drawn from the wild (Mbow et al. 2008). Related to agroforestry, Mugi-Ngenga et al. (2016) mention changes in crop spacing to adapt to climate change and other correlated factors, and Altieri and Koohafkan (2008) mention the importance of permaculture to ensure long-term use and sustainability of the land.

2.3.2. Adaptation Strategies Complementary to Agriculture

I. Activity Diversification

Diversifying activities is one of the main adaptation strategies adopted by smallholders and new activities are adopted both within and beyond agriculture. Depending on the circumstances, some smallholders may extract natural resources such as honey, wood for charcoal, medicinal plants, or wild fruits (Mbow et al. 2008). They may also take up fishing as a new source of protein for the household or as a source of income by catching fish to sell in local markets (Dieye and Roy 2012). Interestingly, smallholders may use education as a diversification strategy, hoping that the education for themselves or their children will pay-off as a long-term investment that will free them from the hardships of agriculture (Dieye and Roy 2012).

Migration is a common strategy to bring new income to the household, be it seasonal or long-term, be it local or international (Burnham and Ma 2016, Dieye and Roy 2012, Mertz et al. 2008, Cohn et al. 2017). Migration has a strong impact on the social order of communities as most emigrants are adult men leaving behind women to look after children and the elderly and to manage the household. Households are then deprived of their strongest labour force, and (female) smallholders are forced to make labour-saving decisions such as reducing animal husbandry (Rogé et al. 2014) to ensure that they can look after their family members and still have time for farming.

II. Community Support

In the face of climate change's heavy toll on agriculture and livelihoods, many smallholding households depend on self-reliance and hardship (Paul et al. 2016). Burnham and Ma's (2015) literature review concludes that there is not much communal pooling, storage or mobility among the communities studied, thus leaving households to fend for themselves and relying on closer, inner circles for support. On the contrary, several sources found that vulnerability and solidarity often come together. In Ethiopia, smallholding households challenged by climate change's negative impact seek help from their communities (Paul et al. 2016).

In Senegal, Ghana and Zimbabwe, communities strive to revitalise traditional solidarity resources and to support traditional safety nets (Mapfumo et al. 2013, Mertz et al. 2008). Sharecropping was a form of safety net used by Nigerian smallholders that do not have enough resources to expand their production or to diversify enough to reduce the risk of crop failure (Othniel Yila and Resurreccion 2013). This area needs further research, not only to understand the evolution of community support, but also, to identify deeper social reasons for social disintegration or reinforcement.

III. Culture, Faith, and Beliefs

Religious and magical practices were only sparingly mentioned in the selected literature. Most research documented follows a scientific, positivist approach, based on the observation of quantifiable facts. Religion, superstition, and magic are inherent to societies all over the world, but maybe they keep a stronger hold in smaller, traditional communities in the Majority World. Most articles analysed were set in the Majority World yet very few addressed religion, superstition, and magic. The reasons for this are multiple: these social aspects may be considered irrelevant or even obstructive in positivist research, mainly agronomy- and climate-focused; and information might be hard to collect and analyse – or even be forbidden to gather – making it out-of-reach and unquestionable to researchers.

Three references mentioned religious and magical practices and, interestingly, these three references applied to West Africa: in Benin, farmers use magical-religious practices to address droughts and prompt rainfall (Gnangle et al. 2012) and, in Senegal and Burkina Faso, climate-related religious practices consist of group prayers and sacrifices (Mertz et al. 2008, Ouédraogo, Dembélé, and Somé 2010).

The recent call for holistic approaches that encompass different sources of knowledge, different actors and the different spheres that constitute one's identity need to also include the spiritual sphere. Acknowledging, respecting and understanding magico-religious beliefs needs to be an integral part of understanding social behaviour and climate change adaptation. And again, these strongly engrained and symbolic aspects are not static and homogenous; they vary in time, between locations, often by gender. Only tailored and flexible approaches will be able to grasp their complexity, dynamism and meaning.

IV. Information

Access to information is extremely valued among smallholders. Certain sources of information are more unidirectional such as training provided by the government and radio weather forecasts, which are increasingly accessible in multiple local languages and dialects (Paul et al. 2016, Dieye and Roy 2012, Sarrouy Kay et al. 2015, Zamasiya, Nyikahadzoi, and Mukamuri 2017). Other sources aim to strengthen co-learning, creating opportunities for smallholders to exchange knowledge and experiences, both locally and regionally, within the communities and with the public and private sectors (Mapfumo et al. 2013, IPCC 2014).

Key themes that were mentioned by smallholders and that require further information and action are disaster prevention (Yu et al. 2014), income stabilisation (Othniel Yila and Resurreccion 2013), capacitating farmers to meet contractual obligations (Mapfumo et al. 2013) and access to credit schemes and support from NGOs (Mertz et al. 2008).

V. Markets

The commercialisation of production surplus or cash crops is an important strategy of income diversification and adaptation to climate change. Smallholders develop local market channels, for small-scale trading, and wider external output markets, with often more specialised and higher-end produce (Burnham and Ma 2016, Dieye and Roy 2012, Mbow et al. 2008, Mapfumo et al. 2013). Both in Kenya and in Senegal, smallholders have started to grow food crops as a source of income, answering the demand from the urban middle classes (Mbow et al. 2008, Mugi-Ngenga et al. 2016). Countries like Senegal benefit from the fact that they can grow counter-season produce, during the nine months of the dry season, that can be shipped easily to the European and North American markets and supply these with tomatoes and green beans during winter (Mbow et al. 2008, Maertens and Swinnen 2009).

Market access is important for outputs but also for inputs and smallholders have worked to develop the availability and timely access to affordable inputs, to ensure successful production outcomes (Mapfumo et al. 2013).

VI. Infrastructure

Infrastructure improvement is an important part of adaptation to climate change (Yu et al. 2014). Most efforts are made to improve local strategic food reserves, by improving storage facilities and granaries (Mugi-Ngenga et al. 2016, Loko et al. 2013, Altieri and Koohafkan 2008, Othniel Yila and Resurreccion 2013, Mapfumo et al. 2013). Some infrastructures may bring new challenges or present dilemmas as exemplified by the Mexican case study where the state has facilitated the construction of storage facilities that are quicker and cheaper to build, yet they are hotter and therefore may increase storage waste (Rogé et al. 2014).

VII. Adaptation Timeframes and Consequences

Climate change has a long-term impact; the changes perceived at present are the consequence of past actions and current activities can help cope with climate change in the short-term but their mitigating effects will only be felt in the future. Kuehne's (2014) study in Australia shows that farmers react to the now and perceive climate change – and explain its drivers – in a way that helps them deal with it in the present, without overthinking the vastly uncertain future. However, Rogé et al.'s (2014) study in Mexico shows that smallholders have long-term strategies to adapt to climate change.

Smallholders are driven by the need to stabilise agriculture and ensure steady yields they can depend on, rather than maximising yields for maximum income (Altieri 2002). Smallholders' attitudes contrast with the productivist approach that is more centred on the maximisation of the current production (typically of specialised crops). As defended by Reid et al. (2015), smallholders practice stabilisation agriculture and adopt long-term radical approaches to ensure climate change adaptation but also soil preservation, labour capability, income security, nutritional adequacy and cultural preservation.

The consequences of adaptation are still an understudied field. Adaptation strategies, endogenous or exogenous, always have correlated impacts which are often overlooked or completely ignored. A holistic approach is needed to correctly assess the real impact of adaptation decisions and their ripple effects. Important questions need to be assessed: Will the new strategy require more work? Who is expected to undertake it? Is the strategy worth the additional effort? Who will gain from it? When will the first benefits be felt?

Present choices have a future impact (IPCC 2014) and all initiatives need to consider more than simply their cost-effectiveness and technical suitability. Strategies need to be assessed according to their environmental impact (water management, soil quality, wildlife and biodiversity, etc.) and social impact (labour needs, land tenure, gender, migration, farmer-to-farmer extension, etc.) (Othniel Yila and Resurreccion 2013).

This literature review brings to the surface several cases in which concerns were raised regarding the consequences of adaptation. In Ghana, there is a call for the expansion of irrigation, especially micro-irrigation and small-scale irrigation schemes that, with government support, could prove sustainable to smallholders. Irrigation has the potential to increase yields and food security but it can also have considerable negative environmental impacts (such as soil salinization), if not well managed (Armah et al. 2011). Similarly, low water allocations in Australia can lead farmers to adopt strategies that have negative impacts on the environment in the long-term (Kuehne 2014). In Senegal, concerns pertain to liberalisation efforts that have not been accompanied by appropriate farmer training on issues such as credit management and export requirements, thus leaving farmers unprepared to take on the burdens of highly-specialised, export-oriented agriculture (Mertz et al. 2008).

Migration is one of the most common adaptation strategies and, as mentioned above, it has had a considerable impact on the workload of the remaining household members, especially women. Certain female smallholders have adopted new crop types and varieties and abandoned traditional ones. These changes have not necessarily brought improvements to the households because certain "improved" varieties have ended up requiring more work. In cases where these new varieties have meant higher production value, women have not necessarily benefited from it because they do not have access to the accrued income held by the head of household, typically a man (Bhattarai, Beilin, and Ford 2015). This same conclusion leads Mugi-Ngenga et al.

(2016: 58) to plead for the need for “research and development to come up with labor saving technologies, which will increase the likelihood of adaptation to climate variability by vulnerable farmers such as women and the elderly farmers”.

When assessing climate change adaptation, Paul et al. (2016) separated community adaptation strategies and household adaptation strategies and concluded that when the first ones increase, households tend to give less emphasis to their own household adaptation. This balancing act shows how smallholders in Ethiopia choose to invest in their community adaptation, at the detriment of their own family’s adaptation, believing that the whole will be stronger than its parts. It would be worth exploring this phenomenon further to better understand the motivations and consequences of adaptation choices.

2.4. Barriers to Smallholder Climate Change Adaptation

There are multiple barriers to climate change adaptation. These can work concomitantly, and they can create self-perpetuating cycles that make it even more difficult to disentangle the lock-in situation in which smallholders may find themselves.

2.4.1. Limited Resources Available to Smallholders

Land, water, seeds, and livestock are important agricultural resources that can be barriers to climate change adaptation. There is a shortage of land (Burnham and Ma 2016) and its tenure is often insecure thus creating conflicts among populations (Mapfumo et al. 2013, Armah et al. 2011, Lasco et al. 2014, Othniel Yila and Resurreccion 2013). Armah et al. (2011) also mention the importance of annual wildfires that further hinder sustainable land management. Water cycles can be affected by activities such as clay mining and constructions thus limiting water flow and storage for agriculture (Mbow et al. 2008). Access to appropriate seeds was a limitation mentioned by smallholders in Sri Lanka (Menike and Arachchi 2016) and livestock theft was mentioned in Senegal (Mertz et al. 2008).

Financial resources are also scarce and a limiting factor for adaptation initiatives. Smallholders lament the absence or the shortage of and the difficulty in accessing credit and/or financial capital or savings (Armah et al. 2011, Burnham and Ma 2016, Othniel Yila and Resurreccion 2013, Menike and Arachchi 2016). These barriers make it harder to renew agricultural equipment or purchase inputs, or to start small businesses in an effort to diversify sources of income (Mertz et al. 2008).

Labour barriers expressed were the lack of human capital (Burnham and Ma 2016, Othniel Yila and Resurreccion 2013, Mertz et al. 2008, Mbow et al. 2008) and the low pay of manual labour (Mertz et al. 2008) that leads people to look for employment in more profitable fields of work. Migration flows have had a strong impact on labour quality and availability. In Senegal, political and economic choices have meant that a strong immigration phase to grow peanut in new land was followed by persistent emigration due to drought and the collapse of peanut production (Mbow et al. 2008). Migration however means that the loss of labour is partially compensated by remittances (Mertz et al. 2008), which can create a dependency on fluctuating market flows, both at the point of employment of the emigrant force and for the rural household that needs to purchase food and farming inputs and equipment.

Knowledge is a barrier because there is limited access to accurate information and technical assistance on climate-change issues (Burnham and Ma 2016, Othniel Yila and Resurreccion 2013). This paucity is due in part to the complexity of climate change drivers and impacts and the need for tailored, location-specific responses (Mapfumo et al. 2013).

Poor basic infrastructure was mentioned especially by smallholders in Ghana (Armah et al. 2011) that lament the poor quality of transport infrastructure and the lack of technological developments, which have led to post-harvest losses. Inadequate irrigation facilities are an often mentioned barrier (Armah et al. 2011, Menike and Arachchi 2016), due in part to poor irrigation potential (Othniel Yila and Resurreccion 2013).

2.4.2. Social Conceptions Inhibiting Action

Some authors mention barriers that are linked to the social, political, cultural, and economic inequalities that have an impact on agriculture. These gaps, caused in part by uneven development processes, often have a snowballing effect on populations already vulnerable to climate-related extremes (IPCC 2014). Violent conflict increases vulnerability to climate change (IPCC 2014, Mapfumo et al. 2013) and the erratic nature of climate change and agricultural markets and policies is also cause for financial and psychological stress (Kuehne 2014). These social issues and their impact on individual lives may lead to a loss of solidarity within communities and, thus, to a loss of important means for knowledge exchange and social safety nets within societies (Mertz et al. 2008).

The social identity of smallholders is a potential barrier to their adaptation to climate change, i.e., the way smallholders perceive themselves in society is strongly linked to the behaviour and attitude they will have towards climate change. Burnham and Ma's (2015) research reveals that projects that contradict the social identity of individuals within the community are more likely to be rejected because these projects would force individuals to act against what they believe is their social role. This reality shows the importance of initiatives created by and with local communities so that they may be compatible with social structures or challenge them from within.

Social roles can bring added power to certain groups, whilst marginalising others. Sova et al.'s (2015) work shows that among people involved in climate change policy formulation, experts in the adaptation regime are considered to be the most knowledgeable and powerful, as opposed to political groups, who are considered to only have limited importance. Smallholders are perceived to have a limited capacity to participate in development planning structures, which alienates this group from key features of the global adaptation regime. Being represented in the climate change policy arena is essential to defend one's rights and priorities. Senegal figures as a negative example on this issue: the promotion of productivist policies embedded in a context of land scarcity, has favoured large-scale farms and further excluded certain marginalised groups such as herders and smallholders (Mbow et al. 2008).

2.4.3. Insufficient Attention Given to Gendered Identities and Differences

Gender is the social construction of roles and characteristics attributed to the male and female sexes (Quisumbing 1996). Gender issues, though present in several articles selected, remain vastly unspoken or undeveloped in research on climate change adaptation.

Certain initiatives analysed adopted an approach with no specific consideration of gender issues (Harvey et al. 2018, Jain et al. 2015, Azadi, Yazdanpanah, and Mahmoudi 2019, Lei et al. 2016). This research was effectively gender-blind; it often implied 'male' when talking about farmers or heads of household, and if women were mentioned it was more by coincidence than because they were actively included in the research. Gender-sensitive research was aware and actively addressing both women and men's considerations, knowledge, and limitations in its methods and analysis (Assan et al. 2018, Zamasiya, Nyikahadzoi, and Mukamuri 2017). Finally, some research was gender-centred as it was either addressing gender specifically, such as Bhattarai et al.'s (2015) research on gendered implications of adaptation to climate change in Nepal, or it was done on a crop traditionally grown by a specific gender, such as Loko et al.'s (2013) work on yam production in Benin (traditionally grown by men).

Women and men have traditionally fulfilled different roles in the household, fields, and as income providers, and research so far has mostly focused on the roles and responsibilities of men. Women are a group that is still largely excluded from climate change discussions and negotiations and more efforts need to be made to integrate gender issues and especially women's experiences and choices to the discussions and negotiations (Jin, Wang, and Gao 2015). Female smallholders also have a deep understanding of their environment and social situation, and they would benefit from farmer-to-farmer knowledge exchanges and from feeling empowered to co-create and co-develop projects for climate change mitigation and adaptation.

The future of climate change adaptation lies on understanding both genders' perception and understanding of climate change and their responses to it. Better than focusing on one gender and thus creating imbalances, future research needs to include both genders and understand the dynamics between them. As with transdisciplinarity and multicriteria research, gender-sensitivity ought to be implemented from an initiative's inception to its conclusion (if conclusion there is), ideally being reassessed in an iterative and cyclical process.

2.4.4. Weak Institutions and Markets

Political and economic decisions are perceived to have a strong impact on smallholders' capacity to adapt to climate change. Political institutions are accused of creating inappropriate policies (Armah et al. 2011) and of constituting institutional bottlenecks that hinder the adaptation process (Mapfumo et al. 2013). In Senegal, political and economic decentralisation has contributed to environmental degradation because of the lack of

resources allocated to land management and the poor accountability of local decision-making (Mbow et al. 2008).

Climate change presents the challenge of making important decisions in a context of deep uncertainty, yet smallholders lament the poor planning that overemphasises short-term outcomes and fails to sufficiently anticipate adaptation consequences (IPCC 2014, Menike and Arachchi 2016). Climate change adaptation responses tend to be “common and non-differentiated”, they favour technocratic and hard-science approaches to the detriment of more holistic and community- and ecosystem-based approaches (Sova et al. 2015: 471).

Markets are also seen as a barrier to adaptation because of their uncertainty: in certain countries, governments have promoted the specialisation in profitable crops adapted to the local climate, however the world price of these crops has plummeted making their production less viable and interesting for farmers (Mbow et al. 2008, Mapfumo et al. 2013). Whilst some smallholders complain of the high input costs and low commodity prices (Kuehne 2014); others complain of the rising price of basic supplies and food that cannot be tapped on because of the lack of business opportunities and the limited expertise and success of smallholders at doing business (Mertz et al. 2008).

2.5. Conclusions from the Literature Review and Identified Research Gaps

Great progress has been made in climate change research in the past few decades. From a field of research scattered between disciplines, climate change is now a well-known area of research, increasingly comfortable in its diversity and complexity. Climate change itself is now widely accepted as anthropogenic and requiring concerted efforts to mitigate its impact on Earth.

However, it seems that the literature triangulates the information in a unidirectional way that recognises climate change as a geophysical phenomenon with environmental impacts and then assesses almost separately smallholder perceptions and adaptation strategies (Figure 2.A) (e.g., Azadi et al. (2019)). This misconception forgets that these three instances are in constant mutation and evolution and that they impact on and are impacted by each other. To address this gap, I adopt instead a circular view of climate change factors, environmental impacts and smallholder perceptions and adaptation strategies (Figure 2.B).

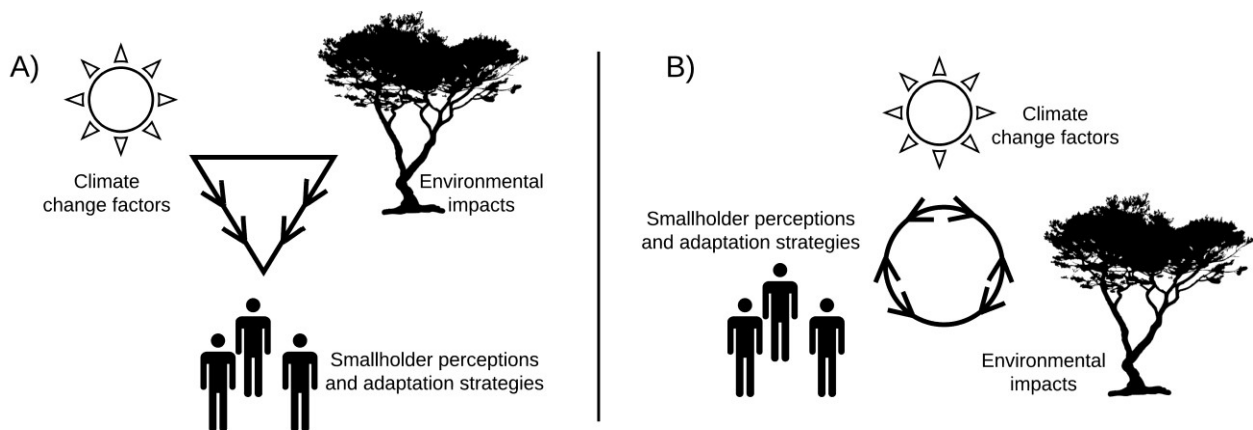


Figure 2. From top-down triangulation of climate change data (A) to circularity between climate change factors, impacts, and perceptions and adaptation strategies (B) (source: author)

To address the barriers to climate change adaptation there is urgent need to improve resource access and use. Yet, although resource access and use is a key limitation to climate change adaptation, this research does not aim to address it in isolation. The approach here takes one step back and aims to unravel the causes of this constraint, how it is affecting peoples differently and how they are using the resources they do have.

Smallholders have accumulated over generations a deep understanding of their environment and farming practices. Yet efforts to mobilise and share this wealth of knowledge are still insufficient in research. I aim to address this gap by giving emphasis to smallholders themselves and facilitating a horizontal transfer of knowledge (Altieri and Koohafkan 2008).

By conducting time- and place-specific research, I trust smallholders' different biophysical and socio-economic circumstances can be better understood (Gnangle et al. 2012, Mugi-Ngenga et al. 2016, van der Linden 2017). This will enable the development of holistic approaches to enhance resilience, valuing smallholders' embodied and embedded experiences and not solely the single connection to climate issues (Reid, Chambwera, and Murray 2013). Moreover, the way populations live their faith and beliefs, and practice magico-religious rituals needs to figure in and shape research and action, in its own right, without being ignored or overlooked by – supposedly – secular and modern research (Gnangle et al. 2012).

3. Key Theoretical and Conceptual Frameworks

3.1. Sustainable Livelihoods Framework

3.1.1. Overview of the Sustainable Livelihoods Framework

The first framework that guided this research is the Sustainable Livelihoods Framework (hereinafter SLF), developed in the 1990s in the United Kingdom by the Institute of Development Studies and the British Government's Department for International Development. According to a seminal work by Ian Scoones (1998: 8):

« A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, while not undermining the natural resource base (Scoones 1998: 5). At any scale, livelihoods are composed in complex ways, with multiple and dynamic portfolios of different activities, often improvised as part of an on-going 'performance' (cf. Richards 1989). »

This framework is people-centred, and it recognises the complexity and dynamic character of systems. It chooses to focus on the positives – i.e., the assets that entities have and how to maximise them – rather than the negatives – i.e., entities' weaknesses and how to minimise them. This framework recognises everyone's inherent potential by focusing on their assets, social and material, tangible and intangible. It excels at recognising that the poor have resources and capabilities (Small 2018), that constitute readily available, often low-cost, knowledge-intensive, low-risk, diversified, location-specific tools that can be used.

Figure 3 shows the SLF in its most commonly used representation (DFID 1999). There is no beginning nor end to the framework, each section is interlinked and must be analysed in relation to the others. Livelihood assets are composed of the different capitals of the entity under analysis. Natural capital is the resources individuals or groups have regarding land, water, forests, plants and animals and how and why they use them. Physical capital is tangible and relates to the tools and infrastructure they have access to or control over. Financial capital is the different sources of financial income, for example from livestock sales, bank loans, paid work, presents or remittances. Human capital relates to individuals; the set of skills, competences, knowledge, and experiences that different people have. Social capital relates to the connections people have, and how and when these connections are relevant (DFID 1999, McDonagh 2007). Other capitals may be added too, such as spiritual and intellectual capitals (Morse and McNamara 2013) or cultural capital (Owen 2014, Daskon and McGregor 2012).

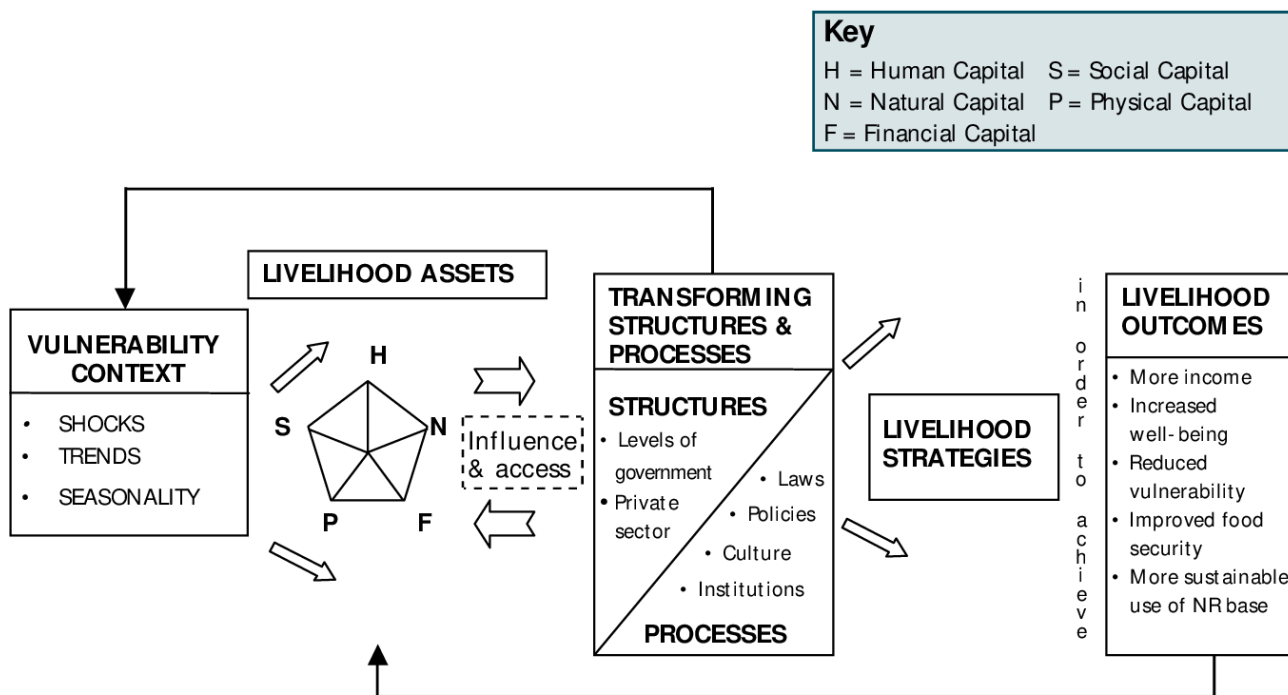


Figure 3. Sustainable Livelihoods Framework (DFID 1999)

Livelihood assets are influenced by the system’s vulnerability context, i.e., the shocks, trends, seasonality, and tensions they exist in. The assets also influence and access the institutional processes and organisational structures. Whilst institutions are “the rules of the game”, organisations are its key players (Scoones 1998: 12). Each entity adopts livelihood strategies to achieve their desired sustainable livelihood outcomes.

Carney (2003: 14–15) distinguishes between the normative and the operative principles of the SLF. The normative approach is people-centred, empowering, participatory, responsive, and sustainable. To achieve this, the SLF must be operated in a way that is multi-level and holistic, flexible and long-term, conducted in partnership. Feedback loops are highly important in the SLF. They highlight the connections between its different sections, demonstrating how actors impact each other, their context, and their goals. At smaller scales, feedback loops become stronger and more direct, both socially and environmentally (Sundkvist, Milestad, and Jansson 2005).

The connections and feedback loops between sections situate the SLF as a historic process that requires an iterative approach (Ashley and Carney 1999). From its onset, the SLF was intended to be used as a flexible tool, that would necessarily have to be adapted and reviewed to best reflect the specificity and complexity of each case in time (see, for example, Laeis and Lemke (2016: 1087) for an example of a SLF adapted to a specific research case in South Africa). Moreover, the framework can be adapted to different scales and levels and it encourages the use of hybrid methods to best grasp and understand the multi-faceted character of complex social constructions (Scoones 1998).

3.1.2. From Livelihoods to Food Systems

To better understand the impact of climate change and globalisation on the livelihoods of peasants, this research is centred around the concept of *food system*. Food systems cover the activities and outcomes from production to consumption and disposal of food (Figure 4). Food systems are not limited to food provision, instead they are the interplay of social and ecological factors that mutually impact on each other, hence the use of the term “social-ecological systems” (Ericksen 2008). This research uses the definition of food systems as summarised by Tendall et al. (2015: 18):

« Food systems are social–ecological systems, formed of biophysical and social factors linked through feedback mechanisms (Berkes et al., 2003; Ericksen, 2008b). They comprise, at a minimum, the activities involved in food production, processing and packaging, distribution and retail, and consumption (Ericksen, 2008a). These activities encompass social, economic, political, institutional and environmental processes and dimensions, referred to as scales. The processes play out at different levels, that is, at different positions on a scale (Cash et al., 2006). »

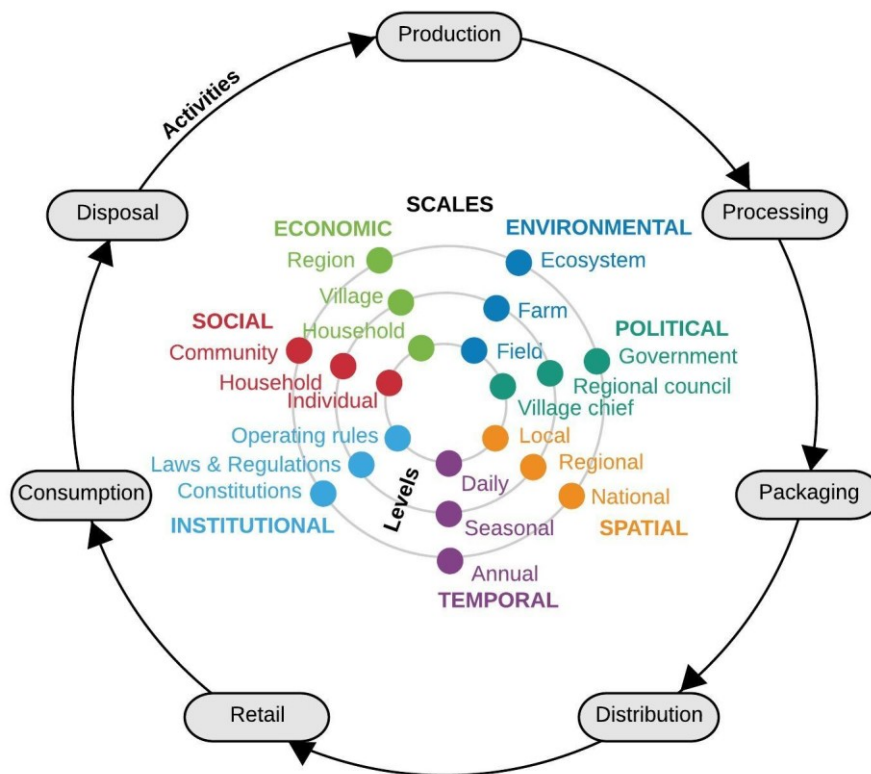


Figure 4. Food systems’ interconnected activities, scales and levels (source: author, inspired by Tendall et al. (2015: 18) and Pimbert (2015))

Figure 4 aims to show graphically the different activities encompassed in food systems and how, ideally, in a circular system, these would be interconnected and regenerative (Pimbert 2015). The figure also shows the scales and their different levels in which food systems operate thus representing the web of complexity and interdependence at interplay in food systems (IISD 2013).

3.1.3. From Sustainability to Resilience

The concept of resilience originates from the Latin *resi-lire*, which means the capacity to spring back after external shocks. The notion of *engineering resilience* was initially used by physical scientists to describe the capacity of systems to recover to an equilibrium after disturbance (Davoudi 2012). Disturbances could be either natural (such as floods or volcano eruptions) or social (such as wars or strikes). Resilience was then measured as the resistance to disturbance and how quickly the system would return to its equilibrium state. As explained by Holling (1996: 31), the focus of engineering resilience “is on return time, “efficiency, constancy and predictability”, all of which are sought-after qualities for a “fail-safe” engineering design”.

Later, a more organic conception of *ecological resilience* addressed the “magnitude of the disturbance that can be absorbed before the system changes its structure” (Holling (1996: 33) in Davoudi (2012: 300)). The focus is not only on the time it takes for a system to return to an equilibrium, but also on the amplitude of disturbance it can withstand whilst remaining within critical thresholds. According to Neil Adger (2003: 1), ecological resilience focuses on “the ability to persist and the ability to adapt”. The key difference between engineering resilience and ecological resilience is that the second rejects the idea of a single, stable equilibrium. Instead, ecological resilience considers that there are multiple equilibria; systems have distinct capacities to adapt to and absorb disturbances and they can find alternative stability domains (Davoudi 2012). However, these two perspectives embrace the idea of equilibrium in systems, assuming that there is either a pre-existing or a newly attained system equilibrium.

Evolutionary resilience or *socio-ecological resilience* (Folke et al. 2010) contests the notion of system equilibrium, stating that systems change over time, whether confronted by external disturbances or not (Scheffer (2009) in Davoudi (2012)). Systems are not seen as orderly and predictable; on the contrary, they are seen as chaotic, “complex, non-linear, and self-organising, permeated by uncertainty and discontinuities” (Berkes and Folke 1998: 12). Therefore, their goal is not to return to some state of normality, but rather to constantly adapt and transform themselves in response to change. This notion means that a system’s future cannot be predicted simply by looking at its past. Change can happen due to internal or external stresses and the extent of the change may not be proportional to the intensity of stress it is under (cf. Edward Lorenz’s concept of *butterfly effect*).

This research embraces the notion of evolutionary resilience, as a unified, complementary, interdependent, and non-linear socio-ecological resilience.

3.1.4. Food System Resilience

The notion of food system (socio-ecological) resilience lies within the complexity of each of its component concepts. When addressing food system resilience, the goal is to avoid splitting human and nature as two separate entities; on the contrary, as repeatedly defended by research and other stakeholders, it is essential to couple social and ecological systems to assess food system resilience (see, for example, Folke (2006) and Brand and Jax (2007)).

In this research, I adopt the definition of food system resilience developed by Tendall et al. (2015: 19): “the capacity over time of a food system and its units at multiple levels, to provide sufficient, appropriate and accessible food to all, in the face of various and even unforeseen disturbances”. As explained by the authors, this definition highlights the importance of the time dimension, the interactions between different levels, the need for participatory food systems to strengthen resilience and the systemic and holistic perspective.

Figure 5 demonstrates graphically the various forms resilience in food systems may adopt, depending on (a) the capacity of the system to withstand a disturbance, (b) their disturbance absorbance capacity, (c) the rapidity and flexibility of the system to recover and provide food to all and (d) the resourcefulness determining to what extent food security is recovered overall.

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Figure 5. Food system resilience (Tendall et al. 2015: 19)

Although disturbance and shock are commonly referred to in negative terms as deteriorating food system resilience (e.g., tsunamis or wars), there can be positive disturbances too such as exceptionally good annual rainfall or the surprise implementation of policies supporting smallholders. As explained by Tendall et al. (2015), embracing a holistic view leads to the observation that the impact of disturbances is never simple and that disturbances may have different (positive and/or negative) impacts depending on timing, levels and stakeholders involved.

Also, worth noting, a holistic approach and the organic nature of systems mean that there is not a single disturbance as simply shown in the figure above, but rather constant change with varying times, locations, intensities, vulnerabilities and responses.

3.2. Feminist Political Ecology

3.2.1. Introduction to Feminist Political Ecology

According to Garry Peterson (2000: 325), Political Ecology combines:

« the concerns of ecology and political economy that together represent an ever-changing dynamic tension between ecological and human change, and between diverse groups within society at scales from the local individual to the Earth as a whole. »

Political Ecology defends the idea that ecological issues must be understood and analysed in relation to the political economy and that, reversibly, political economic issues require analysing their ecology to be truly understood (Sundberg 2017). There are very strong links between political economy and climate change and this research aims to add depth to the consideration of actors who are often marginalised socially – and in research – due to their gender, ethnicity, age, faith, race, or sexuality. This research is embedded in Feminist Political Ecology by placing intersectionality centre-stage in the research process.

3.2.2. The Fundamental Role of Intersectionality

Identity is understood in this research as “social categories in which an individual claims membership as well as the personal meaning associated with those categories” (Ashmore et al. (2004) in Shields (2008: 301)). Identity is here studied through the angle of *intersectionality*, defined by Shields (2008: 301) as “the mutually constitutive relations among social identities”; considering that social identity or “subjectivity is constituted by mutually reinforcing vectors of race, gender, class and sexuality” (Nash 2008: 2).

An initial focus on gender, considering how female and male peasants’ experience of food systems coincided or differed led to the insight that simply gendering the research would not be sufficient and that other social relations would have to be included, especially age. Therefore, this research embraces Rebecca Elmhirst’s (2011: 130–131) approach where “‘gender’ is destabilized as a central analytical category”:

« People are conceptualised as inhabiting multiple and fragmented identities, constituted through social relations that include gender, but also include class, religion, sexuality, race/ethnicity and postcoloniality, as well as in multiple networks for coping with, transforming or resisting development (Nagar et al. 2002; Lawson, 2007). »

Choosing to subvert binaries, I acknowledge that identities are complex, and that this complexity occurs not only between categories (intercategorical complexity) but also, importantly, within categories (intracategorical complexity) (Crenshaw 1991, Nash 2008: 5–6). Female peasants in the same village may experience different systems of privilege and oppression according to their marital status, land access and ownership, offspring, or religion, for example. Equally, young and inexperienced peasants deal with very

different challenges than those faced currently or in the past by their old and wise parents. For both these examples, the intersectional identities are a construction dependent on the relevance and relation between categories; they are emergent and fluid.

This complexity ought to be acknowledged and incorporated in the theoretical framework of this research. Although it is a hard – and often incomplete – task, the adoption of intersectionality as a key concept in this research aims to be not a token gesture but rather, as Shields (2008: 309) puts it, “an invitation to move beyond one’s own research comfort zone”.

To surpass a potential simplistic gender (binary) approach and to further enhance the importance of intersectionality in the construction of the research, I refer to this theoretical framework as *Intersectional Political Ecology* (hereinafter IPE). The research places emphasis on the role of social characteristics (and especially gender and age) in the way ecology (and climate change) is perceived and acted upon, and in the way the political economy builds and formats roles in the location under study.

There are multiple and non-linear power dynamics at play when researching food systems using an IPE lens (Nightingale 2011). Power dynamics are revealed in the multi-dimensionality of individuals themselves. Each actor encompasses several subjectivities, separate or concomitant, complementary or contradictory, scaling from the intimate to the global (Elmhirst 2011).

This framework gives room for the expression of complexity (Rocheleau 2008) and even “murkiness” (Nash 2008: 89). The world’s climate and biodiversity are two complex adaptive systems and they both have important feedback loops and tipping points that remind us that the whole is greater than the sum of its parts (Nyantakyi-Frimpong and Bezner-Kerr 2015, Bhattarai, Beilin, and Ford 2015). I consider it essential in this research to address the dynamic processes of emergent complexity, finding ways to disentangle them and make sense out of them.

The literature shows that smallholders do not tend to mention climate change as their main concern, but rather that evolutions in food systems, politico-economy and the society present more pressing challenges to their daily lives. This research aims to use IPE to explore the linkages and areas of influence between these three spheres, connecting them to climate change, to assess the socio-ecological resilience of food systems.

A key factor that led to the selection of the IPE framework was the notion of *double exposure* (O’Brien and Leichenko 2000), i.e., the exposure to climate change and economic globalisation that was expressed by several local actors when explaining the main challenges they face. Oftentimes, smallholders in the Majority World stated that climate change and variability is a concern, but only a secondary one. Their way of life and their farming practice are engrained in notions of adaptation and flexibility. Unlike the *identity protective cognition* that leads certain Australian farmers to deny climate change in Kuehne’s (2014) research, smallholders in the Majority World recognised important changes in the climate and their impact on their

livelihoods but expressed deeper concern for the impact of neoliberal policies that have led to the commodification of food and have been decreasing the value of their means of subsistence (Nyantakyi-Frimpong and Bezner-Kerr 2015, Rogé et al. 2014, Bee 2014).

3.3. Traditional Ecological Knowledges

A concern loomed however regarding the anthropocentrism of IPE. This framework may seem at first glance centred on human perceptions and experiences, with an instrumental view of the ecology and seeing political economy as the result of (certain) humans alone (Sundberg 2017). Thus, the theoretical framework of *Traditional Ecological Knowledges* (hereinafter TEK) was brought into the research to underscore the sources, multiplicity, and broad scope of *knowledges* (purposefully used in the plural). TEK are understood as:

« [...] a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment. » (Berkes, Colding, and Folke 2000: 1252)

“Climate data available is smaller than the memory of farmers”⁸ (Andrade, Silva, and Souza 2014: 84). Most of the academic research done on climate change is based on Western, scientific data yet one of the main sources of local data should be the peoples themselves and their long-lasting knowledge transmitted from generation to generation. Lived everyday experiences form an important part of peoples’ world views and conceptions, reminding us that knowledge is not only embedded but also embodied (Madhavan and Grover 1998, Bee 2014).

Indigenous knowledges originating from experience, thoughts, dreams, intuitions can be expressed in specific language, myths, ideals, narratives, songs and proverbs (McMillen, Ticktin, and Springer 2017). These “customary knowledge–practice–belief systems” (Berkes (2012) in McMillen et al. (2017: 579–580)) give peoples the ability to learn from the past and they inspire possible futures. It is a matter of cognitive justice to recognise and respect the different systems of knowledge that coexist and that give meaning to peoples’ lives, and to contribute to their debate and dialogue (Santos 2009, Pimbert et al. 2017, Visvanathan 2009).

As seen in the literature, there has been a gradual move towards the valuing of local peoples’ knowledges, but this has been done to varying degrees. Huda (2013), for example, analyses people’s perceptions of climate change but does this using a somewhat external conception of climate change by evaluating how much people learn about climate change from mass media and education. This approach leaves aside the personal, lived experience of farmers, who work in the fields daily and who over decades observe first-hand changes in the climate, their surrounding environment and themselves. These knowledges are place-based, intimately linked with the local natural environment experienced and understood by the population.

The notion of time is equally important for the understanding of TEK as it is the living and experiencing a place for a long period of time that builds, challenges, and shapes indigenous knowledges. As explained by Orlove

⁸ “[...] os registros climáticos disponíveis são menores que as memórias dos próprios agricultores”.

et al. (2010: 244), “[s]uch knowledge tends to be the result of cumulative experience and observation, tested in the context of everyday life, and devolved by oral communication and repetitive engagement rather than through formal instruction”.

There is now an abundant literature on TEK and, more broadly, on indigenous knowledges, though it may be referred to in different ways such as local knowledge(s), traditional knowledge(s), indigenous technical or environmental knowledge(s).

TEK may be presented in opposition to Western scientific knowledges, yet it is important to not set them as fixed, immutable knowledges nor as necessarily incompatible and conflicting knowledges. TEK are heavily impacted by tradition, but they are in constant renewal too. They are flexible, dynamic, fluid and constantly updated and revised. They evolve in time with the integration of new local practices but also with the integration of skills and insights from other knowledges that enrich and reinforce the original source of indigenous knowledges (Orlove et al. 2010, Pearce et al. 2015).

Western, scientific knowledges and TEK may use different methodologies, yet they share the same goal of understanding and explaining phenomena. The recognition that these two knowledges are not incompatible – and are in fact complementary – has led to the development of research approaches that aim to ally them such as Rapid Rural Appraisal (RRA), Participatory Rural Appraisal (PRA) and Participatory Learning and Action (PLA) (Salas and Tillmann 2009).

By including TEK, initiatives accept to expand the often specialised and compartmentalised research focus of Western scientific knowledge to embrace the complexity, interconnectedness and systemic approach of indigenous knowledges. Including TEK in research is essential to (re)situate Western scientific knowledges into a history of cognition and meaning, reconnecting to place, time and life, where uncertainty and unpredictability are inevitable (Boillat and Berkes 2013, Sánchez-Cortés and Chavero 2011).

I believe that the inclusion of TEK ensures a systemic understanding of the issues under analysis in two distinct yet complementary ways. Firstly, the inclusion of TEK opens the research to a diversity of knowledges, thus reiterating the multitude of views and understandings within the group of actors itself. This is inspired by Visvanathan’s (2005) work on a *democracy of knowledges* and Santos’s (Santos 2009) concept of an *ecology of knowledges*. As stated by the proverb: ‘Wisdom is like a baobab⁹, one person alone cannot embrace it’ (Kimmerle 2016: 263).

Secondly, local indigenous people have often kept alive a deeper connection with place and life in its various forms (Toledo 2013). This connection, or interconnections, helps break the mould of researcher-researched

⁹ Tree native to the African continent known for its very wide trunk girth.

and subject-object and celebrates the biodiversity of actors within food systems, under whichever role, and raises awareness of animal and plant life, spirituality and cosmology.

Moreover, placing indigenous knowledges centre-stage in the research is, once again, a push toward more systemic and complex understandings of phenomena. Environmental changes and climate change are only two aspects of food systems; indigenous conceptions of food systems have inherent interconnections between social, political, economic, environmental, and climatic aspects. Acknowledging that there are multi-dimensional subjectivities that lead to different knowledges links with the notion of intersectionality and the social construction of difference (Elmhirst 2011).

Valuing TEK breaks free from the representation of peasants as a homogenous group and as vulnerable and powerless victims (Mohanty 1984). It explores the skills, resources, and knowledges that peasants have and have helped them build sustainable and resilient systems over centuries. This emphasis on what is there, rather than what is missing, builds a bridge with the SLF (Scoones 1998). This framework aims to bring a positive and empowering light to the case study by building on what has been working and how to develop it rather than how things should have been and how to create them. The positive valorisation of TEK and experiences is also closely related to the IPE valorisation of “every day” knowledges and the dignity and belonging that are generated by them (Sundberg 2017).

3.4. From the Sustainable Livelihoods Framework to the Resilient Food Systems Framework

This section looks at how the three selected frameworks – SLF, IPE and TEK – are adopted and adapted to study food systems, developing a merged framework to study the transformation of local food systems giving special emphasis to intersectionality and indigenous knowledges.

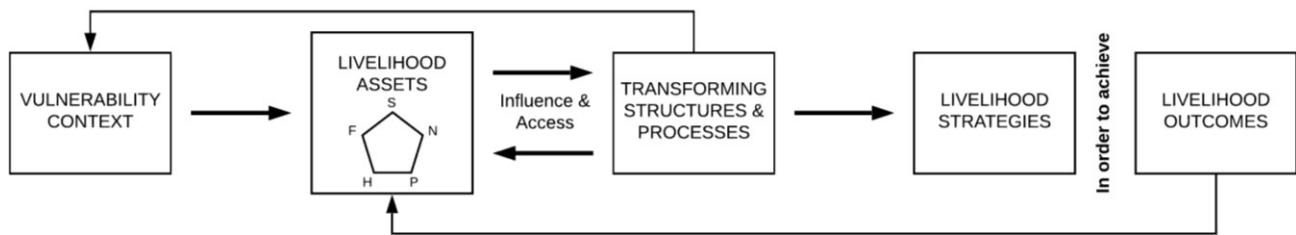
In this research, I use the SLF as a framework that structures and guides the research. The original framework has been largely adapted by other authors to study various topics, including in the food and agriculture areas, such as agricultural programmes (Lemke et al. 2012), agroecology (Addinsall et al. 2015, Amekawa 2011), food supply chains (Owen 2014), cash crops (Su, Wall, and Wang 2019) and pastoralism (Michler et al. 2019). The flexibility of the framework enables the incorporation of IPE and TEK not only in its representation, but also and inevitably, in the research methods used, as demonstrated hereafter. Other theoretical frameworks – such as the Social-Ecological Systems Framework (McGinnis and Ostrom 2014, Partelow 2018, Oteros-Rozas et al. 2015) or the Adaptive Management Framework (Lee 1993, Williams 2011) – highlight similar concepts and could have enabled the merging of similar frameworks; yet they were not selected for this research because the SLF's graphical presentation felt more appropriate to vehiculate the complexity of ideas in a clear, organised way.

This research focuses on resilient food systems, so I have renamed the original framework as *Resilient Food Systems Framework* (hereinafter RFSF) (Figure 6, p. 44). There are strong similarities in the conception of livelihoods and of food systems but the case under study focuses on livelihoods that are deeply embedded in food systems, hence the decision to bring the latter to the forefront.

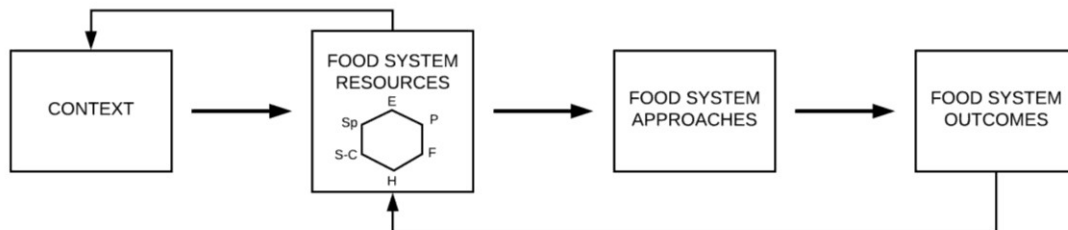
On the one hand, there is a motivation to go beyond the definition of livelihood as “a means of earning a living” (Tang et al. 2013: 15) to embrace the often invisible yet paramount importance of the body and soul nourishing value of food. For many peoples around the world, farming and food are not simply a means of earning a living, they are life itself. On the other hand, there is a need to focus the research from a broader notion of livelihood to a more specific notion of food system, because it was impossible to study whole livelihoods in detail considering the timeframe available.

Following the idea of *optimal ignorance* needed to “identify the institutional matrix which determines the major trade-offs” (Scoones 1998: 13), this research focuses on food systems and even on the specific food system activities deemed most relevant by local co-researchers. Finally, as explained by Owen (2014: 67), the decision to replace the notion of sustainability by that of resilience stems from the increasing concern regarding the co-optation of the first concept. The aim is to look at socio-ecological systems, and their capacity to adapt and overcome various and unforeseen disturbances.

Sustainable Livelihoods Framework



Resilient Food Systems Framework



Legend: S: Social; N: Natural; P: Physical; H: Human; F: Financial; E: Environmental; S-C: Socio-Cultural; Sp: Spiritual.

Figure 6. The Sustainable Livelihoods Framework according to DFID (1999) and its adaptation into a Resilient Food Systems Framework (source: author)

Four further changes were made in the RFSF to better reflect the present research and its ethos. Firstly, the central box, titled originally “Transforming Structures and Processes” (but commonly known as the PIPs box, for “Policies, Institutions and Processes”) was removed. This change does not mean in any way that these structures and processes were deemed irrelevant. On the contrary, the emphasis given to power dynamics – be it through intersectionality and indigenous knowledges – aims above all to highlight their importance and their all-too-often neglect. However, during the research project, its analysis and then its restitution in this thesis, it became clear that the topics under discussion were constantly referred to when discussing the context and the food system resources and approaches. I decided therefore to remove the PIPs box and instead address its content in the Context and the Food System chapters¹⁰ to further enhance their interconnectedness and wide-ranging impact.

Secondly, this major change made me reflect also on the arrows on the SLF and their significance. I decided to connect all the boxes with arrows, simply showing a flow of information and influence. The feedback arrow that in the SLF comes from the PIPs box to the Context box, is represented in the RFSF as flowing from the Food System Resources box to the Context one as the structures, processes, and power relations heavily present in the Resources box, have a direct influence on the food system’s context.

Thirdly, the Assets box of the SLF was also revised. I replaced the concept of *assets* with the term *resource* here understood “in its broadest sense to mean all knowledge and technology, [aesthetic] and spiritual

¹⁰ Chapter 5 (p. 84) and Chapter 6 (p. 130), respectively.

qualities, tangible and intangible sources that together, are deemed by local communities to be necessary to ensure healthy and fulfilling lifestyles for present and future generations” (International Society of Ethnobiology 2006: 12). This shift steers away from the economic and financial connotations of *asset* and *capital* and embraces a more organic and naturalistic notion, closer to the ethos of this research.

I decided to rename the social resources as socio-cultural to expose fully the connection between social and cultural dimensions. Here the main connections within families, villages, and wider socio-political organisations, are presented adopting Robert Putnam’s (2000) terminology of bonding, bridging and linking social capitals. *Bonding* social capital is the strongest form of social connection and typically occurs within families and between friends, i.e., homogenous, horizontal social groups. *Bridging* social capital occurs between groups in a wider, heterogenous network that may not share the same values. These connections may be horizontal or vertical, depending on the connection built. Finally, *linking* social capital occurs when vertical connections are made across different levels of power and/or social status (Owen 2014). This section addresses, for example, the important power relations originally inscribed in the PIPs box of the SLF. Here, however, power relations are analysed directly within their context, exposing their role in influencing and accessing socio-cultural resources.

Moreover, the capital pentagon becomes a resources hexagon in the RFSF with the addition of spiritual resources. Research – even in social sciences – is heavily grounded in a positivist approach, looking for facts, measurable indicators, and pattern formations. Yet, Ndiémane’s food system and livelihoods are totally immersed in inextricable connections that are not only socio-cultural, but also spiritual. As quoted from the famous Malian writer, Amadou Hampâté Bâ (Kerharo 1975: 7) : “Trying to understand Africa and the African without considering traditional religions, would be like opening a gigantic wardrobe emptied of its most precious contents.”¹¹ The adoption of an approach that is deeply transdisciplinary, that embraces indigenous knowledges, and that is framed by different subjectivities and intersectionalities, called for spirituality to gain prominence in the research framework (Aparentiik and Parpart 2006).

Finally, the term *strategies* was replaced by the term *approaches* as the former sounded too top-down, exogenous and policy language, whilst the latter better reflected the experimental nature of the initiatives undertaken by villagers. When questioned about their *adaptive strategies*, peasants felt more comfortable discussing their *resource management approaches*, adopted for the short- or the long-term, but often intuitive and based on traditional knowledges they felt unable to explain in a schematic rationalised way.

The schematic representations in Figure 6 (p. 44) may look simple, linear and even rigid. Schematics are used here to represent in an intelligible way complex dynamics, occurring within and across varying scales and

¹¹ “Essayer de comprendre l’Afrique et l’Africain sans l’apport des religions traditionnelles, serait ouvrir une gigantesque armoire vidée de son contenu le plus précieux.”

levels, with feedback loops, memory, unpredictability and disturbances (Berkes and Ross 2013). The construction of a RFSF is an iterative process and analysing it as a whole is essential for its understanding.

The conscious choice of socio-ecological resilience as a boundary object (Brand and Jax 2007) is a recognition that this research lies in imperfection. It is not a unifying all-encompassing standpoint, but rather a window into a relative perspective, yet none the less relevant and worth exploring. My belief is that by opening it to often marginalised voices, accepting uncertainty, embracing intangible resources such as spirituality, research gains new meanings and depth and may bring new insights on human life, and on life overall.

Different variations of the RFSF are presented within this thesis, as the skeleton of the thesis (Figure 1, p. 9), to demonstrate the allocation and use of mixed methods (Figure 8, p. 58), or to highlight differences between intersectionalities in the data obtained (Figure 164, p. 221). Bringing the RFSF to life in such ways shows that the framework is organic and flexible; it is work in process and open to further adaptations within this research but also for other related studies.

4. Methodology

4.1. Methodological Approach

This research uses a hybrid methodology, and the guiding disciplines vary according to the research methods used. The quantitative approach is inherently positivist and it is based on natural phenomena, their properties and relations, observed through the senses and analysed through logic and reasoning (Macionis and Gerber 2011). Yet, the human and social components are very strong in this research and its qualitative and participatory approaches are influenced by Social Constructivism. Social Constructivism stresses the importance of social and cultural factors in the causation and control of objects; this means that objects and realities might have been otherwise had social and cultural factors been distinct (Mallon 2019). For example, climate change's impacts, perception and adaptation are more complex than variations in greenhouse gas emissions in the atmosphere. As mentioned by van der Linden (2015), to understand climate change – and in this case, resilient food systems – one needs to look at cognitive, experiential and socio-cultural factors too.

The underlying disciplines guiding this hybrid research are multiple. Its quantitative component includes Ecology and Agronomy as the disciplines used to study agricultural practices and biodiversity; Climatology and Physical Geography to study climate change and the geophysical profile of the case study; and Economics to study the management of resources by its community. Within the qualitative approaches, the social sciences disciplines range from Anthropology and Sociology to study the human societies and cultures of the case study; Human Geography to explore how these human societies and cultures are linked to their landscape; and History to delve into past events that have led to the current profile of the case study.

The participatory approach is transdisciplinary, i.e., it brings in new actors and it values their knowledge that surpasses scientific reasoning and includes experiential and cosmological constructions of meaning. This approach is often considered activist because it requires a strong engagement in the field and openly aims to bring about social and political change (Bernstein 2015). The Systems Analysis brought by participatory approaches aims to link the study of natural environments, with the complexity of social relations, involving the peoples themselves. Food systems, political ecologies and indigenous knowledges all involve multiple disciplines and call for a transdisciplinary approach, scope, and impact. Transdisciplinarity is understood here as “a common orientation to transcend disciplinary boundaries and an attempt to bring continuity to inquiry and knowledge” (Mahan (1970:194) *in* Bernstein (2015: 3)).

Although I do not claim expertise in subjects as distinct as climatology, agronomy, sociology, ethnography, nutrition, psychology, and theology (among others), I ascertain the importance of encompassing different disciplines and different sources of knowledge as well as the multi-level and multi-scale character of these

subjects. Following on from the recognition of the complexity of dynamic systems, this research aims to adopt a holistic and inclusive approach that, I am confident, has the potential to increase the resilience of food systems (Reid et al. 2015b).

The reliability of the results is ensured by theoretical saturation, positionality, triangulation, and ground-truth imagery, all made possible with a mixed methods approach. As defended by Andrea Nightingale (2003: 79), “[...] what is most important is not which methods are used, but *how* they are used to ask *which* kinds of questions and how the results are interpreted (Rocheleau 1995; Sheppard 2001).”¹² There are no perfect and complete methods, each data set has its silences and gaps and triangulation is used here to help overcome trade-offs (Feola et al. 2015), to establish a conversation between the different methods, knowledges, (inter)subjectivities and partial objectivities (Rocheleau 1995, Foran et al. 2014).

The hybrid methodology selected for this research calls for three approaches that are often seen as antonyms but that are used here at different stages and for different areas of the research.

A deductive approach is employed by the quantitative research method, when conducting deductive statistical analyses. Here, a more “top-down” approach is applied to establish a theory and hypotheses that are then tested through the collection of observations (Figure 7, p. 49). This deductive approach is used to set the scene and gather initial information on the climatological, ecological and socio-political profiles of Senegal more broadly. This preliminary information is the basis for the more in-depth analysis enabled by the qualitative and participatory research methods.

The qualitative methods in this research favour an inductive approach, based on the causal inference from detailed systematic analysis of patterns of difference and similarity between the various accounts of the case study. This approach is commonly considered “bottom-up” because it starts from specific observation and measures and subsequently aims to detect patterns and regularities, attempting to draw explanatory hypotheses and potential conclusions and theories.

In participatory methods, the adoption of transdisciplinarity, with multiple actors and knowledges, calls for an abductive research approach. It is necessary to meet and listen to the different local actors and to their priorities before setting any participatory research questions or conceptualised hypotheses. These emerge from the field, from the local voices and experiences; they are tentative and open to deeper investigation (Thornberg and Charmaz 2013). Inspired by Grounded Theory, this approach conducts simultaneously data collection and analysis. The process is cyclical; it requires an iterative process of research-action-reflection, with all actors, understanding changes over time that continually inform the next steps or the return to previous steps (as shown by the double arrows in Figure 7). This approach requires openness and humility.

¹² Emphasis from the original.

The abductive process may seem vague at times, but it requires an assessment of the potentially hidden preconceptions underlying in the research approach and in the researchers themselves. Everyday experiences and practices are taken seriously to enable openness to “let the fieldwork speak” (Glaser and Strauss 2012).

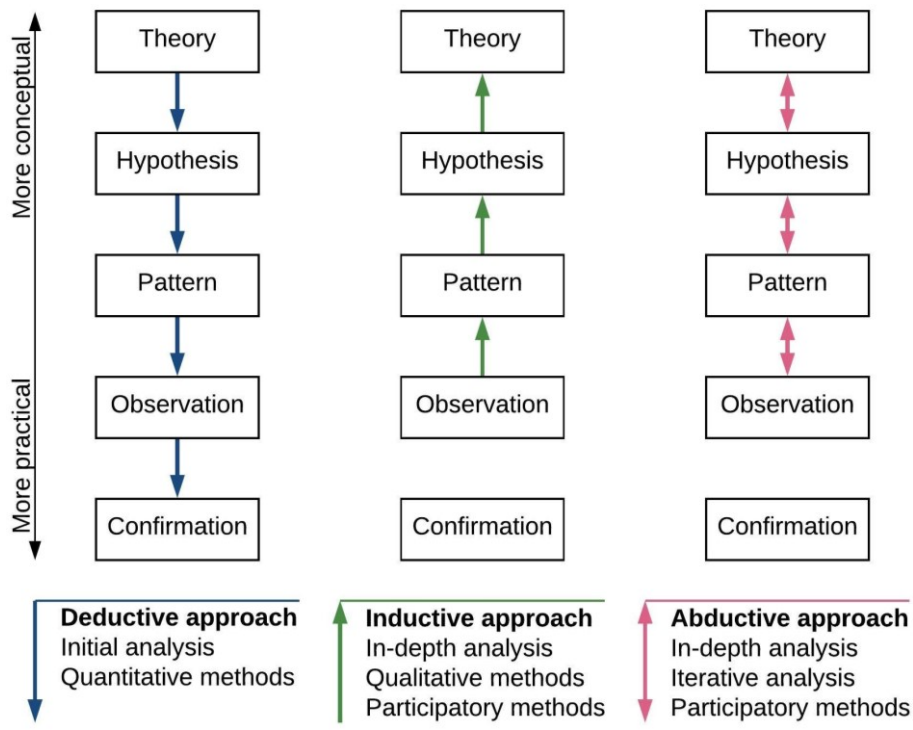


Figure 7. Simplified schematisation of the deductive, inductive and abductive approaches (source: author)

4.2. Historical Archives

One step in the quantitative and qualitative research methods adopted was to analyse historical archives. These archives are vast and include demographic and geoclimatic statistics but also historic and fictional literature; iconography, photography, and videography; mapping and travel diaries. As in Andrade et al. (2014), this secondary data brings new insights on the region and its historical evolution. The information gathered through historical archives is relevant to triangulate with the information gathered during the participatory activities and direct observation in the field. The analysis of historical archives can also be useful in reconstructing the linked social and environmental history of a region.

Historical archive searches were done online or in Senegal, France, Belgium and the United Kingdom using:

- National Archive Centres: Archives Nationales du Sénégal (Senegal), Archives Nationales d’Outre-mer (France), The National Archives (UK);
- Academic Libraries: Université Cheikh Anta Diop (Senegal), Université de Thiès (Senegal), Coventry University (UK), Université Libre de Bruxelles (Belgium);
- Public Libraries: Bibliothèque Nationale de France (France), Bibliothèque Royale de Belgique (Belgium), Cinémathèque de Paris (France);
- Research Institutes and Organisations: Institut Sénégalais de Recherche Agronomique (Senegal), Institut de Recherche pour le Développement (France), Direction des Travaux Géographiques et Cartographiques (Senegal), Centre de Suivi Ecologique (Senegal) ; the United Nations and its Food and Agriculture Organisation ; Direction Météorologique Nationale (France), Global Historical Climate Network, Climate Research Unit (UK);
- Specialised Scientific Journals: such as the Journal of Arid Environments and the Revue Physio-Géo;
- Online Search Engines: Google and Google Scholar;
- Historical Satellite Imagery Programs: Google Earth.

During this research, I subscribed to Gracy’s (2004: 337) concept of Archival Ethnography, defined as:

« [...] a form of naturalistic inquiry which positions the researcher within an archival environment to gain the cultural perspective of those responsible for the creation, collection, care, and use of records. »

Whilst doing archival research I was conscious of my own subjectivity but also of the subjectivity and power of those creating these archives. This relates to the ideas of conscienciatization and decolonisation of the mind (subchapter 4.3.8., p. 73) and of positionality (subchapter 4.3.9., p. 75). Therefore, I strived to confront and complement archives from major archival institutions as those mentioned above in the bullet points, with archives and artefacts from local villagers themselves and their perspective on which information and objects are worth preserving.

4.3. Participatory Action Research

4.3.1. Overview of Participatory Action Research

To avoid the conventional approach that places researchers as experts and local actors and initiatives as research objects, the overarching strategy used in this research is Participatory Action Research (hereinafter PAR). PAR is understood here as:

« a participatory, democratic process that seeks to bring together action and reflection, theory and practice, in participation with others, in the pursuit of practical solutions to issues of pressing concern to people in their communities. » (Reason and Bradbury 2008: 2)

PAR stems from the work developed by the Brazilian educator and philosopher, Paulo Freire, who tried to overcome the “intellectual colonialism of Western social research into the third world development process” (Sohng 1996: 80). This research often places researchers in a position of power and seldom benefits those who are researched, a process akin to colonialism. To overcome this hiatus, PAR developed three major elements:

- I. *People*: PAR works with people with the goal of addressing their needs. By placing participants centre-stage, PAR supports the empowerment of people involved and establishes the researcher more as a facilitator of the research/action process than as an expert. The strength of PAR is in working with people, often marginalised and isolated, to get together around common problems and needs (Sohng 1996: 82).
- II. *Power*: by placing all actors as peers in research, all with their own set of skills and motivation, PAR aims to promote empowerment. “[P]articipatory research is research as collective action in the struggle over power and resources, where knowledge is identified as power” (Sohng 1996: 80).
- III. *Praxis*: PAR defends that theory and practice are inseparable – the presence alone of the researcher is already having an impact on the research – so actors choose to engage in dialogue, within action, to bring about the intended change. This highlights the act (and its importance) of embodying or realising a theory or skill, of practicing ideas.

PAR puts into action the IPE and TEK theories; it aims here to “walk the talk”. This means that beyond understanding a situation, this approach was chosen and built with local co-researchers and it openly aims to change and act upon the situation studied. By working on projects that stem from, and are conducted by local actors, PAR aims to support self-organisation (Reid et al. 2015a). This means that participants are able to communicate in their own language, to value their indigenous knowledges, to work, meet and act upon their own environment, being sensitive to their priorities and rituals. This approach requires thus a process of conscientisation in which actors are led to deeply analyse their own realities to better address them (Dowling 2016), engaging in a cyclical process of research-action-reflection.

PAR aims to avoid doing research that is solely technical and quantitative, that does not have any collaboration with local *informants* and therefore seems to have no real consideration for their views and knowledge (see, as an example, Claessens et al. (2012)). This research's strategy however is not purely participatory; it is hybrid and includes quantitative and qualitative methods. Most methods are used concomitantly without any hierarchy between them. They inform each other thus contributing to the iterative process of research and the adjustment of each new step from the reflection on the previous ones.

The active engagement with PAR is inspired by theories of social change (Kabeer 2010, Tschakert and Machado 2012). The interaction with local groups and the identification, clarification and exploration of group priorities aims to promote the empowerment and the recognition of these groups. By working with traditionally marginalised people, this project aims to support the emergence of self-awareness and recognition, both individually and as a collective, socially and politically, in the community and beyond (Howitt and Stevens 2016).

4.3.2. Ethical Principles and Processes

Throughout the research, and for every field visit, Low and Medium Risk Ethics Approvals¹³ were obtained from Coventry University. These documents highlighted relevant ethical considerations and how they were addressed such as the project design, methods, confidentiality, consent, working with children and working in a foreign language I do not master. Written research leaflets and consent forms were used as the bases for presenting the research to participants and to obtain consent, but communication was done orally and consent was obtained in the participants' mother tongue and audio recorded or filmed¹⁴.

An "Action Research Team of Ndiémane" was symbolically created to gather on equal terms Groupe Mbogayife, me and other villagers, academics and activists involved in this research (such as Centre AFAFA and ASPSP's staff¹⁵). A Code of Ethics was established between the Action Research Team of Ndiémane to stipulate and clarify the principles and values that would guide the research. This code of ethics is based on the International Society of Ethnobiology Code of Ethics (2006) and it can be found in Appendix 10.1. (p. 256).

Local co-researchers referred to a Malian peasant who during a peasant seed fair claimed: "What is done for us, without us, is against us."¹⁶ The Action Research Team of Ndiémane highlighted two principles from the Code of Ethics which were paramount for them:

¹³ See Appendices 10.2.1. to 10.2.6. (pp. 265-270) for Certificates of Ethical Approval, and Appendix 10.2.7. (p. 271) for a copy of the Student Research Project Risk Assessment.

¹⁴ See Appendix 10.2.8. (p. 277) for a copy of the Research Leaflet and Appendix 10.2.9. (p. 278) for a copy of the Consent Form.

¹⁵ See subchapter 5.3.1. (p. 102) for more details on these groups and institutions.

¹⁶ « Ce qui est fait pour nous, sans nous, est contre nous. »

« **Principle of Supporting Indigenous Research:** *This principle recognizes and supports the efforts of Indigenous peoples, traditional societies, and local communities in undertaking their own research based on their own epistemologies and methodologies, in creating their own knowledge-sharing mechanisms, and in utilising their own collections and databases in accordance with their self-defined needs. Capacity-building, training exchanges and technology transfer for communities and local institutions to enable these activities should be included in research, development and co-management activities to the greatest extent possible.* »

(International Society of Ethnobiology 2006: 7)

« **Principle of Full Disclosure:** *This principle recognises that Indigenous peoples, traditional societies and local communities are entitled to be fully informed about the nature, scope and ultimate purpose of the proposed research (including objective, methodology, data collection, and the dissemination and application of results).* » (International Society of Ethnobiology 2006: 6)

The principles of collaboration, self-support and transparency ensured that the different knowledges brought in by each member of the research team would be recognised and respected as reflected by this simple exchange during a focus group discussion and workshop with Groupe Mbogayife (18/10/2019):

— “*God made things well: you can write, and we have a good memory!*” (Adama Ndour)

— “*That’s true! And that’s why we are complementary!*” (Carla Sarrouy Kay)

Together the action research could lead to meaningful change, and together we shared reciprocal responsibility for each other and for the research.

Initially there were discussions regarding adding to the university supervisory team of this doctoral research a local Senegalese peasant, thus bringing into the academic realm new conceptions of knowledge and practice. This idea never materialised though due to the failure to find a person who would have the depth of knowledge and practical experience in Ndiémane *and* with whom the UK academic team (including me) could communicate in English or French. This, arguably, made it harder for the local co-researchers to understand the extent of work happening to write this dissertation but, it is hoped, did not weaken the co-creative process itself nor its local impact.

Adopting PAR requires all researchers to be adaptive in their shared learning process. There is no “blue print programme” (Pimbert 1995: 4) and it may seem at times that the research process is not taking the direction expected, “minor” issues become central aspects of discussion or, the research process is stalled due to major inconsistencies. Far from romanticizing the local (Kapoor 2004), PAR acknowledges that not all is harmonious in local, participatory, intersectional research. “Staying with the trouble” (Di Chiro 2015) means that extra room needs to be given to reflection, debate and U-turns; that the “midwifery” role (Salas and Tillmann 2009) embraced by the researcher as a facilitator in the research process is not neutral and bears its own responsibility and power dynamics. Yet, it is in this transparency, honesty and constructive motivation that lies the relevance of the PAR approach and of its outcomes.

4.3.3. Iterative Ethics and the Cycles of PAR Inquiry

PAR was conducted in “cycles of continuous and on-going communication and interaction”¹⁷ (International Society of Ethnobiology 2006: 7). This meant that participation occurred during the whole process of the research¹⁸ and that each new cycle and iteration was a new opportunity to review the research ethos and any consent matters¹⁹. This was most obvious with the use of Participatory Video (see subchapter 4.3.4., p. 59) with consent being recorded before the films were made (regarding future work)²⁰, once they were made (regarding what had been made and if, how and where to share it in the future) and again at a later date (regarding on-going film dissemination and its impact). Although I was openly interested for my doctoral research in the films made by local peasants, the agreed Code of Ethics meant that I could not keep, analyse nor share the films without the explicit and on-going consent of my local co-researchers²¹.

Consent was an iterative and organic process, that included all people involved, from the individual to the village as an entity. An important requirement that emerged from the very first discussions was that research participants did not want to be anonymised. On the contrary, they requested to be named individually or as a group when opinions were shared so that their contribution, knowledge, and commitment could be recognised. Referencing participants by their real names and not by pseudonyms or codes was also seen as a means to confirm the veracity of the information given. For example, if a quote on environmental changes in the village comes from one of the village elders, it will be taken seriously due to their wisdom and long experience. Villagers and those who know well the village will recognise the names instantly and this will give a certain gravitas to the statements.

¹⁷ « **Principle of The Dynamic Interactive Cycle:** This principle recognises that research and related activities should not be initiated unless there is reasonable assurance that all stages can be completed from (a) preparation and evaluation, to (b) full implementation, to (c) evaluation, dissemination and return of results to the communities in comprehensible and locally appropriate forms, to (d) training and education as an integral part of the project, including practical application of results. Thus, all projects must be seen as cycles of continuous and on-going communication and interaction. » (International Society of Ethnobiology 2006: 7–8)

¹⁸ « **Principle of Active Participation:** This principle recognises the crucial importance of Indigenous peoples, traditional societies and local communities to actively participate in all phases of research and related activities from inception to completion, as well as in application of research results. » (International Society of Ethnobiology 2006: 6)

¹⁹ « **Principle of Remedial Action:** This principle recognises that every effort will be made to avoid any adverse consequences to Indigenous peoples, traditional societies, and local communities from research and related activities and outcomes. Notwithstanding the application of standards set out by this Code of Ethics, should any such adverse consequence occur, discussion will be had with the local peoples or community concerned to decide on what remedial action may be necessary to redress or mitigate adverse consequences. Any such remedial action may include restitution, where appropriate and agreed. » (International Society of Ethnobiology 2006: 8)

²⁰ « Educated prior informed consent must be established prior to undertaking any research activities. Such consent is ideally represented in writing and/or tape recording, uses language and format that are clearly understood by all parties to the research, and is developed with the persons or deliberating bodies identified as the most representative authorities from each potentially affected community. » (International Society of Ethnobiology 2006: 9)

²¹ « **Principle of Reciprocity, Mutual Benefit and Equitable Sharing:** This principle recognises that Indigenous peoples, traditional societies, and local communities are entitled to share in and benefit from tangible and intangible processes, results and outcomes that accrue directly or indirectly and over the shorter and longer term for ethnobiological research and related activities that involve their knowledge and resources. Mutual benefit and equitable sharing will occur in ways that are culturally appropriate and consistent with the wishes of the community involved. » (International Society of Ethnobiology 2006: 7)

Yet, for the readers with no direct connection to the village, I have added when relevant a brief presentation of the source, usually giving a generational, gender and professional reference (e.g., Adama Ndour, elder female peasant). However, on very few occasions, I have made the decision to anonymise the reference because I considered the information too delicate and time-specific. This happened especially when referring to young people and sensitive subjects such as an arranged marriage falling through. On these occasions I decided that the information gathered during private conversations would remain anonymised not to expose the individuals and their relatives, over time.

PAR, under the umbrella of IPE, meant that a considerable effort was made for the research to truly adapt to all co-researchers. Local male activists with extensive experience of working with female peasants “warned” me that “working with women is difficult”, “women don’t leave the house”, “women can’t read nor write”, “women are too jealous”, “women are too competitive and will aim to hinder each other”, “if there are women, there are problems”, “women are not interested in these (important/intellectual) things”, or “women’s goal is to please their husbands, and care for the children and household, this is beyond their interest”. Though generally well-meaning, I found these comments often offensive and oppressive, and I tried not to take them personally (as I am a woman too!).

When working with women and young people, time is an especially important consideration. One key reason why researchers may be less interested in working directly with women is because women require their husband’s permission to participate in initiatives, their primary responsibility is the household, young women move for marriage, and older women may move because their husband remarries or moves for work, because of divorce or potentially for them to work. These social factors have a strong impact on the continuity of the research and its local impact. The most active participants in this research ended up being older women with fewer responsibilities at home, somewhat more freedom from their husbands and with the knowledge and gravitas to be more assertive about what they expected from the research and how willing they were to contribute to it.

Women feel they miss on a lot of training and research opportunities because the location is far from the household and the schedules are not compatible with their child and elderly care responsibilities and household chores. When discussing PAR with female co-researchers, they were extremely keen to get involved and were pleased to see that the research would accommodate their family and farming priorities. This at times meant turning situations around: rather than deciding on what to do and then how and when to do it; activities were planned according to the time available and the location chosen and then its content was discussed and decided in a realistic way.

For example, when being trained on Participatory Video, Groupe Mbogayife chose to be trained in Ndiémame, for three days between 10am and 2pm. This would enable women to deal with the early morning chores of

feeding the family and the livestock and do some cleaning; training would free them by the 2pm prayer; and, because it was Ramadan at the time, it would enable them to cook in the afternoon in order to be ready for the breaking of fast at sunset. Although a total of twelve hours might have seemed insufficient to train the group of women on participatory video considering none of them had ever touched a camera before, their enthusiasm, motivation, focus and team work meant that training was successful and by the end of the three days participants had made three ground-breaking participatory films (Groupe Mbogayife 2017a, 2017b, Groupe Bismillaye 2017).

Equally, research adapted to my own circumstances and by getting pregnant and having a twelve-months maternity leave mid-PhD, the research remit had to be reconfigured. There was a twenty-three months gap between my second and third field experiences in Ndiémame and I became a woman with new priorities and concerns. Interestingly, becoming a mother and villagers meeting my husband and mother made me less alien to the peasants in Ndiémame who struggled before to understand how a thirty-two years old married woman was allowed by her husband to travel alone to another country instead of looking after him. As I was asked repeatedly when in Ndiémame: “Who is looking after your baby?”, “Who is cooking for your husband?” and “Who is washing your parents-in-law’s laundry?”. Questions I would not have been asked had I been a man...

One final consideration is the subject of payment. The history of development projects in the village meant that peasants expected some payment for their participation, either financial or in kind (e.g., a well or a mill) (Youssou Sarr 20/02/2017). From the beginning I explained that, although I was receiving a bursary from my university, the research project was unable to provide payment for participation. This was communicated clearly, and it was hoped that the PAR approach would encourage participants to get involved and shape the research according to their priorities too, so that it would be a relevant process for all. This preliminary condition was consistent throughout the whole research project apart from on three situations: (1) I contributed financially to Centre AFABA and/or the peasant family hosting me for accommodation, (2) I brought small presents (such as fabrics, simple jewellery, photo prints and seeds whose overall financial value was humble) that I personally gave to local acquaintances and friends, including research colleagues, and (3) at the end of the research, funding from my research centre was freed to organise a joint commemorative meal with the whole research team and their families and the most active participants received a cash present²² and a solar-powered torch.

Maybe because of my Catholic and relatively simple upbringing, money is not a subject I am comfortable with and I tried to make it as simple and clear as possible so that it would not be a recurring subject of conflict during the research. I often felt that a “no payment” policy contributed to reinforce the participatory side of

²² Approximately 10,000 F CFA (£13.5, €15) or 20,000 FCFA (£27, €30), in 2020.

PAR, in which all participants feel they can forge the process of research beyond the pure extraction of knowledge by external actors. During the long process of research, participants were always free to join as and when they wished to, although I am conscious that issues of power and perceived dependency are strong and deeply engrained and local actors might have felt, at times, they did not have the option not to participate out of politeness or due to local pressures. The non-payment of the research team potentially affected the agency of participants and might have led to a weaker participation of younger villagers more burdened by the need to provide financially for their families (young men) or by their household chores (young women). However, it also established a more horizontal relationship between local and external participants and, arguably, a more honest participation and exchange of knowledge.

The mix of methods used in this research was extensively discussed and evolved with the research.²³ Apart from external events such as regional seeds fairs, all the methods were chosen specifically for this research, all the activities were instigated by this research process and all results are original. The selection of methods favoured the compliance with the following four essential criteria:

- **Participatory:** methods that were participatory and engaging for intersectionalities (especially all ages and genders);
- **Free:** methods freely accessible, with shared copyright, no passwords, and that were easily reproducible and sharable in order to be given to the community for future reference (e.g., Google Maps);
- **Oral & Visual:** methods mainly based around orality, with as little reading and writing as possible;
- **Local:** methods using as much as possible local tools and proxies, and that could be done/used outdoors.

Figure 8 (p. 58) of the Resilient Food Systems Framework, adapted to the Ndiémame food system, shows the different methods used to inform each of the sections of the research. The subsections below explain each distinct and complementary method.

²³ A list of the activities undertaken during field experiences can be found in Appendix 10.3., p.279.

Resilient Food Systems Framework - Ndiémame -

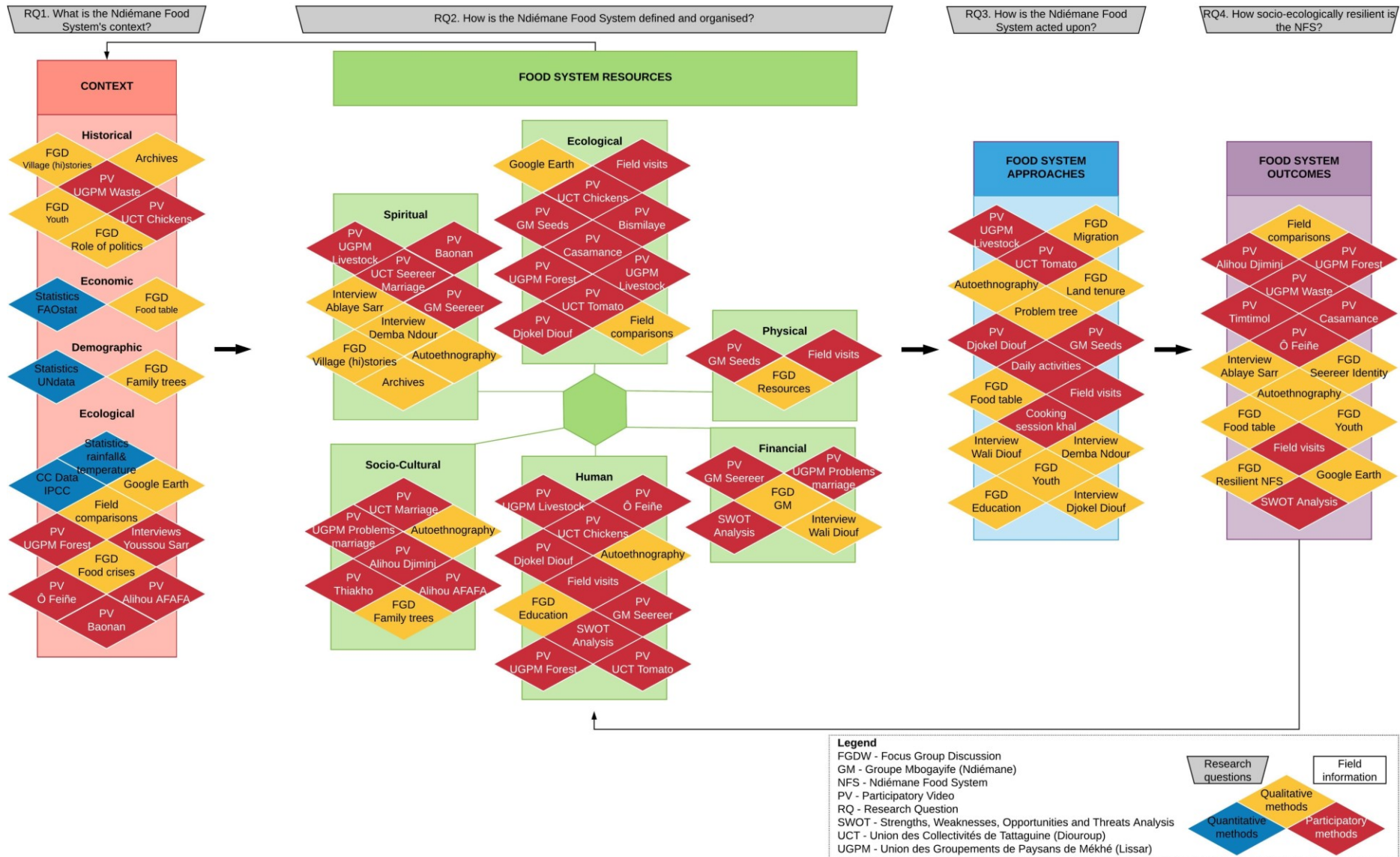


Figure 8. The Resilient Food Systems Framework presented with the methods used in the research on Ndiémame (freely adapted by the author from DFID 1999)

4.3.4. Participatory Video

From the first discussions on participatory research, the research team expressed an interest in working with a participatory video process. Participatory video is “a methodological approach in which a group of individuals create a film on an issue of interest or concern to them, deciding what is important to include and how they wish to be represented” (Gross-Camp and Rodriguez 2016: 1). The local team was looking for ways to communicate their knowledge using a process that is compatible with their skills and limitations. Participatory video offers the opportunity to communicate knowledge in an inherently visual and oral way, thus bypassing written communication. Videos are accessible means of communication; they do not require any prior training for the viewers and can be visualised in group thus contributing to engender discussions (Roberts and Lurch 2015).

The group’s motivation to use participatory video stemmed in part from their past experience during the making of the film *Reverdir le Sahel* (Regreening the Sahel) (Coste 2013). This film²⁴ was made by *Sahel People Service*, a French NGO, and was meant to portray one of the training workshops held at the village’s agroecology centre. The film director was only present for a few days at the beginning and end of the three-week long workshop and both training participants and centre coordinators feel that it does not represent honestly the people and the ethos of the centre and the initiative. Instead, the film overlooks the (environmentally damaging) colonial heritage in the region, focuses excessively on *Sahel People Service* and its national and international coordinators, and totally ignores issues that are close at heart to Ndiémane villagers such as safeguarding peasant seeds.

Local co-researchers were looking for a diametrically opposed experience. They wanted to tell a different story, *their* story. Peasants were interested in developing a tool that they could use and that was relevant to them as peasants and to other villagers. They were interested both in the participatory process of creating videos but also in its outcome, i.e., pedagogical videos that they could show to other villagers in the area and beyond to showcase their activities and thus promote knowledge-exchange and skill-sharing between peasants. These videos would be freely available online and projections would be organised in village squares, gathering women and men, young and old, to discuss issues relevant to them.

Ndiémane villagers feel, to a certain extent, research-fatigue and development project-fatigue as, though rare, projects tend to be exogenous and non-participatory and therefore poorly effective. Therefore, being able to make their own film where peasants share their own techniques, in their own fields (and not being told by (White) visitors what to do) had incommensurable power and appeal (Youssou Sarr 21/02/2017).

²⁴ This 50-minute-long film is available on DVD and can be purchased on the website of the French NGO *Terre & Humanisme*.

An important aspect with the use of Participatory Video (hereinafter PV) is the acquisition of new skills. The older members of the peasant group are conscious that their bodies are slowing down, and they do not have the same energy as they did when they were young. However, their knowledge is much vaster than their children's and they wish to facilitate the transmission of knowledge between generations. PV can serve as a tool to enable this transmission and its technological aspects can help attract younger generations eager to develop their information and communications technology (hereinafter ICT) skills.

With the end goal of creating pedagogical videos, all participants can get involved in the use of PV as a tool for reflection. Participants reflect on their priorities and message: What do we want to talk about? What knowledge do we consider relevant? What knowledge do we want to share with other villagers? How shall we use video to share this knowledge? Who is going to feature in the videos? How do we want to represent ourselves? These are but some of the questions that participants discuss and reflect on.

The PV training process used is demonstrated in Figure 9 (p. 62). Initially, I trained Youssou Sarr, coordinator of Centre AFABA and my co-facilitator and main translator in this research, in PV facilitation (step 0 in the figure). This training took one day, and it was done in French. Village training was done in Seereer (with live translation in French), co-facilitated by Youssou Sarr and I, in three days, and according to the following stages²⁵:

1. The first stage was to understand what PV is, what it enables, its limitations and to practise different filming techniques. Straight away participants were handling the camera and filming each other in turn to introduce themselves. Important issues such as informed consent were discussed and established.
2. Learning from the projection and discussion on stage one, this second stage introduced the tripod (to minimise shaken images), and interviews were recorded.
3. During the afternoon, participants could take the PV equipment with them and they were free to film whoever and wherever they wanted. This was an opportunity to practice and familiarise oneself with the equipment, in informal settings.
4. Stage four was the first occasion to share with the village the products of the day's training. It was an important opportunity for participants to show their work and progress and get wide recognition and appraisal for it. It was also an opportunity to get feedback from village elders, leaders, family, and friends. This was especially relevant considering that PV training was done with people who seldom have access to training and whose capacities are often socially undervalued or ignored.

²⁵ For a more detailed description of each step see Sarrouy Kay and Sarr (2017).

5. Day two started with the creation of a storyboard for the day's film. The theme of the film, its actors, dialogues and location were decided by each group independently.
6. Filming was done independently by the group or with support from PV facilitators. The goal was to make one short video (5 minutes maximum) per group, on a theme relevant to them.
7. Editing was a very time-consuming, skill-intensive, and technology-demanding stage. The group visualised all the rushes and decided together on the selection and order of the rushes that would be in the final video. Following these cues, the video was then co-edited by Youssou Sarr and me. Once the final video was ready, a group viewing was organised so that all participants got the chance to watch the video and give feedback. This was an opportunity to learn from the process as a team. If the group considered that more work needed to be done on the video, it might have been necessary to go back to step 6 (filming) or step 7 (co-editing) to create a video the group was happy to share more widely.
8. Public projections were only done if participants consented to show their work. Because these videos were usually aimed at being shown widely, the villagers had a say in the image that was being given of the village to outsiders. The villagers' feedback was considered and if it required changes or if the discussions spurred participants to rework their videos, there was the possibility to return to step 6 (filming) or step 7 (co-editing) to add to, or amend, the video.
9. Day three started with storyboarding, considering the key lessons from day two.
10. Filming again consisted of a short video.
11. Co-editing, whenever possible, was done with all involved participants.
12. A final public projection was organised, often showing again all the videos made during the training and even some rough footage, if deemed relevant (Figure 10). The final projection ended with an overall appreciation of the outcomes of the training by village elders and leaders and kind acknowledgements to all participants, organisers, and gatekeepers. Discussions were held regarding giving consent to share the videos beyond the village.
13. If consent was given to share the videos online, these were uploaded and shared publicly on YouTube. Even after posting the films online, consent discussions were held regularly with the research team to assess whether the group was still happy to share the content and to discuss feedback received.
14. If consent was granted, the videos were shown in peasant fairs and other relevant peasant-to-peasant events or in video projections organised whilst visiting other villages. These were also opportunities to watch participatory videos made by fellow peasants and to exchange feedback. Consent discussions were held regularly to assess the permission to continue showing the videos and to discuss further work.

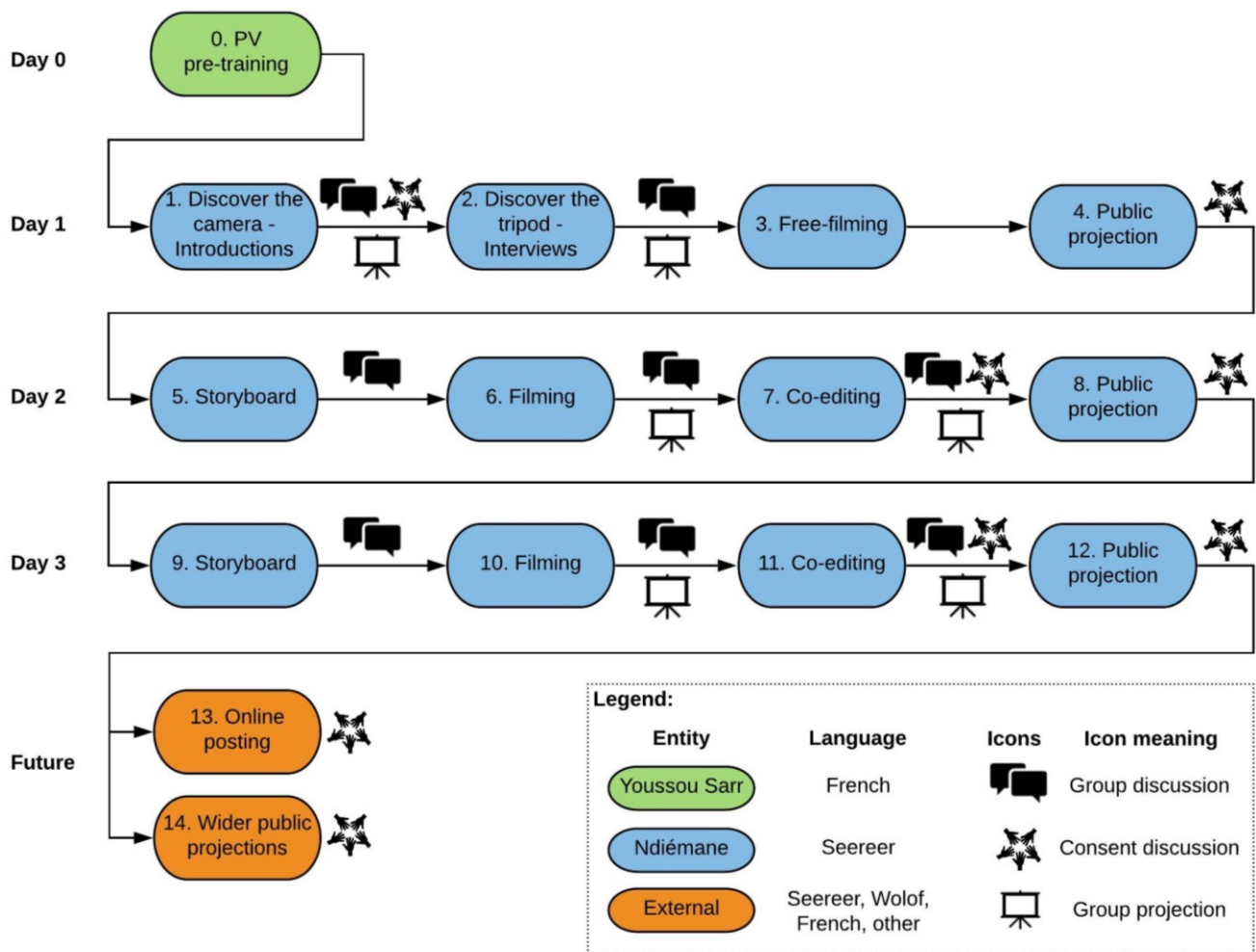


Figure 9. Participatory Video process (source: author, inspired by Roberts and Lunch (2015))



Figure 10. Public video projection in Ndiémane © Carla Sarrouy Kay 2020

The PV process is iterative and consists of learning-by-doing. Once the initial three-day training was done, participants felt enough confidence to be able to organise and manage a whole filming session like training

days two and three. Subsequent training or PV work aimed to perfect knowledge on filming techniques, specifically responding to challenges encountered during previous rounds of PV practice.

During my fieldwork experience, a total of eighteen PV training sessions, eight subsequent PV sessions and seventeen film projections were held. Training was done in Ndiémane (Figure 11), but also for three other peasant organisations in Senegal: *Union des Collectivités de Tattaguine* (Diouroup), *Union des Groupements de Paysans de Mékhé* (Mékhé) and *Timtimol* (Guédé Chantier) (Figure 12). This training was done under the umbrella of Swiss organisations Uniterre and the Genevese Federation of Cooperation. Although the training outside of Ndiémane was not directly linked to my doctoral research and surpassed its geographic boundary, working with other peasant groups for PV training was an excellent opportunity to share PV outcomes and to triangulate the information gathered in Ndiémane. The videos made outside of Ndiémane are referred to throughout this thesis to enrich the analysis of the Ndiémane food system.



Figure 11. Participatory Video group from Ndiémane in June 2017
© Carla Sarrouy Kay 2017



Figure 12. Participatory Video group from Guédé Chantier in July 2017 during filming
© Carla Sarrouy Kay 2017

The videos made by peasant groups revolve mainly around farming, but they also address issues such as traditional marriage practices, the role of women in households, faith and health. As mentioned by Lamine Biaye (17/02/2017), president of the ASPSP, the videos showed and created debates around “agricultural, cultural and cult practices”²⁶. A detailed list of all the videos made during this research can be found in Appendix 10.5. (p. 287).

One important consideration when making participatory videos is the language used to communicate. All the videos made in Ndiémane were in Seereer, the villagers’ native language. It was essential that participants communicated in their own language, even if it is a minority language in Senegal, because it is the language in which they express themselves more freely and naturally. The videos made by a Seereer group being in Seereer language is an important step for the appropriation of the videos and their message.

²⁶ « Pratiques culturelles, culturelles, et cultuelles. »

Each video had opening credits to present who made the video, and its title, date and location (e.g., Figure 13) and closing credits to give the names of the actors, directors, editors, and funders (e.g., Figure 14). These credits were written and a voice over was added to make sure that those who could not read were able to know who had made the video. This simple oral presentation added greatly to the sense of ownership and pride of the participatory video participants and was essential to fulfil the agreed Principle of Acknowledgement and Due Credit²⁷ (International Society of Ethnobiology 2006: 8).



Figure 13. Opening credits for the film *Rew Wa Mbagna Yo Thioossane No Serere* (*Women who master the Seereer tradition*) (Groupe Mbogayife 2017b) <https://youtu.be/TOoIUv9hyFQ>



Figure 14. Closing credits for the film *Rew Wa Mbagna Yo Thioossane No Serere* (*Women who master the Seereer tradition*) (Groupe Mbogayife 2017b) <https://youtu.be/TOoIUv9hyFQ>

The participants then discussed ways to share more widely the videos in other regions of the country, notably by adding dubbing or voice overs in Wolof, the most spoken language in Senegal. Senegalese indigenous languages are mainly oral and, when resorting to the written word, people generally choose to write in French. Finally, French and English subtitles were added so that the videos became accessible to international audiences and to enable me to analyse them in depth.

Translating the videos presented great challenges as it is a time-consuming and skill-intensive task. It also presented unique opportunities to explore in depth the videos, analysing not only the *telling* but also the extended language of the *showing*, expressed through people's emotions, expressions and gestures and their surrounding environment (Humphreys and Brézillon 2002, Ramella and Olmos 2015). Translations from Seereer to French were made with Youssou Sarr and from Fulah to French with Khadiah Pam, Sadio Diallo and Youssou Sarr. I translated the French subtitles into English. During future work, I plan to translate subtitles into Portuguese to connect with Lusophone peasant groups in Brazil, Angola and Mozambique whom, I

²⁷ « This principle recognises that Indigenous peoples, traditional societies and local communities must be acknowledged in accordance with their preference and given due credit in all agreed publications and other forms of dissemination for their tangible and intangible contributions to research activities. Co-authorship should be considered when appropriate. Acknowledgement and due credit to Indigenous peoples, traditional societies and local communities extend equally to secondary or downstream uses and applications and researchers will act in good faith to ensure the connections to original sources of knowledge and resources are maintained in the public record. » (International Society of Ethnobiology 2006: 8)

believe, are facing similar challenges and would identify to the issues communicated by the Senegalese peasant groups.

Technical aspects should not be overlooked with participatory video. The equipment used for this research was chosen to withstand high temperatures, high humidity, and very dusty/sandy environments.²⁸ All precautions were taken (and this was conveyed during training) to protect equipment from external hazards that could spoil it and leave the team without their work tools. Importantly, access to power was a constant concern when working in Ndiémame, a village with no power supply, thus equipment with high power storage was favoured. Still, cameras, projectors, speakers, and computers had to be charged regularly so access to the local secondary school with powerful solar panels was vital to be able to pursue the project.

Equally, being able to back up work was a challenge as it required access to hard-drives or memory cards (access to clouds was not possible from the village) and usually via the use of a computer. This was managed for the remit of this research but keeping copies of all the videos in some sort of storage has been an issue for the villagers as options are few, they break or get lost, or those who have access to these facilities (usually young men) often leave the village for long periods of time and do not necessarily see the value of these videos and end up deleting them to free space in their storage device.

PV presented a unique opportunity for participant observation considering that, as the training evolved, my presence became intentionally surplus to requirements. PV was an opportunity to observe relationships within the PV group and between the group and the larger community. “Although the end result of a participatory video is ultimately a film, the process itself is arguably as important in its opportunities for data collection” (Gross-Camp and Rodriguez 2016: 2, Roberts and Muñiz 2018). The process itself of training is present in the participatory videos such as in a video that ends with a joint prayer stating:

« We extend our arms, we all pray our good God to give us peace, prosperity, success and good health to all. To all those who participated in this training workshop, may God almighty guide our steps and grant us His grace. » (Groupe Mbogayife 2017b)

Or a video in which the final peasant song morphed into a thanksgiving song for the PV training and its facilitators (Figure 15). Although I was grateful for the shared recognition and the joyful celebration, I did not think that the song would feature the final video. Yet, during co-editing, the group of women insisted that it should appear as it was part of the holistic process of training and practicing that ultimately enabled the realisation of the participatory videos.

²⁸ A detailed list of the specific equipment used to do participatory video in Senegal is available in Appendix 10.6. (p. 293).



Figure 15. Screenshot and QR code from the participatory video Mbaye ak Sameu (Agriculture and Animal Rearing) (Groupe Deggo 2017a) <https://youtu.be/kcvhkoC-V4g>

In line with the autoethnographic approach and my participant observation, I made short videos showing, sharing and cementing distinct stages of my journey as a doctoral researcher. The series named “A day as a PhD student...” (Figure 16) (Sarrouy Kay 2017a, 2017b, 2017c, 2019a, 2019b, 2019c, 2019d) shows experiences in Senegal but also in the United Kingdom, revealing the intellectual, physical and emotional commitment to research in all its phases.



Figure 16. Screenshot and QR code for the video A day as a PhD student... giving Participatory Video training in Senegal (Sarrouy Kay 2017a) https://youtu.be/dvK04_7OHGo

In parallel to the PV training done with peasant organisations, three one-day workshops were held in 2017 and 2019 in Thiès to train peasant organisation coordinators in the creation of a website. The platform fr.wordpress.com was used because it is simple, free, fairly intuitive, reliable and aesthetically pleasing and I had been trained on it at the Centre for Agroecology, Water and Resilience in January 2017 by William Mortada (2020) from Technology for Social Purpose. This training was not offered to all the peasants and only to the peasant organisation coordinators because it required some literacy in French and basic knowledge of ICT tools, none or little of which most peasants have. It was hoped instead that peasant organisation coordinators used to some ICT tools and keen to learn website building would provide a platform to share the participatory videos made if consent was given.

In total, three peasant organisations were trained (ASPSP, Centre AFAFA and UGPM²⁹) and three websites created. By 2021, only Centre AFAFA³⁰ and UGPM's³¹ websites are live, but they are incomplete and not regularly updated, and ASPSP's³² website is still under construction.

Meanwhile, I created a website³³ to share my doctoral research and the Participatory Action research in Senegal and have been sharing the information gathered and for which I had consent and requests to share. I also created a YouTube channel³⁴ with a "Participatory Video | Vidéo Participative" playlist³⁵ which gathers all the participatory videos made and is their main point of reference.

For the remit of this thesis, and for each reference (e.g., Figure 16, p. 66), three ways to access online videos are provided:

1. For those reading the thesis on an electronic device with internet access, each reference contains a short link that can be clicked to access the YouTube video;
2. For those reading the thesis on paper but with access to a computer with internet access, each reference contains a short link to the YouTube video that will have to be written onto the computer's web browser to access the YouTube video;
3. For those reading the thesis on paper, with access to a smartphone with internet access, QR (Quick Response) codes of each film are provided so that the reader can scan the code and be directed to the YouTube video. QR code readers are either already integrated in smartphones or are applications that can easily be downloaded from app stores³⁶.

4.3.5. Qualitative Interviews

Interviews were organised with key informants, both women and men, young and old. The goal of these interviews was to gather specific information to complement the broader, group knowledge-exchange activities. As done by Othniel Yila and Resurreccion (2013), these interviews were informal and semi-structured and I conducted a total of twenty-four interviews during my four months and a half of fieldwork. Because of the participatory character of the research, the people interviewed were chosen by the research team and the subjects discussed in the interviews were jointly selected according to the research interests. The goal was to conduct a series of interviews with key informants within Groupe Mbogayife, Centre AFAFA

²⁹ Union des Groupements de Paysans de Mékhé (Union of the Peasant Groups of Mékhé)

³⁰ www.centreaafa.wordpress.com

³¹ www.fermeagroecologiquedelissar.wordpress.com

³² www.senegalaspsp.wordpress.com

³³ www.cskagroecology.wordpress.com

³⁴ <https://www.youtube.com/channel/UCQe1e-rVAvXNI2au-CsksSw/>

³⁵ <https://www.youtube.com/watch?v=ErlISV91BWo&list=PLauCqVmNAhhqBnITQJBTYzLrQGcPy0euL>

³⁶ For instructions on how to scan QR codes with Android and iOS see QR Code Generator (2020a, 2020b).

and the village of Ndiémane but also to interview people in the region and nationally. These external interviews helped gather information about different settings and thus gather extra information that helped characterise local food systems and assess the resilience of the Ndiémane Food System. Interviewees included the administrative team of Centre AFAFA, the managers of Groupe Mbogayife; influential and experienced peasants within the village of Ndiémane; people responsible for parallel activities such as seed saving, livestock management, and agroecological training.

The interviews lasted between one and three hours and they were not part of the participatory video process because it felt unnatural and cumbersome at the time.³⁷ I am conscious of what Olivier de Sardan (2003: 38) calls the recursive character of interviews, i.e., the fact that interviews are done not only to find “good answers”, but also that they must enable the formulation of new questions (or improve former questions). For this reason, a set of guiding questions was formulated but the interviewer did not hesitate to give freedom to interviewees to expand their answers to related subjects or anecdotes they considered relevant to the discussion. The idea was to jointly develop the art of questions that contribute to dialogue (Salas and Tillmann 2009).

The theoretical framework of this research and the work developed within the Ndiémane research team meant that the interviews conducted can be defined as ethnographic interviewing:

« A form of interviewing conducted in the context of a relationship with interviewees with whom the researcher has, through an ongoing presence, established relations of rapport and respect sufficient for a genuine “meeting of minds” and that enable a mutual exploration of the meanings the interviewee applies to their social world (Heyl, 2001). » (Fielding 2006: 99)

4.3.6. Focus Group Discussions

Focus Group Discussions (hereinafter FGDs) were organised to explore collectively the meaning of food system resilience in the context of Ndiémane. A total of twenty-four FGDs were held over the four months and a half of field experience. Again, the idea with these FGDs was to avoid the narrow analysis of farmer climate change perception and adaptation, but rather to adopt a holistic approach to disentangle the interconnected conditions of Ndiémane’s food system. The very vast majority of FGDs were held in Seereer or Wolof with French translations and they were precious opportunities for strengthening connection and trust.

FGDs were organised with the Ndiémane Research Team and with other selected guests whose opinion was deemed relevant for the research process and outcomes. FGDs were organised by gender, activity, age, together and separately, as Dieye and Roy (2012) did in their research. Stratifying groups aims to make

³⁷ Notable exceptions are the interviews conducted and filmed in Diouf (2020e, 2020d) and Sarrouy Kay (2019e, 2019g).

participants more comfortable to speak freely, creating a safe space amongst people in similar conditions, thus diminishing fear of judgment.

The vast majority of the FGDs were held in the village, in peasant concessions. As with the interviews, the subject of the conversations evolved organically and oftentimes participants felt free to (seemingly) go off subject and tell a story to then return to the theme discussed and draw a link with the story shared. Equally, participants felt free to ask each other questions (including to me) to better know and understand one another, our backgrounds, interests and life stories (Apentiik and Parpart 2006). FGD participants were very open to different perspectives. For example, when the group shared stories about Ndiémane, members took turns telling their version of the story and there was a wide acceptance and approval of different stories, as if each version opened a new door, a new possibility, all equally feasible and probable.

4.3.6.1. Visualisation in Participatory Programmes

Visualisation in Participatory Programmes (hereinafter VIPP) was used in FGDs to overcome gender, age, language, literacy, status, and power barriers. VIPP is a way to creatively conduct group events placing participants at the centre of the decision-making process to enable empowering and sustainable changes (Salas and Tillmann 2009). Working in groups and communicating through visualisations, participants get the chance to reflect on experiences, share knowledge, and listen to different perspectives. This “power equalising research” tool (Pimbert et al. 2017) creates a safe environment for the acknowledgement and respect of different views, communicated in a transparent and nonviolent way, for the empowerment and recognition of each and every participant. This process supports participants to share knowledge and experiences, learn from others, and ultimately speak as a group to the wider community.

Contrasting with the ease participants learned and used PV (as natural directors, actors, and storytellers), every time I suggested drawing, the team would go quiet and still. Villagers were extremely reluctant to draw on sand or to use pen and paper because their lack of formal education made them feel uncomfortable and out of depth. Yet props such as photos, videos, printed maps or local objects were excellent to start conversations and oral storytelling. On rare occasions, if drawing was deemed essential by participants, they would ask me to draw according to their instructions, almost doing a reversed “handing over the pen” (Thomas 2002) and giving me permission to draw what they wanted to express.

The VIPP methodology was chosen because it presented two major advantages:

- *For participants:* Participants (and, especially, women) might have in general received little formal education and they might often be marginalised. Thanks to its open and safe space philosophy, VIPP helped create environments where participants were able to communicate freely using methods they were most comfortable with, beyond the written word.

- *For the researcher:* Participants spoke in Seereer and I was not able to communicate in this language. Therefore, I was faced with the challenge of understanding what was being communicated and here VIPP presented the advantage of favouring non-written communication. As a researcher, I had a better chance of understanding what was being communicated by looking at the sand drawings made during the VIPP sessions, for example.

VIPP gives importance to orality and to creative and playful means of communication that break the barriers of literacy and enable the involvement of bodies in the research and reflection process. Figure 17 presents three sets of tools commonly used in VIPP sessions, divided into Space, Time, and People’s Wisdom. These tools can easily be combined, and it is advised to use at least three different tools to triangulate the information and consolidate the reflection and dialogue.

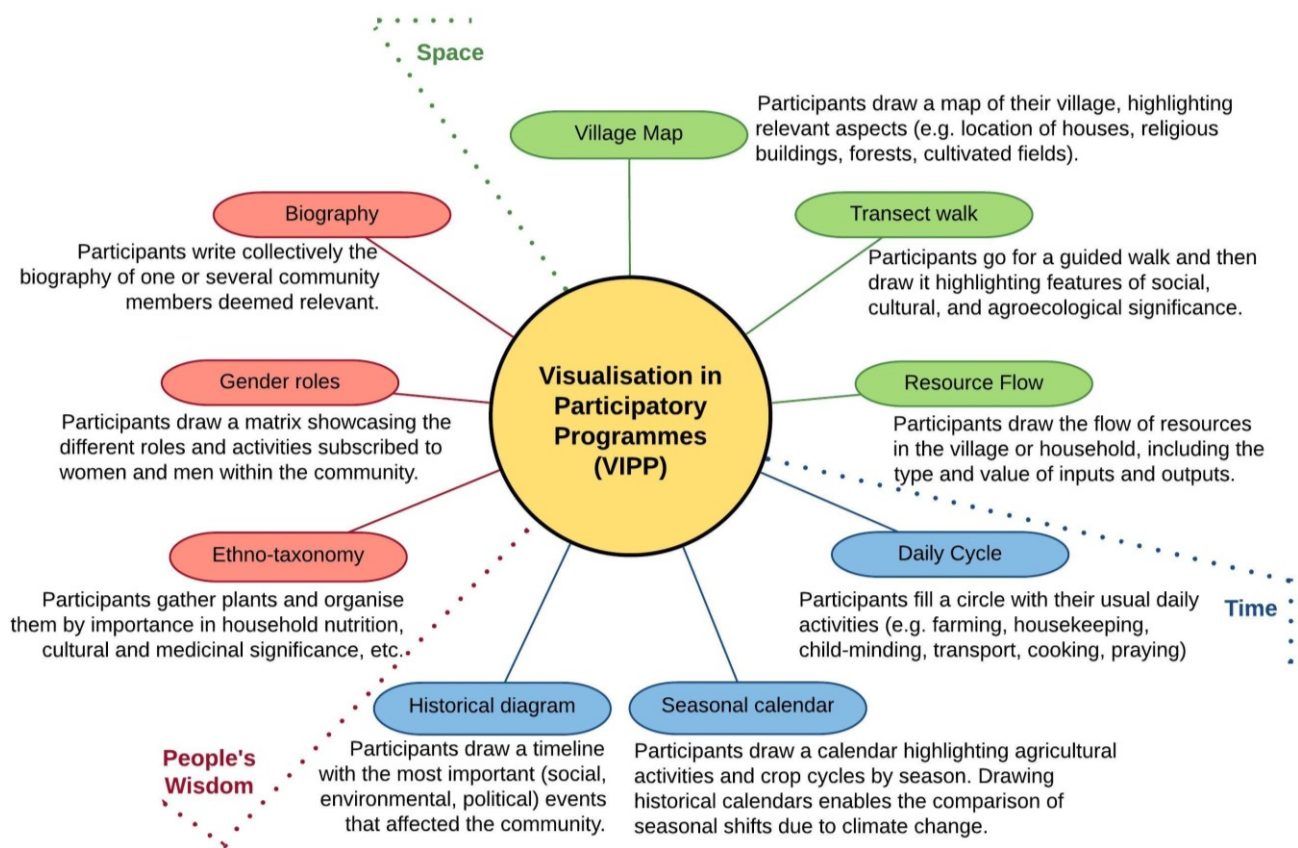


Figure 17. Example of tools used in Visualisation in Participatory Programmes, organised into the categories of Space, Time, and People’s Wisdom (adapted from McKee (1993))

Both Scoones (1998) and DFID (1999) encourage the use of visual participatory methods such as described above when adopting the SLF. Similar techniques have been used in the scientific literature (Djoudi and Brockhaus 2011, Nasuti et al. 2013, Pimbert 1995, Pimbert and Gujja 1997). For example, Bee (2014) held Gender Resource Mapping activities to assess gendered climate change adaptation in Mexico; Ferreira et al. (2011) organised activity, seasonal and crop calendars, field diaries and natural resource mapping to assess

agroecosystem sustainability in Brazil; and Brockhaus et al. (2013) used fodder calendars, resource maps, and historical axis to assess environmental change in Mali.

In the context of Ndiémane, it was relevant to do a SWOT analysis³⁸ of the Ndiémane Food System. To better understand the structure and seasonal organisation of the village, it was relevant to do participatory village and field mapping. These options and the ones shown in Figure 17 were discussed with the research team and a relevant and manageable number of tools were selected and put into practice.

These methods are heavily used in FPE research because they help overcome the often perceived “natural” link of women to the environment to reveal their *contextual* link to the environment (Leach 2007). Researchers adopt hybrid, complementary methods to confront perceptions and listen to excluded voices. For example, Rocheleau (1995) compared satellite imagery which often erase or obscure the role of women – which she called Mapping as Usual (MAU) – with counter-maps, bottom-up imagery which was done by women and revealed an alternative reality nonetheless relevant. Nightingale (2003) complemented aerial photo interpretation with the analysis of ecological oral histories, thus unfolding new insights and perspectives on landscape evolution. Nightingale’s (2011: 154–155) objective, by using an FPE approach and hybrid methods, is to:

« [...] show how space and ecologies are entrenched in power dynamics that are multiple and non-linear. » [...] « How bodies move in relation to physical objects such as the forest, the water tap, the hearth, food containers, religious icons, and substances bodies consume is of vital importance to the production of subjectivities and ecologies. »

In Ndiémane, the use of Google Earth (2020) to access satellite imagery enabled a historical analysis of selected fields, the village, and the wider region from 1972 to 2020. VIPP methods were not used in a cumulative way with the succession of daily cycles done by a large number of participants, for example. Instead few examples were done by gender, marital status, age, and season. These kickstarted group discussions with fellow participants engaging with the answers, challenging them, and explaining in which way they concurred or differed.

4.3.6.2. Transect Walks

As part of the VIPP approach and especially direct observation, regular transect walks were organised (or improvised) to different sites, especially fields (see Figure 17, p. 70). The goal of these visits was to observe first-hand how farms developed over the seasons, assessing the peasants’ knowledge-sharing networks and their social and agricultural structures and challenges in different geoclimatic conditions. Montefrio and Sonnenfeld (2013) used a similar approach when organising visits to observe indigenous agricultural practices,

³⁸ Framework to assess the strengths and weaknesses of a system and the opportunities and threats it faces.

the biophysical attributes of production sites, and the socio-economic conditions of communities in the Philippines.

Visits were sometimes done on a one-to-one basis or they could be done as a group transect walk (Salas and Tillmann 2009, Thomas 2002, Brandt et al. 2014). As mentioned earlier, some site visits were filmed using PV; they were also an opportunity to conduct interviews with different people involved in the farms. The visits were also sources of inspiration, contributing to create stronger knowledge-sharing networks between peasants and challenging them to try new techniques and approaches. A total of twenty field visits were held during my fieldwork experience.

Research site visits were complemented by informal walks around the village. During my field experience, I walked (usually alone) every single day for at least one hour at dawn before the heat of the new day strikes. These were restorative walks that were essential for my mental and physical health as they presented (1) an opportunity to be alone (considering I shared a bedroom with two to six other people and I spent all my days constantly surrounded by multiple host family members and research colleagues), and therefore, (2) an opportunity for reflection, for taking stock of the previous day and night and to think about the day ahead.

In parallel, these walks presented two added advantages:

1. They made me known and familiar in the village as people saw me wandering around every morning and would happily engage in conversation and invite me over to their houses or fields;
2. They were excellent opportunities to get to know the village and its surrounding fields, throughout the seasons. This meant that over time I got to know very well all the paths and closer fields and I observed techniques and rotations then mentioned in interviews and FGDs or demonstrated in site visits.

4.3.6.3. Family Tree

A survey was done to gather quantitative information about the Ndiémane neighbourhood where most of the work was based (i.e., Ndiémane Malaoubé). This survey was not a quick initial assessment of the case study as in Boissière et al. (2013) but rather a complementary source of information on the case study; it was done during fieldwork and was informed by participatory work. This survey – done during a FGD with young people and later checked by elders – enabled the team to list all the neighbourhood inhabitants and assess the composition and distribution of households (including co-wives and respective children). Information on age, gender, marital status and affiliation exposed how closely knit the community is, the importance of patrilocal marriage even to this day and the extent to which family members are migrating mainly for economic reasons. Participants did not give consent to share widely the family trees that resulted from the survey to protect the people mentioned in them.

4.3.7. Participant Observation

Observation was a key component of the participatory research method. Field experiences consisted of twenty-one weeks, divided into five trips to Senegal, of durations ranging from two to twelve weeks each time. I lived in the village of Ndiémane or in the nearby city of Mbour, I participated in the group's activities and shared the daily life and seasonal rhythms of the village. I also did occasional trips to other areas of the country, often with members of the Ndiémane research team. When living in Ndiémane, I was expected to contribute to some of the workload by supporting the team during certain activities such as food preparation. Furthermore, to better understand the organisation of the village, the impact of different social characteristics such as gender, age, and ethnicity, I participated in daily activities such as cooking and village discussions.

Being a woman in a mainly patriarchal, Muslim, polygamic society meant at times that I was not able to participate in certain male-only activities, yet it also enabled me to get more easily involved in other often marginalised but equally instructive activities like housekeeping and childminding.

Direct observation meant that I observed and experienced first-hand behaviours as they occurred, without the intermediary of documents or testimonies. Observing behaviours was relevant for the research because they "reveal systems of social relations and their cultural and ideological founding principles" (Van Campenhoudt and Quivy 2011: 174), which are often under- or unspoken because they are seen as normal or insignificant.

Sharing daily life helped build rapport and trust between the research team members (Apentiik and Parpart 2006). It also enabled the reversal of roles which greatly contributed to a feeling of co-learning and co-benefit. Whilst during the day I might have been teaching women how to hold a camera and make a video, the same evening women would teach me how to hold a pestle and grind millet. As Fatou Thiaw (15/06/2019), the president of Groupe Mbogayife and my host, put it: "You are a little child, you learn and I help you."

Direct participation in the life of the village affected me deeply, because of the questions it raised regarding others but also regarding my own life experience and vision. From the onset of the research, I reflected on my positionality and it was decided that I would add an autoethnography component to the ethnographic participant observation, as described in the subsection below.

4.3.8. Autoethnography

For this ethnographic participant observation, I created a routine of keeping a diary with notes and drawings of my observations, with detailed activities and interactions. Occasionally, I asked to observe a person for a full day or a specific task to get a full and detailed account of the steps involved in the activities undertaken. This participant observation was taken very seriously and was done in a "systematic, meticulous, reflexive and

interpretative way” (Olivier de Sardan 2003: 10). As done by Bhattarai et al. (2015), the direct observations were then triangulated with the secondary data and the participatory activities to allow the emergence of patterns and difference in the analysis.

Autoethnography (also known as auto-biographical ethnography or critical reflexivity), is a reflexive approach to analyse my own subjectivity and life experiences (Phillips and Johns 2012, Reed-Danahay 2006). It is often contrasted to objective or positivist methods that advocate the separation between research subject and object, requiring a stance of “distance from the self, from those who are being studied and from the social contexts of the research situation” (Reed-Danahay 2006: 16). Yet, I defend this distance is not achievable nor desirable. It is preferable to be conscious of one’s unavoidable preconceptions about our research subject and our influence on our research, its participants, our fieldwork, than to pretend to conduct “objective research solely based on facts”.

All research is embedded in issues of power and influence from the selection of a subject and the sources of funding, to language and location preferences and the selection and decision-making capacity of participants. Autoethnography (and PAR) create a platform for reflection on these issues of power and to reflect on “complex and nuanced relationships between researcher and researched, dominant and subordinate, in the context of individual experience and socio-cultural structures of beliefs and control” (Reed-Danahay 2006: 16). I believe that this process did not hinder the scientific quality of the research, on the contrary, it added depth, truth, and validity to the research.

Several researchers take the idea of self-reflexivity further and advocate for an “emotional sociology” that aims to surpass the boundaries between the self of the researcher and that of the researched (Ellis and Flaherty 1992, Ellis 1991, Bochner and Ellis 2002). Autoethnography enabled me to be conscious of and work on my self-awareness in the intercultural dialogue promoted in this research. I engaged and directly participated in activities with the local populations during my field experience, but I was also constantly reflecting on my positioning in these interactions.

Doing participatory research is an exposure to others but it is also being exposed to others. As Farhana Sultana (2007: 380) puts it, it is “like being part of a larger family where people [feel] free to prod, pry, and pontificate.” When I asked questions about farming in the village, it was only fair to accept to be questioned too. And when one young rebellious peasant asked me whether my parents, grandparents or great-grandparents were ever peasants and I answer negatively to all these questions, I had to accept his look of disapproval implying I would never understand his cause.

4.3.9. Positionality

I am a white, female, highly formally educated, Catholic practicing spiritual³⁹, Western European researcher working with black, mainly female, illiterate, highly knowledgeable, mainly Muslim, West African peasants. Although these may seem contrasting aspects – and to some extent some are –, there is a strong background of interests, education and culture that have led me to dedicate my work to this area of the world and its people.

Positionality is understood here as “the stance or positioning of the researcher in relation to the social and political context of the study—the community, the organization or the participant group” (Rowe 2014: 627). Because the position I had as a researcher impacted every phase of the research process, it was essential to start this reflection on positionality at the inception of the research and to make it iterative.

Positionalities are multiple and can be conflicting. Believing that this exercise alone would enable me to become an insider in the community I worked with would have been an illusion. Yet, a sense of complementary skills and mutual respect created opportunities for the research group to openly talk, listen and learn from each other. Although we did not share the same identity, the research team bonded over strong affinities (Rocheleau 1995).

Reflecting on my positionality simply at the final analysis stage of this research would have left multiple positivist methodologies unchallenged (Sultana 2007). Moreover, reflecting on my positionality ought to be a reflection beyond me as an individual researcher, instead exploring the wider economic, socio-political and institutional processes and structures that provide the background for this research and the relationships developed during it (Routledge and Driscoll Derickson 2015). Reflexivity aimed to expose, untangle, and address power, privilege, and change; it made me reflect on the preconceptions held by others and by me.

One key factor that affected my positionality and that impacted on the research undertaken was the simple fact I do not speak the local language in which the Action Research Team of Ndiémame commonly communicate, i.e., Seereer. Despite sharing the same roof and the same food as my colleagues, I was unable to communicate directly (beyond greetings and signs of respect) with the peasants I was working with. I was unable to learn the language during my field experiences and therefore was missing an important – some would say, essential – window into the local culture and cosmovisions. Although this was at first frustrating for me, I came to realise over the length of the research that it was a major source of empowerment for the people I was working with.

³⁹ Although I do not believe in nor abide by any specific religion, I consider myself deeply spiritual and cannot deny the influence of my Catholic upbringing in my personality today. My Catholic practicing comes from my marriage and my husband’s motivation to practice Catholicism and raise our family as Catholic, a commitment I have agreed to and am happy to support whilst acknowledging and respecting other religions (and none).

Participants truly felt they were in control of the quantity and quality of the information communicated; no data was extracted without consent. The act of translating to French was itself a preliminary consent. A two-stage approach meant that local peasants could debate issues amongst themselves in Seereer and then open them to me and whichever non-Seereer speakers were present, for a wider debate in Seereer with French translations.

Women in Ndiémane do not tend to speak French or even Wolof, so for them language – or the lack of it – is often a source of low self-esteem, struggle and disempowerment, as it excludes them from debates with other cultures or higher political spheres (Ferreira et al. 2009). Yet, here, the situation was reversed and their mastering of Seereer gave them power and control over the research.

I could have worked in French with male peasants in Ndiémane, but this would have been a totally different project, academically less innovative and with different outcomes. By choosing to work with mainly women and with participants expressing themselves in their mother tongue meant I did not compromise on the source of information. The process and the outcomes had instead to adapt to the motivation to work with commonly marginalised peasants.

4.4. Data Collection and Analysis

4.4.1. Sampling and Representations

The sampling methods used in this research were varied to adapt to the different research methods employed. Most of the research used purposive sampling because it addressed directly the whole population of a specific group: the members of Groupe Mbogayife (Van Campenhoudt and Quivy 2011). The activities such as participatory video-making and FGDs were open to all members of the peasant group, though we were conscious that not all would engage in the same way in these activities. It was important to keep the invitation open to all members and it was paramount, as facilitators, to create a welcoming and inclusive participatory process ensuring that all views were heard and considered.

The goal with this purposive sampling was to avoid a top-down approach that privileges “top of the hierarchy” position holders, as done in many research projects in this area such as Paul et al.’s (2016) work with only community representatives or regional government officers or Yu et al.’s (2014) work with heads of households. Othniel Yila and Resurreccion (2013) obtained from village leaders a list of household heads that would serve as key informants for their research. This approach however raises questions about patriarchy, power, and gender-blindness. I aimed to work with social groups that were often marginalised (such as women and young people) and therefore these might not have been the top suggestions of village leaders. Giving the sampling responsibility solely to village leaders would have contradicted my IPE framework and participatory approach. Women and young people are the core members of Groupe Mbogayife and it was essential to involve them centre-stage in this research so that they could share their views and understandings of the resilience-building process underway in Ndiémane.

The interviews and site visits were done with targeted invitees, i.e., key informants selected jointly by the research team, considered to hold knowledge and experience relevant for the research. These key informants could be selected internally (as members of Groupe Mbogayife) or externally (i.e., fellow villagers and peasants). Part of the participatory and iterative process meant that there was some snowballing sampling, with a person interviewed or a field visited, leading to another.

Finally, village restitutions (in Ndiémane and beyond) were open to all villagers and potential visitors. This open participation approach meant that I may not have known every person attending these restitution meetings but here the goal was to assess the overall receptivity to the material shown and to take notes on the discussions being held.

4.4.2. Complementary fieldwork skills within the Participatory Research Team

As with the previous sections, the implementation of the research varied according to the different research methods used. The core team of facilitators was composed of two people: Youssou Sarr and me. I trained Youssou on the methods he was less familiar with (or unfamiliar with) and we subsequently co-facilitated most meetings, events, and activities. A second step in the process, was the organisation of events and activities that were facilitated by Groupe Mbogayife members, such as participatory video sessions and village restitutions.

This approach had a dual purpose: firstly, we acknowledged that nobody was an expert on everything and we aimed here to complement each other's skills so that "the whole is bigger than the sum of its parts"; and secondly, this shared implementation gave me the opportunity at times to take a step back and fulfil my observational role. I trusted that activities would flow naturally and that their iterative process meant that gradually participants would feel more confident in the methods used and feel fully empowered to use them and lead them. As with Rogé et al.'s (2014) participatory research, the goal here was to empower peasants to conduct their own analysis, beyond the scope of this specific research project.

Table 2 (p. 79) gives further information about the knowledge and skill base present in the research team (who has certain skills and knowledge), how this was shared (who gave training and developed skills and knowledge) and who put the skills into practice. Regarding the research methods, the main flow of skills went from me (C) to initially Youssou Sarr (Y) and then Groupe Mbogayife (G), with the idea that ultimately all the participatory approaches required skills that all three of these entities had and could use.

Certain skills were already part of the skillset of the peasant group or Youssou but were not conceived of under a social sciences viewpoint: for example, Senegalese villagers are used to group discussions and I cannot claim to have introduced them to this technique to discuss and solve village matters but my training consisted of adapting this tool to the specific framework of this research and thus use it as a specific, targeted data collection tool in the field.

Regarding the knowledge base, the main flow of information went from Groupe Mbogayife and Youssou to me. The exchange of knowledge was done in two overlapping flows. I acquired knowledge that I used for the elaboration of this thesis, with the aim of answering the research questions. Other peasants – from Groupe Mbogayife primarily but also from other groups – acquired knowledge that was directly relevant to reflect on the resilience of their food systems. Although peasants had a vast array of skills relevant to food system resilience, these were not stated in Table 2 because the goal of this research was to gather knowledge to understand how practices influence food system resilience in Ndiémame and not for me to acquire skills on composting or cooking, for example.

Table 2. Knowledge and skill transfer within the research project team

Category	Skill	Skilled			Giving training			Receiving training			Using skill		
		G	Y	C	G	Y	C	G	Y	C	G	Y	C
Research Methods	Participant observation			C									C
	Archival Research			C									C
	Participatory Video			C			C	G	Y		G	Y	C
	Website building			C			C		Y			Y	C
	Interviews	(G)	(Y)	C							G	Y	C
	FGD techniques	(G)	Y	C							G	Y	C
	VIPP			C			C	(G)	(Y)		G	Y	C
	Site visits	G	Y	C							G	Y	C

Category	Knowledge	Known-geable			Teaching			Learning		
		G	Y	C	G	Y	C	G	Y	C
Languages	Seereer	G	Y		G	Y				C
	Wolof		Y							
	French		Y	C						
Local knowledge	Agricultural practices	G	(Y)		G	(Y)		(G)	(Y)	C
	Historical knowledge	G	(Y)		G	(Y)		(G)	(Y)	C
	Climate knowledge	G	(Y)		G	(Y)		(G)	(Y)	C
	Social organisation	G	(Y)		G	(Y)		(G)	(Y)	C
	Culture and traditions	G	(Y)		G	(Y)		(G)	(Y)	C

Legend:

G – Groupe Mbogayife

Y – Youssou Sarr

C – Carla Sarrouy Kay

() – Entity already has some prior knowledge or skill but it will be reinforced or entity is familiar with the approach but not as part of research.

Certain activities were done individually such as taking notes on my participatory observations. This autoethnographic work was meticulous and constituted an important and complementary part of the research. Other activities were also individual in character such as archival research, which was done by me, mainly in the different libraries and research institutes deemed relevant. This individual research and reflection fed part of the participatory work such as the use in interviews of questions that arose from observation or the use of archival images to start conversations during FGDs.

All the data collected helped fill the RSFS, and variables arose from the different methods used. Based on peasant discussions and expressions of their cosmovisions, variables stood out because of the number of occurrences and the relevance given to them by peasants. Variables were then discussed and reviewed iteratively by the Ndiémame Research Team to assess their relevance for this specific research and their differentiated impact on differing intersectionalities. The variables selected by the research team were then

organised in the RFSF⁴⁰, which was described and explained to all the members and iteratively reassessed and reorganised by the team to ensure that it continually represented the evolution of the reflection.

The opinion of actors external to the Ndiémane Research Team was sought for and valued. The opinions manifested by village elders, for example, during village restitutions was taken into consideration, however, the orientation of the research was ultimately decided by the research team according to its own goals (of which this thesis is a major component).

4.4.3. Data Analysis

The data collected using mixed methods consisted of different types and formats (Table 3). All participatory videos were translated and thus transcripts in English and French were used for the analysis. All the written, audio and audio-visual qualitative data gathered was analysed using the NVivo 12 Plus qualitative data analysis computer software. This software also enabled the addition of the literature used in the research (extracted from Mendeley in .ris format to include the PDF documents and my notes).

Table 3. Type of data gathered with different research methods (source: author)

Method	Type:	Sound	Photos	Videos	Notes	Diagrams & Drawings
	Format:	.mp3	.jpeg	.mp4	.docx, .pdf	.jpeg, .xcel
Participant observation		X	X	X	X	X
Historical Archives			X	X	X	
Participatory Video		X	X	X	X	
Interviews		X	X	X	X	
FGD		X	X	X	X	X
Household Survey					X	X
Site Visits		X	X	X	X	X

This tool enabled me to gather complex and extensive information to help manage the analytical and theorising processes (Gibbs 2014). Coding was used to select relevant information and identify categories of “manageable and meaningful analytical units” (Bong (2002: 31) in Gibbs (2014: 9)).

I started by reading/listening/watching carefully all the data and conducting open coding, i.e., interpreting the information, and developing new codes inductively. As coding and the research evolved, I then conducted coding and data collection iteratively. The constant method of comparing data with data, data with code and code with code meant that similarities and differences were emerging progressively, thus creating opportunities to sort and merge codes into categories and highlighting gaps to further explore. The abductive

⁴⁰ The full Resilient Food Systems Framework for Ndiémane showing all the variables and their ranking by intersectionality can be found in Figure 164, p. 221.

approach described here led to theoretical coding, i.e., the tentative development of more focused, selective and conceptual codes, both assessing their connection between each other, with initial codes, and with data collected so far and data gaps to address (Thornberg and Charmaz 2013).

The comparative method was conducted on NVivo, but also on paper through the construction of graphs and diagrams to help process and organise ideas, and also through regular, iterative discussions with the research team to assess how the wider research group constructed the emerging research outcomes (member checking). These discussions, often held in interviews or FGDs, were in turn the starting point for further data exploration, clarifying *faux pas* and generating new initiatives to fill important gaps or missing links.

This process was long in its iteration and constant re-evaluation, yet it served three paramount goals: (1) it was an opportunity for self-reflexivity, challenging my positionality, the biases and limits of my worldviews and how these inevitably impact the research and its analysis; (2) it strived to capture the “poly-vocality” of the field (Winter 2014: 13), the different voices and knowledges revealed by the participatory intersectional research; and (3) it contributed to a sense of empowerment through participation as all research team members felt their contribution mattered and directed the research throughout its whole lifecycle and not simply at initial data collection points.

All written content underwent discourse analysis, focusing on the action orientation of talk (Willig 2014), paying attention to the language used, the message (values, beliefs, assumptions) communicated, and how language relates to the wider social, political and historical context.

Video analysis – complemented by the discourse analysis of its transcripts and field notes – consisted of the three steps of co-deliberation as defined by Mikos (2014: 2): (1) analysing the intentions of those making the participatory videos; (2) analysing the structure of the video and the functions of each component in relation to the whole video; and (3) analysing the intended message and impact on the audience.


Interviews, FGDs and obviously participatory videos, were all understood as “sites of performativity” in which participants projected a certain image, influenced by ideas of self and of their context (Brannen and Pattman (2005) in Barbour (2014: 9)).

Finally, data collection ended once theoretical saturation was reached; as explained by Glaser ((2001: 191) in Thornberg and Charmaz (Thornberg and Charmaz 2013)) once the research team considered that new data did not bring new theoretical insights as the research had satisfactory “conceptual density” and “theoretical completeness”.

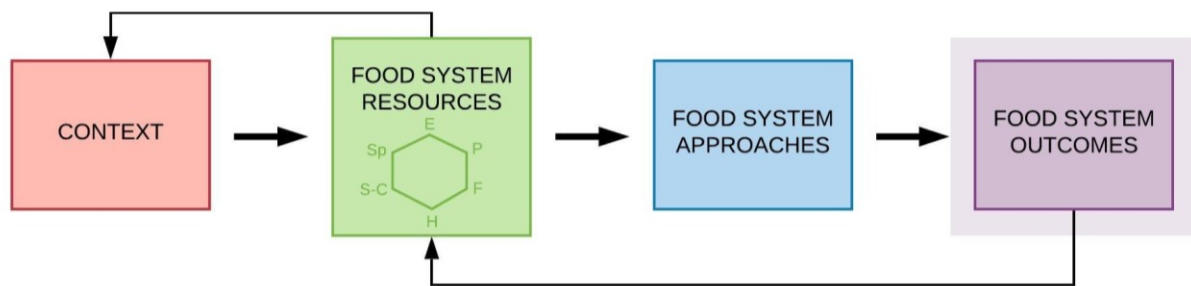
Figure 18 (p. 83) gives an example of coding on an excerpt of a participatory video (Groupe Mboga’Yiif 2017a). The English subtitles are analysed (along with the images and sound) initially under open coding, identifying specific codes or keywords that then helped determine categories for theoretical coding at the next level of

analysis. Theoretical coding is more abstract and conceptual and helped to flesh out the Resilient Food Systems Framework used as the structure of this thesis. In the example provided by Figure 18, the three theoretical codes contributed to understand the section dedicated to Ndiémame's food system outcomes (purple box of the RFSF).

This process though, in its iteration, meant that theoretical codes generated new insights during the analysis I made, and then new discussions during reporting and checking with the research team. The procedure questioned, challenged, and sometimes restructured the original theoretical framework. It also led to the creation of new analytical diagrams that explored in more detail sections of the RFSF as, for example, to better account for intersectional nuances (Figure 169, p. 235) or to present the causes and consequences of a specific issue as shown as a problem tree in Figure 148, p. 184.

Screenshot	Timespan	Subtitles	Open Coding	Theoretical Coding
	00:02:11 – 00:02:14	Farming local chickens is very important regarding human health	Enabling healthy eating	Healthy diet
	00:02:14 – 00:02:15	because you eat well and healthily.		
	00:02:15 – 00:02:20	The product of the sale helps you to solve problems in the household. If your husband has some difficulties,	Solving household financial problems discretely	Intra-household dynamics
	00:02:20 – 00:02:24	you can sell chickens and buy food for your family, without anyone knowing about it.		
	00:02:24 – 00:02:28	Farming local chickens is very important for our health because, since we've started	Buying school supplies with profit Buying shoes with profit Buying rice with profit	Women's financial independence
	00:02:28 – 00:02:33	until now, it has only had advantages.		
	00:02:34 – 00:02:37	With the product of the sale we buy school supplies for our children.		
	00:02:37 – 00:02:41	We also pay for shoes for our children.		
	00:02:41 – 00:02:44	We also buy rice for the household.		

Resilient Food Systems Framework



Legend: NFS: Ndiémame Food System; RQ: Research Question; E: Environmental resources; P: Physical resources; F: Financial resources; H: Human resources; S-C: Socio-Cultural resources; Sp: Spiritual resources.

Figure 18. Example of open and theoretical coding on an excerpt from a participatory video then connected to the RFSF (source: author, inspired by Thornberg and Charmaz (Thornberg and Charmaz 2013))

5. Presentation of Senegal and Ndiémane's Context

5.1. Introduction

This research is based in Senegal, West Africa. Senegal was selected for this study because of its agricultural sector, geostrategic location, and its history. As it stands today, Senegal is a West African country bordered by Mauritania, Mali, Guinea, Guinea-Bissau and The Gambia and its west coast faces the Atlantic Ocean (Figure 19). Ndiémane is situated in the West Central Agricultural Region, also known as “Peanut Basin”, which presents a Sudano-Sahelian climate.

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Figure 19. Map showing Senegal's ecoregions, climate zones, and isohyets, and the location of Ndiémane, Mbour, Thiès and Dakar (isohyets and climate zones based on Mertz et al. (2008: 212), and ecoregions from Tappan et al. (2004: 430). Image: Simon Kay)

In this chapter we take a step back to look at the village of Ndiémane firstly within its national context, or even a wider regional or global scale, and secondly to look at the village's social and environmental past. The idea is to identify where the village is situated, both physically and symbolically, to understand its heritage and the wider context it navigates.

The historical analysis presented in this chapter is based on archival sources such as books, maps and photographs, along with statistical climate data and historical satellite imagery, interweaved with local people's storytelling and living memory recollections. The analysis includes a look at the history, politics, economy, demography, and natural environment of Senegal in a flow that aims to show how all these spheres are interlinked and influence one another over time, assessing how changes in each have impacted villagers differently, depending on their age and gender (Figure 20, p. 86). The goal is to look at Senegal's heritage – expressed using different epistemologies and methods – to highlight different stories and paths that together create the Ndiémane of today.

I aim to address vulnerability and its components (drivers, systems and subclasses (Paloviita et al. 2016)) but also highlight its characteristics that are strengths and – if capitalised positively – may be the vectors of future resilience.

RQ1. What is the Ndiémame Food System's context?

CONTEXT				
Context impacting on:	Young Women	Old Women	Young Men	Old Men
HISTORICAL				
Empires and Kingdoms	+	+	+	+
Colonialism	+	++	+	++
Democracy and Political Stability	++	++	++	++
Modernisation (pressure toward)	+++	++	+++	++
POLITICAL				
Policies				
Structural Adjustment				
LOASP				
GOANA				
Plan Sénégal Emergent				
SNSAR				
PNBSF	++	++	++	++
Institutions/Organisations				
National Government				
Regional Authorities				
Village Chief	+	+	+	+
ASPSP	+	++	+	+
Centre AFAFA	+	+++	++	+
Groupe Mbogayife	++	+++	++	+
ECONOMIC				
Monetised economy	+++	+++	+++	+++
Import dependency	+++	+++	+++	+++
Lower price of cash crops			++	+++
DEMOGRAPHIC				
Population growth	++	++	+	+
Young average population	++	++	++	++
Increased youth migration	+++	++	+++	++
ENVIRONMENTAL				
Climate change	+++	+++	+++	+++
Soil erosion (wind&water)	+	+++	+	+++
Unsustainable agricultural practices	+	+	++	++
Deforestation	+++	+++	+++	+++
Salinisation	+++	++	+++	++
Shorter&erratic rainy season	+++	+++	+++	+++
Decreased water resources	+++	+++	+++	+++
Drought	+++	+++	+++	+++

Legend

RQ: Research Question
NFS: Ndiémame Food System

Ranking system	
Symbol	Meaning
	zero
?	unknown
+	low
++	medium
+++	high

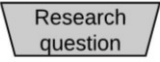
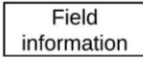
 Research question
  Field information

Figure 20. Detail⁴¹ of the Resilient Food Systems Framework for Ndiémame, addressing the Context (RQ1) impacting on the different intersectionalities under study (source: author, adapted from DFID 1999)

⁴¹ The full Resilient Food Systems Framework for Ndiémame can be found in Figure 164, p. 221.

5.2. Senegal's History and Profile

5.2.1. From Empires and Colonialism to Becoming an Independent Republic

Senegal has a rich history of empires and kingdoms which continued long into colonialism. Senegal has multiple sites of Neolithic and Palaeolithic relevance and between the ninth and the fifteenth century it was under three major empires: the Takrur, the Namandiru and the Jolof empires. The wider region had a strong movement of ethnic groups looking for new territories to integrate and/or dominate. The Seereer are thought to have come from as far as Egypt, arriving in Senegal probably during the first millennium A.D. from the north and then finally settling down in the Sine Saloum and the coastal area of the Petite Côte (Sarr 1986). The Seereer were famed for their fierce sense of independence, they were indeed the last ethnic group to surrender to colonial oppression.

Colonialism happened in waves, it affected the whole country progressively, and fed a rich trade of slaves and other goods. The fifteenth century marked the beginning of colonialism with firstly the Portuguese conquest. In 1444, Dinis Dias sailed south of the Senegal River shore and reached the Westernmost point of continental Africa, the Green Cape – where Dakar is situated – so called for its lush vegetation. Portugal did not settle permanently there (their goal was India) but they did use this geostrategic location for trade. Portugal was soon followed by The Netherlands and the United Kingdom (Figure 21). In 1677, France took control of Senegal as a colony and developed considerably all trade (Figure 22).

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Figure 21. British colonial map of West Africa. Note that Senegal is represented with lions, the coast is considerably more explored than inland (yet relatively

Figure 22. Colonial map of Senegal under the title of "France, French Africa, Senegal", with an illustration of a lion (Archives Nationales Françaises 1845)

*inaccurate) and the seas are dominated by colonial ships
(The National Archives 1626)*

The power of the “guns and sails” (Santos 2009) reaches far beyond the control of land and territories and spans beyond colonial independence. Colonialism dominated the mental universe of the colonisers and the colonised, and it influenced (and continues to influence) the way people see themselves and see the world.

There are many examples of journal diaries by missionaries, doctors and adventurers who travelled to the colonies and brought back to the French metropole descriptions imbued in total disrespect for the local cultures, and a sense of superiority and entitlement of White Westerners as the purveyors of civilisation and development. These stories did not have to be real (Pruneau de Pommegorge 1789); they fed the fascination for the *distant*, the *unknown*, the *other*, and they had the power to pave the imaginary world of the generations who followed. An example of these testimonies is the front cover of medical doctor André Petit’s (1922) book about his travels to West Africa in which he is depicted sitting on a hammock attached to a trunk and being carried by two black slaves with the caption “An African mode of transport” (Figure 24, p. 90). Similarly, thirty-five years earlier, during a trip to Senegal, Georges Haurigot, described the Seereer as follows:

Les *Sérères* appartiennent à la race ouloff, dont ils ont presque tous les caractères physiques et moraux. Ils habitent principalement le long des côtes qui s’étendent entre le cap Vert et le Saloum, et sont partagés en plusieurs petits royaumes qui tous relèvent actuellement de la France. Chez eux, le mahométisme ne compte que peu d’adeptes : presque tous idolâtres, ils ont la plus grande frayeur des sorciers et le plus répréhensible amour des liqueurs fortes, du *Sangara* ou eau-de-vie, dont ils font de fréquentes et copieuses libations, au grand scandale des musulmans.

En ce qui concerne la guerre, dit le général Faidherbe, ils « ont pour habitude, lorsqu’ils redoutent quelque attaque, de se réfugier dans les bois fourrés qui entourent leurs cultures, avec leurs troupeaux et leurs biens; ils ne laissent à la merci de leurs ennemis que de mauvaises cases en paille, qu’ils peuvent rétablir en peu de jours. »

« *The Seereer belong to the Wolof race, of which they have almost all physical and moral characteristics. They live mainly along the coasts that extend from the Green cape to the Saloum, and are shared among multiple little kingdoms that all come under the jurisdiction of France. With them, Mohammedism only has few followers: almost all idolatrous, they have the biggest fear of sorcerers and the most reprehensible love of strong liqueurs, of Sangara or eau-de-vie, of which they do regular and copious libations, to the great scandal of Muslims.*

Regarding war, according to the General Faidherbe, “when they fear an attack, they have the habit of looking for shelter in the dense woods that surround their fields, with their herds and their goods; they only leave at the mercy of their enemies bad straw huts, that they can rebuild in a few days. »

Figure 23. Description of the Seereer by Georges Haurigot (1887: 72)

Senegambia (the area encompassing Senegal and The Gambia) was a strategic location in the slave trade (International Slavery Museum 2020). Colonisers promoted slavery from the fifteenth century onward, especially following the discovery of the New World and the exploitation of its wealth. A new business opportunity arose to develop mines and plantations because the European workforce was too limited, and the local American Indian workforce had been decimated by exploitation and disease (Curtin 1968).

The transatlantic trade triangle started in the sixteenth century with European traders bringing manufactured goods to the African coasts in exchange for captives handed in by slave traders and certain local kingdoms. European ships would then take the slaves across the Atlantic to sell them to settlers along the American coasts. The plantations where slaves worked produced the goods (such as coffee, sugar, and cocoa) that were then exported to Europe. This highly lucrative trade lasted approximately four centuries, and it is estimated that 12.5 million people were deported, with more than 1.5 million dying during the Atlantic crossing alone (International Slavery Museum 2020).

Pruneau de Pommegorge's (1789) description of the atrocities of slavery and questioning the Catholic church's approval of it, addresses also the conditions under which human beings were caught and how they were selected and treated even before reaching the trading ships (Figure 25, p. 91). France abolished slave trade from its colonies in 1848 but kept the colonial rule for another 110 years.

Independence from France was acquired in 1960 and since then Senegal has been heralded as a leading African example of democracy and political stability (The World Bank 2016). Senegal's first president, Léopold Sédar Senghor, was a Seereer, a poet and cultural theorist. Since Independence, Senegal has had a succession of peaceful elections and already two major party shifts: from the Socialist Party of Senegal (PSS) between 1960 and 2000 (Léopold Sédar Senghor and Abdou Diouf), to the Senegalese Democratic Party (PDS) with Abdoulaye Wade between 2000 and 2012, and since then the Alliance for the Republic (APR), under Macky Sall's presidency.

DOCTEUR ANDRÉ PETIT
Ancien Médecin de l'Assistance médicale en A. O. F.

333
MON VOYAGE

49
au

SOUDAN FRANÇAIS

LETTRE-PRÉFACE

de

M. M. DELAFOSSE, Gouverneur honoraire des Colonies



Un mode de transport africain

PARIS

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Figure 24. Front cover of Doctor André Petit's book "My trip to the French Sudan" (1922) with descriptions of livelihoods, landscapes and health matters in Western Africa during the French colonisation.

S'il se vend dans toute la côte d'Afrique quarante à quarante-cinq mille esclaves par an, qui proviennent partie des prisonniers faits à la guerre, partie de pillages, il faut calculer que les chefs de toutes ces nations, pour se procurer les quarante-cinq mille captifs dont il s'agit, en font tuer un nombre infini, les plus âgés sont toujours égorgés, & les autres malheureux ne se rendent qu'après s'être bien défendus; ainsi, c'est donc encore les européens à qui il faut attribuer cette destruction d'hommes, de femmes, d'enfants, & de vieillards. Ajoutez à cela la prodigieuse quantité de nègres, qui meurent dans les navires par la longueur des traversées d'Afrique en Amérique; par leur mauvaise nourriture, & le chagrin qui achève de les tuer.

Un dernier motif de destruction de la moitié de ces malheureux captifs, c'est qu'après avoir été sept à huit mois en mer, quelquefois dix mois les fers aux pieds, en arrivant dans nos îles, ils sont vendus, & envoyés aussi-tôt à un travail forcé.

On ne force point l'expression, en disant qu'il n'arrive point de captif en Amérique, qui n'ait coûté beaucoup d'autres individus à la nature humaine. Et ce sont des hommes, des français qui se disent chrétiens, à qui l'intérêt fait commettre de pareils forfaits! Les plus coupables feroient les souverains, si connoissant ces horribles détails, ils n'interdisoient pas à leurs sujets le droit d'être des scélérats. Triste conséquence de nos loix; elles condamnent à la mort une infortunée, dont l'ame est honnête, puisqu'elle est sensible à la honte, & qui, forcée de commettre un crime, en est la première suppliciée par l'horreur de le commettre; & ces mêmes loix autoriseroient un commerce, qui ne peut se faire sans multiplier à l'infini des forfaits plus grands encore, car le motif en est vil. En effet, de quel droit nous arrogeons-nous celui d'aller arracher nos semblables à leur patrie? d'y causer des massacres & des guerres perpétuelles? de séparer les mères de leurs enfans, les maris de leurs femmes? d'être cause, par notre avidité à acheter ces malheureux, que les vieillards qui ne sont plus d'âge à être vendus soient égorgés & massacrés dans les pillages aux yeux de leurs enfans? que les enfans nouvellement nés soient la nuit, jettés aux loups, afin que la mère ne soit pas refusée des capitaines de navires en traites? Ceci se passe à Juda.

« In the whole of the African coast are sold forty to forty-five thousand slaves every year, who are in part war prisoners, in part from pillages, it is necessary to calculate that the chief of all those nations, to acquire those forty-five thousand captives mentioned, they get killed an infinite number, the eldest always get their throats cut, and the other unfortunates only surrender after defending themselves well; thus, it is again to the Europeans to whom one ought to attribute this destruction of men, women and children and elderly. Add to this the phenomenal number of negroes who die in the ships due to the length of the crossing from Africa to America; due to their bad food, and the sorrow that finishes them off.

One last reason for the destruction of half of these unfortunate captives, is that after having been seven to eight months at sea, sometimes ten months with irons on the feet, when arriving at our islands, they are sold and sent straight away to forced labour.

It is not exaggerating when saying that there arrives no captive to America that hasn't cost many more individuals to the human race.

And it is men, French people who claim themselves as Christians, to whom interest makes them commit such infamy! The guiltiest would be the sovereigns who, aware of these horrible details, wouldn't forbid their subjects the right to be criminals. Sad inconsequence of our laws; they sentence to death an unfortunate, whose soul is honest, as it is sensitive to shame, and whom, forced to commit a crime, is the first one tortured by the horrors of committing it; and those same laws authorise a trade, which cannot be done without multiplying to the infinite the infamies bigger still, for its motive is vile. Indeed, to what right do we arrogate the right of snatching our fellows from their party? Of causing perpetual massacres and wars? Of separating mothers from their children, husbands from their wives? Of being the cause, due to our avidity to buy these unfortunate, that the elderly who are too old to be sold get their throats slit and are massacred during the pillages in front of their children's sight? That the new-borns be thrown to the wolfs at night so that the mothers are not refused by the slave trade ship captains? This happens in Whydah*.

* kingdom on the coast of West Africa (currently Benin), one of the main landmarks of the slave trade.

Figure 25. Description by Antoine Edme Pruneau de Pommegorge of the slave trade atrocities (Pruneau de Pommegorge 1789: 213–215)

5.2.2. A National Economy Dependent on Imports

Economically, Senegal has pursued after Independence the same logic of export specialisation first introduced by France during colonisation. Food-wise, Senegal specialises in key cash crops (peanuts) and fish exports to then purchase essential goods, such as rice, the main food staple of the country, and wheat (The Observatory of Economic Complexity 2020). Although the price of cash crops has decreased over time, the country continues focusing on their production due to its dependency on imports (UN Comtrade 2020). In 2018, Senegal’s overall exports per capita were £181 and its imports per capita were £518, leading to a national negative trade balance of -£5.35 billion (The Observatory of Economic Complexity 2020).

Senegal’s trading profile is still heavily influenced by its history and geography. Most imports come from Europe and Central Asia, and especially France (13%), and most exports are traded in Sub-Saharan Africa and then in Europe and Central Asia (Figure 26) (WITS 2020).

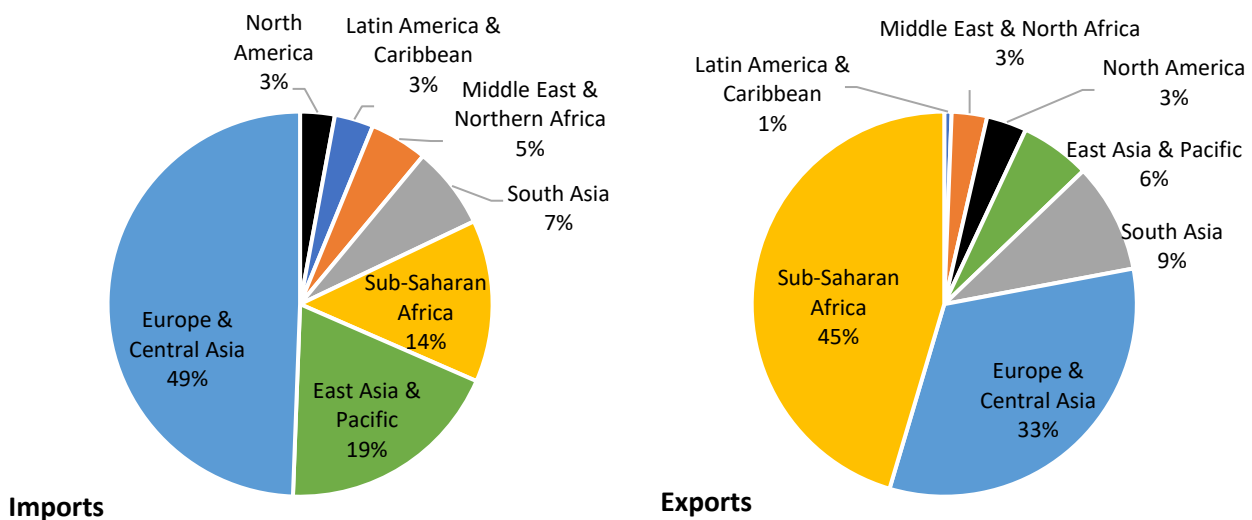


Figure 26. Share of Senegalese imports and exports by world region in 2018 (WITS 2020)

According to the United Nations, Senegal ranks 111/192 in the world by nominal Gross Domestic Product (UN 2020). Growth has been high in Senegal since 2014 at 6% and prospects remain positive, particularly considering the expected production of offshore oil and gas in 2025. All sectors grew in 2018, especially agriculture thanks to the various support programs it benefits from, external demand, and infrastructure investments in the context of the agricultural policy *Plan Sénégal Emergent*⁴².

However, regarding its Human Development Index, Senegal ranks 168 out of 188 countries, mainly due to poor levels of education, inequality issues and low life expectancy (United Nations 2019). Poverty rates remain very high. In 2011, it was estimated that 46.7% of the Senegalese population was living below the national poverty

⁴² See subchapter 5.2.4., p. 98.

line and 38% lived below the international poverty line (i.e., less than US\$1.9 PPP per day per capita) (World Bank 2020).

Poverty varies according to the marital status of the head of household: 50% of people living in a household headed by married polygamic heads of household are poor, compared to 47% of those headed by a married monogamic head of household and 36% of those headed by an unmarried person. The age of the head of household also has an impact on the incidence of poverty considering that poverty is more prevalent in households whose head is 60 years old or more. Finally, the incidence of poverty is higher in farming households: 61% of people living in rural households headed by an independent farmer were poor whilst only 31% or 37% were when headed by people working for the public sector or as independent, non-agricultural professions, respectively (ANSD 2013: 35).

Despite its strong growth, the Senegalese economy is struggling to overcome inherent inequalities. Job creation remains insufficient to absorb rural exodus and population growth; and labour remains informal, with low remuneration, high underemployment and limited social protection (World Bank 2020). Official data reveals that unemployment remains highest for young people at 12.7% (compared to 10.2% overall), and in particular for women who account for 71% of young unemployed people (ANSD 2014). Prospects for the youth, and especially young women, are challenging with high illiteracy rates, high unemployment (even among university graduates) and widespread poverty (Central Intelligence Agency 2020).

These economic vulnerabilities further exacerbate the concerns regarding the impact of climate change in Senegal (Pettengell 2015). Moreover, the COVID-19 global pandemic in 2020-2021 further aggravates these vulnerabilities. The World Bank (2020) urges the country to further deepen its reforms for growth to resume its pre-pandemic trajectory.

Agriculture employs most of the active population, but it is mainly small-scale family farming and it only contributes to a relatively small share of the country's trading revenues. Data from the Central Intelligence Agency (2020) (Figure 27) shows the discrepancy between the share of the population working in agriculture (77.5%) and their contribution to the national GDP (16.9%). On the contrary, services employ 22.5% of the labour force and generate 58.8% of the GDP. Services are a sector where the youth leaving their rural setting hope to find employment and generous financial reward for their work.

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Figure 27. Share (%) of the GDP and labour force by sector in Senegal (2017 est.) (Central Intelligence Agency 2020)

Available projections of the impact of climate change on agricultural productions reveal that the Senegalese agricultural production is expected to decrease considerably (15%-50%) by 2080 (Figure 28). This trend, juxtaposed to a tilting production/consumption balance, creates a precarious situation for the country's economy and inhabitants, and especially its farmers.

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Figure 28. Projected changes in agricultural production in 2080 due to climate change (Cline 2007)

5.2.3. A Fast-Growing Population Shifting Towards Urbanisation

Senegal has a surface of 196,712 km² and a population of 16.3 million people (approximately a third of the surface of France and a quarter of its population) with a population growth rate of 2.4%, compared to 0.4% for France (UN 2020). Life expectancy at birth in Senegal in 2015-2020 is of 69 years for women and 65 years

for men. Life expectancy has almost doubled since 1950-1955 and is projected to reach 83 and 79 years for women and men, respectively, by 2095-2100 (UN 2020). Meanwhile, France boasts a life expectancy amongst the highest in the world at 85 for women and 79 for men in 2015-2020 – fifteen years of life more than Senegal –, a sign of the inequalities between former colonising powers and their colonies (UN 2020).

Figure 29 shows the distribution and the evolution of the population from rural and urban areas. Two main changes can be observed: (1) Senegal’s total population was multiplied by 6.6 between 1950 and 2018; (2) the urban population share has grown from 17% in 1950 to 47% of the total population by 2018. Senegal’s population is now mostly composed of young children and teenagers (the average age in Senegal is 19 years old).

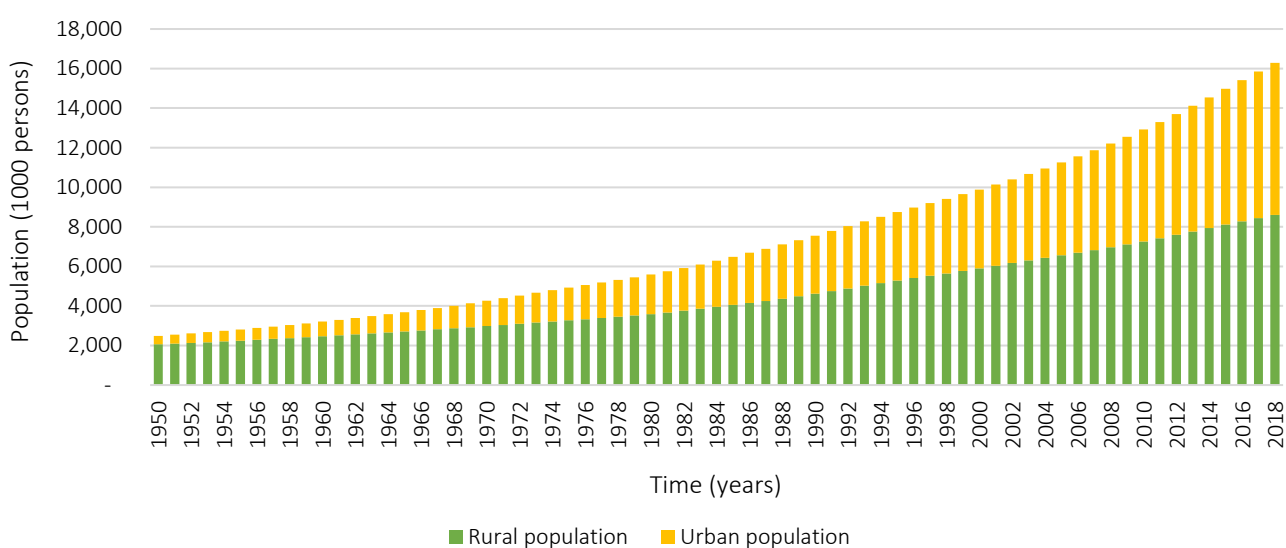


Figure 29. Rural and urban population of Senegal between 1950-2018 (FAO 2020)

There are important differences between life expectancy in Senegal’s rural and urban areas: in 2013, life expectancy at birth was four and five years shorter for women and men, respectively, if they lived in rural areas (Figure 30). One of the reasons for the gap between life expectancies is access to health care. Figure 31 shows that health cover in Senegal is much lower than the norm recommended by the World Health Organisation (WHO), especially for larger, more specialised facilities such as hospitals.

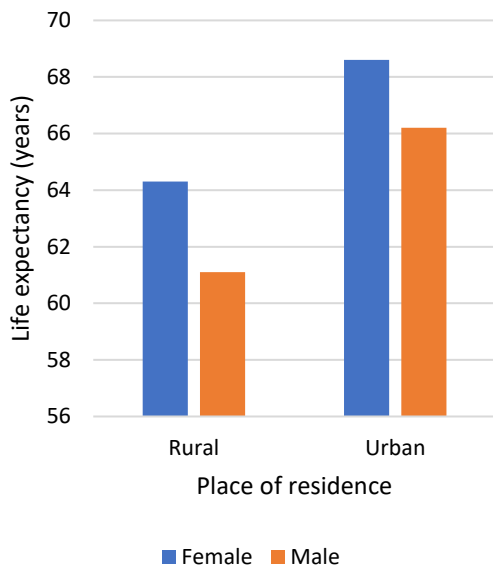


Figure 30. Life expectancy at birth by sex and place of residence in Senegal in 2013 (ANSD 2014: 207)

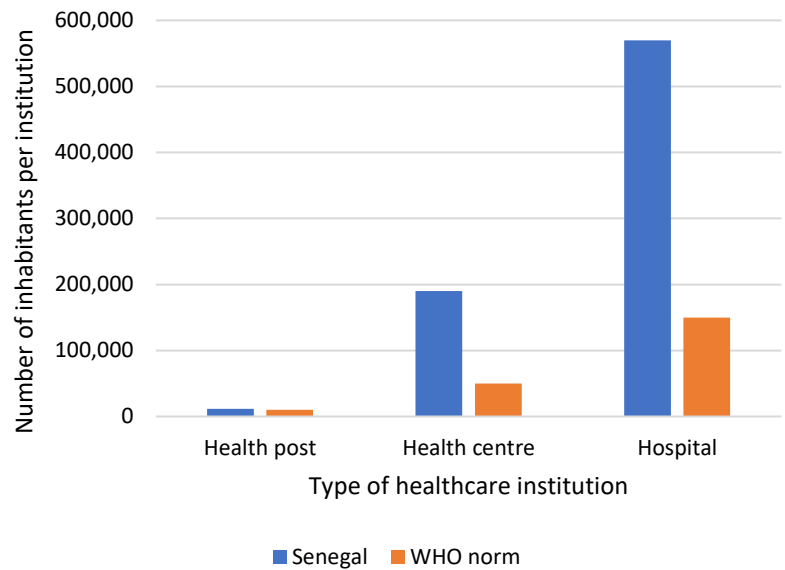


Figure 31. Health cover in the region of Thiès in 2014, compared to the World Health Organisation's (WHO) norm (ANSD 2017a: 47)

The national population pyramid shows a rapidly expanding profile, typical of the Majority World (Figure 32). The pyramid has a cone shape revealing the high number of children – both male and female – and the gradual decrease of the population by age. However, data from the last census reveals that the urban population is shifting from an expanding profile onto a contracting one (Figure 33). This may be due to two key reasons: (1) people living in urban areas tend to have less children, and (2) it is often (young) adults who migrate to cities for work and studies, and they may leave in the village children who are then brought up by the wider family.

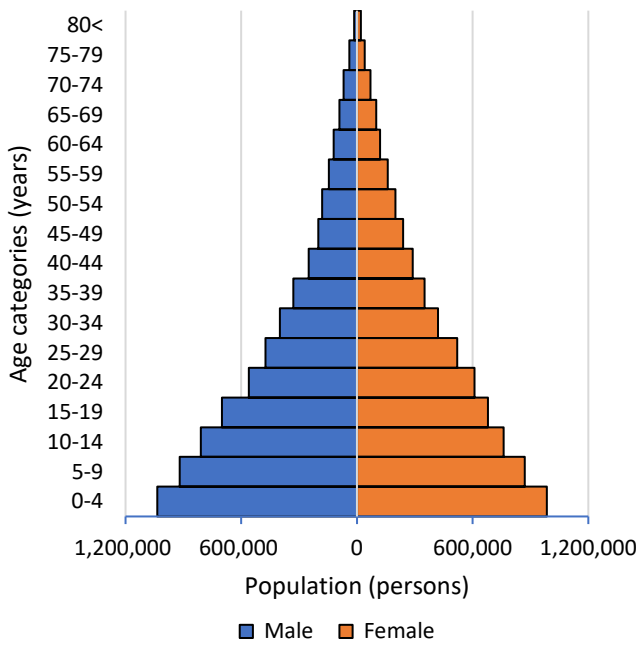


Figure 32. National population pyramid for Senegal in 2013 (ANSD 2014)

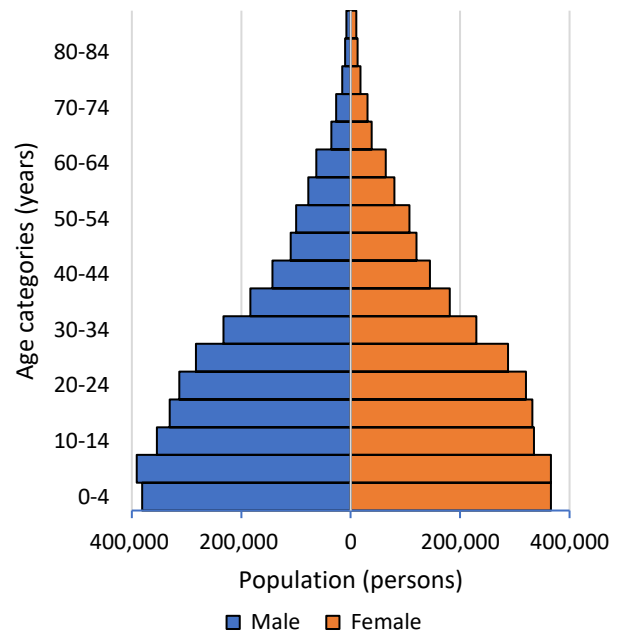


Figure 33. Urban population pyramid for Senegal in 2013 (ANSD 2014)

Senegal's fertility rate by age is much higher in rural areas than in urban areas (Figure 34). The national fertility rate has decreased from seven children per woman in the 1960s to 4.5 by 2020 (est.), yet it remains much higher than renewal rates because of the desire for large families, the low use of family planning, and early childbearing (Figure 35) (UN 2020). Projections estimate that fertility will continue declining to just over two live births by the end of the century.

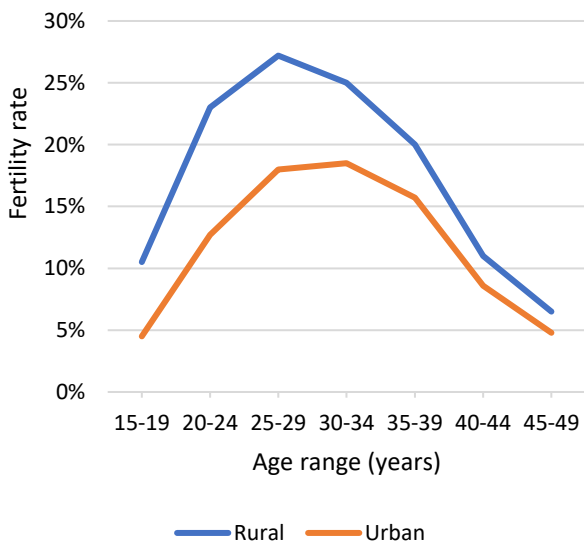


Figure 34. Fertility rate by age and place of residence in Senegal in 2013 (ANSD 2014: 165)

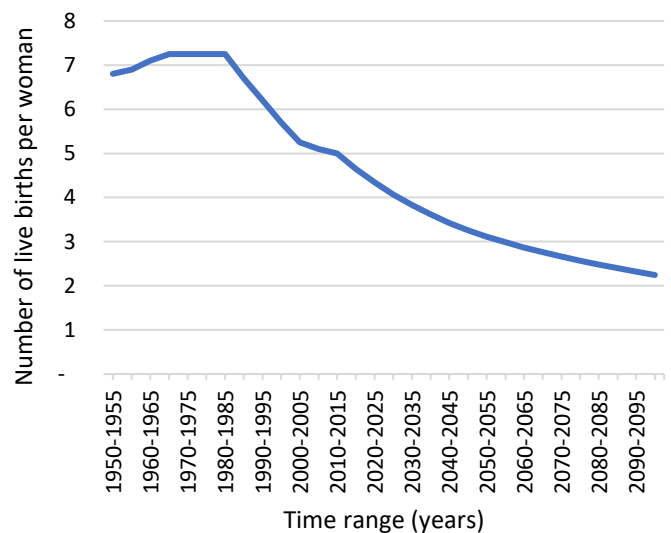


Figure 35. Total fertility rate in Senegal between 1950-1955 and 2095-2100 (UN 2020)

Undernourishment remains a painful reality in the country nowadays. Despite the decrease both in absolute and relative terms, there were still an estimated 1.8 million people suffering from undernourishment in

Senegal in 2016-2018, i.e., 11% of the population (Figure 36). Undernourishment does not affect all the population equally and rural areas tend to be more hardly hit, as do women and children (Madzorera and Fawzi 2020). In fact, stunting (low height-for-age) is an indicator of chronic undernutrition and it affects 27% of children under five years old (UN 2020).

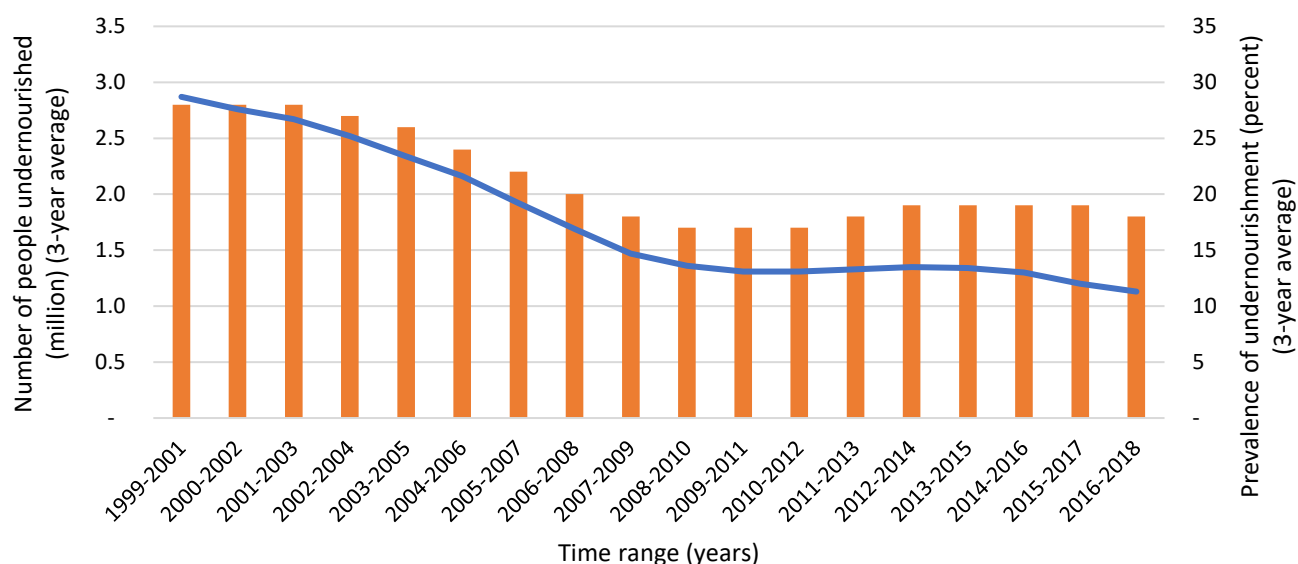


Figure 36. Undernourishment in Senegal between 1999-2001 and 2016-2018 (FAO 2020)

5.2.4. Key National Agricultural and Food Policies since Independence

Below is a selection of six key policies which have most influenced agriculture, food security and household resilience in Senegal:

Structural Adjustment Programme for the Agricultural Sector and the Devaluation of the West-African Franc (1994)

The Structural Adjustment Programme aimed to remove the barriers of monopolistic state influence, especially on high consumption produce such as rice, sugar, flour and oil (Faye et al. 2007). In January 1994, the value of the West-African Franc was halved. This drastic measure aimed at promoting exports had an immediate effect: between 1993 and 2003 the share of exports in the Gross Domestic Product increased from 20% to 26% (Faye et al. 2007). Although exports were promoted and imports discouraged, the expected longer-term outcomes of this measure were not attained. As exposed in the economic analysis (subchapter 5.2.2., p. 92), Senegal depends heavily on food imports and its food exports are dwindling.

The World Bank recognised that the primary sector was the great loser of this policy as its relative Gross Domestic Product share dropped (Wodon, 2006). Urban households were heavily impacted by this policy due to their dependence on purchased food, however rural households also suffered due to their dependence on

imported foods and the limited revenues they get from exports (Kelly et al. 1995). In a national survey on poverty reduction, the Structural Adjustment Programme was mentioned as one of the key institutional measures that reinforced poverty in the country (République du Sénégal 2002).

Loi d’Orientation Agro-Sylvo-Pastorale (Law of Agro-Sylvo-Pastoral Orientation – LOASP) (2004)

The goal of this law was to promote economic growth based on the agricultural sector. By promoting “more intensive, diversified, sustainable and environmentally-friendly farming systems”, the government was hoping to develop family farming and attract investors (République du Sénégal 2004: 30). Although this law was an encouraging step toward food security and sovereignty and environmental protection, the diverging opinions on the importance of family farming between the government and peasant organisations meant that this law never came into force (Faye et al. 2007).

Grande Offensive pour la Nourriture et l’Abondance (Big Offensive for Food and Abundance – GOANA) (2008)

President Abdoulaye Wade’s flagship policy was the GOANA, which came in response to the eruption of food riots in Senegal and around the world. The explicit goal of this policy was to achieve national food self-sufficiency in the short-term, notably by trebling (cassava) and quadrupling (corn) production by 2015 (République du Sénégal 2008).

These goals were heavily criticised as over-ambitious and unrealistic by Senegal’s main peasant organisation. Once again, the Senegalese government is criticised for planning agricultural policies without consulting its rural population and therefore without a real understanding of rural concerns (CNCR 2008). This agricultural policy was created to satisfy urban populations with a strong protest potential, and not to promote a rural development *for* rural communities (the main victims of economic liberalisation and undernutrition).

Plan Sénégal Emergent (Emerging Senegal Plan – PSE) (2014)

The current strategy, promoted by President Macky Sall, promotes a new and broader development model to accelerate Senegal’s “emergence” by 2035 (République du Sénégal 2014). It emphasises the structural transformation of the economy, from one based essentially on subsistence agriculture to an integrated economy with a thriving commercial agriculture sector that contributes significantly to overall economic growth (Moss et al. 2018). The development of the agricultural sector is envisioned via the promotion of commercial agriculture, external investments, and exports, with four key steps:

1. The organisation of smallholders around large industrial actors to promote the contractual financing of agricultural activities;

2. The promotion of cereal corridors (focusing on rice) through foreign investment for the creation of “megafarms” and the development of the food processing industry, to attain food self-sufficiency in the long-term;
3. The establishment of food processing hubs for the development of a high value-added agro-industry;
4. The relaunch of peanut production for the substitution of cooking oil imports, via the development of industries, the structuring of artisanal oil production units and the promotion of innovative processing industries.

Family agriculture is meant to receive support to intensify its production, diversify income sources and progressively shift production to high value added productions (such as market gardening and fruit) (République du Sénégal 2014). The PSE aims to promote economic growth with a strong impact on human development but the International Monetary Fund itself and researchers have alerted the country leaders that more needs to be done to ensure that benefits are felt by all the population (Mansoor and Issoufou 2018, Hrabanski 2011).

Programme National des Bourses de Sécurité Familiale (National Programme for Family Security Grants – PNBSF) (2013)

PNBSF is a conditional cash transfer programme introduced in 2013 that aims to fight vulnerability and social exclusion of families, and to promote their productive and education capabilities. The programme binds beneficiaries to three conditions: civil registration; children’s formal schooling registration and attendance; and up-to-date vaccination records for 0-5 year old children (Hathie et al. 2017).

By 2016, the registry included nearly 300,000 households, of which two thirds were benefitting from cash transfers, which consist of quarterly transfers of 25,000 CFA francs⁴³ per household for a duration of five years (Cissokho 2018). Despite its limitations in reach and means, this programme is celebrated as “proof of the feasibility and appropriateness of developing cash-based social safety nets in the Sahel region” (Cissokho 2018: 27).

Interestingly, this was the only policy or programme ever mentioned by Ndiémane’s villagers who claimed most of them benefitted from the transfers. These had a positive impact on people’s livelihoods and were appreciated for their regularity which meant villagers could trust the system and plan ahead (Groupe Mbogayife 10/10/2019).

⁴³ Approximately £34 and €38 in 2020.

Stratégie Nationale de Sécurité Alimentaire et de Résilience (National Strategy for Food Security and Resilience – SNSAR) (2016)

Following on from the PSE, the Senegalese Government launched in 2016 an additional national strategy dedicated to food security and resilience. The goal is to ensure that the national population has sustainable food security and a better resilience to shocks by 2035 (République du Sénégal 2016).

The SNSAR has four strategic objectives (Hathie et al. 2017: 1):

1. sustaining improvement in the availability of diversified, healthy, and nutritious food;
2. enhancing the accessibility and affordability of diversified, healthy, and nutritious food to vulnerable populations;
3. reinforcing governance and information systems for food security and resilience; and
4. strengthening coordination capacity, prevention, and management of food crises.

It is too early to assess the success of this vast policy but concerns were raised regarding the over-ambition of the governmental targets and its focus on initiatives which have short-term effects rather than addressing long-term growth in the sector (Hathie et al. 2017), as well as, once more, the lack of focus on the regions that most need support (FAO 2017).

5.3. Ndiémane's Heritage

5.3.1. Ndiémane's Social Context

The following section is dedicated to Ndiémane's village history, mainly as described by its inhabitants. It shows to what extent the wider historical context of the country influenced the way the village was created and developed.

5.3.1.1. Ndiémane: The Lush Village that Attracted Hunters and Traders

According to Yako Ndour (14/06/2019), a male elder, "to talk about the tree, you must first talk about the roots." The name Ndiémane comes from the fact that Moors used to sell salt in the region and that their stocking place was this village. In the local language, salt is "foudiême" and "Ndiémane" means "that is salty". Yako Ndour specified that during the time of President Senghor, when there was the assassination of politician Demba Diop (in 1967), Moors used to bring to Ndiémane salt from Pointe Sarène or Sine-Saloum to barter for millet, peanuts or cowpea. Ndiémane had very fertile and clayey soil and the surplus food production was used to barter. Moors often arrived late in the day so they would stay over for the night and nearby villagers knew they could find them in Ndiémane.

Diene Kama and Marie Djogoul, two elders, agreed with this story and Marie Djogoul explained that the village had a type of tree that is poisonous to camels so the Moors never stayed very long because they were afraid their animals might eat its leaves and die. In the 1960s there were many camels in the village though this is hard to imagine for today's youth who have probably never seen a camel, let alone in their own village (Marie Djogoul 19/06/2019)! Participants laughed remembering that when parents could see camels, they would tell their children "Run, run, run, because under each camel footprint there is a coin"! The children would run excitedly behind all the camels (Adama Ndour 19/06/2019)!

Another version, from Anne-Marie Dieng (13/06/2019), a female elder from a different neighbourhood, states that Ndiémane's first well was a little bit salty. The village's name derives again from the word "salt" in Seereer, Ndiémane now meaning "the salty well".

Finally, according to Ablaye Sarr, a male elder, there used to be a big village nearby called Ndiémane, and some of the villagers used to come to hunt in this area because there was a very big tree and the land was so fertile. They came repeatedly so people started naming this area Ndiémane as a reference to the origin of the hunters. Ablaye said this was a long time ago and, unable to place it in time, he simply smiled and said "This was when Ndiémane was full of trees, water and wild animals" (Ablaye Sarr 27/06/2019).

The first two versions of the story of the origins of the name Ndiémame relate clearly to salt whilst the third version relates to how wild and bountiful the village's area used to be and therefore made it attractive to hunters. Both the Moorish salt traders and the local hunters are a distant memory. Salt is now easily available in any corner shop and the village has lost all its forest and wild game, so no hunting is done in the area. However, the unfortunate salty well remains a reality, with villagers referring that, especially during drought years, wells become salty and then dry completely (Michel Diouf 14/10/2019).

According to Binta Sen, a female elder, the first person to ever live in Ndiémame was the grandfather of a man called Ibadiaye whose name she could not recall. Ibadiaye was the first person in the village to have a horse. The first three concessions⁴⁴ in Ndiémame were from the families Diop, Niang and Nian. They came to produce charcoal and to do agriculture (growing peanuts as cash crops). According to Anne-Marie Dieng, another female elder, during the time of President Senghor (1960-1980), there were only four concessions in Ndiémame, including the one of her family. Later there were five neighbourhoods in Ndiémame: Bin Kémessou (the first one), Bin Couli, Bin Sasamba, Marché/Wolof and Keur Malaoubé. These have since evolved, grown and sometimes changed names. Figure 37 shows Ndiémame's current neighbourhood names and their spatial distribution, according to the research participants.

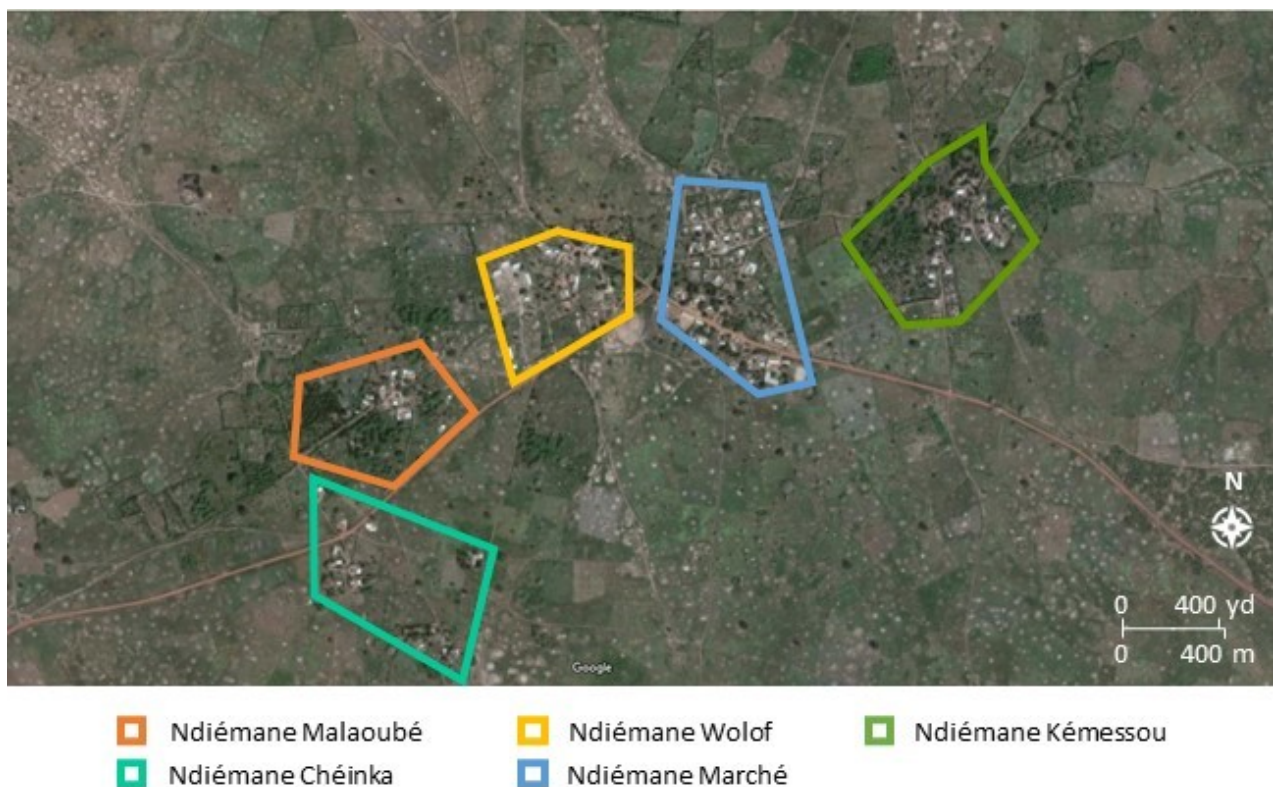


Figure 37. Delimitation of Ndiémame's neighbourhoods according to the research participants (satellite imagery by Google Maps (2017), areas added by the Participatory Research Team (17/10/2019))

⁴⁴ A *concession* is a family unit which may comprise one head of household, multiple cowives (for polygamic families), generations and subfamilies if children are married and have their own families. Concessions may include several buildings and usually are fenced to delineate their limits.

There have been three different village chiefs since Independence, whose names the group knew well but did not give consent to disclose. All chiefs so far have been Seereer and from different families. Village chiefs are chosen by the village and often keep the role for multiple decades.

5.3.1.2. Ndiémane Malaoubé: The Independent Neighbourhood

According to Adama Ndour (13/06/2019), a female elder, the neighbourhood of Malaoubé was created by a person with the same name. Malaoubé came from the area of the fig tree (“a few kilometres away”) and built the first house of the neighbourhood. First the land was fertile and largely forested, the main activities were charcoal production and agriculture. People would come here to work and eventually they asked for land to settle instead of coming every rainy season.

According to a different version from Groupe Mbogayife (13/06/2019), the neighbourhood Malaoubé was created by a person called Malik, from the ethnic group laobe, so both words were merged to create *Malaoubé*. A marabout (Muslim religious leader and teacher) called Boymor came to visit Malik and to cultivate with his talibés (Quranic students). They cleared a large area of forest for the neighbourhood to settle and farm. In the past, there used to be small independent concessions, organised by family. Later four families gathered and created a denser neighbourhood: the families of Sitor Ndour⁴⁵, Gor Ndiaye, Gor Gimbor (Fula) and Malik.

Ousseynou Ndour was the first person in charge of the neighbourhood (Groupe Mbogayife 13/06/2019). He was a very respected, inspiring, and revered imam who converted the neighbourhood to Islam (probably in the 1960s) and is now remembered fondly by all inhabitants. Amongst the key research participants, Adama Ndour (a female elder) is one of the imam’s three widows, Mamadou Ndour (a young male adult) is the imam and Adama’s son, and Binta Sen (a female elder) is the daughter-in-law of the imam.

Ousseynou Ndour had a twin brother and a gift for getting people together and following his word. People appreciated his capacity to solve problems internally, without creating much fuss and without needing external help nor mediation. According to Groupe Mbogayife, the imam had a gift for religious healing and was known for being kind. “He may not have been the most knowledgeable regarding religion, but he had a very good heart and that you can’t learn from books. The new imams may be more versed in Islamic theory, but have they got such a big heart?” (Groupe Mbogayife 13/06/2019)

Female elder participants remembered fondly that the imam would check all the households to make sure everyone had prayed in the morning. He would support households by buying salt for everyone and by buying matches to help women start household fires for cooking. Participants claimed the four family concessions in

⁴⁵ The grandfather of Yako Ndour, a key member of the Participatory Research Team.

Malaoubé were very large and had a perfect understanding. Everyone ate together, everything was shared, and there were no solidarity problems back then because everyone was together with the imam (Groupe Mbogayife 13/06/2019).

The imam died in the late 2000s. The recent history of religious conversion and the adoption of new practices has shaped greatly the character of Malaoubé's inhabitants. The neighbourhood is proudly independent, it does not engage much with the other neighbourhoods and women dream of being self-sufficient in infrastructures with their own neighbourhood tap and grain mill (Groupe Mbogayife 17/10/2019). This "island behaviour" is visible and reinforced by the simple location of the neighbourhood, which is outside of central Ndiémane⁴⁶ and, unlike the Chéinka neighbourhood that was created more recently, it is not crossed by the main road access to the area.

Young and old, male and female, Ndiémane Malaoubé's villagers talk with nostalgia when referring to the past of their neighbourhood. The older generations, male and female, remember fondly the Ousseynou Ndour years when there was a religious leader and strong neighbourhood harmony (Groupe Mbogayife 18/06/2019). According to Alihou Ndiaye (10/06/2019), a male elder, the village used to have queues of cars with people waiting to see the imam and benefit from his healing capacities, yet now the neighbourhood seldom sees cars passing through. These major changes mean that the neighbourhood is questioning itself, it is in a transition period and in search of a (re)new(ed) identity. It is essential to understand these changes when assessing the social and environmental resilience of the village.

5.3.1.3. Centre AFAFA: The Centre for Peasant-to-Peasant Agroecology Training

In 1993, three university graduate friends decided to start a new farm. Alihou Ndiaye, Gora Ndour and El Hadji Ndour joined forces to buy land and start farming using agroecological practices to regenerate land exhausted by the monoculture of peanuts (Sarrouy Kay 2019e). They managed to acquire land in Ndiémane, yet this was done, not with the village chief's approval, but with more formalised, higher political instances. Over the decades, the farm evolved, it became a training centre dedicated to peasant-to-peasant knowledge exchange on agroecology. The centre is always referred to as Centre AFAFA. Its name was originally "Aide aux Femmes Africaines par la Formation en Agroécologie" (Support to African Women through Training in Agroecology). Due to complaints from male peasants who felt excluded, the centre was renamed "Aide aux Forces Vives Africaines par la Formation en Agroécologie" (Support to the Live Forces of Africa through Training in Agroecology) (Youssou Sarr 21/02/2017).

⁴⁶ Ndiémane Marché is seen as the centre of the village, closely linked to Ndiémane Wolof and Kémessou.

The centre had 7 ha of land and, at its peak around 2010, employed six local people: three in charge of training and facilitation, and three villagers responsible for site maintenance. The site encompassed a meeting room, six huts, a shower room, and a dry toilet (Figure 38 and Figure 39). There was no access to the mains and electricity was produced by one solar panel.

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Figure 38. One of the huts in Centre AFAFA © Terra Symbiosis

Figure 39. Training hut at Centre AFAFA © Terra Symbiosis

Centre AFAFA benefited from extensive financial and knowledge support from several international NGOs, mainly *Sahel People Service* and *Terre & Humanisme*. In 2007, *Sahel People Service* started a new partnership with Centre AFAFA and funded the construction of twenty-four wells that enabled farmers to have access to water all year round and hence extend production periods (Sarrouy Kay 2019e). Each well cost 180,000 F CFA⁴⁷ and interest-free credits were refundable in thirty-six months.

Access to wells and the use of traditional and agroecological techniques contributed to the creation of green agricultural plots, with a large diversity of trees, crops and animals. These plots stood out from the surrounding dry and eroded land and were nicknamed by the population “oases” (Youssou Sarr 18/02/2017). Figure 40 shows an aerial view of Ndiémame Malaoubé during the dry season, where the green contour of its oases is clearly visible.

⁴⁷ Approximately €275 and £238 in 2020.

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Figure 40. Aerial view of Ndiémane Malaoubé in 2013, during the dry season (Coste 2013)

Centre AFAFA was closed in 2018. Although during my first visits in 2017 I lived in the centre and most meetings were held at the centre, it was evident that the organisation was in decline. Although the farm was created by three friends, on paper the sole owner of the land was El Hadji Ndour and, when he died, his widow decided to claim the land. Initially Alihou Ndiaye (13/05/2017) tried to negotiate a fifty-fifty agreement to give away the housing built on-site but keep the land that had been cultivated agroecologically for decades. However, this agreement fell through and by the time I went back to Ndiémane in 2019, the area of the Centre AFAFA had been largely fenced off and it looked abandoned. At present, the managing team of Centre AFAFA is looking for a location to start a new training centre.

The younger generations, especially males in their late teens or in their twenties, remember the times when there was a buzz of activity at the Centre AFAFA. There was training they could follow informally. There were also visits from foreigners who stayed at the centre for short or long stays to learn about agroecology in Senegal. Young villagers interacted with them and learned about a world beyond the village to which they had no direct access (Male Youth 23/10/2019; Cheikh Ndour 03/03/2020).

5.3.1.4. Groupe Mbogayife: Women Uniting for Support and Knowledge-Sharing

Mbogayife means in Seereer to share the same ideas and the same concerns, to look at one same direction, the spirit of understanding (Groupe Mbogayife 18/06/2019). Groupe Mbogayife is a self-organised peasant group, it was founded by Fatou Sen, about forty years ago, to organise the preparation of weddings or any other event. It was created originally to welcome the women who joined the village of Ndiémane when they got married, by gathering and dancing. The bride would give a little sum of money to show her gratitude and would thus join the group too. Groupe Mbogayife still welcomes new brides and it also prepares millet and sugar pancakes for christenings. The group shares agricultural equipment and chores too, and they give value to seed saving as they are guardians of peasant seeds (Groupe Mbogayife 18/06/2019).

Groupe Mbogayife aims to ensure knowledge-sharing from highly experienced and skilled older women who are increasingly physically tired, to their young, fit and enthusiastic children who are still lacking experience and confidence. Many young adults left the village to work in urban areas such as Mbour, Thiès or Dakar but returned to the village after months of struggle and hardship in cities where competition is very high and life conditions are harsh. This youth returns to the village hoping to gain new skills that will contribute to build a decent life in the village, where they hope to settle down (Groupe Mbogayife 18/06/2019).

Nowadays, the three managers are: Fatou Thiaw (president), Rokhie Ndiaye (treasurer) and Adama Ndour (secretary) (Figure 41). According to them, there are approximately 45-50 members, only women, of all ages, which abide by a collective internal regulation. There are no regular subscriptions, but they receive occasional donations which are saved to buy equipment such as pans and chairs.



Figure 41. Coordinators of Groupe Mbogayife with Youssou Sarr (top left, coordinator of Centre AFAFA) and me (top right). The group is coordinated by (clockwise) Marie Djogoul, Rokhie Ndiaye, Mamadou Ndour, Fatou Thiaw, Mben Faye and Adama Ndour. © Carla Sarrouy Kay 2017

5.3.2. Ndiémane's Natural Context

5.3.2.1. Cycles and Perturbations of an Ever-Changing Climate

Mbour⁴⁸ is a city located on the coast, 20 miles northwest of Ndiémane. It has the nearest longstanding weather station to Ndiémane although, according to the villagers, the two locations do not share exactly the

⁴⁸ See Figure 19, p. 84.

same climate. For this section, I will analyse Mbour’s climate data and add specifications related to Ndiémane when different from Mbour.

Mbour has a distinct rainy season between June and October and is virtually rainless the rest of the year, between November and May. The rains dictate agricultural work and, traditionally, farming households produce during each rainy season the staple foods needed until the following rainy season. Rainfall data for Mbour ranging from 1901 to 2017 (Figure 42) reveals that the intramonthly variation of rainfall is considerable and can be at times over two-fold its median value.

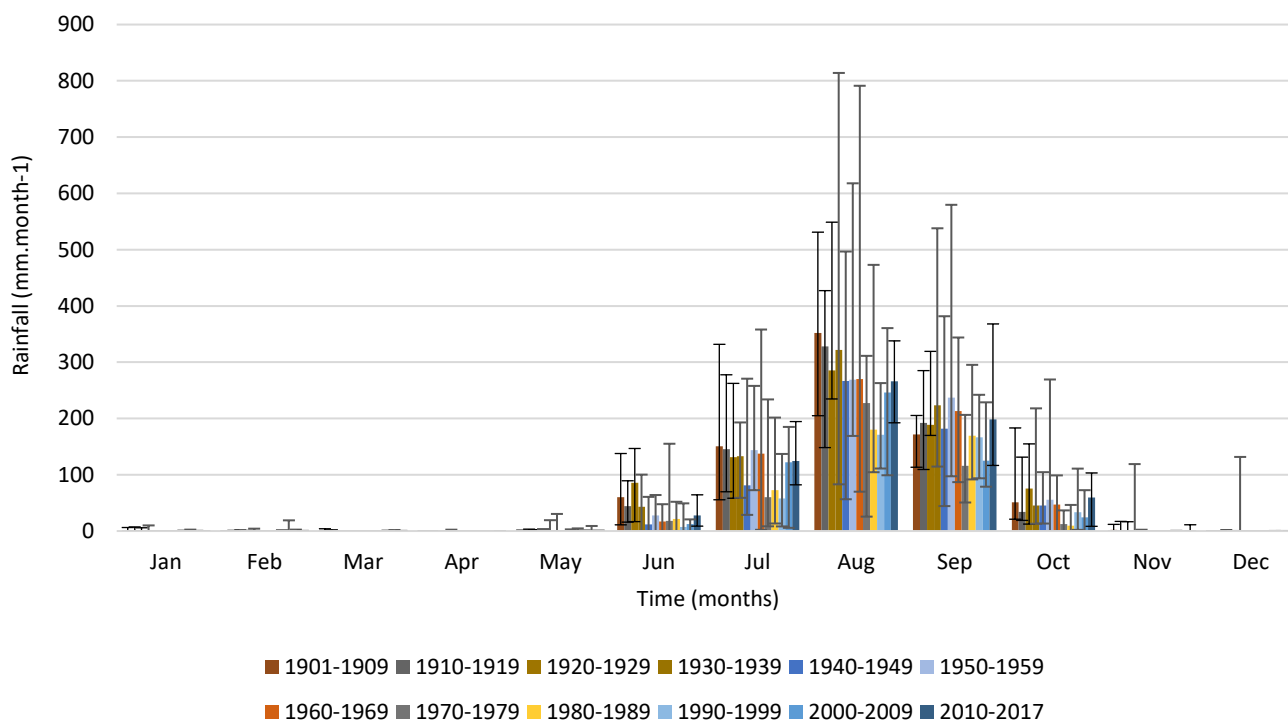


Figure 42. Annual cycle of the median rainfall amount in Mbour between 1901-2017 (Data from DMN, GHCN and CRU⁴⁹, figure by the author)

When adding up the total annual rainfall amount for Mbour during the same period, it becomes clear that the values have been decreasing over time (Figure 43), which leads to isohyets moving southwards (Fall 2017). However, a reverse of the trend may be starting since the mid-2000s, with more rain and less variability, conditions that should be positive for agriculture.

⁴⁹ DMN: Direction Météorologique Nationale, GHCN: Global Historical Climate Network, CRU: Climate Research Unit.

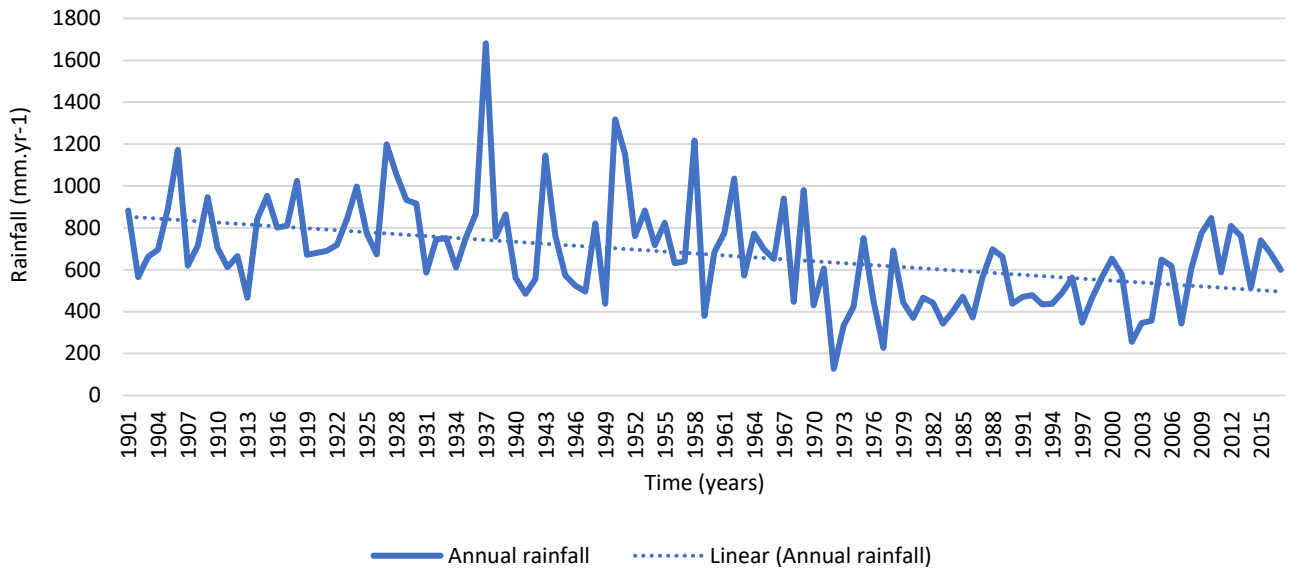


Figure 43. Total annual rainfall amount in Mbour between 1901-2017 (Data from CRU TS4⁵⁰, figure by the author)

Monthly temperature changes follow the flow of the rainy season with the hotter months corresponding to June to October (Figure 44). Between November and May, the temperatures in Mbour are milder and, provided there is abundant access to water, this period can be conducive to the production of out-of-season fruit and vegetables. The colour gradient in Figure 44 reveals that between 1901 and 2017 the average temperatures have followed an upward trend, with the latest (darkest) decades registering the highest temperatures on average. This trend is not unique to Mbour, it is clearly visible in Senegal and more broadly in Africa and even globally, where temperatures have increased by at least 1°C since the 1970s (Figure 45).

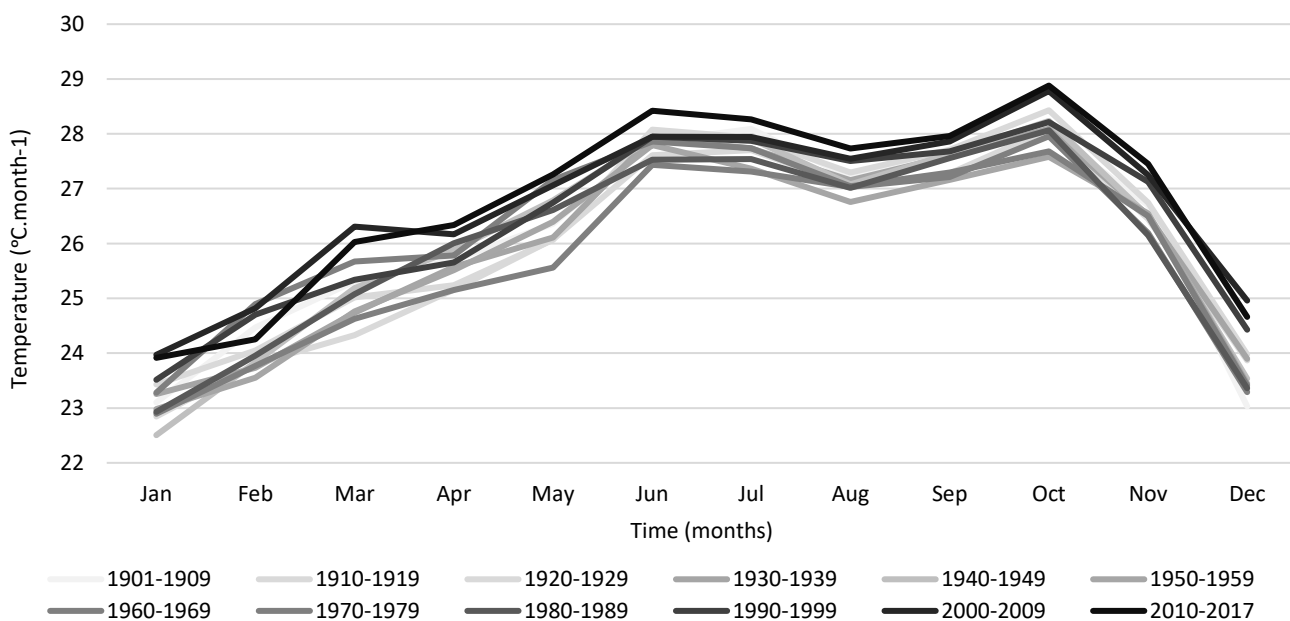


Figure 44. Annual cycle of the average temperature in Mbour between 1901-2017 (Data from CRU TS4, figure by the author)

⁵⁰ Climate Research Unit TS version 4.

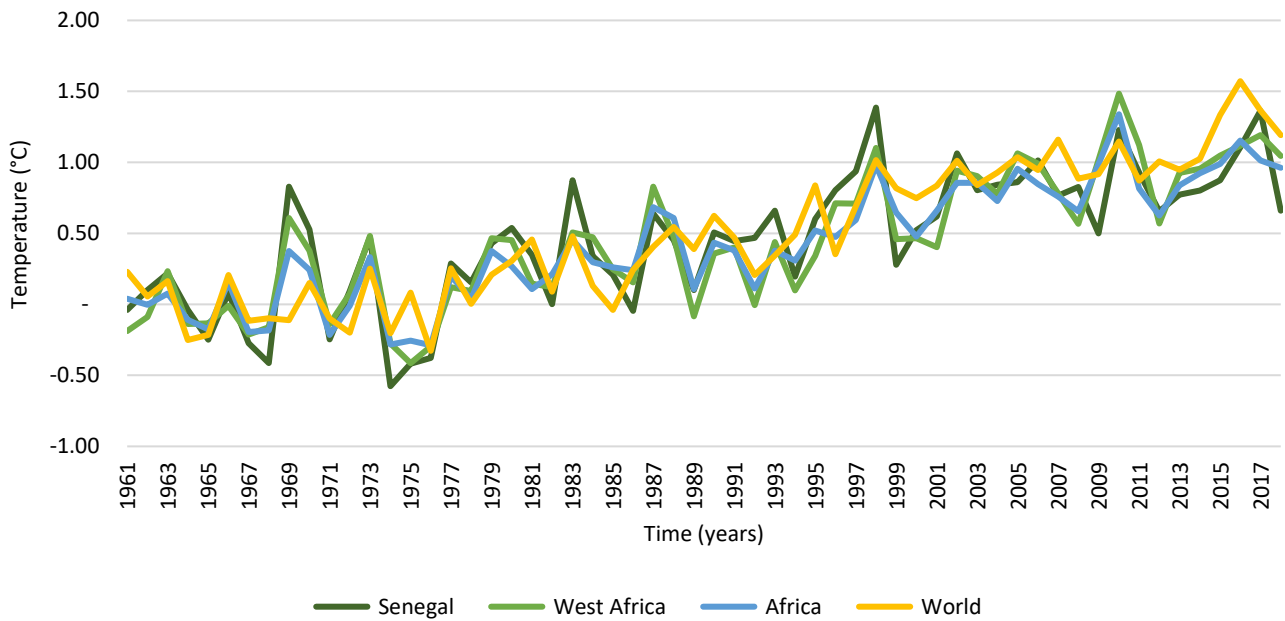


Figure 45. Mean surface temperature change in Senegal, West Africa, Africa and the world between 1961 and 2017 (FAO, 2019)

Finally, and linked to rainfall and temperature, humidity levels in Mbour vary greatly during the year (Figure 46 and Figure 47). During the dry season, the gap between the maximum and the minimum temperatures and humidity levels is much larger than during the rainy season (June to October). During the rainy season, maximum temperatures decrease slightly due to the increase in rainfall and consequent humidity. Rainy season minimum temperatures and humidity levels remain persistently high thus creating conditions for very fast plant growth. The intramonthly variation for both temperature and humidity is considerable all through the year for the periods under analysis, which explains the paramount concern of peasants to minimise risk above all to insure some production whichever the weather conditions.

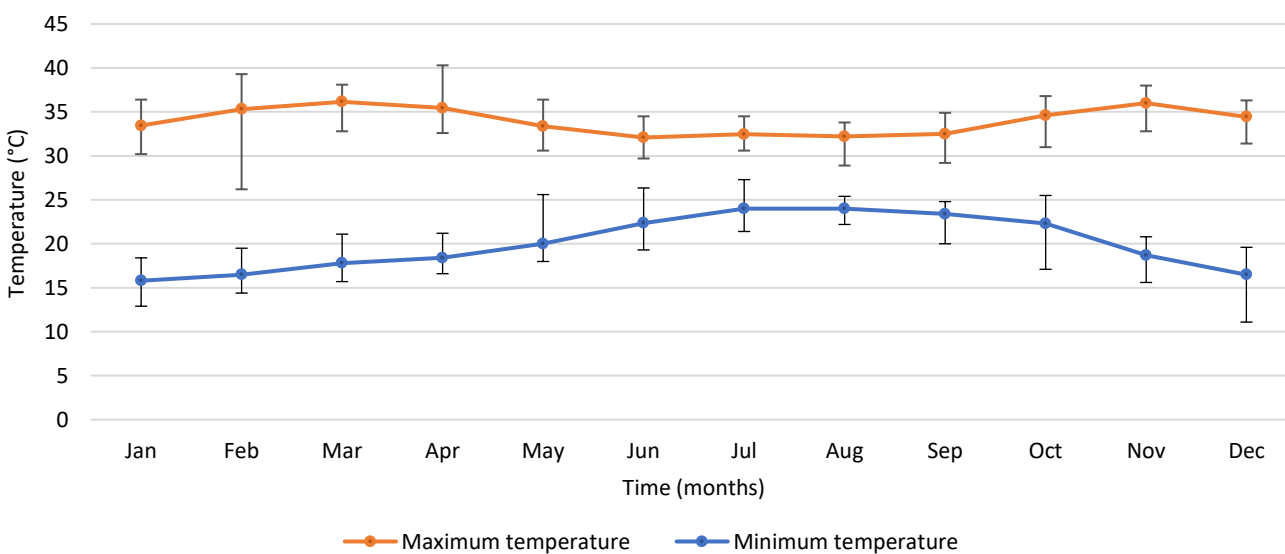


Figure 46. Annual cycle of the median temperature in Mbour between 1961-2003 (Data from DMN, figure by the author)

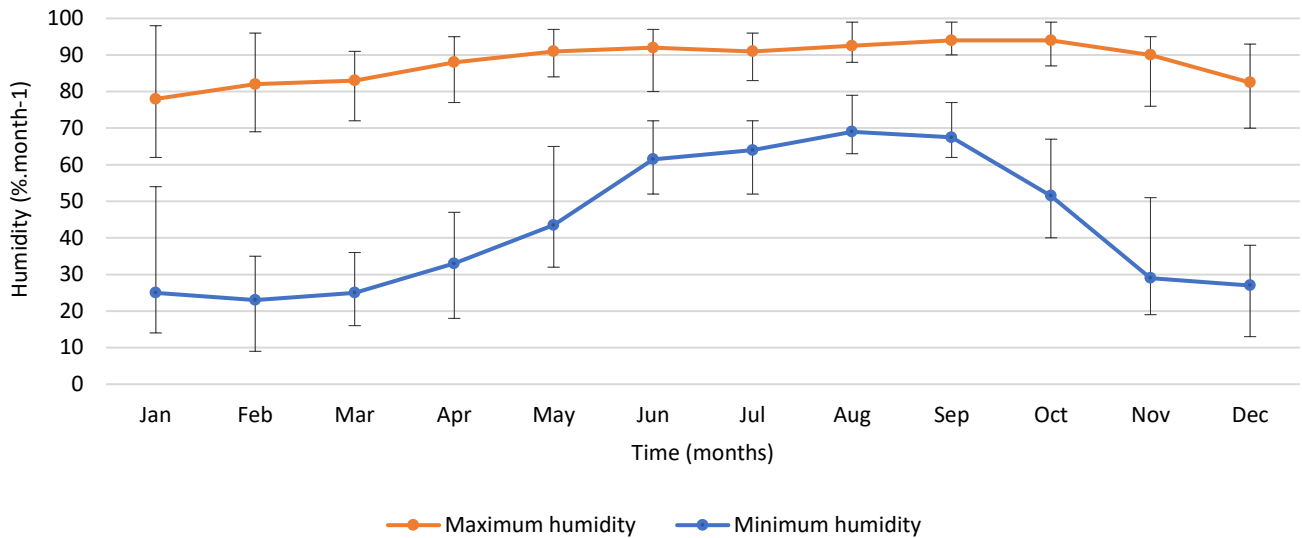


Figure 47. Annual cycle of the median humidity in Mbour between 1976-2003 (Data from DMN, figure by the author)

In Ndiémame, the change from the dry season to the rainy season leads to dramatic changes in the landscape from a dry ochre landscape to a fertile green one, in only a matter of weeks (Figure 48).



Figure 48. Aerial view of Ndiémame Malaoubé in February 2017 during the dry season (left) and in October 2017 towards the end of the rainy season (right) (Google Earth 2020)

5.3.2.2. Regular Droughts Testing Adaptation Skills

Senegal is highly vulnerable to various impacts of climate change. Its main manifestation is water scarcity, mainly due to the lack of rainfall, a situation shared with most African countries (Altieri and Koohafkan 2008, Mapfumo et al. 2013). Over the past decades, average temperatures have increased, and the rainy season has

become shorter and less intense. Farmers suffer from the decreased availability of water resources and from increased soil erosion mainly due to wind and water.

The villagers of Ndiémane have vivid memories of droughts (Groupe Mbogayife 10/10/2019, Michel Diouf 25/06/2019). During the period of this doctoral research alone (2016-2021), peasants talked about the difficult experience of 2019. The rainfalls of 2017 and 2018 had been poor and insufficient to replenish the village wells, so in 2019 the wells dried up early during the dry season and peasants were unable to do any market gardening (Figure 49).

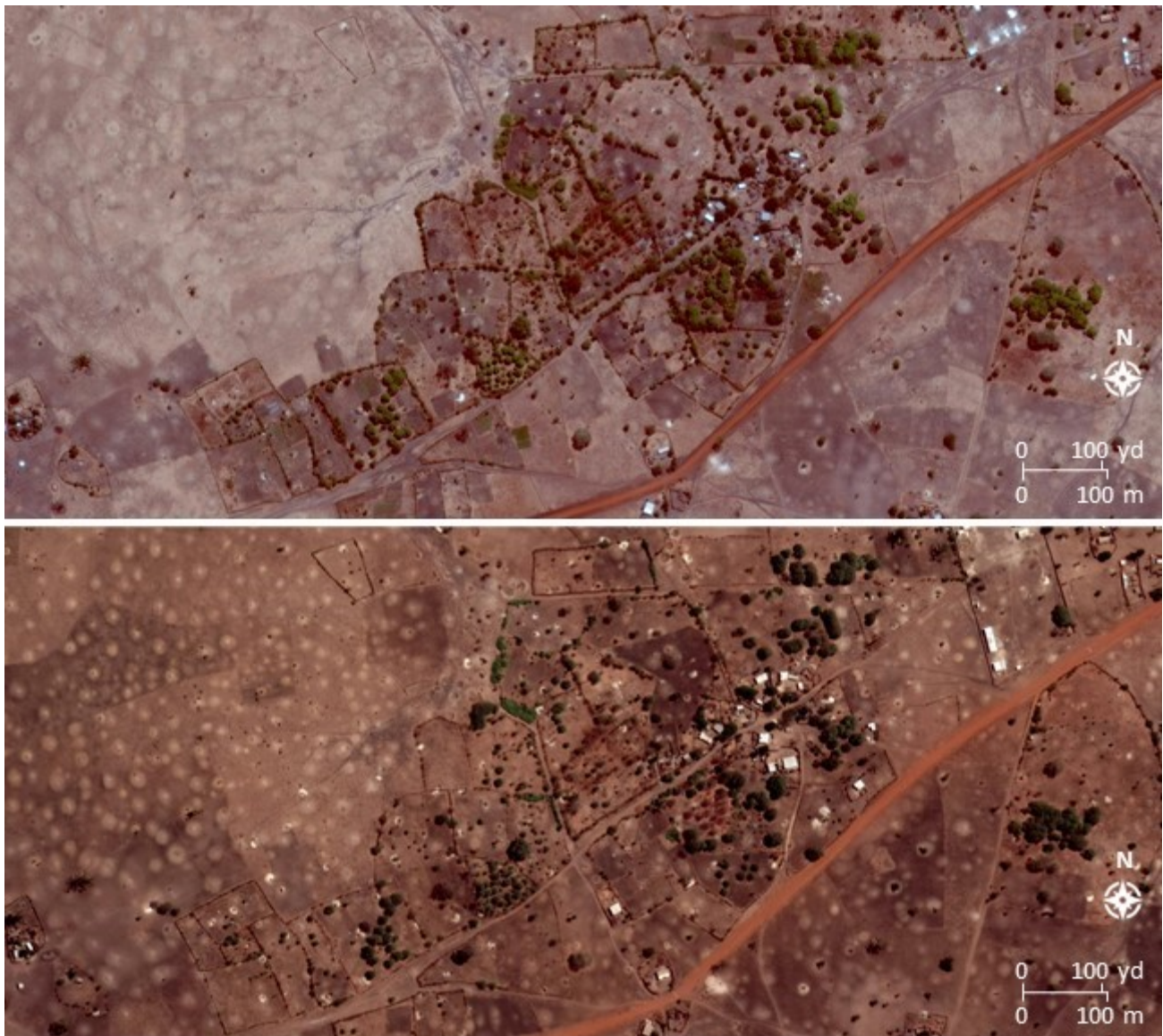


Figure 49. Aerial view of Ndiémane Malaoubé in June 2016 (top) and in June 2019 (bottom) (Google Earth 2020). Both pictures were taken at the end of the dry season but note how the drought of 2019 meant that fewer fields were farmed, many trees dried out and most green hedges vanished.

Michel Diouf (14/10/2019), one of the most experienced elder peasants in Ndiémane, described how he had a successful year in 2017 with agroforestry associating papaya trees and market gardening crops such as aubergine, tomato and okra, yet the two following years were difficult. After the rainy season of 2018, Michel

sowed peppers but, conscious of the lack of water, he would water his crops sparsely and wait for the wells to refill. The wells stopped refilling after 3-4 months, so by February 2019 the peppers had died and even the papaya trees had perished due to their shallow root system which is more vulnerable to droughts. Michel did not try to dig deeper wells. By the end of the dry season of 2019, Michel’s field was totally empty and dry (Figure 50).



Figure 50. Michel Diouf's fields and wells in May 2017 (left) and in June 2019 (right). Note the complex agroforestry system on the left, with papaya trees providing some shade to the lower crops, intercropping, mulching, and frogs in the wells. On the right images, the wells are totally dry, there are only some trees on the hedges or adjacent fields, some pepper stalks, and straw. © Carla Sarrouy Kay 2017 and 2019

5.3.2.3. Flora and Fauna: A Journey from Abundance to Scarcity

Droughts are often associated to land cover changes (Armah et al. 2011) and research shows that land cover affects, and is affected, by the climate. According to Stehenne and Lambin (2001), the long-term decline in tree cover in the Sahel has led to a change in the region’s climate. Equally, when conducting a multivariate analysis of the climate, soil and population in the area, Gonzalez et al. (2012) conclude that the single factor that has the most significant impact on tree cover changes is the climate, and especially the temperature.

In Senegal, Ababacar Fall (2017: 71) analysed the role of rainfall in defining the national landscape and concluded that human pressure has a more prominent role than rainfall: “[t]he level of anthropisation may be seen as a global factor that leaves after all little time to ecosystems to reconstitute themselves and therefore defines the type of landscape”.

National data reveals that land use in Senegal has changed considerably in the past decades. Forest cover and tree density have decreased between the 1950s and the 2010s (Figure 51) (ANSD 2017b, FAO 2020, Stehenne

and Lambin 2001, Gonzalez 2001). Aggregating national data, Tappan et al. (2004) show that between 1965 and 2000 savannas decreased from 74% to 70% of land cover and cropland expanded from 17% to 21%. The authors draw attention to the detail behind these aggregated values: (1) the country is experiencing a loss of more than half of its dense canopy forests; and (2) there is a clear decline in woody cover throughout the country. The authors suggest that although humans (and especially farmers) can be guardians of trees because they represent a source of natural wealth, humans are also responsible for the loss of wooded savannas and woodlands because of charcoal production, an activity discussed in more detail in the next subchapter (p. 119).

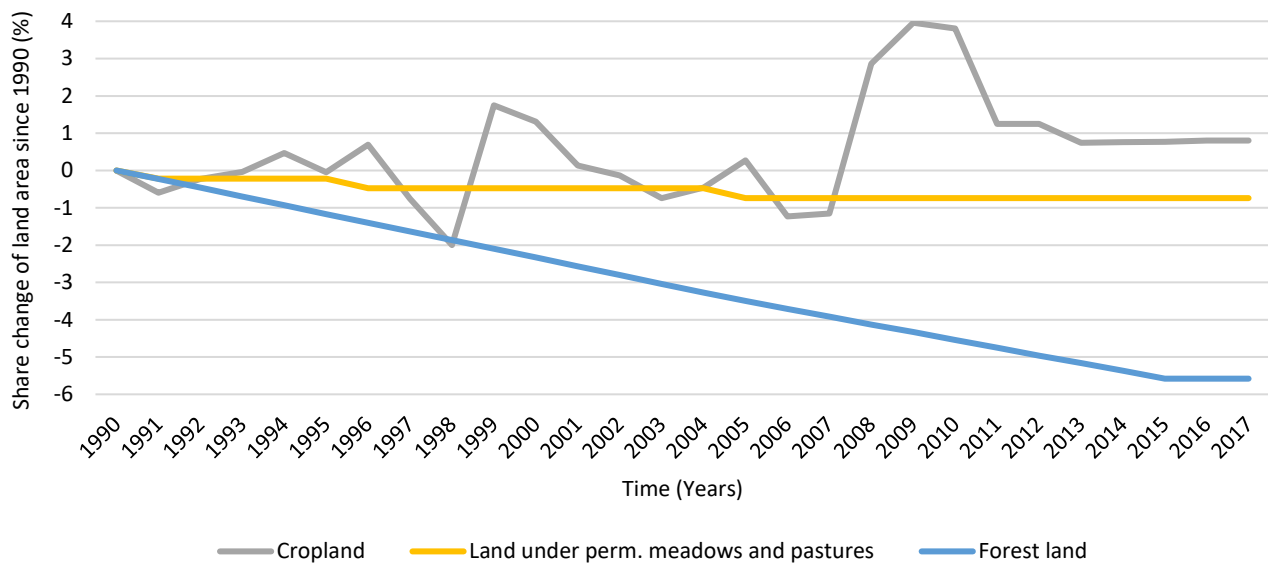


Figure 51. Land use change in Senegal between 1990 and 2017 (FAO 2020)

There are considerable differences in land use, land-cover change and forestry throughout Senegal, and more detailed regional analyses reveal that the trend is particularly strong in the West-Central Agricultural Region, where Ndiémame is situated (Tappan et al. 2004). According to Mbow et al. (2008), the conversion of forest and savanna areas to agricultural land, especially since the 1980s, has led to rapid environmental degradation in the region. A fact, the authors argue, that was exacerbated by concomitant changes in precipitation, soil quality, environmental policy, markets, and population numbers.

Regarding the biodiversity of wooded areas, since the 1980s there has been an overall reduction in woody species richness with the loss of large trees and the increased dominance of shrubs (Herrmann and Tappan 2013). Although some areas of Senegal may have shown a tendency for greening, large trees are under increasing pressure, they are increasingly replaced by smaller bushes and thus there is a loss of forest species richness and tree density (Gonzalez 2001).

Aerial photography and historical statistics are corroborated by local people’s perceptions. When conducting research in Linguère (central Senegal), Brandt et al. (2014) asked informants about their perception of changes

in tree species composition in the past forty years. The results show that participants consider that two-thirds of the tree species assessed have strongly or very strongly declined or totally disappeared (only one-sixth had a positive result with either an increase or strong increase) (Brandt et al. 2014: 62).

This tendency is also observed in nearby Sahelian countries such as Burkina Faso (Lykke, Kristensen, and Ganaba 2004) and Mali (Brandt et al. 2014) and it reveals a shift of plant species towards the South – concomitant with the isohyet shifts southward – with the clear implantation of arid-tolerant, Sahelian species progressively descending from the north of Senegal (Herrmann and Tappan 2013).

So, what did the West-Central Agricultural Region look like in the past? Figure 52, dating from 1681, depicts the view from the sea of the Rufisque Bay, just off Dakar, on the Petite Côte toward Mbour and Ndiémane. The image shows a deeply forested landscape, intertwined with huts, with local fishing boats and sailing boats, and a variety of trees, birds, and animals. This depiction relates closely with La Tourrasse's (1901) illustration more than two hundred years later of Rufisque still appearing densely forested (Figure 53). Today, Rufisque is one of the biggest cities of Senegal and is progressively being engulfed by Dakar's suburbs as they overflow the Green Cape peninsula.

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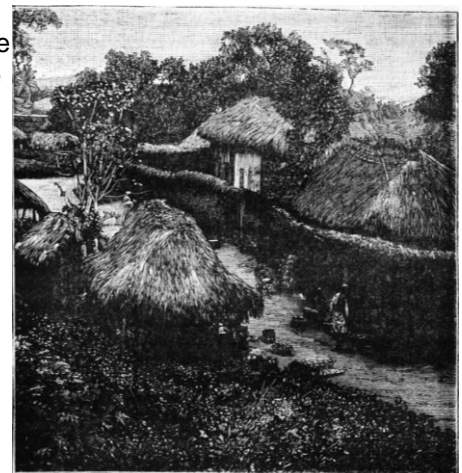


Figure 52. Rufisque Bay, Petite Côte, Senegal (The National Archives 1681)

Figure 53. A street of Rufisque, Petite Côte, Senegal (La Tourrasse 1901)

John Ogilby's illustration (Figure 54), dating from 1670, shows an exchange between the king of Cayor (a Senegalese kingdom situated between the Senegal and Gambia rivers) and colonialist traders. The coast is depicted as a busy location between the vast ocean on one side, and dense forests on the other.

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Figure 54. *The king of Cayor, in the Green Cape, charging the right to drop anchor to the captain of a European vessel. (Ogilby 1670)*

Figure 55. *Animals of Guinea. (Ogilby 1670)*

Every colonial explorer that was sent to describe, illustrate, and study the Senegalese fauna and flora expressed their amazement when contemplating their richness and diversity. Explorers felt inebriated by such luxurious landscapes:

Je marchois en chassant dans une terre déserte, qui n'avoit jamais été défrichée, toute couverte de bois aussi anciens que le pays, & dont l'épaisseur seule, indépendamment des bêtes féroces qui s'y retirent, auroit dû m'inspirer de la frayeur. Malgré les dangers & les incommodités inséparables de cette chasse, ma curiosité me portoit à pénétrer dans les lieux les plus épais de ces bois; les animaux, les plantes & les oiseaux que je rencontrois à chaque pas m'y invitoient.

« I walked hunting in a desert land, that had never been cleared, all covered by woods as old as the country and whose thickness alone, independently from the ferocious animals that rest there, should have inspired some fear in me. Despite the dangers and the inseparable inconveniences of this hunting, my curiosity made me penetrate in the deepest woods; the animals, the plants and the birds that I encountered at every step invited me into it. »

Figure 56. Michel Adanson (1757: 77), French naturalist and explorer describing a hunting trip in Senegal

Among the bigger wild animals, there are descriptions of elephants, hippopotami, crocodiles, gazelles, tigers, wolves, leopards, boars, monkeys, hyenas, jackals, lynxes, and snakes. There were also descriptions of the vast array of insects, birds and obviously fish and other sea creatures (Adanson 1757, Pruneau de Pommegorge 1789, Da Mosto 1895, Haurigot 1887). Ogilby's illustration (Figure 55), though relating to Guinea, shows animals that were probably common in Senegal at the time and largely unknown in France.

Observations tended to be quite descriptive to give a better chance to readers in Europe to imagine this world new to them (Figure 57). The local fauna and flora were described paying attention to their uses by the local population and also their potential uses for the colonial powers, such as construction wood and gum arabic (Haurigot 1887, Adanson 1757).

Dans ce païs se trouvent plusieurs animaux de diverse sorte et mêmement de grans et petits serpens, dont les uns sont venimeux, les autres non ; entre lesquels il y en a de longs de deux pas, et plus, qui n'ont ailes, ny pieds, mais ils sont gros, si bien qu'on dit y en avoyr veu qui ont transglouti une chevre entiere, sans la demembrer.

Les bœufs et vaches de ce païs, et même de toutes les terres des Noirs sont de plus petite corpulence que les nôtres, ce que je pense encore proceder de la chaleur. Et à grande difficulté y pourroyt on trouver une vache de poil roux, mais trop bien de noires, blanches ou bien tachetées de l'une et l'autre couleur. Ils s'y trouve des lions, lionnesses et leopars en grande quantité, avec des loups, chevrels et lievres.

Il y a semblablement des elephans sauvages, pour ce que on n'a coutume de les aprivoiser, comme aux autres parties de la terre. Ils vont par bandes ainsi que font deçà les porcs parmy les boys. Quant à la description de leur stature, je m'en deporte, à cause qu'un chacun sait (comme je pense) que ce sont animaux de grande corpulence et bas enjambés.

« In this country there are multiple animals of different kinds and equally big and small snakes, of which some are poisonous and others not; of which there are as long as two steps [3 metres], and more, that have no wings, no feet, but they are fat, such that people report having seen some that have gobbled a whole goat, without dismembering it. [...]

The bulls and cows of this country, and even of all the lands of Negroes, are of a smaller corpulence than ours, what I think proceeds from the heat. And with great difficulty one could find a cow with red fur, but rather black ones, white ones, or with spots of one or the other colour. There are lions, lionesses and leopards in big quantity, with wolfs, deer and hares.

There are apparently wild elephants, there is no habit of taming them, like in other parts of the earth. They go in groups as do pigs among the woods. As for the description of their stature, I stray away from it, as everyone knows (I think) that they are animals of big corpulence and short legged. »

Figure 57. Description of the fauna of Senegal (Da Mosto 1895: 106, 110)

Descriptions were imbued in fascination especially when involving local populations as in the description by Pruneau de Pommegorge of a boy killing a tiger in Joal, a town situated 15 km south of Ndiémane (Figure 58).

Ce pays est rempli d'une quantité prodigieuse d'animaux sauvages & carnassiers, de toutes les espèces, & de plusieurs même inconnus ailleurs. Les plus nombreux, sont les éléphants, les lions, les tigres, les chats-tigres, les ânes sauvages, &c.

J'ai vu à Joal, un jeune enfant de huit ans, en tuer un, à la pointe du jour, d'un coup de flèche, près de la case où je dormois. Le chant des louanges que la moitié du village lui donna aussitôt, me réveilla, & me rendit témoin de sa victoire. La peau de cet animal me fut présentée, & je l'ai rapportée en France.

« This country is full of a phenomenal quantity of wild and carnivorous animals, of all species, and of several even unknown elsewhere. The most common are elephants, lions, tigers, tiger-cats, wild donkeys, etc. »

[...]

« I saw in Joal a young child of eight years old kill [a tiger], at dawn, with an arrow, near the hut where I slept. The song of praise that half the village immediately gave him woke me up and made me a witness of the victory. The skin of this animal was presented to me and I brought it back to France. »

Figure 58. Pruneau de Pommegorge (1789: 63–64, 70–71), a former advisor to the governor of Senegal, describes the large local fauna and a scene of killing a tiger near Joal.

As the trees became scarce over the centuries, so did most large fauna. Large mammals are so rare nowadays in Senegal that it makes international news when they make brief appearances in National Parks (Le Monde 2020). The government's report on the social and economic situation in Thiès, the region where Ndiémane is situated, divides today's regional fauna in two categories: (1) the hairy fauna constituted of small ruminants

and rodents, and (2) aviary fauna (ANSD 2017a). There are no large animals beyond livestock in Ndiémame, though some villagers claim some hyenas might still occasionally come near the village at night (Mamadou Ndour 09/05/2017). The area has, however, a wealth of creatures, some of which are so numerous they seem to invade every square meter of the village (such as millipedes and toads during the rainy season), some others are a lot more unique and shy, such as snails and chameleons (Figure 59).



Figure 59. Wild creatures found in Ndiémame and its surroundings. © Carla Sarrouy Kay 2017, 2019 and 2020

5.3.2.4. The Landscape of Ndiémame in the Past and in the Present

The villagers of Ndiémame agree unanimously the area used to be fertile and largely forested. As explained during the village history analysis (subchapter 5.3.1.1., p. 102), a large area of wood had to be cleared for the neighbourhood to settle and farm (Groupe Mbogayife 13/06/2019). The practice of land clearing was described by the French naturalist and explorer, Michel Adanson, in the eighteenth century when recounting a trip to Saly, a coastal town adjacent to Mbour:

Une pirogue m'y
 mena sans aucun accident. Je me trouvai dans une
 terre sablonneuse, mais d'une fertilité inconcevable &
 toute couverte de bois.

Les nègres avoient coupé
 ce bois en plusieurs endroits pour y faire des champs
 de petit mil : il étoit alors près de sa maturité.

« A pirogue took me there without any incident. I
 found myself in a sandy soil, but of an unconceivable
 fertility and totally covered in woods. »

[...]

« Negroes had cut this wood in several places to
 have small millet fields: this was then nearing
 maturity. »

Figure 60. Description of land clearing for millet production in Senegal (Adanson 1757: 59)

Daouda Ndour (15/10/2019), a male elder, explained that, traditionally, if a newcomer wished to settle in or if a villager wanted more land, they had to request it from the village chief who would then allocate land according to the perceived needs and would give permission to clear land with fire.

In the Seereer tradition there are two land rights: the right of fire and the right of axe (Pélissier 1966: 124). The first person to burn the forest to get land would be the “Master of Fire” and their territory would encompass the area burnt during a fire of three, four or six days. The “Masters of Fire” would not necessarily use all the land acquired through fire: they would use the land they were able to clear and where they behaved as landowners. The remaining land was granted to other peasants who then acquired the “right of axe”, i.e., permission to clear the land, often in exchange for annual fees in kind. Note that “Masters of Fire” may accumulate the right of fire and the right of axe, that land tenure is inalienable, and it is family-owned and not individual. The right of axe is not necessarily temporary and disputable though. As long as the “Master of Axe” respects their customary obligations, their rights are imprescriptible and hereditary.

Times are changing and although traditions remain strong, it is possible nowadays to acquire land by other means, either directly from a peasant who decides to sell their land or by official routes, such as Centre AFAPA’s land acquisition via the mayor.

Ablaye Sarr (27/06/2019), a male elder, arrived in Ndiémame in 1966 and remembers everything being so different: there were lots of trees and water and people would have small plots and yet produce a surplus of food. However nowadays many have a lot of hectares, but they cannot profit from the whole land, so they only use the portion that their scarce means allow and that is just about enough to live. I praised Ablaye Sarr’s extensive knowledge about the village and about farming, but he said that nowadays his only goal is to try and make ends meet, a far cry from his youthhood memories of bounty and wealth.

Often, during interviews and focus group discussions, when participants were unable to situate events in the past but knew they belonged to a distant and very different past, they would say “This was when Ndiémame was full of trees, water and wild animals”. This notion, though hard to grasp for the young generations, was a trigger that made the elders reminisce of a childhood so different from today’s life and challenges.

According to Yako Ndour (14/06/2019), a male elder, surrounded by a dense forest, the people of Ndiémame started dedicating themselves to charcoal production to make money. Yako Ndour explains: “People were self-sufficient with lots of milk, millet, livestock, game, etc. so all the money made was simply saved.” Yako Ndour clearly remembers in 1973, relaxing in the village with his friend Ousmane and wondering about the future. Ousmane observed that life was changing and predicted that one day people would even have to buy charcoal which was so abundant at the time. Yako laughed at this thought that seemed so implausible. Yet, only 45 years later, as we were talking, his son brought a little bag of charcoal that he had just purchased from the local shop to be able to prepare some tea.

Charcoal is now a scarce resource due to the extreme deforestation that occurred in Ndiémame during these past decades, which totally reversed Ndiémame’s position from a supplier into a net purchaser of charcoal. According to Tappan et al. (2004: 459), since 1994, charcoal production has led to the moderate or severe

degradation of 28% of Senegal's wooded savannas and woodlands. It would not be a surprise if this value was even higher in Ndiémane.

Groupe Mbogayife (14/06/2019) recalled the times when, at the end of the rainy season, once granaries were full, villagers would gather on the public square to play checkers or to go hunting. Men particularly remember gathering to hunt around the village. According to Mamadou Ndour (13/06/2019), a young man, children used to organise hunting days in the 1980s, using sticks to hunt animals. They would go to the surroundings of the village to hunt rabbits, pheasants, guinea fowl, palmist rats, etc. These animals are not as large as the ones described in the seventeenth and eighteenth century in the region, nonetheless they are species that are now very rarely seen.

Far beyond the landscape changes between rainy and dry seasons, deforestation could be observed even during the length of this research, in the past five years. Villagers are conscious – and academic research concurs – that the trees' and, more widely, the forests' existence depends strongly on human action. Humans are probably the most important agent of change responsible for deforestation in the area, before droughts or even global climate change (Tappan et al. 2004, Boissière et al. 2013).

Humans have led to the deforestation of the landscape and yet, the same agents have also carefully selected which tree varieties would be saved, and in which locations. Figure 61 shows a distant view of Ndiémane Malaoubé. Whilst the fields that lead to the neighbourhood are clearly deforested and few hedgerow trees remain, the neighbourhood itself remains largely green and forested, with tree varieties that are widely used in the household diet and with important cultural and spiritual significance such as mango trees, baobabs and neem. As shown by Fairhead and Leach (1996a, 1996b), it is often local indigenous communities who protect, revive and even create forests, and the absence of humans in a region does not necessarily equate with forest regeneration and gains for biodiversity (Bavington, Grzetic, and Neis 2004, Pimbert and Gujja 1997).



Figure 61. Distant view of Ndiémane Malaoubé in October 2019, at the end of the rainy season. Note the deforested fields with only some occasional trees and afar the neighbourhood marked by a high density and diversity of trees. © Carla Sarrouy Kay 2019

Changes, such as deforestation, have decreased the human carrying capacity to below actual population densities. As shown by Gonzalez et al. (2012: 217) for the West African Sahel, “[t]he rural population of 45

people km⁻² exceeded the 1993 carrying capacity, for firewood from shrubs, of 13 people km⁻² (range 1 to 21 people km⁻²)." And whilst villagers described the past landscape as "so dense you wouldn't even dare go in!" (Maman Diouf 14/10/2019), nowadays the idea of producing charcoal or hunting seems almost absurd. Yako Ndour (14/06/2019), a male elder, remembers going in 1982 to the nearby forest of Saly to hunt, but this forest is now completely gone. There is now a large holiday resort on that location and Saly has become one of the biggest touristic ports in the whole of West Africa. One would have to travel hundreds of kilometres to hunt anything relevant (Mamadou Ndour 13/06/2019).

Land around Ndiémane is coveted due to its proximity to major urban hubs such as Mbour or even Dakar⁵¹, both easily accessible thanks to good quality national roads and motorways. According to villagers, there is an increasing demand for land from large, export-oriented businesses and from wealthy urban individuals who now wish to invest in farming, a new challenge often perceived as a hobby. These purchased plots can be seen all around Ndiémane and are often easily recognisable as they have high initial investments (to build permanent metal fences, wells or even boreholes, and to pay for guards and labourers) and more specialised or higher risk agricultural approaches than subsistence farming.

The demand for land also comes from the tourist industry and the ambitions to further develop the Petite Côte as a West-African tourism destination, mainly targeted at Europeans. Ndiémane is only 7 km off the coast and the land along the beautiful and underexploited coast between Mbour and Joal is progressively being purchased to build holiday resorts. This pressure on land has a direct impact on land demand and prices in Ndiémane.

Finally, land grabbing is also a reality in Ndiémane. Maureen Mackintosh (1989: 44) analysed how "[i]n 1972, the beginning of the worst year of the 1970s drought in the Sahel, Bud Senegal [an international company] arrived in the village of Kirène⁵² and began measuring and staking out the village land. They appropriated, without negotiation or prior compensation, a large tract of the best village land [...]". The process of appropriation of land in Ndiémane was described to me in similar terms, for example for the construction of the road that now crosses the village and that was built over and across fields that were expropriated and for which peasants received no compensation.

Similarly, since 2014, the acquisition by Spanish investors of 100 ha of pastoral land near Ndiémane for a farm to grow melons for export remains highly contested. Although there were local negotiations prior to the acquisition of the land, the project is not supported unanimously by the local population and it features

⁵¹ Respectively 16 miles (25 km) and 71 miles (115 km) away.

⁵² Kirène is a village near Thiès and, although the company has changed hands since, it is still operating and most middle-aged and older women in Ndiémane work there during the dry season.

regularly in local and national news due to confrontations and arrests (Bakhoum 2019, Agence de Presse Sénégalaise 2020, MbourTV 2020).

In June 2019, a focus group discussion with Groupe Mbogayife was unexpectedly interrupted by a member of the group who arrived late and announced that she had just learned about two members of her close family that had been arrested. A group of people from a neighbouring village were planning a march to expose what they considered a case of land grabbing by the mayor in favour of foreign investors. The authorities got wind of the march and decided to arrest the organisers the night before the event. No clear charges were made against those arrested and they ended up being released. This sort of police intervention did not seem to be exceptional and it serves to instil a certain fear of the authorities. It also creates a feeling of distrust, or even corruption.

The reasons for drastic changes in landscape are indeed multiple, however, the biggest single reason that has led to deforestation in Senegal has been the production of peanuts.

5.3.2.5. Peanuts: Swapping Trees for the Golden Seed

The West-Central Agricultural Region where Ndiémane is situated is more commonly known as the “Peanut Basin”. This denomination stems from colonisation, when France decided to promote Senegal’s specialisation in peanut production to supply the metropole with peanut oil (Figure 62 and Figure 63) (Sidibé 2005). The focus on peanuts was done at the expense of forested areas:

« Of all of Senegal’s ecological regions, the Peanut Basin has been the most fundamentally altered by centuries of human activity. In particular, the last 150 years have witnessed a nearly complete transformation of its landscapes. In the mid-1800s, small farming communities were scattered throughout a mosaic of wooded savannas and open woodlands. [...] Today, continuous cultivation under an acacia tree parkland has replaced all vestiges of the natural vegetation [...]. » (Tappan et al. 2004: 435–436)

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Figure 62. Peanut field cultivated with a harnessed sower in the red dunes of the northern Cayor. (Pélissier 1966, fig. 2)

Figure 63. Peanut field in Ndiémane in October 2019 © Carla Sarrouy Kay 2019

According to Sidibé (2005), peanut production started in the 1860s with low to medium production zones near Dakar (West), Saint Louis (Northwest) and Kolda (South). Peanut production rapidly expanded and intensified and by 1900 there was a belt of high production, supported by a railroad system, connecting the two main national ports of Dakar and Saint Louis (Figure 64). Demand was high and production expanded during the mid-1900s mainly toward the south and centre of the country.

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Figure 64. Evolution of the peanut production area in Senegal from 1900 to date (Mbow et al. 2008: 213)

The construction of the train line between Dakar and Bamako (the Dakar-Niger Railway) further expanded eastward the area dedicated to peanuts. As the overall peanut area shifted, so did its high production zone, in part due to land degradation. Since independence in 1960, the area dedicated to peanuts is also firmly established in the south and centre of the country. Here the landscape was previously much more densely forested than the original Peanut Basin, and it has, thus, suffered extensively from deforestation for peanut production (Sidibé 2005, Mbow et al. 2008). Due to its proximity to the coast and the cities of Mbour and even Dakar, Ndiémane was from the onset in the high production zone of peanuts.

Peanuts (*arachis hypogaea*) were probably imported from South America by Portuguese colonisers in the sixteenth century. They were quickly adopted by the local population as a subsistence crop because their short growing cycle (approximately 100 days) adapted perfectly to Senegal's traditional rainy season cereal production (Pélissier 1966). Peanut production has a prominent place in descriptions of the landscape and local activities in colonial reports (Figure 65 to Figure 67, pp. 125-126) (Haurigot 1887, La Tourrasse 1901, Petit 1922, Archives Nationales d'Outre-Mer 1945) and in post-colonial studies of the country and especially the Peanut Basin region (Figure 68, p. 126) (Pélissier 1966, Becker et al. 1999).

Mais la grande culture du pays est celle des graines oléagineuses, et principalement de l'arachide.

Cette dernière a le triple avantage de produire très vite, presque sans travail, de ne pas fatiguer la terre, et de se vendre à un prix rémunérateur. Les indigènes commencent par brûler les herbes qui ont envahi un champ, puis ils le grattent légèrement avec un bois pointu, font leurs semailles, et ils n'ont plus à s'occuper de rien jusqu'au moment de la récolte. L'arachide n'exige ni engrais ni jachères; non seulement on peut la planter indéfiniment dans le même terrain, mais elle le fait même gagner en fertilité.

On conçoit que la culture d'une telle plante se soit rapidement étendue. On la trouve dans le Cayor, une partie du Oualo, le Baol, le Sine, le Saloum, les pays de la côte jusqu'à Sierra-Leone, le long des rives de la Gambie, enfin dans tout le haut Sénégal. L'exportation annuelle, en 1840, était seulement de 1.210 kilogrammes; elle dépasse aujourd'hui 40 millions de kilogrammes.

« The great cultivation of the country is that of oil seeds, and especially peanut.

The latter has the triple advantage of producing very fast, almost without work, of not tiring the soil, and of being sold at a lucrative price. The indigenous start by burning the weeds that have invaded a field, then they scratch it lightly with a pointy stick, they do their sowing, and they have nothing left to do until the moment to harvest. Peanuts require no fertilisers nor fallows; not only one can sow it indefinitely in the same plot, but it even makes it gain fertility.

One understands that the cultivation of such a crop has spread quickly. It is found in the Cayor, part of the Oualo, the Baol, the Sine, the Saloum, in the coastal countries till Sierra Leone, along the shores of the Gambia, well in the whole of Senegal. Annual exports, in 1840, were only 1,210 kilograms; it exceeds 40 million kilograms today. »

Figure 65. Description of peanut production in Senegal (Haurigot 1887: 200–201)

In Ndiémane Malaoubé, the crop was probably responsible for the creation of the neighbourhood itself as its first residents came looking for new land to grow peanuts. Even today this importance persists. Peanut

production and consumption are important agri-cultural activities, hence why multiple peasants chose to mention them in their participatory videos (Figure 69 and Figure 70) (Groupe Mbogayife 2017a, Groupe Deggo 2017a, Diouf 2019a, 2020a).

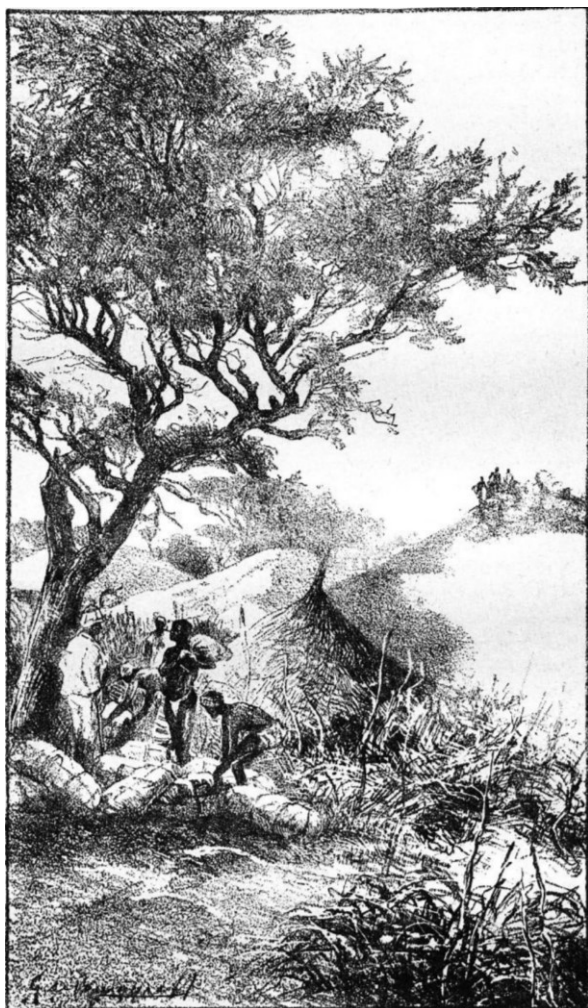


Figure 66. Peanut trade in Kéllé, Peanut Basin, Senegal (La Tourrasse 1901)

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Figure 67. Peanut distribution centre at the port of Dakar (Archives Nationales d'Outre-Mer 1945)

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Figure 68. Threshing and winnowing of peanuts. The two tasks are held at the same time: to the left, there are the Firdou, threshing specialists; to the right, women do the winnowing. (Sidibé 2005: 227)

Figure 69. Young men threshing the peanut harvest in Ndiémane (Diouf 2019a)

Figure 70. Women winnowing the peanut harvest in Ndiémane (Diouf 2019a)

Peanut production can have a fertilising effect on the soils due to its nitrogen-fixing capacities, but in Senegal the plant is often grown in monoculture, and the whole plant is harvested at once (Figure 71 and Figure 72).

Whilst the seed is used for home consumption or sold, the rest of the plant is used as fodder (Diouf 2020a).

Leaving the soil bare after harvests means that the soil is exposed to wind and water erosion, susceptible to leaching, and therefore it loses its fertility progressively.

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Figure 71. Harvesting peanuts with a daramba in Séfa, Senegal. Note the harvesting of the full plant, leaving the soil bare, and the intercropping with corn and other crops surrounding the peasants. (Archives Nationales d’Outre-Mer 1960)

Figure 72. Mature peanut plant in Vélingara, Senegal. Note the plant is upside down, the seeds grow underground, hence the harvesting of the whole plant. (Archives Nationales d’Outre-Mer 1954)

Figure 73 shows the rise of peanut exports in Senegal. Despite a dip due to the Second World War (1939-1945), Senegal became the world leading exporter of peanuts with a staggering eight-fold increase in exports between 1884 and 1969. However, since independence in 1960, peanut production has decreased progressively (Figure 74). With almost stagnant yields at 9,800 hg/ha during the past fifty-six years and a decreasing production trend, revenues from peanuts have gradually lost importance for the Senegalese household and government (Faye et al. 2007, Noba et al. 2014).

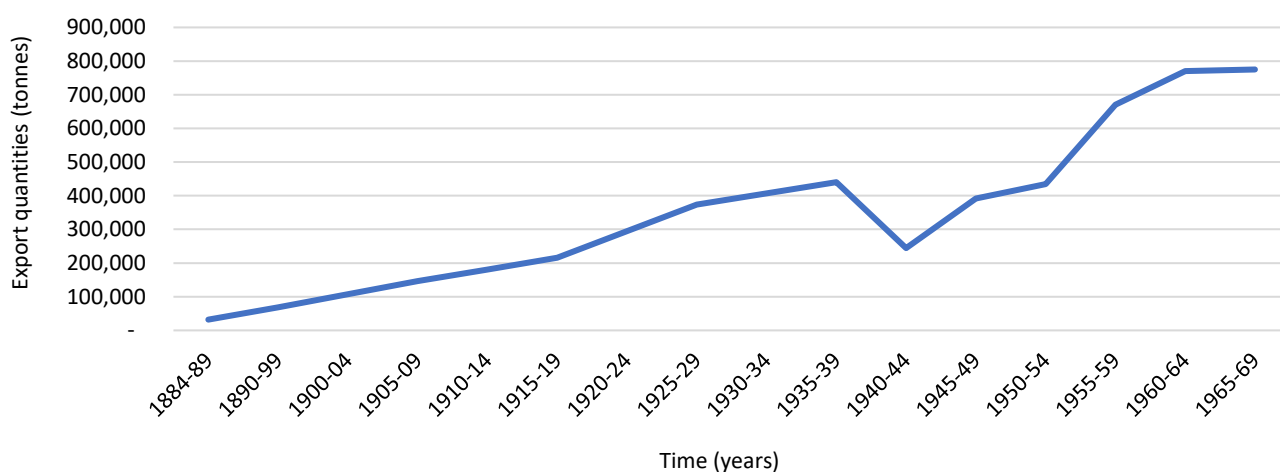


Figure 73. Export quantities of shelled peanuts (adapted by the author from Amin (1971) quoted in Faye et al. (2007: 189))

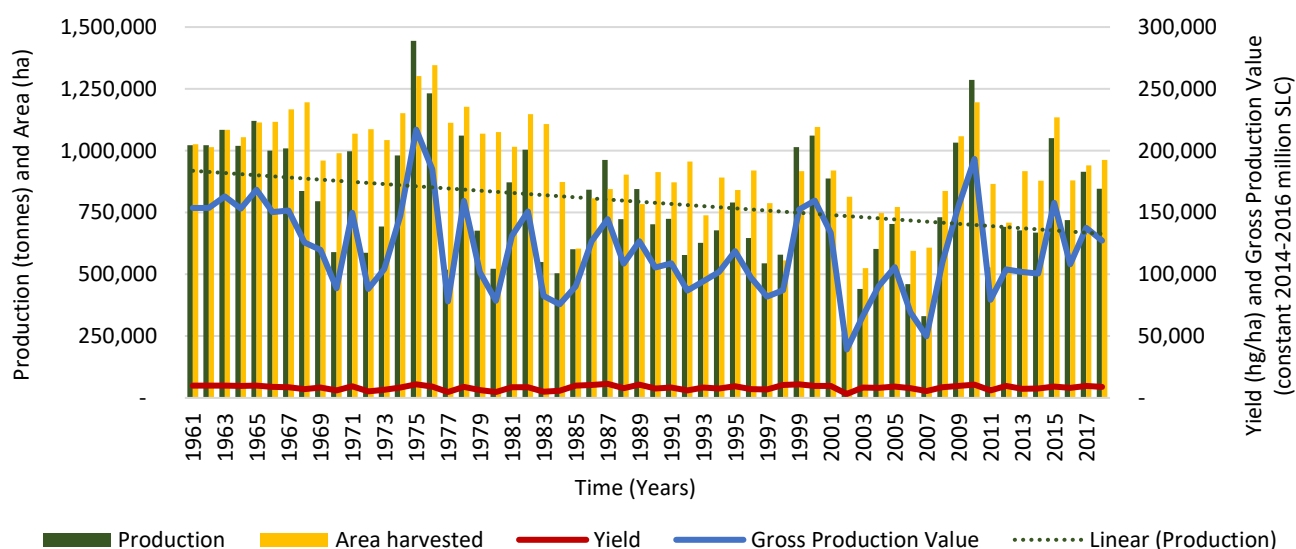


Figure 74. Area, production, yields and gross production value for shelled peanuts in Senegal between 1961 and 2018 (FAO 2020)

Despite Senegal’s prominent role in world peanut production, the crop did little to empower the Senegalese peasantry. The advent of peanuts in Senegal was done to the benefit of the coloniser with no real consideration for the local environmental and social impacts of its production in the short and long terms. As expressed by Naila Kabeer (1999), it was (and, I argue, remains) a process of foreign empowerment stopping actual empowerment. Senegalese households dedicated considerable land, time, energy, and skill to the production of peanuts, and this had two major consequences: (1) peanuts promoted the commodification of food and consequent dependence of peasants on market prices, (2) peasants produced proportionately less subsistence crops and therefore became dependent on purchased food to feed their families.

In exchange for the exports of peanuts, France (as a colonising power) – and then Senegal (as an “in”dependent country) – imported rice to feed its population. Rice came from Asia and was heavily subsidised, thus creating economic dependency and new dietary habits. Later came French wheat, a cereal especially adapted to breadmaking, as the habit and demand for baguettes grew steadily, first in urban areas and then expanding into rural areas (Demont et al. 2013).

Figure 75 shows the rise in rice and wheat import quantities and value. The rice value peak in 2008 relates to the food price increase in the world market that led to major food riots in Senegal and other countries around the world, and were also directly related to the Arab Spring uprising (Brancati and Lucardi 2019). Between 1961 and 2017, rice imports were multiplied by 10.8 and wheat imports by 8.7, despite a decline in peanut production. This shows that although peanut production and rice consumption were initially linked, they are now totally disconnected. Senegal gets minimal revenues from its former main cash crop yet continues dependent on importing food staples to feed its rapidly growing population (Figure 76 and Figure 77).

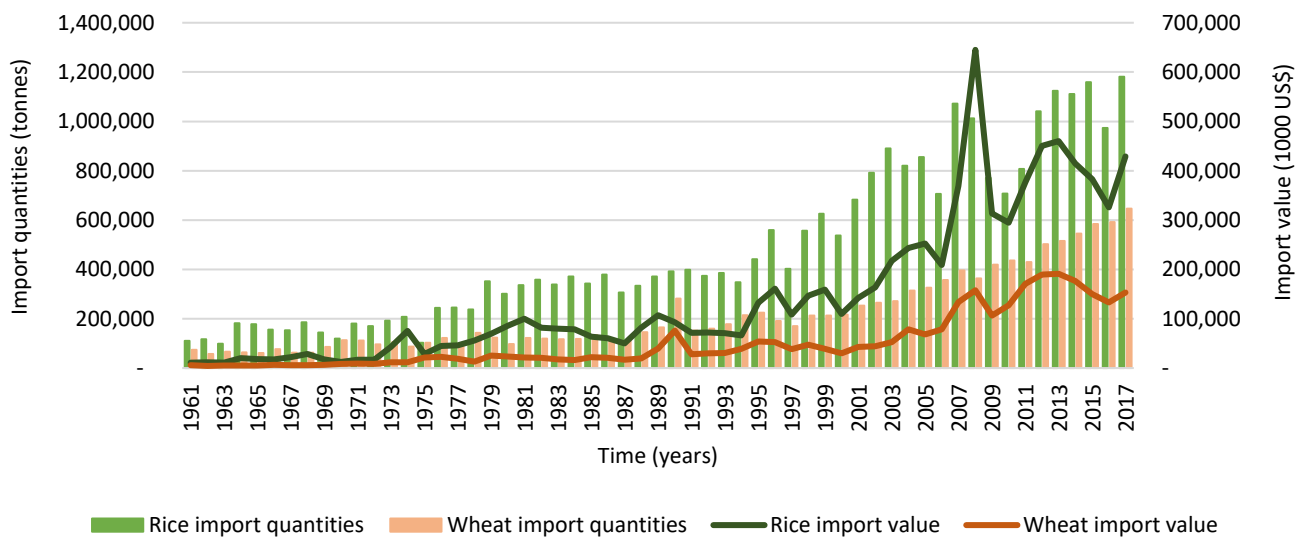


Figure 75. Rice and wheat import quantities and values for Senegal between 1961 and 2017 (FAO 2020)



Figure 76. Typical lunch in a Ndiémame concession during the dry season: imported rice cooked with stock cubes, pepper, dried chillies and salt with – if available – some sea fish. No fresh vegetables are available, and they are expensive to purchase. Foraged plants are not appreciated by children so seldom used in cooking. This dish was shared between nine adults and children. © Carla Sarrouy Kay 2019



Figure 77. Breakfast consisting of a baguette made with French refined wheat, traditional tea (kinkéliba) made with local tree leaves and refined cane sugar. Note that this meal and the one shown in Figure 76 rely heavily on purchased food and have very low nutritional values. © Carla Sarrouy Kay 2020

6. The Ndiémane Food System

With an understanding of the natural and historical context in which Ndiémane is situated, this chapter delves into a deeper understanding of Ndiémane, its current inhabitants and their livelihoods, its food system. Following the RFSF, this section is dedicated to Ndiémane's food system resources and the resource management approaches adopted by villagers (Figure 78, p. 131). I focus here on how villagers analyse and understand the dynamics of the Ndiémane food system, from their own endogenous perspectives as well as through their participatory analysis and own film making.

Research question 2 (How is the Ndiémane Food System defined and organised?) leads to a detailed analysis of the resources the system has and who owns and/or accesses them. To answer research question 3 (How is the Ndiémane Food System acted upon?), I present the approaches adopted by villagers – young and old, women and men – to deal with their realities. To ease understanding, the resources and approaches are presented by category, namely environmental, physical, financial, human, socio-cultural, and spiritual.

There are different levels of scales in the information presented. This chapter focuses on gender and age differences to demonstrate how, although the food system may have rich and promising resources, at times these may be fully controlled by and/or only accessible to a certain gender or age group. The implications of these discrepancies are debated on a case-by-case basis.

RQ2. How is the Ndiémane Food System defined and organised?

FOOD SYSTEM RESOURCES

ENVIRONMENTAL				
Resources owned or accessed by:	Young Women	Old Women	Young Men	Old Men
Seed selection & storage	+	+++		+
Tree and plant diversity	+	++	+	++
Peasant Seeds	++	+++	+	+++
Hybrid Seeds	+?	+?	+++	+++
Use of natural inputs	++	+++	+	++
Use of chemical inputs			+++	+++

SPIRITUAL				
Resources owned or accessed by:	Young Women	Old Women	Young Men	Old Men
Seereer Siin	+++	+++	+++	+++
Animism	+	++	+	++
Islam	+++	+++	+++	+++

SOCIO-CULTURAL				
Resources owned or accessed by:	Young Women	Old Women	Young Men	Old Men
Family networks	+++	+++	+++	+++
Peasant networks	+	+++	+	+++
Other networks (ex. area, ethnicity)	+	+	+	+
NGO support		+		+

HUMAN				
Resources owned or accessed by:	Young Women	Old Women	Young Men	Old Men
Agroecological Knowledge & Skills	++	+++	++	+++
Literacy	++		++	+
ICT literacy	++	+	+++	+
Motivation to farm	+	+++	+	+++
Motivation to migrate for work	+++		+++	
Good health	+++	++	+++	++

PHYSICAL				
Resources owned or accessed by:	Young Women	Old Women	Young Men	Old Men
Wells	++	++	++	+++
Water pumps			+	++
Neighbourhood tap	+	++	+	
Boreholes			++	
Access & control of prod. equip. & tech.	+	+	+	++
Draught animal ownership				+++
Access to draught animals	+	+	++	+++
Field ownership			+	+++
Access to neighbourhood mill	+++		++	

FINANCIAL				
Resources owned or accessed by:	Young Women	Old Women	Young Men	Old Men
Access & control of cash		+	++	++
Access to credit			?	+
Savings				++
Property ownership		?	+	+++
Property rented out				+
Pensions				+
Remittances		+	+++	+
Seasonal informal jobs	+++	+	+++	

RQ3. How is the Ndiémane Food System acted upon?

FOOD SYSTEM APPROACHES

Approaches adopted by:	Young Women	Old Women	Young Men	Old Men
ENVIRONMENTAL				
Compost & Manure	++	++	++	++
Field cover	+++	+++	+++	+++
Intercropping	+++	+++	++	+++
Zai-inspired techniques	+++	+++	+++	+++
Change crops sown	+++	+++	+++	+++
Food crops	++	+++	+	+++
Cash crops	+	++	+++	+++
Short-cycle varieties	+++	+++	+++	+++
Peasant seeds	++	+++	+	+++
Hybrid seeds	+	+	+++	+++
Chemical inputs			+++	+++
Tree nursery/regeneration	+	+	+	+
Green hedges	++	++	+	++
Water management	+	+	+	+
Sale of farm land				+
Decrease land laboured	+	+	++	++
Wood and straw collection	+++	+++		
Livestock sale				++
Livestock purchase				++
PHYSICAL				
Permanent metal fence			+	+
Concession constructions			++	+++
Neighbourhood mill	+++	+++		
Info&Com Techs	+++	+	+++	+
FINANCIAL				
Seasonal paid work		+++	++	+
Small local entrepreneurship	+	+++	++	
Economic migration	+		+++	
HUMAN				
Formal education	+++		+++	
Delay of marriage age	+++		+++	
SOCIO-CULTURAL				
Peasant knowledge sharing	+	+++	+	+
External help requests	+++	+++	+	+
Food purchase	+++	+++		
SPIRITUAL				
Prayer	+++	+++	+++	+++
Trad. ceremonies&divination	++	+++	++	+++

Legend

RQ: Research Question

→ Flow of influence

Research question

Field information

Ranking system	
Symbol	Meaning
	zero
?	unknown
+	low
++	medium
+++	high

Figure 78. Detail of the Ndiémane's Resilient Food Systems Framework addressing the Resources (RQ2) owned or accessed by the different intersectionalities under study, and the Approaches (RQ3) adopted by them (source: author, adapted from DFID 1999)

6.1. Environmental Resources

6.1.1. Land: A Critical Gendered Resource

Peasants often have multiple plots of land, with varying soil types. Different criteria come into play when allocating the uses of plots. Some plots can be allocated to specific crops, better adapted to their pedological conditions. Some plots may be allocated to some family members depending on their strength and age. As an example, in Michel Diouf's family, Michel, the head of household, keeps the plot of land that is closest to the household so that he can easily access it by foot. His two eldest sons were given the responsibility of farming plots that are further away from the household and that therefore require travelling by horse cart, which adds extra challenges to farming.

Scattered plots are a risk-reducing strategy. Having plots in different locations increases the chance of having at least one plot that has water. Although most of the area surrounding Ndiémame has been suffering from a drought, there remain plots that do have water in their wells and therefore where it is possible to practice market gardening throughout the dry season. During field visits, peasants were always perplexed by the availability of water in some wells but not others. Blaise Diouf (23/10/2019), a young male peasant, showed me his main field, which he has had to fallow for another year because both his wells are totally dry (Figure 79). "At least it gives the land a bit of extra time to recover." And he insisted to show me the field of his friend Antoine Sarr, just 500 metres away, who has water in the well and therefore was managing to do market gardening in October 2019 and throughout the whole dry season of 2019/2020 (Figure 80).



Figure 79. Blaise Diouf's fallow field in October 2019 © Carla Sarrouy Kay 2019



Figure 80. Antoine Sarr's field in October 2019. Antoine was in the process of applying mulches to protect his pepper crop. © Carla Sarrouy Kay 2019

Although land is a precious resource, male peasants did not generally talk about it as a limiting factor. Ablaye Sarr (27/06/2019), a male elder, mentioned, on the contrary, that today people have too much land and that

it is not used to its full potential. Firstly, land is not as productive as before. Secondly, many households have lost labour force due to life choices such as formal schooling and rural exodus.

Female peasants did mention repeatedly that land is a limiting factor or a challenging resource to get access to. Women do not own land. When a woman gets married and joins her husband's household, she is traditionally allocated a plot of land where she may grow food for the household or even for market selling.

Anne-Marie Dieng (10/10/2019), a female elder, recalled that her motivation for agriculture was such when she got married that she was given a piece of land, but she quickly used it all. She asked her husband for more land, but he said he could not give her more land, so she decided to stop people who were working with a horse to ask for more land. Her husband got annoyed and embarrassed by her unacceptable behaviour and slapped her in the face. It was the first and only time in their marriage her husband slapped her, but the incident made him realise that she was very keen and indeed she got extra land.

Anne-Marie Dieng was the only woman with whom I worked and whose house I visited that had a home garden within the family concession (Figure 81 and Figure 82). She used it to grow food for household consumption, mainly hibiscus and moringa, grown for their leaves which are used to make sauces and bring additional nutrition to homecooked meals. She also mentioned that the home garden is good to experiment new crops and new techniques as she can follow closely the progress of the experiment and decide whether to extend the experiment to the whole plot or even other plots.



Figure 81. Anne-Marie Dieng in her house garden where she was growing hibiscus, tomatoes, moringa and where she had a pepper nursery in October 2019. Anne-Marie's house can be seen in the background, behind the fence aimed at keeping livestock out of the house garden. © Carla Sarrouy Kay 2019



Figure 82. Anne-Marie Dieng, a peasant from Ndiémane Marché © Carla Sarrouy Kay 2019

Another example given by female peasants was the difficulties Groupe Mbogayife found as a group to get land to grow food. In 2016, Yako Ndour (the husband of Groupe Mbogayife's president, Fatou Thiaw) gave one of his plots to the group. This plot had an excellent location: it was very close to the centre of Ndiémane Malaoubé, big enough to grow food communally or to divide in smaller individual plots, and it already had

wells dug and water basins built. Extra funding from the ASPSP enabled the construction of a metal fence around the plot to protect it all year round from free grazing animals.

Unfortunately, for several reasons, the fence was never completed, and Groupe Mbogayife never took full ownership of the plot. There were internal complaints about the fact that the plot never felt communal as it was given by a close family member and still felt owned by that family. What the group wanted – and is still hoping to get – is a plot of land that is totally neutral and collective. The plot has indeed been used by the Ndour family to grow crops since 2016 but at present, as all fields around Ndiémane Malaoubé, it has dry wells and is abandoned as can be seen in the participatory video *Ô Feiñe* (The Drought) (Groupe Mbogayife 2019)⁵³.

Young men also mentioned the challenges of owning land. Young men might work land and have responsibility for certain plots, but ultimately these belong to the head of household, typically their fathers. According to young male peasants, this presented limitations regarding which and how crops are grown, and who profits from the work. For example, a young peasant confided to me that he hopes to get married soon. He has found a woman he likes, both parents have agreed to the marriage and now all that is left to do is to amass a sum of money for the dowry and the wedding ceremony. This young peasant works tirelessly in multiple family plots and also looks after the cattle overnight, yet the fruit of his work is owned and distributed by his father and therefore he cannot simply work for himself and save for his own goals. Interestingly, this young peasant did not criticise his elders for his situation. He respected deeply his parents and the family and ethnic traditions, and trusted that solutions would arise with patience, hard work and faith.

6.1.1.1. Soil Types and Soil Health

As explained by Blaise Diouf (24/06/2019), a young male peasant, there are three soil types around the village of Ndiémane:

- *Dior*: light, mobile, permeable, sandy soils. In Ndiémane these soils are found in the north and east, toward the centre of the Peanut Basin. *Dior* soils are good for peanut production but too light for many other crops.
- *Deck*: hard, dense, compact, clayey soils. They have higher clay, silt, and organic matter content. The high clay content may impede root, water and air movement and although they generally contain adequate plant nutrients, they need to be fertilized to obtain high yields. They can be found typically under hardwood forest cover and, in Ndiémane, they are present toward Joal in the south. These soils are good for sorghum and certain market gardening crops.
- *Deck-dior*: in between sandy and clayey soils. These soils are adapted to millet and other cereal crops.

⁵³ See Figure 87, p. 138, for a link and QR code to access the video online.

Blaise Diouf explained that most soils around Ndiémame are clayey *deck* (Figure 83). This observation concurs with the claim that this area used to be covered in woods only a few decades ago. Moreover, the current uncovered clayey soils do not absorb water quickly and efficiently during short and intense rainy season cloudbursts, hence contributing to soil erosion and leaching, and low availability of water in soils and wells.



Figure 83. Blaise Diouf demonstrating the various soil types in Ndiémame © Carla Sarrouy Kay 2019

Deck soils are usually red or brown coloured, but the soils around Ndiémame are very dark and many people claim it is a sign of their fertility. However, Alihou Ndiaye, a male elder, explains that this colour comes from the time when Ndiémame's forests were being cut and charcoal was produced locally (Sarrouy Kay 2019e).

6.1.1.2. Land and Soil Management

Peasants in Ndiémame have been adopting two main land management approaches: decreasing the amount of land farmed and selling farmland. The first option means that, due to limited water and physical and financial means, peasants select portions of their fields to grow crops that can realistically reach maturity. Otherwise, peasants choose to fallow their fields. As explained by Groupe Mbogayife (10/10/2019), free land, such as fallow land, is important to give time for soils to rest, to protect crops by acting as shields, to ensure the land is worked according to the labour available, and to leave land for pasture.

Selling farmland comes from the fact that “the youth doesn't believe anymore in agriculture, only in rural exodus and migration” (Yako Ndour 13/06/2019). As explored in more detail later in the financial and human approaches (subchapters 6.3., p. 181, and 6.4, p. 190), the youth educated in formal French schools is fleeing the family farming fields and trying their luck in paid employment in the village or beyond. The freeing of land

that this generates, coupled with the increased pressure from land speculators, means that farming land is increasingly being sold. Groupe Mbogayife (13/06/2019) also mentioned the social pressure and competitive element of seeing fellow peasants selling their land and thus receiving important sums of money.

The use of organic matter to manage soils is widespread in Ndiémame. Resource-poor yet knowledge-rich peasants such as those in Ndiémame are keen to use free, readily available, and renewable resources to ensure good harvests thus contributing to close mineral cycles. Animal manure, and to some extent compost, are the favoured agroecological fertilizers (Figure 84). Female peasants expressed in participatory videos the importance of collecting household animal manure and taking it to the fields to fertilize crops (Groupe Mboga'Yiif 2017a, UGPM 2017). These resources matter most to women peasants who have no or limited access to chemical inputs and who are mainly responsible for food crops.



Figure 84. Pepper and squash seedlings with horse manure fertilisation © Carla Sarrouy Kay 2017

Homemade recipes for fertilizers and pesticides were often exchanged between peasants, both male and female. Recipes included using fish scales and guts to fertilise soils (Youssou Sarr 22/03/2017), mixing soap, black tobacco, ashes and neem tree leaves (*Azadirachta indica*) to fortify and protect plants, or making an insecticide with dead insects caught near plants (Mamadou Ndour 09/05/2017). Finally, organic inputs are sometimes brought into fields or managed within fields to create diversions to pests. For example, Blaise Diouf (24/06/2019), a young male peasant, explained how he puts straw and manure under the green hedges of his fields to encourage termites to build their nests there rather than in the middle of the fields and therefore potentially attacking the main crops.

6.1.2. With No Water, There Is No Life

Water is the most challenging natural resource in Ndiémame. Villagers would tell me repeatedly: “With no water, there is no life.”, “With no water, there is no farming.”, “With no water, we cannot fulfil even our most

basic needs.”. Despite the slight increase in rainfall registered in Mbour in the past few years⁵⁴, rainfall in Ndiémane has been late, erratic, and insufficient to fill wells. Towards the end of the rainy season 2019, old natural ponds were still empty (Figure 85) or had only a little amount of water (Figure 86), insufficient to fulfil the household, farming and livestock needs and survive the hot sun of the dry season.



Figure 85. Natural pond near Ndiémane, totally dry even at the end of the rainy season in October 2019 © Carla Sarrouy Kay 2019



Figure 86. Natural pond near Ndiémane, with some water at the end of the rainy season in October 2019 © Carla Sarrouy Kay 2019

Women are active farmers and thus are impacted by periods of drought; yet they usually linked the hardship of drought to the added challenges they face at home trying to feed the family. Ndiémane has known periods of crisis and periods of bounty (Figure 87, p. 138) and women often recalled past periods of difficulty through the rescue foods used to feed their families.

Women (13/06/2019) shared stories of their own lived experience or stories they remember from their parents. Most stories relate to the *niakho mbaal*, the “dark period” of the hunger gap when the granaries are empty, and millet is not mature yet. It used to be the month of August but now, with the uncertain climate and erratic rains, this critical period has been extended. For example, the year 1985 was very difficult, villagers remember eating palm fruit pulp, carrots and fish. There was no cereal. Some recalled *ongok*, a plant that grows during the wet season and that was used to make couscous.

Ndèye Ndior and Rokhie Ndiaye were told by their parents that before Independence (1960), during periods of crisis, people would dig out termite mounds or anthills to reach the insects’ reserves of cereal (usually millet) and either sow these or eat them.

Anne-Marie Dieng, a female elder, remembers being told by her elders that in times of crisis people would dig wells and all sorts of millipedes and insects would fall in the water but because there was nothing else, people drank that water. Women would fetch water daily from the road crossing five miles away to provide for their

⁵⁴ See subchapter 5.3.2.1., p. 108.

families. They would typically carry a ceramic water pot (*canari*) on their heads and their baby on the back. The return trip, with the extra weight of the water, was so hard that women had to stop regularly to rest.



« In the olden days there was life in Ndiémane, everything was green like this mango tree branch. [...] We only knew market gardening and we were very happy with the work we did in the gardens. But now we are like the dry branch you see here. We have no more work. Everything is dry, even us the women of the village. [...] We have no more water to drink, livestock neither. We can't do any more market gardening, we are exhausted, the situation gets harder day by day. The drought becomes unbearable. [...]. We have all the trouble in the world even to drink water. We use our donkeys to draw water and we have huge challenges because sometimes our carts overturn with the weight of the barrels of water. We are really tired, there were cases of accidents with the overturning of carts and it is the mothers who have to take their children to hospital. If children went to fetch water in the village, there would be no problem, but they have to go to surrounding villages and do many miles to find the precious liquid. Our children do the same journey every day. We have tried many solutions, but the problem persists. There is nothing, nothing, nothing, so we are forced to look elsewhere to find work to be able to feed our families. »

Figure 87. Screenshot, QR code and quote for the participatory video Ô Feiñe (*The Drought*) (Groupe Mbogayife 2019) <https://youtu.be/ZcJrdshGWBA>

To survive a crisis, it is paramount to remain hopeful and Youssou Sarr remembers that, during shortage periods, families would put a pot cooking with only water, it would last the whole day, only to give hope to children who thought something would be served to eat at dinner time.

Interestingly, though only six miles from the sea, villagers remember surviving on fish from local ponds and not from the sea. There used to be a pond near Ndiémane, it was natural and had water all year round. The whole village would gather to walk along the pond, to create clouds of clayey water; this would force the fish into a smaller area and make it easier to catch. This reality seems hard to imagine nowadays as ponds are few, shallow and seasonal and the trade of sea fish is very important in the village, namely due to the high number of young men who now work as fishermen to earn a living.

6.1.2.1. Water Management and Erosion Control

Water management in Ndiémame is poor. Despite the recurrent droughts in the past decades, when the rainy season does arrive, farmers and households are generally ill-prepared to best harvest rain water (Figure 88 and Figure 89). Initiatives like contour stone bunds have proven highly effective in similar environments slowing runoff and increasing infiltration but they are not adopted in Ndiémame. The reason for this is the lack of group action and the lack of financial means deemed necessary for such initiatives.

Most families have multiple fields scattered around the village so if they adopted water management techniques such as contour bunds, slopes, ridges, or dykes, in isolated fields, the benefits would only be minimal. Life changing improvements can be achieved if large areas are under management, and if stemming from local knowledges and initiatives. The frustration of multiple peasants in Ndiémame is that, as agriculture becomes a more individualised and profit maximising activity, it becomes harder to gather the village to undertake initiatives that would ultimately greatly benefit the whole (Blaise Diouf 24/06/2019).



Figure 88. Concession flooded after a strong cloudburst at the end of the rainy season, October 2019 © Carla Sarrouy Kay 2019



Figure 89. Family trying to manage the water from a cloudburst: the young child collects into containers the water falling from the roof and the older son digs a path for the water to flow to the corn field. © Carla Sarrouy Kay 2019

The two main water management techniques vastly used in Ndiémame at the individual field level are mulching and improved planting pits, also known as *zai*. As shown in Figure 90, when planting, peasants dig planting pits in which they put manure and compost to help retain humidity and fertilize the soil. Peasants also cover the fields around the crops with straw and cut weeds. Mulching has the quadruple advantage of

(1) decreasing evaporation, (2) improving water infiltration, (3) protecting the soil from the sun, and water and wind erosion, and (4) protecting the crops from certain pests.

Finally, a very important point in agroecological farming in general and in the specific setting of Ndiémane, is the coexistence of crops with wild plants. When not using chemicals, and especially for food crops, so-called weeds are managed but not totally suppressed from fields. Equally, wild plants border fields and grow profusely during the rainy season. These plants can be used for mulching as done by two young peasants in Ndiémane (Figure 91). Surrounding plants also act as a barrier between fields to prevent the dissemination and implantation of pests, and they contribute to water infiltration. Wild plants support the genetic diversity and evolution of peasant crops too, as exemplified in the cohabitation between finger millet and wild millet (*setaria viridis*) (Figure 92).



Figure 90. Babou Sarr in a field of peppers planted using a zai-inspired technique © Carla Sarrouy Kay 2017



Figure 91. Antoine Sarr and Blaise Diouf mulching a field of peppers with cut surrounding weeds © Carla Sarrouy Kay 2019



Figure 92. Sorghum field (back left) and millet field (back right) surrounded by wild plants (front), including wild millet © Carla Sarrouy Kay 2019

6.1.3. Forests: A Feature of The Past

Around Ndiémane there are no more dense forests as described in historical documents. Bushland has some scattered villages and most of it is farmed during the rainy season. Although the map view (top) in Figure 93 delineates the Forest of Balabougou, satellite imagery (bottom) reveals that this “green area” does not look much different from its surroundings. In fact, the export-oriented farm mentioned earlier in the section dedicated to landgrabs⁵⁵ is situated within the Forest of Balabougou and can be recognised in the satellite view by its linear and agglomerated fields. There are some occasional protected areas, sometimes the size of small plots, where villagers are not allowed to cut wood or grow crops, but these tend to be sparsely vegetated with only some trees or shrubs.

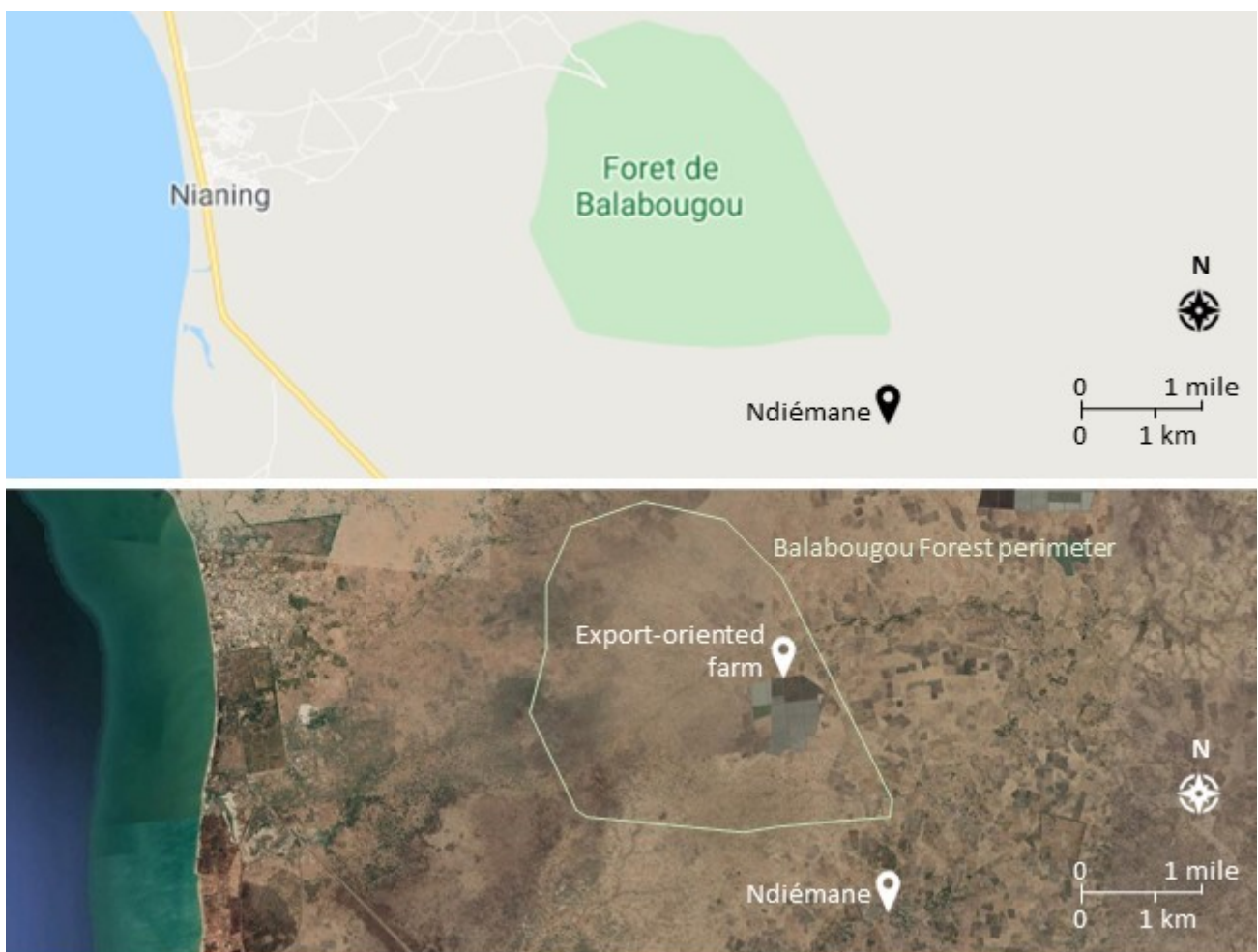


Figure 93. The Ndiémane surroundings seen as a map view (top, Google Maps 2020) and as a satellite view (bottom, Google Earth 2020) with pinpoints and forest perimeter added by the author.

⁵⁵ See subchapter 5.3.2.4, p. 119.

6.1.3.1. Tree and Shrub Regeneration

Although peasants have manifested their motivation to regenerate the tree cover of the village and its surroundings, efforts so far have been limited and unfruitful and thus unable to counter the deforestation trend. Both young and old, female and male peasants mentioned planting or nurturing naturally sprouting trees such as cashew trees (*Anacardium occidentale*), jujube (*Ziziphus jujube*) or mango trees (*Mangifera indica*) mainly to fight wind erosion, to promote water infiltration, and to provide extra sources of food and income.

Participatory videos addressed the efforts being made by villagers – sometimes with governmental incentives and constraints – to “bring back biodiversity” to villages (Groupe Deggo 2017b, 2017a, Diouf 2019b). However, the recurrent recent droughts have meant that young trees are generally not surviving, and therefore villagers feel trapped in a vicious cycle where droughts kill trees and the lack of trees further intensifies droughts (Michel Diouf 14/10/2019).

Green hedges offer a glimpse of hope. Despite being progressively replaced by metal fences⁵⁶, most peasants in Ndiémane still rely on green hedges to protect their crops (Figure 94). Furthermore, green hedges also represent important habitats for wildlife.



Figure 94. Green hedges protecting an agroforestry field during the dry season of 2017 © Carla Sarrouy Kay 2017

6.1.3.2. Wood and Straw Collection

The most concerning environmental approach being undertaken in Ndiémane to cope with the drought context is wood and straw collection. Wood is an important cooking fuel but, with the decrease of available

⁵⁶ See subchapter 6.2.5., p. 180.

firewood, women are having to rely increasingly on cow dung. As shown in the participatory video *Aar Aleu-bi* (Protecting the Forest), managing woodland is not simple and the stakes for women are very high considering their responsibilities in the household (Figure 95).



« — You must do a request before cutting trees. [...] [The Water and Forest Government Agent] came to Lissar and gave a 20-day permit for women to fetch firewood from the forest. You wait for the end of that period to go and cut trees. At your age, how could this happen to you? — I wasn't aware, you didn't inform me in time. If I had been the first one to be informed, before fetching wood, I would have taken the time to do the tour of the concessions to inform all the women of the village that we have a permit to fetch wood from the forest. But you all went to the forest to fetch wood without informing me. Each one of you has a big pile of firewood in your concession, as opposed to me that have nothing for my parents-in-law. [...] Nobody can stop me from cutting wood. I have no coal, no wood, no gas. »

Figure 95. Screenshot, QR code and quote from the participatory video *Aar Aleu-bi* (Protecting the Forest) (Groupe Deggo 2017b) <https://youtu.be/mO4Mh6o1Nml>

Wood cutting is done by women in need of firewood, but it might be done by men for sale. On occasion, I saw men around the village with donkey carts full of wood, who had cut trees illegally under cover of night. At times, peasants would return to their fields only to realise that somebody had harshly pruned their trees and/or hedges overnight.

In the past decade, women have started collecting straw from post-harvest fields that is then typically sold by their children to the women who smoke fish in Joal, the nearest port town (Figure 96, p. 144). In the past, this straw remained in the fields as a soil cover during the long and hot dry season and served as feed for the many stray animals. Occasionally men would collect some straw to sell. According to Groupe Mbogayife (18/06/2019), this activity is now undertaken by women and it is so generalised that few are the fields during the dry season that have any considerable straw left.

Women are conscious that this practice contributes to the depletion of their environment, especially if done repeatedly over consecutive years. Women only hope that their situation will improve, that rains will return and that they will be able to find more sustainable ways to feed their families.



Figure 96. Children attaching the straw to be sold. Women collect the straw and they, or their children, sell it in Joal © Carla Sarrouy Kay 2019

6.1.4. Crop Diversity for Sustenance and for Sale

Ndiémame's agriculture is divided in two main seasons and crop types. During the rainy season, peasants produce mainly subsistence crops such as millet, sorghum, and corn. This production is stored and consumed throughout the year. Though not produced in Ndiémame, rice is mentioned here because of its history and importance in villagers' diets. Two more rainy season productions, often intercropped with cereals, are analysed in this section: peanuts due to their national importance and cowpea due to its significance for the nutrition of rural households.

During the dry season and provided they have access to water, peasants practice market gardening, aiming mainly to sell their produce in local or regional markets. The main market garden crops are onions, sweet and bitter aubergines, peppers, okra, and tomatoes.

6.1.4.1. Millet: An Essential Indigenous Crop

In Ndiémame, millet suits the short and hot rainy season, and it is the main production of traditional agriculture (Figure 97 and Figure 98). At present, in most households, millet is consumed in the morning and in the evenings, usually as couscous. The couscous base can be eaten sweet, with cane sugar and fresh or powdered milk, or savoury, with peanut sauce or dried fish, for example. If there is nothing else to eat, the couscous will be consumed simply with water.

Millet is a highly nutritious cereal, and it has a strong symbolic image associated to it. Groupe Mbogayife (13/06/2019) complained that their children refused to eat millet for lunch as it was perceived as a thing of the past, a sign of poverty and of being out of touch with modern times when families consume rice for lunch. In urban areas, millet is also progressively disappearing from the breakfast table as the wheat baguette becomes increasingly popular.



Figure 97. Pearl millet field in Ndiémame in October 2019 © Youssou Sarr 2019



Figure 98. Pearl millet heads exhibited at the Peasant Seed Fair of Thiakho, Senegal © Carla Sarrouy Kay 2017

6.1.4.2. Sorghum: A Fallback Indigenous Crop Regaining Prominence

Sorghum is the second most important cereal crop in Ndiémame nowadays (Figure 99 and Figure 100, p. 146). According to the villagers' memories of the village creation, sorghum was the first crop to have been grown in the village because Ndiémame's original soil type suited better sorghum production.

In Ndiémame, sorghum production has increased in the past few years because it has a shorter growing cycle than millet and therefore it is considered a safer bet when the rainy season is very delayed and expected to be short.

Blaise Diouf, a young male peasant trained in participatory video for this research, has been recording Ndiémame's production of sorghum since 2018. Blaise made a film about the rainy season of 2018/2019 in which he showcased sorghum fields (Diouf 2019a)⁵⁷. During the following rainy season, Blaise dedicated a whole film to sorghum, showing how it is harvested, threshed and then conserved in Ndiémame at present (Figure 101, p. 146) (Diouf 2020b).

⁵⁷ See *Film témoignage de 2018* (Testimony film for 2018) in Appendix 10.5., p. 287, for a link and QR code to access the video online.



Figure 99. Sorghum field in Ndiémane in October 2019 © Youssou Sarr



Figure 100. Sorghum exhibited at the Peasant Seed Fair of Thiakho, Senegal © Carla Sarrouy Kay 2017



Figure 101. Screenshot and QR code for the film *La récolte, le battage et la conservation du sorgho* (Sorghum harvesting, threshing and conservation) (Diouf 2020b) <https://www.youtube.com/watch?v=RdHrX3sbl-Y>

6.1.4.3. Corn: The Rising Star in Senegalese Agriculture

In Ndiémane, corn is an important crop, both for home consumption and as a source of income (Figure 102 and Figure 103, p. 147).

According to Boukary Barry (16/02/2017), a Malian peasant rights activist, corn used to be grown in West Africa as a first crop before the main crop (millet or sorghum) was mature. Corn ears were often harvested and consumed grilled and there is even a term in Bambara language for corn as an intermediary and readily available crop: *djeni ka gnimi* (grill-and-crunch). In October 2019, I witnessed the “grill-and-crunch” role of corn as often, mainly children, would go to their family’s corn fields, select a corn cob and grill it as a snack, shared among children or the wider family. These healthy and tasty snacks were very welcome during this hunger gap period when fields are all green and the previous year’s harvest is almost or already finished.



Figure 102. Michel Diouf in front of his corn field in Ndiémane in October 2019 © Carla Sarrouy Kay 2019



Figure 103. Corn ear before maturation © Carla Sarrouy Kay 2019

6.1.4.4. Cowpea: Protein Source and Soil Cover

Cowpeas are widely grown in Ndiémane and can perform well in sandy and impoverished soils. They are a major source of protein for households and are also grown as feed. Cowpeas are nitrogen-fixing plants and are often intercropped with millet, sorghum, corn or peanuts (Figure 104 and Figure 105).



Figure 104. Field of cowpea, in association with some corn, in Ndiémane in October 2019 © Carla Sarrouy Kay 2019



Figure 105. Adama Ndour showing a cowpea pod © Carla Sarrouy Kay 2019

In Ndiémane, they play an important role in traditional diets and, during the cowpea harvest season, many were the focus group discussions with women held whilst shelling cowpeas! Multiple participatory videos were made on the theme of seed conservation, including discussions on how to preserve cowpea (Groupe de

Vidéo Participative de Casamance 2018, UGPM 2017, Diouf 2020c). One participatory video was totally dedicated to the demonstration of a simple technique women in Ndiémame use to store cowpea for months (Figure 106) (Diouf 2020c).



Figure 106. Screenshot and QR code for the video Conservation du haricot niébé (Cowpea conservation) on how women preserve cowpea in sand. <https://youtu.be/ChSuEPPXWl4> Please note that this video is not public; it is only accessible for the remit of this research, by request of the villagers featured in the participatory video.

6.1.4.5. Rice: The Grain Now in Every Lunch

In Senegal, rice is produced in the north along the Senegal river (Figure 107 and Figure 108), and in the south in the Casamance. In Ndiémame there is no history of rice production but, in a nearby town of Seereer majority, rice used to be produced in marshes that have since dried.



Figure 107. Rice paddies in Guédé Chantier, along the Senegal river, north Senegal, in May 2017 © Carla Sarrouy Kay 2017



Figure 108. Rice panicles in a paddy in Guédé Chantier, Senegal, in July 2017 © Carla Sarrouy Kay 2017

In a participatory video on rice culture according to traditional Seereer practices, Diouroup villagers decided to show how rice used to be grown in the area. The video is presented by two young female villagers, a peasant

and a primary schoolteacher, and demonstrates how to prepare the soil, sow, harvest, and store rice (Figure 109). The whole video refers to a time gone by. During the video editing and projection, villagers discussed the loss of traditions and noted how quickly it can happen. Interestingly, people also noted how it was clear that one of the actresses in the participatory video (the schoolteacher) did not know rice production at all and used inaccurate vocabulary whilst the peasant – even if not by personal experience – had a much better understanding of how rice used to be grown.



Figure 109. Screenshot and QR code from the participatory video *A Khookh Maalo No Thiossane Serere (Rice culture according to traditional Seereer practices)* (Groupe Mboga'Yiif 2017b) <https://www.youtube.com/watch?v=etyuUJqR8o>

6.1.4.6. Peanuts: The Colonialists' Golden Seed that Became Tradition

In Ndiémane, peasants have lost faith in peanut production as an important source of income but keep producing it for self-consumption and some extra agricultural income. Peanuts continue to have a central role in agriculture and diets, and peanut seeds are one of the seeds that peasants consider essential to preserve year after year: “We [...] keep with us peanut and millet seeds for the rainy season. We will never lose these seeds. [...] We must not neglect these seeds because they are our life. It's the tradition.” (Groupe Mbogayife 2019)

Groupe Mbogayife made a participatory video on the selection and conservation of traditional seeds (Figure 110). In it, Fatou Thiaw, the president, explains the importance for her of saving peanut seeds and not relying on purchasing imported (improved) seeds from the market (Groupe Mbogayife 2017a).



« I am separating my peanut seeds because the rainy season is coming. I want to check these peanut seeds I had saved carefully to see if some of them have rotten. [...] We don't buy seeds from the market, because the seeds from the market are not sufficient. What we need to favour is the production of one's own seeds as our ancestors did. »

Figure 110. Screenshot, QR code and quote from the participatory video *A Thiile Fa A Kheek Akhe Thioissane (The Selection and Conservation of Traditional Seeds)* (Groupe Mbogayife 2017a) https://youtu.be/H8CaGd_7xos

6.1.4.7. Market Gardening: Opportunities for Counter-Season Agriculture

According to Groupe Mbogayife (19/06/2019), it was the imam Ousseynou Ndour who started practicing market gardening in Ndiémane Malaoubé. The expansion of the activity came a few decades later with the mass construction of wells in the area, thanks to *Sahel People Service* and Centre AFAFA. Once the rainy season was over and staple foods were harvested, empty fields were used to grow cash crops.

Figure 111 (p. 151) shows the expansion of market gardening fields around Ndiémane Malaoubé, the agglomeration of houses top right of the images. Between December 2009 (top) and January 2016 (middle), there was a considerable expansion of small plots mainly toward the south-west of the neighbourhood, but also north and south of it. The bright white spots in the first image that are not within house agglomerations, are newly dug wells with limestone mounds next to them. It was these new wells that enabled the market gardening expansion observed in 2016.

Market gardening was one of the key themes in participatory videos (Groupe Mbogayife 2017a, 2017b, 2019, Sarrouy Kay 2019f, UGPM 2017, Mbootay Baykat Derr UCT 2017a, Groupe Bismillaye 2017). Groupe Mbogayife made a participatory video in 2019 on the impact of the drought on market gardening activities and the consequent loss of one of their main sources of income. The bottom image in Figure 111 (p. p. 151) shows how in just three years, all market gardening fields in Ndiémane were lost.



Figure 111. Aerial view of Ndiémane Malaoubé in December 2009 (top), January 2016 (middle) and April 2019 (bottom). (Google Earth 2020)

In October 2019, I made a film with Djokel Diouf, a young male peasant, showing the family aubergine field he was responsible for (Figure 112). This field was quite a distance away from Ndiémane and was reached by horse cart. Even though he had a water pump, Djokel watered his field by hand to preserve as much water as possible.



Figure 112. Screenshot and QR code for the video *Arrosage du champ d'aubergines de Djokel Diouf (Watering Djokel Diouf's aubergine field)* (Sarrouy Kay 2019f) <https://youtu.be/2C-pjuV3VXs> Please note that this video is not public; it is only accessible for the remit of this research, by request of the peasant featured in the film.

6.1.4.8. Crop Selection and Succession

Food crops are still largely grown in Ndiémane and they provide an important source of self-sufficiency and food security and nutrition to households. Although peasants acknowledge that the share of food crops has decreased over time, they could not envisage omitting completely traditional food staples such as millet, sorghum and peanuts.

The use and preservation of peasant seeds is essential to Ndiémane's peasants and, as Groupe Mbogayife (2019) put it in a participatory video, peasant seeds "are our life". The preservation of local genetic diversity is paramount both for young and old, female and male peasants in Ndiémane (Groupe Mbogayife 18/06/2019, Blaise Junior Diouf 24/06/2019, Michel Diouf 25/06/2019). In participatory videos, villagers took the opportunity to explain how to select and preserve seeds as shown in Figure 113 (p. 153) in which a woman impersonates an old and wise peasant (left).

Local peasants believe their seeds are more locally adapted, and that they also encompass a wealth of knowledges and capability within local communities that are crucial in the adaptation to environmental and social changes. Yet the peasant seed cycle can be fragile, and, with only a few gap years, it can be broken.

Ndiémane has seen a rapid and wide spread of small-scale peasant production of cash crops. Increasingly integrated in the market economy, male and especially young peasants grow crops to be sold for profit. When producing cash crops, Ndiémane's peasants purchase hybrid seeds in markets thus side-lining peasant seeds and creating a dependence in purchased seeds that cannot be saved and grown subsequently.



« —Me, Makhaly, since I started cultivating, I grow the millet variety called Makhaly. My way of selecting seeds is to choose the biggest millet ears amongst the heap, put them in a bag and keep them in my store waiting for the farassou⁵⁸. With the arrival of the rainy season, I take my selected millet ears out and ask the young girls to beat the millet to separate the grains from the stalks. After getting the seed, I go to the field to sow the millet. »

Figure 113. Screenshot, QR code and quote from the participatory video Mbaye ak Sameu (Farming and Animal Rearing) (UGPM 2017) <https://youtu.be/kcvhkoC-V4g>

A participatory video made by a group of female peasants from all over Senegal addresses the issue of purchase dependency regarding seeds (Figure 114). One woman complains that she is trapped in a cycle of having to purchase seeds because she lost her traditional, reproducible seeds. She had purchased industrial seeds the previous year but had no production. Again, with no seed to sow, she purchased seeds but doubts they will produce anything this time around. A second woman explains that purchased seeds create dependency; their hybrid or even genetically-modified varieties mean that seeds cannot be saved to sow again, they rely on chemical inputs to attain high productivity and they are the source of health issues and environmental pollution (Groupe de Vidéo Participative de Casamance 2018).



«—Me too. Last year I bought industrial seeds; they didn't produce anything. Industrial seeds don't give anything. I have no seeds, that's why I went again to buy a second time.

⁵⁸ Preparation for the rainy season.

«— You, every year you'll be forced to go to the shop and buy seeds. You used these seeds last year and it didn't work. This year again you use them, it won't work again. You will be forced to go and buy again next year. When you use these seeds, you are forced to buy them every time.

These industrial seeds, they are ill. They cannot live without pesticides, without chemical fertilisers, without genetic manipulation. They are polluting for the environment, they are the starting point of food nutritional deficiencies, of poisons, of cancers and other degenerative diseases *in humans and animals.* »

Figure 114. Screenshot, QR code and quote from the participatory video *L'Importance des Semences Paysannes (The Importance of Peasant Seeds)* (Groupe de Vidéo Participative de Casamance 2018) https://www.youtube.com/watch?v=Ffi_cXBCrPo

Intercropping is largely adopted in Ndiémane and is commonly acclaimed as an agroecological technique that promotes soil quality and water conservation. Rich crop associations in time and space are an ancestral technique already mentioned in the eighteenth century by French colonialists (Figure 115). Nowadays, the most common associations are peanuts, cowpea and hibiscus; millet and cowpea; or corn and cowpea (Figure 116).

Comme les haricots rouges viennent très-bien chez eux, souvent ils en sèment de la même manière dans les intervalles de leur maïs, qu'on nomme en France bled de turquie. Lorsqu'ils coupent les récoltes de ce grain, au bout de soixante ou soixante-dix jours, les haricots se trouvent en fleurs, alors dégagés du maïs qui les étouffoit; cette nouvelle production mûrit à son tour, & un mois après, ils en font la récolte.

« Because red beans grow very well there, often they sow them in the same way in the intervals between their corn, that we call "Bled de Turquie" in France. When they cut the harvest of this grain, at the end of sixty or sixty-five days, the beans are in flower, by then cleared of the corn that suffocated them; this new production ripens in turn, and a month later, they harvest it. »

Figure 115. Reference to intercropping in Antoine Edme Pruneau de Pommegorge's book *Description de la Nigritie (Description of Nigritia)* (1789: 32–33)



Figure 116. Intercropping corn and cowpea in the field of a member of Groupe Mbogayife © Carla Sarrouy Kay 2019

Ndiémane peasants change the type and variety of crops sown depending on rainy season observations and predictions. Beyond the traditional rotation system, peasants increase the diversity of crops sown to reduce risk. The most mentioned change is the switch from growing millet as the main staple crop to growing sorghum which is also traditional, culturally adapted, highly nutritional and that, crucially, has a shorter growing season. Even within each crop type, peasants choose the varieties best adapted to each seasonal expectation.

The erratic climate forces peasants to change the timing of sowings. In the past, villagers could rely on set dates for sowing their crops and aimed to sow early so that seeds could grow faster than weeds. Now the rains are too erratic and the dry spells too frequent, so villagers prefer to wait for the rain before they start sowing. Fatou Thiaw (10/10/2019), a female elder, described how she and her neighbours had to resow their fields

multiple times in 2019, up to five times. Sometimes there is no rain and the seeds burn; sometimes the seedlings develop but die during dry spells; and sometimes seedlings may develop but then are devastated by pests. Even with multiple sowings, some fields grow profusely but others only generate some seed heads, probably due to the sowing times, and soil and seed quality.

6.1.5. Livestock's Meaning and Multifunctionality

Land farming is the main activity of Ndiémane's peasants, and animal rearing is an integral part of it. Animal rearing is practiced for multiple reasons. Animals are a source of food, providing meat, eggs, or milk. Animal manure is an excellent natural fertilizer used in agriculture. Dry zebu cow dung is used as a cooking fuel, due to the lack of firewood. Animals have a strong symbolic meaning and are often used as sacrifices in religious ceremonies. Animals are also an investment – and therefore, a sign of wealth –, a crucial source of savings and a buffer in times of difficulty.

Traditionally, men have access to and control larger animals, especially cattle, horses, donkeys, and goats. Women look after smaller animals, especially poultry such as chickens, ducks, turkeys or even pigeons (Figure 117, p. 156). Women and men might sell some of their livestock to neighbours or in the local market (Groupe Mbogayife 2017b).

The sale of livestock often happens at times of penury, at the end of the dry season or beginning of the rainy season. Prices obtained are relatively low because the offer is high as several peasants seek the same approach concomitantly. However, the sale of livestock means an immediate gain of income that can be straight away spent on food for the family. When household income is higher, usually at the end of the rainy season, Ndiémane peasants might invest in some young animals to grow and fatten, either for home consumption or to sell later if the family needs again some fast income to feed the family.

Testimony of the importance of livestock in peasant livelihoods, several participatory videos addressed animal rearing, explicitly or not (Groupe Mboga'Yiif 2017a, UGPM 2017, Groupe Mbogayife 2017b, Diouf 2020a, 2019a). In one video (Tintimol 2017), a peasant tells her fellow peasants: "You ought to feel the same love for your family as you do for your animals and goods". In Lissar, north of Thiès, a group of women made a participatory video about agriculture and animal rearing (Groupe Deggo 2017a). In it they share tips on how to look after sheep and cows, giving recommendations on feed, shelter, and animal manure as fertilizer (Figure 118, p. 157). The video ends with the main character – old Makhali – shouting as he notices that some wandering goats have entered his field and are eating his crops. This video, in which women play the role of men, was received by the community with a lot of humour but especially with great admiration – from men and women, elders and youth alike – for the clear explanation of the challenges of agriculture and animal rearing nowadays. These challenges are identical in Ndiémane and the video was very well received there too.



Figure 117. Livestock in Ndiémane: (from left to right, top to bottom) horse, sow and piglets, kid, zebu herd, hen and chicks, turkey, pigeons, and a donkey pushing children on a cart. © Carla Sarrouy Kay 2017, 2019, 2020



« —Hello! What have you done for your cow to be so pretty to look at?
—You see, I built a shelter for my cow. Then I put a trough in which I put its feed. Each morning I give feed, peanut shells, and baobab leaf powder [in water] for it to drink. Then I pick the cow dung and take it directly to the fields. »

Figure 118. Screenshot, QR code and quote from the video Mbaye ak Sameu (*Farming and Animal Rearing*) (Groupe Deggo 2017a) <https://youtu.be/kcvhkoC-V4g>

Echoing the defence of peasant seeds, villagers praised the qualities of local livestock breeds. The participatory video *O Djirigne A Yaara Thieck Kaam Mbind* (The Importance of Chicken Farming for the Household) compares the rearing of local chickens and broiler chickens (which, incidentally, in the video are called *toubab* chickens, i.e., White-man's chickens or coloniser chickens).

On one side, an older woman – Rokhaya – grows local chickens and explains how they are easy to look after: they free roam, feed on whatever they find, are adapted to the local environment and are a small yet safe and easy investment. On the other side, a young woman – Ndèye – grows broiler chickens to sell their meat. She explains that this is a hazardous and complex task as it requires an initial investment to buy the chicks, then she needs to buy feed and pills to prevent diseases (Figure 119, p. 158). The chickens are kept in a coop that requires a lot of attention as the chickens are not adapted to the local environment and their high density in a coop often means more cleaning and high mortality rates. It is only with some luck and skill that Ndèye manages to make a profit out of this activity.

Although broiler chickens reared in ideal conditions could potentially produce more meat quicker, it is essential to understand the reality of small-scale chicken rearing. It is often women who rear smaller animals and this activity is complementary to their other main household tasks such as cooking and looking after the children and the elderly. Being able to rear animals within their usual household context, with little added effort, and almost no financial investment, are advantages of local chickens that should not be underestimated and that may easily outweigh the potential increase in meat production and consequent increase in income from sales with broiler chickens.



« I have encountered many problems when farming broiler chickens. First of all, you need to buy feed, you must also buy pills, you must clean the feeding and drinking troughs regularly. The chicken coop must also be cleaned frequently, and it must be well-ventilated. »

Figure 119. Screenshot, QR code and quote from the participatory video O Djirigne A Yaara Thieck Kaam Mbind (*The Importance of Chicken Farming for the Household*) (Groupe Mboga'Yiif 2017a) https://youtu.be/cE5Zv_YfmA

In Ndiémane Malaoubé, draft animals are of paramount importance. The most praised draft animals are horses, and most families have one or two horses. Donkeys are a second choice, and families generally own more donkeys than horses. Draft animals are mainly used for local transport (to fetch water or go to rural markets) and to work the fields: “The horse, for transport, it is very important. When you have a beautiful horse, well fed, it can do everything well. And when you have a pair of oxen, it is very easy to plough.” (Alihou Ndiaye in Sarrouy Kay (2019g))

Animal divagation follows certain rules. During the dry season, animals can be freed and let loose during the day. This divagation means that animals feed on whichever grass and leaves they may find, and they fertilize the soils with manure. During the rainy season though, animals must be kept in a pen or within the concession to make sure that they do not enter the fields where new crops are growing. This means that animals must be fed.

To ensure that no animals enter their fields, especially during the rainy season, peasants build green hedges with live plants and trees and additional dried branches with spikes (Figure 120, p. 159). For extra security, children are often given the responsibility to watch the fields and protect them if unwelcome animals come in (Figure 121, p. 159). Those who can afford it build metal fences, the only method considered to securely keep out wandering animals.

Ndiémane villagers are not pastoralists, but the village’s food system and environmental resources are impacted by the pastoralists’ transient cycles. As the dry season grows in intensity, Fula pastoralists from the north of the country slowly move their cattle southward and, half-way through the dry season, many reach Ndiémane on their way to the wetter and greener Saloum area.



Figure 120. Entrance to a peasant's field protected by spikey branches © Carla Sarrouy Kay 2017



Figure 121. Young men resting as they watch over their aubergine field © Carla Sarrouy Kay 2017 Note they have water and food to last for the whole day.

Fula pastoralists settle down camp around the village for a few days or weeks and interact with the villagers. The Seereer and the Fula are two ethnic groups that traditionally get along very well and with a strong, ritualised joking relationship⁵⁹. The Fula give or sell fresh milk, a foodstuff with high nutritional value and high symbolic value too. Their pastoralist knowledge is highly respected as demonstrated in a song featured in a participatory video (Groupe Djoubo 2017a):

*« The Fula deserves the cow's milk!
The Fula dares to face the night,
The Fula knows how to graze the cows, and how to milk, so
The Fula deserves the cow's milk! »*

Some Ndiémâne villagers have cattle that they graze locally but, those who can afford it, buy cattle and pay Fula pastoralists to look after it. Tensions can arise due to land management as traditional transhumance routes are blocked by agricultural, touristic and urban developments (Youssou Sarr 11/06/2019).

During my stay in Ndiémâne I observed that animals are also part of training for children to become responsible adults. Children are involved in animal rearing and might even be allocated a specific animal to look after. Pre-teenage boys may be honoured with – and feel the weight of the responsibility of – looking after a horse, for example. It is often with pride and care that they wash, feed and attend the horse, to prove

⁵⁹ “[...] “joking relationship” is a relation between two persons in which one is by custom permitted, and in some instances required, to tease or make fun of the other, who in turn is required to take no offence. [...] The joking relationship is a peculiar combination of friendliness and antagonism.” (Radcliffe-Brown 1940: 195–196)

their father right for choosing them among the multiple young male siblings to look after such an important animal for the household.

Finally, animals are also a source of amusement and companionship. They are part of the family and are accepted in the house in a way I had never witnessed before. On one occasion, a peasant observed that I always smiled when seeing the chickens and ducks coming to eat the rice that falls on the floor whilst people are having lunch. He said to me: “They deserve their share, don’t they?!” Meanwhile cats may come to eat the fish bones and goats roam around looking for any leaves fallen off the trees. This diversity means that life is much less compartmentalised than in Europe and that it is by living together that all animals – human or not – learn about each other and how to live together.

6.2. Physical Resources

6.2.1. Concessions: The Heart of Family Life

In Ndiémane, families typically live in concessions with a male head of household, his wife or cowives, and respective children, sometimes elderly parents, and occasionally one or more brothers of the head of household and their families. According to my analysis, in Ndiémane Malaoubé in 2019, all concessions were headed by men, most of them in their sixties or seventies, and the average size of concessions was twelve people⁶⁰.

Concessions have changed rapidly in the past few decades, mainly due to the change in materials used. Traditionally Seereer huts (Figure 122) were made with natural, local materials and needed to be renewed regularly. Nowadays Ndiémane's villagers are investing in cement, brick, and corrugated iron constructions (Figure 123). These last longer but (1) they are made using materials that are external to the village and need to be purchased, (2) they need to be built by skilled (paid) bricklayers, (3) they are not as efficient at regulating temperatures and keeping the inside cool, mainly due to the metal roof.

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Figure 122. Traditional Seereer hut (Pélissier 1966, fig. 7)

Figure 123. Brick, cement, and corrugated iron sheet construction in Ndiémane © Carla Sarrouy Kay 2019

As shown in Figure 124, this change has occurred at a fast pace in the past decade. Compared to the aerial view of the neighbourhood in 2014, where few iron roofs could be seen and many concessions still had huts, by 2018 most concessions had iron roofs on a single, bigger construction that housed most or all members of the concession. The neighbourhood also grew during that time, with two new concessions (right of the image), one of which doubles as a shop.

⁶⁰ This information stems from an initial focus group discussion and my own analysis and it would need further checking with local inhabitants for a full confirmation of the data.



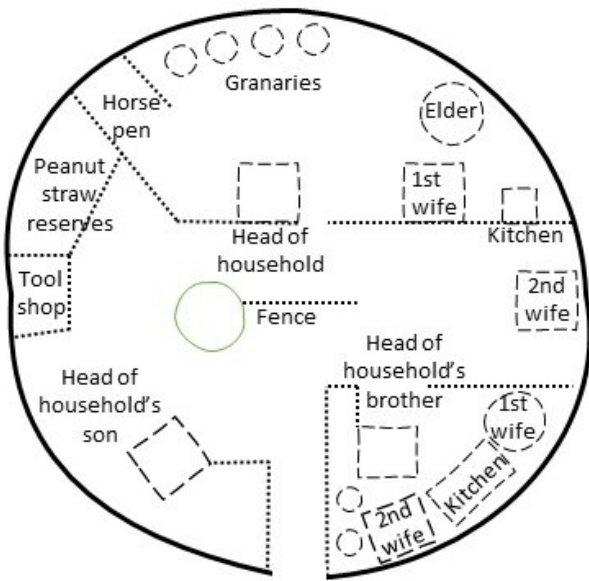
Figure 124. Aerial view of Ndiémane Malaoubé in October 2014 (left) and October 2018 (right) showing the proliferation of permanent constructions with tinned roofs (Google Earth 2020)

A focus group discussion with Groupe Mbogayife (18/10/2019), dedicated to the evolution of concessions in the neighbourhood, highlighted important changes that affected livelihoods and the food system. The conversation was kickstarted with a drawing of a Seereer concession in the 1960s I brought from my archival research (Pélissier 1966, fig. 18) (Figure 125, p. 163). Participants identified to the image but asked me to draw under their instructions a concession in Ndiémane Malaoubé from the 1970s, according to what they remembered from their teens or early twenties, when they had just married and joined the village. According to the women, certain aspects of the 1970s concession were important:

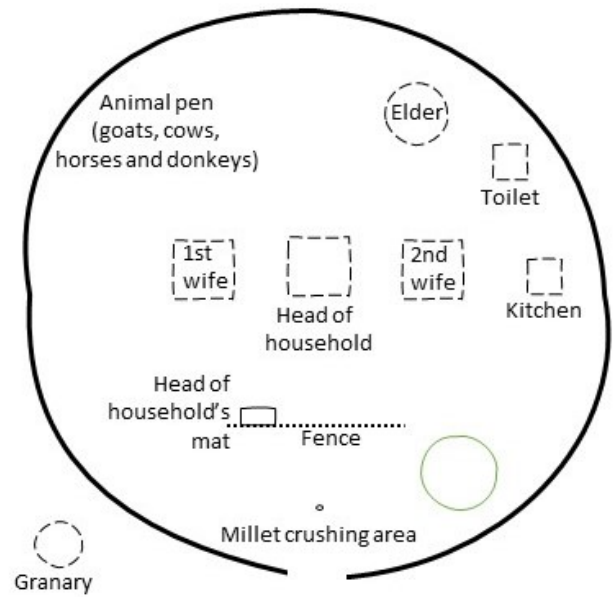
- A straw fence hid the entrance of the hut of the head of household;
- Millet had a crushing area; it was publicly visible and not too close to the huts not to bother those in them;
- Granaries were kept outside of the concession (or even the village) so that if a fire occurred in the concession, families would not lose their food reserves;
- Elders had huts close to the toilet due to their limited mobility.

By the 2010s concessions had changed and most constructions were made of cement. Whilst small children still slept in their mother's room, older children were often in a separate room. Groupe Mbogayife women said that nowadays there is less guidance regarding the construction of houses, their orientation and who lives in them. Women admitted not remembering very well old traditions and the reasoning behind them; they thought this was a sign of tradition loss in the name of modernity.

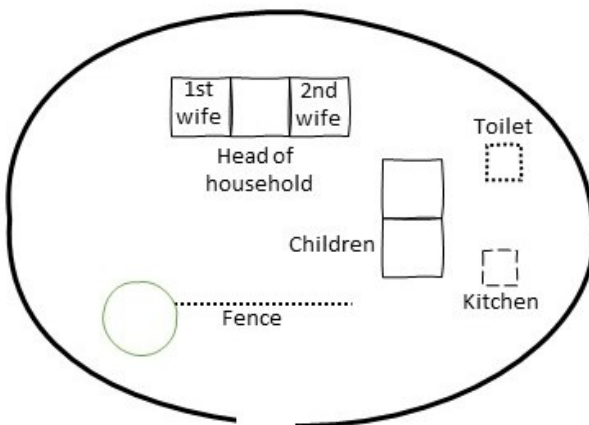
1960s



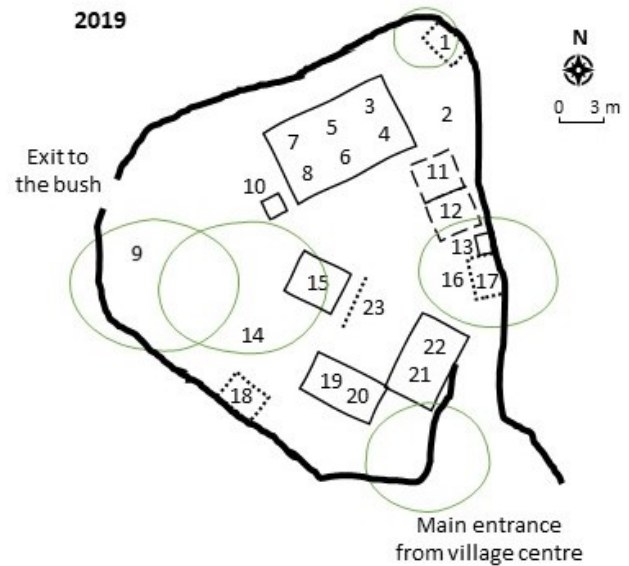
1970s



2010s



2019



Legend for all drawings:		
— Concession cane border	— storage.	— abandoned)
— Cement construction	4 – Water storage for first wife	13 – Pigeon coop
--- Traditional hut	5 – Temporary room for teenager boys from both wives	14 – Open area kitchen for second wife
..... Cane wall	6 – Entrance hall	15 – Head of household's father
○ Tree	7 – Water and kitchen storage for second wife	16 – Open area kitchen for first wife
Legend for 2019:	8 – Farming tool storage for head of household	17 – Female toilet for first wife's family
1 – Male toilet for first wife's family	9 – Horse and donkey pen	18 – Toilet for second wife's family and head of household's aunt
2 – Goats' pen	10 – Turkey coop	19 – Head of household's aunt
3 – First wife's eldest son. No wife and children yet. Room used by teenager girls from both wives when he is absent. Grain	11 – Kitchen storage for first wife	20 – Head of household
	12 – Storage for first wife (partially	21 – Second wife and her small children
		22 – First wife and her small children
		23 – Fence

Figure 125. Drawings of Seereer concessions in the 1960s (copied from Pélissier (1966, fig. 18)), 1970s, 2010s (Groupe Mbogayife 18/10/2019) and a specific example from Ndiémame in 2019 (source: author).

Nevertheless, it is important to acknowledge that these drawings are only generalisations and that there are great variations within concessions even in a small neighbourhood like Ndiémame Malaoubé. The final drawing of Figure 125 (p. 163) shows a neighbourhood concession composed of sixteen people. This example is not necessarily typical of the neighbourhood, but it shows the complexity of a real case. There are three key differences between the 2010s and the 2019 drawings that were commonly observed in the neighbourhood but were not shown in the somewhat simplified 2010s drawing:

- High diversity of livestock;
- Two openings, one to access the village centre and one to access the bush;
- Mix of cement constructions and more traditional huts made with mudbricks and straw.

Additionally, and compared to the 1970s drawing, there are no more traditional granaries in Ndiémame Malaoubé. Houses are now built using materials that are a lot less prone to fires, and grains are stored in lockable cement rooms (e.g., number 3 in the 2019 drawing)⁶¹.

The separation of rooms, storage and cooking area between the two cowives seemed to be specific to the 2019 concession and was adopted to improve family life and cohabitation. The 2019 concession changed continually, and even during the four years of my research I observed major changes such as the construction of the large cement building (numbers 3-8) which was still unfinished by March 2020 but already partially inhabited.

Interestingly, when comparing historical satellite imagery with research colleagues, it became clear that the improvements made in concessions were not linked to good or bad farming years. New cement constructions erupted almost randomly, and participants explained that most of the time they were linked to income from work in urban areas. It is the income brought by those who left the farms and village that is enabling paying for construction materials and skilled labour. Participants insisted on the importance of image, of appearing to be well off (Groupe Mbogayife 13/06/2019). If a concession builds a cement house, all concessions want one too to look as wealthy and as modern as the first one. For a family, it is very symbolic to let sons leave the village to work elsewhere and cement houses are a clear way of showing that the family investment in the son's departure has paid off.

6.2.1.1. The Story of Wells in Ndiémame

The elderly of Ndiémame talk unanimously about the vivid memories they have of water abundance in the village and the presence of fish in ponds⁶². They remember in the 1960s there was a wealth of water and trees

⁶¹ See subchapter 6.2.1.5., p. 170, for more information on the evolution of mills and granaries in the village.

⁶² See subchapter 6.1.2., p. 136.

in the village, “one would make a hole in the soil and water would come straight away” (Yako Ndour 14/06/2019). Wells would be 5-7 metres deep and have 3-3.5 metres of water but now wells can be ten or twenty meters deep and still have no water. Ndiémane Malaoubé’s central well is approximately forty metres deep and it did not have a drop of water in June 2019 or March 2020 (Fatou Thiaw 06/03/2020).

Nonetheless there have been in the past periods of water shortage in the area, and Groupe Mbogayife recalls that in the 1990s the village had a committee that managed the well and the lack of water. Villagers were only allowed to draw water at night because during the day wells were reserved for people from other villages. These measures insured that wells were well maintained: they were being consistently drawn, which meant that they would not stagnate, the sources would not get blocked, and their levels would increase again (Groupe Mbogayife 10/10/2019).

By the early 2000s, water levels in Ndiémane were decreasing and Centre AFAFA received funding from *Sahel People Service* to dig wells for peasants. Peasants had to sign an Agroecology Charter which stipulated that they accepted to practice agroecology in their fields in exchange for an interest-free loan to dig a well in their field. The uptake of this initiative was tremendous, and more than 120 wells were dug by Centre AFAFA in Ndiémane (Sarrouy Kay 2019e).

Thanks to the new access to water in their fields, many peasants managed to increase their production of dry season market gardening crops and therefore increase their income. This led to further investment in wells but also in water pumps. Villagers described how in the late 2000s the village would wake up with the sound of water pumps watering onion fields (Youssou Sarr 15/05/2017). As shown in the film *Reverdir le Sahel* (Regreening the Sahel) (Coste 2013), commissioned by *Sahel People Service*, plots were often flooded with water gushing seemingly-endlessly from water pumps.

Centre AFAFA and *Sahel People Service* realised that the situation got out of control. Peasants were not abiding by the Agroecology Charter; water was being wasted due to uncontrolled and unsustainable watering methods and – due to internal failures – the two organisations were losing track of who had had wells built and how much money was yet to be repaid. According to Alihou Ndiaye and Youssou Sarr (13/05/2017), several peasants had up to three wells dug in their fields, had not paid for them, and were not intending to do so.

According to Youssou Sarr (15/05/2017), the current coordinator of Centre AFAFA, to resolve the situation *Sahel People Service* took two measures. Firstly, it decided to add a new clause to the Agroecology Charter, encouraging peasants not to water plots using the water pumps but rather to use these to fill water basins and then water plots using watering cans. This is a more time- and labour-consuming process but it ensures that crops get an appropriate amount of water and less resources are wasted. Unfortunately, although peasants were signing the Charter, very few abided by the new clause.

Secondly, the organisation decided to employ a new person to assess the situation and do an inventory of the peasants benefiting from the initiative, the number of wells dug, the sums of money borrowed and the amounts yet to be repaid. Youssou Sarr was chosen for this task and it took months to assess the amplitude of the problem. The analysis was clear: there were many wells that had never been repaid but there were also fictional wells for which a loan had been received but no well was built, and no repayment was made.

Facing the impossibility of recovering their loans, the relationship between *Sahel People Service*, Centre AFABA, and the village chief and the villagers soured, the French organisation left the partnership and to this day the wells remain to be paid (Youssou Sarr 15/05/2017).

The environmental impact of the uncontrolled construction of wells and use of water pumps is a considerably lower availability of water. Peasants are now facing again a shortage of water despite access to numerous deep wells and the possession of water pumps. Groupe Mbogayife mentioned the decrease in quantity of water but also in quality as the over usage has led to the salinization of wells due to the proximity to the ocean. After decades, or even centuries, Ndiémane seems haunted again by its nominative determinism and becomes known again for its “salty wells”.

6.2.1.2. Wells, Taps and Boreholes: Complementary Resources with Distinct Challenges

In Ndiémane Malaoubé, none of the concessions has access to indoor or outdoor concession taps. Nowadays there is a central tap in the neighbourhood, but its water supply is irregular. In June 2019, the tap was locked to control usage and its flux was very low during the day, so women had to queue at night to fill their plastic containers. At approximately three in the morning, women gathered around the tap and took turns to fill in containers. To make sure that all the households got water, each family filled a container a time and it is only once all the families had filled a container that they started the cycle again. The bigger the family, the longer the woman would have to wait to fill all the containers she needed for her household.

Women would often fill in the containers and leave them near the tap for the young men to carry them home in the early morning. With each container weighing approximately 20 kg, it was not an easy task to carry 10-15 containers for 50 metres every day. Young men often carried two containers at a time, but they complained of shoulder pains. This water was commonly used for cooking, personal hygiene and washing clothes and dishes (Figure 126) and once all the containers were empty again, they needed to be taken back to the tap to be refilled for the following day.



« I had left to fetch water from the well. Wells have dried up here in this area. I only have one water basin with which I must work all day. [...] With this sole basin, I must wash the millet already hulled and I must bathe my children. »

Figure 126. Screenshot, QR code and quote for the participatory video *Rew Wa Mbagna Yo Thiossane No Serere (Women Who Master the Seereer Tradition)* (Groupe Mbogayife 2017b) <https://youtu.be/TOoIUv9hyFQ>

In March 2020, with the worsening drought, there was no more water in the neighbourhood tap (Figure 127). Villagers had to go to the village's central borehole, although its water was becoming increasingly salty (Figure 128). Each container filled at the borehole cost 20 FCFA⁶³, which added up over the course of the month means a considerable increase in family expenses during difficult times.



Figure 127. Ndiémane Malaoubé's abandoned dry tap in March 2020 © Carla Sarrouy Kay 2020



Figure 128. Children with donkey carts at Ndiémane's central borehole to fetch water for their concessions, in March 2020 © Carla Sarrouy Kay 2020

As soon as the rains come and wells start having water, families start using again free well water for their household needs. It is often the young in the family who gather the containers on a donkey cart and go to the nearest well or borehole to fill the containers (Figure 129). This work is physically demanding, and it encompasses other risks because old carts often break or topple, and children get hurt. As mentioned by Mben

⁶³ Approximately £0.027 and €0.031 in 2020.

Faye, a mother of six, this is a risk to the wellbeing of children and an extra concern for parents as children may need to be taken to hospital and fees may need to be paid for their treatment (Figure 87, p. 138).



Figure 129. Children collecting water for their household in a nearby well during a misty morning of the rainy season in Ndiémame, in October 2020. Three boys aged between 10- and 15-years old fill fifteen water containers. Note the children were given access to a donkey cart for the activity and the well has been cemented but it does not have a bar to facilitate water collection. © Carla Sarrouy Kay 2019

All the water options available to Ndiémame Malaoubé's villagers are time- and energy-consuming for those who need to collect it, generally women and children. Access to drinking water, or the lack of it, has an impact on cooking and washing up methods. Water is carefully used and, if possible, reused, sometimes to the detriment of health and hygiene (at least from a Western, hyper-sanitised perspective).

Wells depend on seasonal rains but are free so, although they may not have drinking water as such, they are the favoured option for drinking, cooking and washing. In fact, the question for villagers was not whether water sources were considered drinkable or not (they have their own evaluation criteria for this), but rather whether they had *access* to water or not.

The issue of access to water relates also to access to used water disposal methods. In Ndiémame there are no proper facilities built for this purpose so used waters are disposed of in the wild.

6.2.1.3. Rudimentary Sanitation Facilities and Its Impact on The Most Vulnerable

In Ndiémane there was a mix of latrines and open defecation and I am unclear on the share of each. Centre AFABA had the only example I saw of compost toilets, with a bag of wood shavings, a seat, and a bucket to collect the urine, faeces, and wood shavings. This option was simple and cheap (provided there is a basic shelter and access to wood shavings or any other suitable material), it was fairly hygienic, with no odours, yet I did not see it being adopted by any of the households who did not have pit latrines. Note that none of the options most common in Ndiémane had access to running water and therefore the possibility to wash hands depended on each person's discretion and stored water availability.

The concession I was housed in during my field experience – like many others in the village – did not have any latrines. It had a little area (1.5 m x 1.5 m), surrounded by straw walls and no door, with a slab of stone on the floor, where people could urinate or wash themselves. Defecation was done in the wild. Although wandering in the bush due to bodily functions did not cause a high risk to safety in Ndiémane – even to women, even at night – it is still a situation of exposure and vulnerability.

To me, it caused a certain amount of anxiety because I always felt I stood out, I often had children following me, and village people always seemed to know of my every whereabouts. I lived in a concession with more than a dozen people, shared a room with two to six people, shared every meal, worked incessantly with a large number of people, showered and urinated in an area highly exposed due to the broken straw wall and the lack of door, and so felt I never had the privacy one might be accustomed to in the United Kingdom.

As a woman, I felt additionally vulnerable due to menstruation. I planned my field experience timing according to my cycle but – when unavoidable – I did my best to manage it in the field. My concern was for my health but also for local perception. I never had the opportunity or the right relationship to discuss these matters with local women.

6.2.1.4. Cooking Facilities, Tools and Fuel

Kitchens in Ndiémane are usually in the open air, at times with a simple straw shelter to protect from the wind. Food used to be home-grown and served in natural containers, such as calabashes, for groups to eat by hand. Nowadays, most food consumed is purchased, often imported and processed. Most containers and tools are made of plastic and metal, and food is served for groups or individuals to eat by hand or with a spoon (Groupe Mbogayife 09/10/2019).

Due to the lack of wood in Ndiémane's surroundings, households rely mainly on cow dung to cook. Whilst straw and some wood (mainly small branches) may be used to start fires, cow dung constitutes the bulk of cooking fuel used in the village (Figure 130).



Figure 130. Open air kitchen in Ndiémame Malaoubé with cooking fire using cow dung, straw and sticks. Note the pile of cow dung in the back, ready to be used. © Carla Sarrouy Kay 2020

Cow dung is local and free yet using it as the main cooking fuel has multiple implications. Firstly, cow manure is an important natural fertilizer and peasants wisely make use of their cattle to fertilize their plots during the dry season. Losing this source of fertilization contributes to the degradation of soils with a consequent decrease of yields and therefore of their reliance on farming for subsistence or income generation. Secondly, collecting cow dung represents an additional activity, done by women, to fulfil the needs of the household. Women walk around the village and further into the bush to collect cow dung; a chore that can be very time-consuming and physically tiring. Thirdly, there are health issues associated to cooking with cow dung, but this did not seem to be an issue for women in Ndiémame, mainly because complications come from indoor fire smokes whilst in the village cooking is done outdoors.

6.2.1.5. Mills and Granaries: Evolving Traditions

Mills and granaries are important physical resources for women because they are responsible for the storage and transformation of crops. Traditionally, women are responsible for grinding the millet and sorghum grains using a pestle and mortar. This activity is extremely strenuous, and causes pain in the back, shoulders, arms, and hands. Millet grinding may also be an important moment of socialisation, shared between cowives, and mothers and daughters. It used to set the pace of the village with the regular thumping, often accompanied by clapping (Figure 131), in the early hours of the morning or at sunset, when temperatures were cooler.



Figure 131. Women grinding millet in Ndiémame in preparation for a wedding © Ami Kama 2020



Figure 132. Electric mil at the Nguéniène rural market, near Ndiémame © Carla Sarrouy Kay 2019

Nowadays, there are several electric mills in Ndiémame and in the neighbouring rural market town of Nguéniène (Figure 132). Usually, women bring their cereal in a basin and a male miller grinds it. This service has a cost so not every household can afford it, or at least all the time. Some mills are connected to the mains and thus are relatively quiet, others require a motor pump which makes them very noisy and a nuisance to work with.

In Ndiémame, there are mills in some neighbourhoods but not in Ndiémame Malaoubé. This is a point of contention for women as they feel it hurts their pride to have to go to other neighbourhoods to mill their cereal (Youssou Sarr 16/06/2019). Oftentimes, Groupe Mbogayife (27/06/2019, 10/10/2019) asked me if I could fund a mill in their neighbourhood as they feel it would improve greatly their livelihoods.

With the possibility to purchase food as and when needed, preservation and storage facilities and techniques have declined. Families used to store their harvests in granaries (Figure 133), usually outside concessions (see Figure 125, p. 163) but these have disappeared from most Seereer villages. Families now store their threshed cereal in sacks in a lockable cemented room of the concession (Figure 134). This change means that cereals are more easily accessible to women, and they are already threshed when women collect the daily amount to

grind. Rare food items such as meat used to be preserved meticulously, but nowadays they are purchased on a retail basis (Anne-Marie Dieng 13/06/2019).

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Figure 133. Traditional Seereer millet granaries (Pélissier 1966, fig. 7)

Figure 134. Home storage of millet and sorghum in Ndiémame in 2020 © Carla Sarrouy Kay 2020

Why talk about sanitation, cooking, processing and storage in a food systems analysis? I believe these four subjects are important, especially if adopting an intersectional approach and yet they are not addressed usually, if ever, in these terms. The (lack of) health, safety and dignity for peasants on issues such as cooking and sanitation impacts their capacity to produce/sell/purchase food, cook it, ingest it, digest it, and eliminate it. Broader feelings of dignity, pride and privilege impact on (and are impacted by) the willingness and capacity to improve lives. And both for cooking and sanitation, women and the most vulnerable age categories (children and the elderly) are most exposed and most affected by the ill effects of poor practice.

6.2.2. Electricity: Lighting and the Advent of Information and Communications Technologies

Ndiémame is not an electrified village. In Ndiémame Malaoubé most concessions have at least one small solar-powered light for the main room(s) of the house, which gets enough power during the day to work for a few hours at night. When moving or needing stronger lights, people use either mobile phones (even the simplest mobile phones in Senegal have a small torch) or torches (usually with non-rechargeable batteries, but a few are solar-powered).

Wealthier concessions have large solar panels (Figure 135) and some form of battery to save energy and enable the family to have light for longer at night, charge equipment, or even watch television. Concessions with no form of charging equipment rely on their neighbours' generosity or may charge equipment at the village public high school. Centre AFAFA used to have a highly sought-after large solar panel, but this facility is not available anymore.



Figure 135. Sunset over a concession in Ndiémane with a large solar panel on the roof of the central cement construction © Carla Sarrouy Kay 2020

The co-researchers' opinion regarding electricity was unanimous: electricity changes life for the better and it does not have downsides (Groupe Mbogayife 14/06/2019). Conducting certain activities at night, in the dark, is challenging. Women need some type of lighting to collect water at night from the neighbourhood tap. Children often do their school homework at night, but they struggle to get access to a source of light, which hinders the quality of their work and learning. Cooking is also made harder with poor lighting, especially during Ramadan when a lot of the cooking is done between sunset and sunrise.

Electricity is also a matter of safety, as some methods incur undeniable risks (especially if including open flames or if generators or batteries get in contact with water). And finally, it is a matter of prestige too, as for example being able to host television sessions for one's family and neighbours is a clear sign of status and success.

6.2.2.1. Television: A Window to the Outside

As for electricity, the general opinion on televisions is very positive (Groupe Mbogayife 14/06/2019). In Ndiémane Malaoubé, three out of ten concessions had the capacity to set up televisions outdoors at night for their families and neighbours to watch. According to participants, films shown on television are well studied and they show interesting content. There is an increase in Senegal of national programmes in local languages and these are highly appreciated by all generations because they show appropriate and relevant content viewers can directly identify to.

Nonetheless, participants acknowledged that some images can hurt (e.g., "kisses and violence"). There are a lot of imported, dubbed B movies shown on television and these often show behaviour that is not approved by the local culture. Characters are shown shouting and swearing, smoking, drinking alcoholic drinks and getting inebriated, wearing inappropriate clothing, kissing, or even having intercourse. Yet, the great

advantage of television is that it is easily controllable. With large household viewings, a responsible adult has the remote control and changes channel every time the content shown is considered inappropriate.

Even though there are still few televisions in Ndiémame Malaoubé and they are watched in public, it is undeniable that they have changed the social habits of the neighbourhood. Even with some chatting happening whilst watching films, people gathered barely talk compared to the olden-days' evening conversations and storytelling in the main square (Groupe Mbogayife 14/06/2019).

Televisions are efficient tools to vehiculate messages – constructed to variable degrees – about a different reality. Viewers were attentive to what was being eaten, worn, said and done on screen and oftentimes they aspired to it. It would be relevant to do more research on the extent to which television has contributed to the decrease in consumption of traditional foods and the ever-growing popularity of rice-based dishes.

6.2.2.2. Mobile Phones: Individual Communication Tools

There are no phone landlines in Ndiémame, but most adults have mobile phones, sometimes shared between several members of the family. Some people may have several phones and/or several SIM cards with different companies, and phones are regularly changed, broken, lost or stolen. This presented a challenge more than once to reach colleagues or for them to reach me.

People do not tend to use their phone to read information or send written messages; they are mainly used to call, send voice messages or to listen to music and watch videos. Some contact numbers may be saved but usually users memorise the numbers of all the key people they wish to contact. A lot of the calls are spontaneous, very quick (only a few seconds) and are a way of greeting someone not seen in a long time.

On one occasion, during a field trip to a peasant seed fair, Fatou Thiaw (Groupe Mbogayife's president) gave me her mobile phone and asked me to call a specific person. I apologised and explained that I did not have the number of that person. It was only after a while that I understood that Fatou was asking me to go through her contact list and start the call because she was unable to read the contacts and did not know the number by heart. She would also show her phone to people and ask what the time was. Although Fatou could only make use of her phone with somebody's help, it was still an important tool for her independence and affirmation.

The opinion on mobile phones is a lot less unanimous and positive than that of television, and it reveals a clear generation gap. Groupe Mbogayife agreed that mobile phones brought many problems to their lives. Phones do enable distant communication and may make life easier sometimes: "People can place orders by phone for people to bring items for them, without even needing to leave Ndiémame" (Groupe Mbogayife 14/06/2019).

However, participants were concerned that mobile phones have meant that there are no more discussions and games in the public square. They are especially concerned for their children as they observe that children

are glued to their phones, they do not listen anymore and do not want to study anymore. Whilst children were often curious and could easily spend hours exploring all the settings and games of the phones, adults tended to make use of them in a quicker and more simplistic way (checking the time and making calls).

Phones were considered dangerous because parents were unable to control who their children were communicating with or what they were watching or listening to. One participatory video made by Groupe Djoubo of Lissar (north of Thiès) is about a couple that is having marital problems (Figure 136). When the young wife (character on the right) speaks with her family about the issues she is having with her husband, her mother (centre) says she does not want to listen to any of it because she was against the marriage, but the daughter did not pay attention to her parents' advice and married a man she had found through online dating. According to the mother, and concurred by the aunt (left), mobile phones and the internet have meant that important traditions are being lost, like arranged marriages and respect for the elders.



« You used to spend all your time on the internet looking for a husband. You were only interested in cameras. »

Figure 136. Screenshot, QR code and quote from the participatory video Djiguene ak Diafe Diafe Say Thie Biir Keur Ram (*The Woman and Her Household's Issues*) (Groupe Djoubo 2017b) <https://www.youtube.com/watch?v=BfvRRuOwlkA>

More technological communication was not seen as an obvious positive change (Groupe Mbogayife 14/06/2019). There were concerns that communication could be used for malevolent reasons, such as claims that mobile phones have enabled certain coordinated thefts. During participatory video training mobile phones were a real hinder, especially among younger participants. Participants did not listen attentively to the group progress and information had to be repeated. Most phone users have very limited access to the internet so a lot of the content being accessed is simply what is saved on the phone, watched or listened to *ad nauseam*.

However, I must say that my positioning influenced my view on the matter: I am a very light user of social media and therefore almost identified more with the views and concerns of the elders. It is true that mobile phones have muddled up the notions of local and global, of here and there, of presence and absence. Yet the strengthening of distant connections and communities seems to have weakened local connections so essential for identity building, co-creation and activism.

6.2.3. Roads and Modes of Transport: Varying Mobilities Depending on Intersectionalities

Ndiémane had an old sand track connecting it to its neighbouring villages up till 2015 when a soil track was built by the government⁶⁴. According to Groupe Mbogayife (13/06/2019), the new track brought major changes to the village (Figure 137). The road has facilitated access to surrounding cities, such as Mbour and Joal, but also Thiès and Dakar. This creates new, easier routes to sell harvests and to buy produce to resell in the village. It also means that residents can access more safely, day and night, certain services, like hospitals, which are inexistent in the village.



Figure 137. Entrance to Ndiémane © Carla Sarrouy Kay 2019



Figure 138. Ndiémane road track partially flooded during the rainy season © Carla Sarrouy Kay 2019

The road is an opportunity for job creation, especially as taxi drivers, a job that has attracted multiple young men that now hope to make a living whilst still residing in the village. Villagers are appreciative of the taxi union as it created a management committee that gets a commission for every taxi ride and reinvests the money in the village, thus benefiting the whole community.

Finally, improved roads opened the village to new people and new influences. The village grows, it opens itself to others and, as one participant mentioned positively, “one day we will not know anymore who is from the village and who is not” (Groupe Mbogayife 14/06/2019). Yet, the road also gives access to “livestock thieves and child kidnappers”, which were of concern to villagers. Although the road track has greatly facilitated travels, there are still some concerns about floods during the wet season and the health impact of dust during the dry season (Figure 138).

None of the residents of Ndiémane Malaoubé has a car. Some men, heads of household or young men earning a living, purchase motorbikes, considered to be a quick, reliable, and cheap mode of transport. Local travel is done by horse cart or eventually by donkey cart, and these too are managed by men. Distant travel such as going to Mbour or beyond, is done by shared taxi, usually seven seaters where eight or nine adults travel (plus

⁶⁴ The new road is the orange line clearly visible in Figure 37, p. 103.

any children on knees). Women do not own any mode of transport, so they travel longer distances by shared taxi and, for local distances, either they get a lift on a cart or they walk.

All modes of transport can be unreliable, and accidents are common. For example, going to the nearest rural market takes approximately fifteen minutes by car or one hour by horse cart. On the occasion I joined a family to go to the market by horse cart, on the way there we had a flat tire and had to stop to collect hay to feed the horse, and on the way back the midday heat and the extra luggage from the market purchases meant that the horse refused to trot and walked all the way back, making the trip nearly twice as long. These are not exceptional occurrences. and they reveal the extra time, energy, work hours, health risks, and cost encompassed in transport methods.

6.2.4. Farming Equipment and Chemical Inputs

Nobody owns a tractor in Ndiémame Malaoubé. All farm work is manual, with simple hand tools, some animal traction and simple mechanisation such as sowers and ploughs (Figure 139). Women do not have mechanised equipment, but they can ask their sons to prepare the land on their plots, using the concession's animals and equipment (Figure 140).



Figure 139. Three peasants planting an aubergine field in Ndiémame by hand and using an iler (traditional farming tool) © Carla Sarrouy Kay 2017



Figure 140. Teenagers planting corn with a harnessed sower in Groupe Mbogayife's field in Ndiémame © Carla Sarrouy Kay 2017

The development of industrial agriculture in the country is more visible in the use of farming inputs. According to Cheikh Ndour (03/03/2020), a young male peasant, and as confirmed during all the field visits undertaken during research, the vast majority of male farmers, young or old, wish to use or already use chemical inputs to fight pests and fertilise soils. In fact, young male peasants (21/10/2019) consider chemical inputs inevitable

when doing market gardening. Hybrid seeds and chemical fertilisers and pesticides are purchased in local markets mainly for cash crops (Figure 141).



Figure 141. Stall selling chemical farming inputs and equipment at a local rural market near Ndiémame © Carla Sarrouy Kay 2019

There is a big gap between the recommended best practice and the reality in the fields. Peasants were often unable to read labels, they were unaware of what they were spraying and best practice for dosage, process, and disposal. All farmers who used chemicals in their activity admitted not wearing any protective equipment and bottles would often just lie on the floor of the field, abandoned and forgotten (Figure 142 to Figure 144, p. 179).

In participatory videos, peasants talked about the search for simplicity: “it is the lazy who practice industrial agriculture” (Mbootay Baykat Derr UCT 2017a)! But peasants acknowledged they have learned the hard way that “the use of chemical fertilisers means you may have good yields on the first year, the second year too, but if you don’t use them the third year, you won’t produce anything” (Michel Diouf 14/10/2019).

Videos also addressed the concerns about using chemicals in farming, including the dangers of mishandling chemical products (Figure 145, p. 179) (Mbootay Baykat Derr UCT 2017b, 2017a) and of consuming food grown using chemical inputs (Tintimol 2017, Groupe de Vidéo Participative de Casamance 2018).



Figure 142. Young peasant in Ndiémame showing the chemical he has been using in his aubergine field. © Carla Sarrouy Kay 2019



Figure 143. Young peasant in Guédé Chantier (North of Senegal) mixing the chemicals in water before spraying the rice paddy. Note there is no protective equipment whatsoever and the peasant walks barefoot in the field he is spraying. © Carla Sarrouy Kay 2017



Figure 144. Bottles of chemicals abandoned in a field in Ndiémame. © Carla Sarrouy Kay 2017



« When I left to the market, I bought a product called Dicovol. It is a product that, if sprayed on plants, destroys all the diseases that it finds on the plant. I went to buy the product and sprayed it over the plants, I treated my plants and there are no more diseases. What I've learned from all this, is that I treated my plants with a product that isn't good. These are products that aren't good for the soil, and that aren't good either for human health. When you use it, not only it destroys the soil, but it is also at the origin of many diseases for those eating the produce that comes from the soil. The other inconvenience is that, if you throw the bottle that you've just used, your own children might come after you, pick up the bottle, put water in it and drink from it. If children drink this water, they may get sick or even die. I advise all market gardening peasants to use organic products. [...] If you assess the difference, you must know that the culture free of chemical inputs is the best. This type of agriculture is the best for the human body, the best equally for the soil. »

Figure 145. Screenshot, QR code and quote from the participatory video Mbayumtaamat (Tomato growing) (Mbootay Baykat Derr UCT 2017a) <https://youtu.be/Uvg9RPLVQOI>

6.2.5. Physical Resources Management

Physical approaches are limited. After the advent of the construction of wells which improved greatly market gardening opportunities in the village and now is seen as one of the reasons that led to Ndiémane's drought, new physical approaches are mainly related to the expansion of cement concession constructions. Houses are increasingly made with more permanent materials, thus making them more sedentary and less flexible than traditional straw huts. Interestingly, the development of new building materials can be linked to increased post-harvest damage. Poor current storage facilities show the adaptivity of traditional constructions, potentially the misuse of new building materials, the intensification of pests with a changing climate and environment, and, maybe, reduced care given to stored foods in an increasingly commodified food system reliant on purchased foods to feed the family.

The construction of metal fences in and around the village is a recent yet evolving trend. Metal fences are considered the only way to truly protect fields from vagrant animals or thieves (Blaise Diouf 24/06/2019). Most peasants, if they have the financial means or support, do not hesitate to build permanent fences around their fields dedicated to market gardening crops. This, however, is progressively leading to a loss of commons. Common land and freely accessible fallow land are essential in agro-pastoralist systems and the multiplication of permanent fences is likely to create future tensions related to land ownership and land use.

Finally, the last approach, but arguably one of the most important approaches of all, is the investment in ICT. Mobile phones and televisions are resources that are deemed essential in the village, and especially by its youth that strives to connect with the wider world. ICTs are symbols of wealth and affirmation, of modernity and connectivity. Mobile phones, for example, can be important sources of weather and market information, thus helping interconnected, market-dependent peasants. Mobile phones especially have the capacity to change the face of agriculture in the future, either by pulling its labour force out of the fields, or by supplying relevant information and connections that help peasants better adapt to and transform the ever-changing environment and society they are a part of.

6.3. Financial Resources

6.3.1. Formal and Informal Financial Resources

Although Ndiémame Malaoubé may look very poor at first sight relative to global wealth levels, I found it very difficult to assess the poverty levels of households and was advised on multiple occasions not to assume too quickly that villagers were poor. I did not find it pertinent nor appropriate to conduct a thorough survey on financial resources and the information conveyed in this chapter comes from interviews and focus group discussions when participants accepted to talk about finances, which are considered a difficult and private matter.

Considering the decreased incomes from farming and the increased pressure toward rural exodus, remittances are important resources for family finances in Ndiémame, either in kind (e.g., goods or food) or in cash, often done hand-in-hand or via intermediaries. Peasants said they did not engage with or had no access to banks for their finances.

The informality of the financial sector becomes most evident when addressing loans and savings. Loans come mainly from informal sources, such as shopkeepers opening a tab, or trusted friends and family lending money (Groupe Djoubo 2017b, 2017a). To the best of my knowledge, women did not organise group savings in Ndiémame Malaoubé⁶⁵, despite these being popular among women at the national level. Yet savings play an important role in risk-reduction.

Markets are essential resources both for selling and buying items, and Ndiémame has one local rural market (Nguéniène) and two big urban markets (Mbour and Joal) that peasants use according to their needs (Figure 146, p. 182). As mentioned earlier, livestock can be purchased or sold depending on the needs of the family⁶⁶. Savings in livestock are especially popular among women, who purchase small animals with the little economies they might have. Men, however, have access to bigger amounts of money and, if investing in livestock, they purchase larger animals (Youssou Sarr 15/05/2017).

Another important investment is in real estate and several families in Ndiémame own houses in Mbour that they rent out. These properties were often acquired several decades ago when land was still very cheap (or even free) but, with the ensuing urban sprawl, they are now located in central areas and become important, regular sources of income (Male elder 12/10/2019).

⁶⁵ Centre AFABA encouraged the creation of a “*Calebasse de Solidarité*” (Solidarity Calabash), a calabash in which women put a donation every time they meet so that the group can do something together later or allocate it to somebody in need. This idea never took off because of a lack of motivation, empowerment, leadership, and organisation, according to my analysis.

⁶⁶ See subchapter 6.1.5., p. 155.



Figure 146. View over Mbour's fish market © Carla Sarrouy Kay 2020

Occasionally there are NGO projects in the neighbourhood that may bring some income or some support in kind, but these are few and far apart. Since the failure to repay the *Sahel People Service* well loans and the collapse of Centre AFAFA, Ndiémane Malaoubé has had very little input from NGOs. Some support enables female and male peasants to attend training such as the participatory video training in 2017 and 2018 or attending peasant seed fairs around the country but no subsistence can rely on this support.

6.3.2. Financial Resources Management

The financial management adopted by Ndiémane's peasants revolves around one simple fact: households now depend on financial income to fulfil their needs. Many crops are grown to be sold; food is purchased to be consumed. There is less subsistence farming, less self-sufficiency, and a total dependence on a monetised economy. The main concern of households in Ndiémane is to earn money.

Some young peasants dream of living off their land, diversifying activities and adapting to the agricultural market, but remaining true to their peasant origins and developing agroecological approaches locally. Cheikh Ndour (03/03/2020), a young agroecologically-trained peasant, dreams of acquiring "a small plot with simply one hectare, where [he] could have some fields, some animal rearing, a house and [his] own little family". And Blaise Diouf (23/10/2019), a young male peasant, dreams of converting his family's fields into agroecology, to produce enough for the family, sell any surplus, and even create an agroecology peasant-to-peasant training school to share knowledges and experiences especially for the young generations.

Generally, though, young people acknowledge that working in the fields is hard and they believe one receives very little financial reward and social recognition for it. This lack of belief in agriculture was often lamented by elders as they associated it to laziness:



« —Are you still not awake? Diodio? Daba?

—Get up, we're heading to the fields.

—I will go to the fields for no one. You can ask Mame Khoudia and Mame Ndiaye to go to the fields but I'll go nowhere.

—We're heading to work in Baba's field. Fasten the horse carriage and find me at Baba's. I'm on my way.

—Father, I won't go to the field today. [...] I'm tired.

—A man should never say he's tired. Since I was born, I've never heard a man say he's tired. »

Figure 147. Screenshot, QR code and quote from the participatory video *Mbaye ak Sameu (Agriculture and Animal Farming)* (Groupe Deggo 2017a) <https://youtu.be/kcvhkoC-V4g> The screenshot shows the elder father (in blue) waking up his two young sons (on the rug) to come and help him in the fields.

When asked whether there were new projects and initiatives that give hope to peasants, Groupe Mbogayife (14/06/2019) responded: “There is no hope without rain and full wells. The land is no good and life is expensive.” Yet, more than the climate changing, it is the people who have changed (Blaise Diouf 11/10/2019). The shift from subsistence farming to economic migration is so deep and seemingly irreversible that peasants reckon that in the future farming in the area will only be a hobby (Yako Ndour 13/06/2019) or it will disappear altogether (Youssou Sarr 13/06/2019).

Apart from farming, the three main approaches employed to earn money are: small local entrepreneurship, paid local seasonal work, and economic migration (Figure 148). The first two approaches enable workers to continue living in the village. Economic migration implies looking for work outside of the village and therefore being absent from the village most of the time. These activities involve both men and women, young and old, and range from occasional work to full-time employment, sometimes overlapping in time and place.

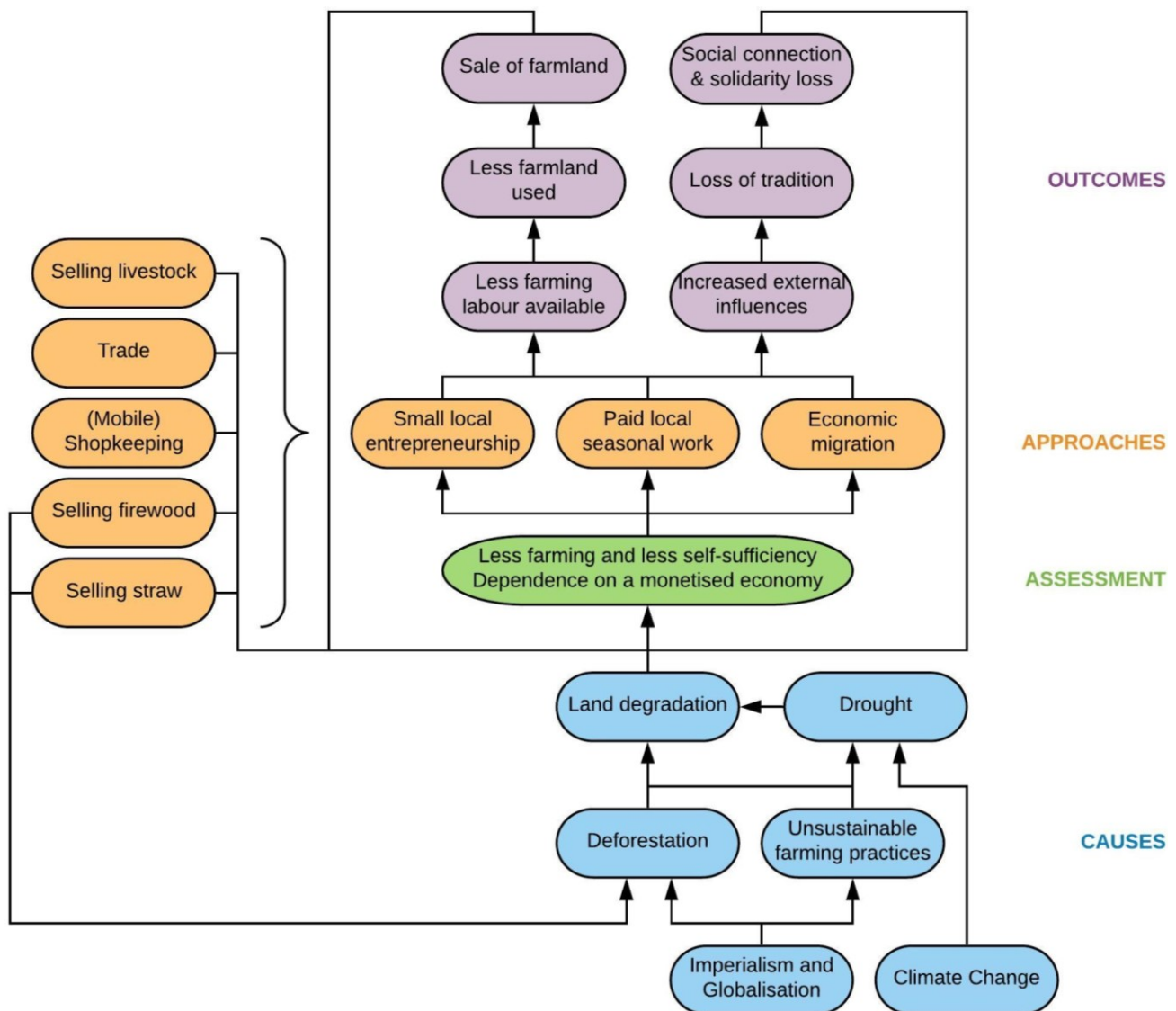


Figure 148. Causes, approaches and outcomes related to less farming, less self-sufficiency, and higher dependence on a monetised economy in Ndiémane (source: author)

6.3.2.1. Small Local Entrepreneurship

Small local entrepreneurship in Ndiémane is varied but it does not include crafts as its community is not traditionally involved in any craftsmanship. As seen earlier, some female and male peasants use the sale of livestock as a source of income and a resilience approach⁶⁷.

There are in and near Ndiémane some local trade opportunities, such as fishing, carpentry, masonry, or taxi driving. These are mainly taken by young men, with or without prior training, sometimes to provide income to complement school education (Young male student 06/03/2020).

⁶⁷ See subchapter 6.1.5., p. 155.

Some women focus their attention on mobile trading, at markets or door-to-door. Market trading seems to only be seasonal, related to bountiful rainy season harvests, or abundant market gardening during the dry season (which has not happened in the past few years). Some women purchase produce at the nearby main crossroads, such as fish, ice, ice-cream, biscuits, and sweets. Others make cakes at home using mainly wheat flour, millet flour and desiccated coconut, and sell these snacks at school gates. These activities require energy to travel, financial capital to purchase produce and skill at buying and selling.

Finally, as seen under the environmental approaches⁶⁸, women (and children) are involved in wood and straw collection and sale. This activity provides some income but, as shown in Figure 148 (p. 184), it promotes deforestation, and therefore land degradation, thus reinforcing degradation of the farming environment and dependency on a monetised economy.

6.3.2.2. Paid Local Seasonal Work

Women in Ndiémane feel trapped; although their role in society is to look after the children, the elderly, do the housework, and farm, they have no choice but to look for paid work to feed their families. Women seek preferably work that is local (so that they can continue looking after their families), and temporary (so that it can adapt to their various obligations).

Most women from Ndiémane Malaoubé work at an export-oriented farm located in the village of Ndiass, near Thiès, at approximately 37 miles (60 km) from Ndiémane. Six days a week, during six months over the dry season, buses come to Ndiémane at 5 am to pick up the female workers. The journey lasts approximately two hours each way and women return to the village at approximately 8 pm, depending on traffic. Many potential workers live closer to the work site, but some choose not to work there due to the harsh work conditions. According to the Ndiémane female workers' coordinator, Anne-Marie Dieng (13/06/2019), Ndiémane's women have gained a reputation for being hard-working and therefore are the first ones to be contacted when there is work.

Women work on spring onion, green beans, tomato, watermelon, and peppers, mainly for export. They are responsible for post-harvest tasks, preparing the crops for transport. They all work sat on the floor, in the middle of the fields, with no sun or wind protection, sorting crops by size and shape, cutting off outer leaves, tying them together and then packing in boxes. This is long, tedious, and meticulous work (Groupe Mbogayife 13/06/2019). There is no binding contract between Ndiass and female workers and, if needed, workers can miss work for personal reasons or to attend events such as weddings and funerals.

⁶⁸ See subchapter 6.1.3.2., p. 142.

Women are paid per box completed. For example, for a box of green beans they are paid 230 F CFA⁶⁹. Women receive a token per box completed and they are paid according to the number of tokens they have collected. Depending on speed and skill, for a day's work, women expect to earn approximately 5,000 F CFA⁷⁰. Women can be paid daily but, rather than receiving small sums that are quickly spent and hardly saved, some women choose to be paid sporadically to receive larger lump sums.

Men also find paid seasonal work locally. The nearby Spanish-owned fruit farm growing mainly watermelons for export to Europe, employs many people from Ndiémane (Figure 93, p. 141). The farm offers dry season employment to men as machine technicians, watchmen, or farmers. One villager earned 80,000 F CFA⁷¹ for work six days/week as a watchman at the farm (Male peasant 16/10/2019). Work conditions at the fruit farm seemed better than those at Ndiass: the farm has a room with air conditioning to sort and pack melons and it is located approximately 2 miles (3.2 km) from Ndiémane, so most workers walk, cycle or motorcycle to reach it (Young male peasant 09/03/2020).

An interesting example from Ndiémane Malaoubé is that of Cheikh Ndour, a young man, trained in agroecology farming in multiple renowned schools and training centres, who now in his mid-twenties has returned to Ndiémane to work as a farmer. He has found work in the nearby town of Nguéniène, in a foreign-owned export-oriented farm using chemical inputs. Because his training did not suit the type of agriculture practiced at the farm, he has not risen to the level of manager as initially expected and he is now having to learn how to use chemicals in agriculture. This young peasant is disappointed that he is having to work in a farm that does not practice the type of agriculture he knows and believes in. Yet, he maintains this activity because it is an important source of income to contribute to his household's needs and to start saving hoping to buy one day his own farm and start his own family in the village.

Working as a farm labourer six days/week, Cheikh is earning 125,000 F CFA/month⁷² and he hopes to start earning 175,000 F CFA/month⁷³ once he is promoted to a managerial role. Moreover, his employer has purchased a motorbike for him (reimbursed now by monthly increments), it covers petrol costs, and it also pays for a room in Nguéniène so that he does not have to travel back home every day thus enabling him to work longer hours (Cheikh Ndour 03/03/2020).

For ambitious young men these are very considerable conditions that enable them to live very close to home, whilst making a living and, to a certain extent, making their own decisions and savings. Yet, when companies set base in a certain place, it is mainly indigenous peoples who have to adapt to global production networks,

⁶⁹ Approximately £0.31 and €0.35 in 2020.

⁷⁰ Approximately £6.78 and €7.64 in 2020.

⁷¹ Approximately £109 and €122 in 2020.

⁷² Approximately £170 and €191 in 2020.

⁷³ Approximately £237 and €267 in 2020.

rather than these adapting to endogenous social and ecological practices. Cheikh Ndour is having to learn about and work using methods he does not approve of, which he thinks are detrimental to his health and that of the earth, to retain paid employment.

6.3.2.3. Migration

When villagers do not find local profitable options, leaving Ndiémane becomes a necessary approach. This is not a new approach though; it is how the village was created and many of the village elders were once economic migrants too (Youssou Sarr 11/06/2019, Yako Ndour 12/10/2019, Daouda Ndour 15/10/2019). It is urban areas, their values and professional opportunities that attract most migrants, especially young ones.

Migration is often used as a family diversification approach: the eldest son might migrate whilst younger siblings – even if already adult – look for local employment that would hopefully complement the remittances sent by the eldest child. Villagers, mainly men, migrate for work and for education, and increasingly their home upbringing sets them on this path. During a male youth focus group discussion (23/10/2019), boys aged fifteen and sixteen years old believed they too would migrate as soon as they sensed a work opportunity.

Migrants' lives and work conditions can be harsh, and they are often filled with urban disillusion. By leaving their cradle, migrants often enter highly competitive markets where their original skillset is not necessarily valued. Migration is not always profitable, and it entails important costs, affecting all the community resource web.

« The youth is lazy, they don't want to work in the fields, or very little. But leaving to the city is very hard, it's expensive, and it's hard to find work. The young people who left but are struggling end up coming to see their parents for help. » (Marie Djogoul 09/10/2019)

Staying in the village is not easy and Groupe Mbogayife (2019) often expressed the difficulties lived by women who had to stay at home and face the problems, without the support of their husbands or sons. When seeing their husbands and sons leaving to work in cities, women are conscious that it means they must manage the household by themselves and, increase their workload, undertake traditionally male activities, or make do without certain contributions altogether.

Migration was often felt by women, not as an adaptive approach (as men did), but as an added cause of vulnerability. This shows how traditional activities do not exist in a dichotomy but rather as a spectrum of activities in which women and men share responsibilities, cooperating and complementing each other. Equally, urban and rural areas do not exist separately, they are mutually dependent. Cities provide certain work opportunities, yet they are fed by rural areas mainly.

People move between the two according to the season and the domestic and professional needs. For example, Yako Ndour, a male elder, described how, during the drought of 1983-1985, he moved his whole family from

Ndiémane to the nearest city (Mbour) because they had a better chance of surviving in an urban area. The whole family returned to the village after the drought, apart from Yako who, even with good rainfall, would still earn more in Mbour working as a diver than he would as a peasant in Ndiémane.

This approach from nearly four decades ago has not changed completely: male teenagers in 2019 described how they would like to continue their studies and work in cities, but they hope to one day settle their wives and children in the village (Young male peasants 09/10/2019). Equally, peasants are certain that if good rains return to Ndiémane, many of those who left to work in cities, will return to farm the land. This has happened before, and the elder members of the community remember the energy and enthusiasm flowing back to the village with the hope of bountiful market gardening (Yako Ndour 03/03/2020).

Migration can be seasonal and for young single women it relates to school holidays. Schools close during the rainy season traditionally to free labour to work in the fields. Young women aged 15-20 years old take this opportunity to migrate to cities and work as cleaners and cooks. In the past, this activity enabled young women to save some money for their future marriage; savings were used for their own needs and their future children's, thus giving them some independence from their husband's household financial management. Nowadays, however, most young women spend their earnings on clothes and mobile phones and may give a small share to their families.

Though only seasonal, this migration can have a considerable impact on the overall household if all the daughters leave for three months and there are no daughters-in-law to do house chores (Groupe Mbogayife 18/06/2019). For example, Fatou Thiaw, a female elder, finds herself responsible for all the housework, child and elderly care for eight people over the rainy season because her sons are not married yet and her oldest daughter leaves to work as a cleaner in Mbour. This means that, for Fatou, the busiest time in the fields competes with the busiest time at home.

Migration does not necessarily mean a total abandonment of work with the land. Some villagers migrate seasonally or permanently to work as labourers in areas considered more fertile such as the Niayes (Figure 19, p. 84), the main (often export-oriented) market gardening area in the country. This activity though means that peasants join the labour market rather than the product market and therefore become dependent on labour demand and employers' instructions.

A different option, meaning migrants can remain self-employed is to move to nearby zones with better rainfall and soils, such as at the village of Ndianda⁷⁴ where several Ndiémane peasants have acquired fields to practice market gardening thanks to the presence of water in wells (Djokel Diouf 11/10/2019).

⁷⁴ Approximately 12 miles (20 km) southeast of Ndiémane.

Fishing is one of the main financial approaches, especially for young men. For Ndiémane's migrants, fishing presents several advantages: (1) it is an annual activity not oscillating much between seasons; (2) it is flexible in schedule with pirogues returning daily, weekly or even monthly⁷⁵; and, (3) thanks to the coastal geography and the upwelling phenomenon, fishing is abundant and diverse and can be a highly profitable activity.

However, there are also risks associated to this activity: (1) the catch may not be good and income low at times; (2) there may be cross-border legal conflicts, and collisions with other boats, especially large industrial ships at night; (3) there can be important storms to which fishermen on their pirogues are highly exposed. The risk of drowning is always lurking as most fishermen do not have sufficient skills to swim in a stormy sea (Mamadou Ndour 10/10/2019). According to Demba Ndour (19/06/2019), a young single professional fisherman, "fishing is high effort, high reward" and it means that he can earn enough to support his family. The mothers in Groupe Mbogayife (10/10/2019) though are concerned about the risks at sea and claim they would prefer to have their children in the village.

One final relevant point about fishing is the poor consideration of the profession. Despite the high knowledge and skill it entails, fishermen feel poorly valued by the society because – as peasants – their work is seen as simple and directly linked to the earth. It is as if fishermen were the peasants of the sea (Demba Ndour 19/06/2019).

The youth of Ndiémane say they would like to go to Europe, mainly for the perceived opportunities to "earn a lot of money" but migrating is a path paved with risk and difficulties. Although young men ask for permission from their elders before going to the sea to work as fishermen, they would not ask for their blessing to migrate internationally because they know their elders would not grant it for fear of losing their family member (Young male 10/10/2019).

⁷⁵ Depending on the availability of fish and the setup of the pirogue, fishermen may sail past The Gambia, to Guinea Bissau, Guinea Conakry or even as far as Sierra Leone.

6.4. Human Resources

6.4.1. Health and Diets

In Ndiémane, there is a health post and an ambulance for urgent transport to Mbour's health facilities but no permanent health care staff. Interestingly, during focus group discussions with Groupe Mbogayife and several village elders, participants agreed collectively that the population's health has degraded over time.

Elders believe that health has changed because food has changed; that changes in lifestyle and diet are done at the expense of people's health. Purchased processed foods are now mainstream, and the negative health effects are already visible. Ablaye Sarr (27/06/2019), elder peasant and imam, is concerned because "we [the villagers] grow too quickly, just like our crops". Ablaye wonders about what is in purchased seeds and chemical inputs that makes plants grow faster and to what extent these impact on people consuming them. Elders defended that in the past people lived healthier lives; they were more active and consumed simpler, more nutritious foods (Yako Ndour 14/06/2019, Ablaye Sarr 27/06/2019).

Several participatory videos address the link between health and food production and consumption. Videos discuss the health impacts of new diets, e.g., recommending local rice (Figure 149) (Groupe Mboga'Yiif 2017b) and local chickens (Groupe Mboga'Yiif 2017a) or to stop using processed stock cubes (Tintimol 2017).



« The rice that comes from the rice paddy is very good. This rice is better than the one that you buy in the shop. This rice has more taste than the one from the shop. The other rice is not good. It is not meant to feed us; it is meant to make us ill. »

Figure 149. Screenshot, QR code and quote from the participatory video A Khookh Maalo No Thiossane Serere (Rice culture according to traditional Seereer practices) (Groupe Mboga'Yiif 2017b) https://youtu.be/_etyuUJgR8o

In living memory, peasants used to eat mainly local, seasonal, home-grown, foraged, hunted, or fished foods (Table 4).

Table 4. Main foods produced, bought, exchanged, and foraged in Ndiémane at present and in the past (source: author)

Food type	Produced	Bought	Exchanged	Foraged
Aubergine Bitter & Sweet	X	x		
Baobab Fruit & Leaves				[X] X
Biscuits		x		
Bread		x		
Carrots	X	x		
Cassava	[x] x	x		
Corn	[X] X			
Cowpeas	[X] X			
Djakhat (legume for sugar)				[X]
Eggs	(x)	(x)		
Fish River/Pond				[Fished]
Fish Sea		X	[(x)]	
Fish Smoked		X		
Garlic	X	x		
Hibiscus Flowers & Leaves	[X] X	x		[X] x
Lime		x		
Mangoes	[X] X		[x]	
Margarine		x		
Meat Beef	[x] (x)	(x)		
Meat Chicken	(x)	(x)		
Meat Goat	(x)	(x)		
Meat Sheep	(x)	(x)		
Meat Wild animals				[Hunted]
Milk Curdled		x	[X]	
Milk Fresh	x	(x)	[X]	
Milk Powdered		X		
Millet	[X] X			
Mint		x		
Moringa				[X] X
Okra	X	x		
Onions & Spring Onions	X	x		
Palm oil		x		[X]
Pasta		x		
Peanuts	[X] X			
Pepper & Chilli Pepper	X	x		
Potato & Sweet Potato	[X] X	x		
Pumpkin	[X] X	x		
Rice		[(x)] X		
Salt		X	[X]	
Sorghum	[X] X			
Stock cubes		X		
Sugar Cane		X		
Sweets		x		
Tamarind		x		[X]
Tea Black		X		
Tea Kinkéliba				[X] x
Tomatoes	X	x		
Tomatoes Concentrated		(x)		
Vegetable oil		X		
Water		X		[X] X

Legend: X large quantities, x small quantities, () rarely, [] in the 1960s.

Before the advent of rice in every Senegalese household, millet and sorghum were the main grains. As the Senegalese saying puts it: “In every mouth that he splits, God puts millet”⁷⁶ (Sadj 1958: 155). The home production of millet and sorghum was embedded in rituals that celebrated their importance in family nutrition and identity; rituals that for the majority are lost now as the youth “does not see any sense to them anymore” (Groupe Mbogayife 08/10/2019). Simple dishes such as *lakh* – using millet, curdled milk and baobab fruit (as sweetener) – were commonplace only sixty years ago but now they are seldom cooked and younger generations refuse to eat them, claiming they are tasteless and a sign of poverty and lack of modernity (Groupe Mbogayife 15/10/2019, Male Youth 09/10/2019).

With the loss of traditional foods, foraging has also drastically decreased in the past decades. Foraging, to make nutrient-rich sauces for dishes or the traditional tea *kinkéliba*, is now practiced by a smaller number of peasants and only for a limited number of plants (such as moringa and baobab which continue vastly used). Foraging knowledge is progressively being lost, because peasants are not using the plants, because the plants are disappearing with deforestation and agricultural changes, and because the older generation of peasants with foraging knowledge is dying. The long-term impact of losing these foods and its associated knowledge is detrimental for the health and wellbeing of the community but also for their feeling of connection to the land.

Women remembered a time when eating *ceebu jën* – a dish cooked with rice, fish, and vegetables, now considered Senegal’s national dish – was a rare honour. Those who ate it would have their hands covered in oil (from eating with their hands) and then they would see the children to show them they had had some *ceebu jën* and make them smell their hands (Groupe Mbogayife 15/10/2019)! Nowadays, *ceebu jën* is served for lunch in every household. The dish is highly adaptable and when there are no homegrown crops and no income to purchase food, the dish is at best true to its Wolof name (*ceeb*: rice and *jën*: fish), if not simply rice cooked with oil.

Figure 150 below is a photorecipe of a *ceebu jën* cooked in a household in Ndiémame on a typical day at the end of the dry season. The meal was made without any income to buy vegetables but luckily there was fish freshly brought by the eldest son who makes a living as a fisherman. Note that among the ingredients used to feed the family of ten (rice, fish, oil, onion, stock, salt, pepper, and chilli) not a single one was produced by the household.

Marie Djogoul (09/10/2019), a female elder, remembers that during her childhood “[e]veryone produced everything and the surplus was sold to buy cattle but now people earn money in town and then everything is spent, not on food, but on phones...” Equally, Groupe Mbogayife (08/10/2019) recall that “[i]n the past, if there was

⁷⁶ “Dans toute bouche qu’il fend, Dieu met du mil.”

too much millet, we would give some discretely to those in need. Now women might sell the surplus. Selling [staple foods] was unthinkable before; people took a very dim view of it.”

Women are concerned with the decrease in self-reliance and the added pressures to find money to feed the family (Figure 148, p. 184) (Groupe Djoubo 2017a): “Before it was simpler and easier, we produced everything but now we need to purchase, precarity is very strong. It’s a headache to feed the family.” (Marie Djogoul 09/10/2019) “Is this a negative change? Yes, but we can’t say no to our sons.” (Groupe Mbogayife 09/10/2019)





Recipe (from left to right, top to bottom): Start the fire, with wood and cow dung, in preparation for the cooking. Heat oil in a pan. Chop the onion. Add the chopped onion to the hot oil. Cook the onion thoroughly. Meanwhile, prepare the fish: remove the scales, the guts and cut the tail and the fins of the fish. Wash the fish. Add the fish and some water to the pot. Cook the fish thoroughly. Meanwhile wash the rice with water. Mix the water and rice thoroughly. Drain the water out. Wash the rice two or three times. Leave the rice to soak in water for a few minutes. Remove the scales from a piece of dried fish (used to give flavour to the dish). Add the dried fish to the pot. Drain the rice and prepare it for steaming above the fish water. Place the rice dish on top of the pot and close gaps between the two dishes using a wet piece of fabric. Leave to steam partially for 20 minutes. Meanwhile, crush together the pepper corns, dried chillis, one stock cube and garlic. Add the onion and crush it together with the mix. Remove all the fish from the pot and some of the water. Leave the fish to rest. Add the pre-steamed rice to the pot. Add the spice mix, mix well and leave to cook for 30 minutes. Once cooked, serve the rice in the dishes for the respective family member or group. Top it up with the fish and some grilled rice from the bottom of the pot. Bismillah!

Figure 150. Simple ceebu jën photorecipe, meal cooked by a young single woman in Ndiémane at the end of the dry season of 2019 © Carla Sarrouy Kay 2019

6.4.2. Formal Education: Ndiémane as a Local Educational Hub

Despite being a village, Ndiémane has two primary schools and one secondary school (Figure 151) and it is an educational hub for children from neighbouring villages. The new public secondary school, built in 2014, has enabled children to further their education locally up to GCSE-equivalent level. Nowadays most children from Ndiémane Malaoubé attend school but the educational system faces considerable challenges. The facilities are new but basic, there are endless staff strikes, some staff is poorly trained, and, in most cases, children get very little educational support at home. The result is that students tend to lack motivation, resitting is very common, and GCSEs are finally passed aged nineteen or twenty, with overall poor reading, writing and

numerical skills. Although formal schooling now feels like the inevitable path to adulthood and independence, it is one paved with boredom, memorization, and little understanding and ownership.



Figure 151. Map showing the location and perimeter of Ndiémame's schools in 2011 (top), and in 2020 with the new secondary school (bottom) (Google Earth 2020 with pinpoints and perimeters added by the author).

Investing in formal school education is the most important and most vastly debated human approach adopted by Ndiémame's peasants. None of the adults participating in the research could read nor write in any language. They were all fluent in Seereer (their mother tongue), most could communicate in Wolof (the language most spoken in Senegal), some had a grasp of Arabic (mainly for religious reasons) and only a few could speak French, and in most cases, not proficiently. None of the members of Groupe Mbogayife could read nor write and they regretted not having those skills as they noticed that, at peasant fairs, fellow female peasants took notes during interesting workshops and were then better able to share the knowledge they had acquired (Groupe Mbogayife 14/06/2019).

Groupe Mbogayife's concern is that the school brings a loss of values and of respect for the parents and therefore breaks the immaterial, value-laden inheritance from ancestors. According to Marie Djogoul (17/10/2019), a member of Groupe Mbogayife and influential mother in the neighbourhood, "it is the school

that broke this social web. Children are not at home anymore, learning from the parents; they learn other things and then work far away, bring rice, and make decisions at home without permission.”

Young people themselves agree to a certain extent with this analysis: “People don’t learn values [at school], how to behave, how to dress... Young people want to do like modernity, White people, and therefore they dress differently and lose their values.” (Male teenager 23/10/2019) However, “it is not because people are educated in a French school that they may have less respect for their parents” (Male undergraduate 17/10/2019). There remain sources to learn values such as families and Quranic schools (which are perceived to teach relevant values).

Youngsters agreed that traditional values were progressively being eroded but they considered that their generation still knew and understood them; their concern was toward their younger siblings and their future children. One male teenager (23/10/2019) said that, to preserve a good balance of values in his household and still grasp the opportunities offered by French formal schooling, if he had three children, he would put two in a French school and the third one in a Quranic school. This example shows how, even the youth increasingly influenced by individualistic worldviews, still considers families as a whole and not children as individuals with unique paths and opportunities.

6.4.3. Local Knowledges: The Hidden Immeasurable Wealth

Ndiémane’s biggest wealth is arguably the local knowledges held by its inhabitants. Local knowledges are traditional – even ancestral – and deeply cultural. Knowledges are multiple and interconnected, complementary rather than contradictory. As with the saying “There is not only one path to get to the river” (Badian 1972: 128) or the multiple stories about the origin of the name “Ndiémane”⁷⁷, local knowledges weave through relativity in a much more comfortable fashion than positivist scientific knowledge does.

Local knowledges are not stagnant; they are not unquestionable nor remain unquestioned. Notwithstanding the respect for local traditional knowledges, the iterative and complementary characteristics of knowledge mean they are enriched, diversified, and strengthened, rather than contradicted or disproved. Part of this acceptance stems from the recognition that local knowledges are deeply localized and rooted.

In Ndiémane Malaoubé, villagers were clear that their knowledge derived from being Seereer and that other ethnic groups would hold different types of knowledge. Even within the Seereer, there are different subgroups with their own specialisms. For example, despite living so close to the sea, villagers did not know how to swim.

⁷⁷ See subchapter 5.3.1.1., p. 102.

They knew how to farm because they are Seereer Siin, while it is the Seereer Niominka who are fisherfolk and know how to swim.

Local knowledges are the fruit of careful observation and accumulated experiences and experimentation. They are acquired and amassed over time and with patience. Local knowledges are typically passed on orally, especially through anecdotes, proverbs, and parables. From trivial daily chatter to the council of the wise, knowledges are traditionally shared in person. They are shared through relationships of trust and respect.

Oftentimes, during this research, colleagues would interrupt interviews precisely when they were becoming more engaging, thanking for the interesting discussion, and inviting me to come again another time to continue the discussion. This may feel as a drawback when time is so precious and creating opportunities might be challenging, but it is also a way of acknowledging what had been shared so far and of marking an iterative process of reflection and relationship building.

This example also reveals the ritualization of knowledge sharing which is also linked to a sense of belonging. During this research, there was information shared with me but that could not figure in the research, other information was accepted within the research, but it was not to be shared widely and randomly. And obviously some knowledge was not shared with me in the first place, such as, for example, wedding initiation ceremonies as I am not a Seereer woman and I am not married to a Seereer man.

Participatory videos made in Ndiémane showed clearly that their livelihoods, food system and knowledge systems are centred around farming (Figure 152) (Groupe Mbogayife 2017b, 2017a, Groupe Bismillaye 2017). Local food knowledges range from foraging to food production. They include conservation, reproduction, processing, and cooking, along with extensive knowledge of animal rearing and medicinal plants. Peasants have an acute knowledge, observation and interpretation of climatic and landscape indicators that guide their farming practices and daily life activities and rituals.



« We, the population of Ndiémane, only know agriculture, nothing but agriculture. »

Figure 152. Screenshot, QR code and quote from the participatory video Rew Wa Mbagna Yo Thioossane No Serere (Women who Master the Seereer Traditions) (Groupe Mbogayife 2017b) <https://youtu.be/TOoUv9hyFQ>

Local knowledges are still mainly held by the elders of the village, both women and men, sometimes with different specialisms. However, these knowledges are evolving rapidly as younger generations learn from new and different sources. Youngsters are still deeply rooted in their culture, their villages, and landscapes. Yet, through ICTs, they are exposed to the outside world to an extent and depth unknown to their elders. Influenced by what people are doing in Dakar or New York, Toulouse or Tambacounda, youngsters are exposed to different realities that they may aspire to, reject, adapt, or maybe adopt.

6.5. Socio-Cultural Resources

6.5.1. Family and Gender Dynamics

The family is the strongest and most important form of social connection in Ndiémane. A person is identified as belonging to a family tradition, as “the child of”. People often introduce themselves by their surname thus giving information about their family, their ancestry, but also their ethnic group or even occupation. Women traditionally keep their maiden name after marriage whilst children continue their father’s name trail. The family’s generational hierarchy inscribes each individual in a continuum which instils a sense of respect and responsibility toward their heritage.

Newly-wed women traditionally move into their husband’s concession upon marriage, and thus join a complex network of power and influence, with parents-in-law, brothers-in-law, sisters-in-law, and – for polygamous families – cowives and their children. Understandably, marriages are important political arrangements that would traditionally involve the whole family and especially the parents, uncles and aunts of the bride and groom. Each new addition to the family must be well thought through, not just the individual but their whole family. Growing the family is constructing a social network. When family members discuss the allocation of wedding presents for the new family-in-law, it is about discussing the family of the groom, who is reliable, who knows what of whom, which stories people tell, who the bride will need on her side, etc. (Youssou Sarr 20/05/2017).

Families are wide yet very tight webs and the safest bet for marriage is often a family member. Though following strict rules such as “Two children who have sucked the same breast can never marry” (Mackintosh 1989: 50), marriages between cousins and distant cousins are common. As sung by women in a participatory video made by Groupe Djoubo (2017a): “In my uncle’s house, I get a wife [for my brother] and money! In my uncle’s house, I get a husband and money!”

The success of a marriage depends so much on the relationship between the bride and her parents-in-law that most of the advice given to women focuses on how they should treat their new parents (Figure 153, p. 200). In the participatory video presenting a traditional Seereer marriage, the aunt tells the bride: “Once at your parents-in-law’s house, you must be temperate and brave. The exemplary behaviour you have towards your parents, it is the same behaviour we ask you to have towards your husband and parents-in-law.” (Groupe Mboga’Yiif 2017c)

On a separate video, from Groupe Djoubo (2017a), a woman praises publicly her daughter-in-law saying: “My daughter-in-law washes my clothes, irons my clothes, cleans my house, washes my kitchen utensils. I do nothing. She does everything. She even puts henna on my feet. [...] It’s good to have a daughter-in-law that

looks well after you!” Similarly, women from Groupe Mbogayife once interrupted a focus group discussion to ask me: “If you are here now, who is cooking for your mother-in-law?”. I explained that I do not live with my parents-in-law and rarely cook for them, two facts that were received with looks of disapproval and incomprehension. This is seen by elders as reasons not to follow Western influences; a view that I told them I could understand and, to some extent, supported.



« If marriage were that pleasant, we wouldn't put this cloth of peace over you, advising you to be temperate. Do not look for friends nor companions. You must always sit next to your parents-in-law. If they forbid you, you stop. If they allow you, you act. »

Figure 153. Screenshot, QR code and quote from the participatory video *Da Nuy Yengatu Cicosân Ak Aada Céet (We are active in the traditional practices of marriage)* (Groupe Mboga'Yiif 2017c) <https://youtu.be/ErLISV91BWo>

All households in Ndiémame Malaoubé are Muslim and most are polygamous. The relationships between cowives – whether the first wife that sees new wives joining the household, or the subsequent wife that arrives in the first wife’s “territory” – is often a subject of discussion and especially laughter. In a participatory video about marital issues, a young woman hoping to become a man’s second wife tells his older and tired first wife: “If you let your husband wander around, another woman will rescue him and look well after him. You don't even have the time to look after your husband because all you do is have babies.” (Groupe Djoubo 2017b) The threat of finding a subsequent wife was a running joke with research colleagues but it also creates a sense of insecurity for women.

According to men, men can marry several women, but the opposite cannot happen because men are too jealous, and they would not accept to share the same wife. Conversely, women are seen as more accommodating. Men claim that once women start having children, they focus on the children and start neglecting their husbands. This is a difficult period in a man’s life and a reason to look for a second wife (Male elder 18/02/2017). The advantage of marrying a second wife – often younger than the first one – is that the husband is looked after by her but also that this newly-gained attention will spark the first wife’s attention on the husband too. “Positive competition between wives to please the husband” (Youssou Sarr 21/02/2017).

6.5.1.1. Patriarchy and Social Conventions

Relationships in Ndiémane are not gender equal and do not aim for equality. Roles are clearly defined and following them is essential to maintain social order and traditions. Be it for cultural or religious reasons, women are seen as weaker and inferior to men. The place of the woman is clearly revealed in local expressions as, for example, in Wolof the expression *borom keur* (the owner of the house) refers to husbands as owners of their wives. Equally, women refer to their husbands as the owners of their houses, i.e., themselves. Another interesting expression, “to gain a wife” to talk about getting married, gives again an idea of ownership.

In a participatory video, the bride’s aunt tells the groom:

« [The bride’s father] said you must accept her as she is, that you must be patient with her. Support her, help her, she is a young woman, she does not know much yet. It is her first marriage. You must look after her. You must find her a household. The marriage must be consummated. She cannot lack clothes. She must not lack food nor water. You must have pity for her because women are not perfect, and all women are inferior to men. You must make sure she respects the principles of Islam in which she was brought up. » (Groupe Mboga’Yiif 2017c)

Women are considered essential in the household, and a household would not function without a woman, yet they are inferior and there is no contradiction in this. According to Islam (Quran 4:34), “men are the protectors and maintainers of women” and, oftentimes, research colleagues talked about women using the same terms as used for children, saying that women need to be taught and shown the way because they do not know certain things. There is a glass ceiling that limits what women can do, or at least, what some people believe women can do. From birth, women are taught to obey, follow instructions, and submit and it would take several generations to change this deeply inherited way of thinking and behaving.

Control comes from male references but also from other women or even from self-control. I was struck by the lack of knowledge women had, especially young women, of the surroundings of Ndiémane. I would regularly go for walks alone or do field visits with peasants, but young women would discourage me from going alone because of “thefts and aggressions”. Women’s farming fields were usually close to the concessions, where they spent most of their time with household chores. There was no need to explore further and going alone would probably require permission from a male authority, which would probably not be granted, so there was no point in debating about it.

Patriarchy is a form of economic system and, be it from before, during or after Western Imperialism, men have always been the self-proclaimed dominant sex. For example, on one occasion, a male colleague was complaining about having to give a daily stipend to his wife for family food expenses. I asked whether he had ever tried giving a weekly stipend for example, but he said she would not know how to make the money last a whole week so he could not do it. Ironically, this colleague travels sometimes for several days and his wife

manages the family expenses efficiently during those periods yet, once he is back, he returns to the daily stipend, which is a clear form of control.

Figure 154 is from a scene in a participatory video that portrays a similar situation. A wife is asking her husband for the daily stipend, but he refuses to give it to her, claiming he does not have any money and that she needs to find it somewhere else, although it would traditionally be his responsibility. The screenshot below shows the position of subordination of the wife, sat on the floor, whilst the man, haughty on his chair, does not even deign to look at her.



*« — Ndiaye, give me the family expenses.
— I've got nothing to give you. I don't have money. Sort yourself out.
— But, darling, where do you want me to find the expenses?
— I don't know, it's for you to see.
— I don't know where to go because the shopkeeper helped me a lot, but I now owe him a lot of money. I have a 75,000 francs debt. » (Groupe Djoubo 2017b)*

Figure 154. Screenshot, QR code and quote from the participatory video Djiguene ak Diafe Diafe Say Thie Biir Keur Ram (*The Woman and Her Household's Issues*) (Groupe Djoubo 2017b) <https://youtu.be/BfvRRuOwIkA>

6.5.1.2. Women's Household Responsibilities and the Importance of Offspring

Groupe Mbogayife (2017b) made a participatory video entitled "Women Who Master the Seereer Traditions"⁷⁸ in which different women with distinct intersectionalities take turns outlining the key responsibilities and daily activities of Seereer women:

*« — We go to the bush to work in the fields till the middle of the day, we collect cow dung and head back home to prepare food for the family. [...]
— I am hulling the millet, before sunset, because I have not prepared dinner yet and I have not bathed my children yet. I have not had a wash yet either. [...]
— This is millet. It is millet hulled by the children. I must winnow this millet before washing it with water. Afterwards this millet will be ground by the children and transformed into couscous to feed the family. [...]
— I had left to fetch water from the well. [...] With this sole basin, I must wash the millet already hulled and I must bathe my children. [...]*

⁷⁸ See Figure 152, p. 197, for the QR code and link to access the video online.

—*I have poultry that I am feeding because it finds nothing to peck off the floor.* »

Married women's priorities are the household: cooking, cleaning, child and elderly care. Other activities, such as farming, however essential, are complementary. Traditionally, older women, such as most active members of Groupe Mbogayife, do not cook. Cooking is mainly done by daughters-in-law or, if there are none, by young unmarried daughters. Older women may help with certain activities of food preparation (such as winnowing) and will only cook if no other family member is present to do it. Women are responsible for cleaning the whole concession and washing clothes for all its members (Figure 155). Young men might wash their most precious items of clothing (such as fashionable trainers).



Figure 155. Young unmarried daughters washing clothes by hand for the whole concession. Note in the background, the mother is helping with cooking whilst the daughters are occupied. © Carla Sarrouy Kay 2019

The women's multiple responsibilities can, at times, be conflicting. Women explained that during the rainy season, schools are closed, and all the family is involved in agriculture. Women prepare breakfast in two batches, first they cook for the herders and then for the farmers and only after they can go to their fields. This means that, with the usual delays from both groups, they end up going to the fields late, which hinders their productivity. They then need to come back home because it is hot, and they have more duties back in the household, such as preparing lunch for the farmers (Groupe Mbogayife 2017a).

Childcare is a constant activity; most concessions have children of every age and women usually have a baby on their back and/or a toddler nearby with whom they do all the house chores. In Ndiémame Malaoubé,

women with offspring had on average 5.4 children and among the key members of Groupe Mbogayife the average number of children was 6.5 in 2019 (Male Youth 23/10/2019).

Upon marriage, women are expected to have children and it is through their offspring that they build their reputation as wives and mothers (Groupe Mboga'Yiif 2017c). Women are the main carers of their children and if any problem occurs with the child or their marriage, mothers are considered to be at fault, not fathers (Youssou Sarr 21/02/2017). If the husband dies, inheritance is shared by the number of children and not by the number of wives: a wife with five children would get through them six shares of the inheritance. If there is a divorce, children stay with their fathers – seen as having the status and the authority to raise the children – and women usually return to their parents' house, thus bringing shame on themselves and their parents (Boukary Barry 27/02/2017). So, women spare no effort to resolve issues internally. As mentioned by Groupe Mbogayife (17/06/2019) with pride: “it is a matter of dignity for Senegalese women to be able to fix their problems without asking for help”.

6.5.2. Neighbourhoods and Local Markets

Networking beyond the family is essential to build strong support networks, i.e., *bridging* social capital. The horizontal embeddedness in Ndiémane Malaoubé is extremely strong. Neighbours share the same social and cultural arena that sets them apart from the other neighbourhoods, which did not have such a strong and unifying religious history. Because the neighbourhood is relatively young and it has grown considerably in the past decades with families marrying and having children, residents feel a strong sense of ownership and pride regarding their neighbourhood. Whether blood related or not, the different concessions in Ndiémane Malaoubé rely on each other daily, be it to socialize and share news, knowledge and stories, to support with house and farming chores, or to help in cases of difficulty.

Wider networking arenas include the whole village of Ndiémane and nearby villages, but also local market towns such as Nguéniène, Joal, and Mbour. Meeting regularly at the local market strengthens relationships that share similar values and norms. Formal and informal social networks are often critical in providing essential safety nets to households.

Ndiémane's vertical embeddedness (Sonnino and Marsden 2006), i.e., their *linking* social capital with different hierarchies, institutions and governance systems is extremely weak. Ndiémane Malaoubé's residents, and especially Groupe Mbogayife, are affiliated to Centre AFAFA and its umbrella organisation, ASPSP, but this link is not formalised, it is heavily impacted by complications at either end, and it is unequal. Groupe Mbogayife acts more as a passive recipient of initiatives (which they consider relevant), but they do not engage in a proactive and empowered way.

As for the higher structures of national politics they are extremely weak in Ndiémane. Peasants feel totally disengaged and ignored by political parties, the president, and the urban-biased and pro-agribusiness government.

6.5.3. Peasant Knowledge Sharing

Peasant knowledge sharing is the main socio-cultural approach used by Ndiémane’s peasants to deal with their context. This approach taps directly from the extremely strong bonding social resources of the community. Peasants are also keen to explore ways to strengthen bridging resources with fellow peasants and villagers, or even to connect, to better understand and be understood, with those with whom they have very weak linking resources such as the government, banks, insurance agencies and the courts.

Peasant knowledges are often shared by demonstrating practices and techniques that work in the fields. This process is cyclical and iterative (Figure 156); it is an opportunity to discuss and hear first-hand from fellow peasants about approaches adopted elsewhere, thus strengthening knowledges, skills and practices and shedding new light on potential gaps.

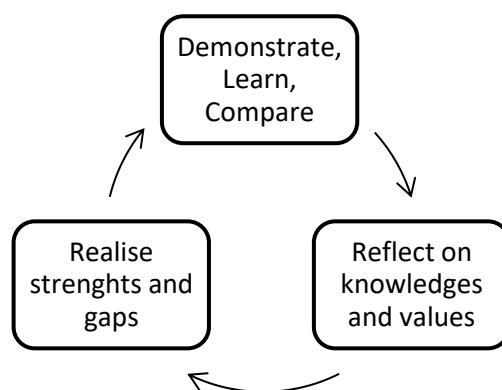


Figure 156. Knowledge exchange cycle (source: author)

Peasant knowledge exchange can happen in a variety of settings and situations, from the natural exchange of salutations and information in extended greetings to formalised peasant fairs and conferences. Climate information is usually global or, at best, regional, and little climate related information supports decision making at the village or even plot scale. The information often does not reach peasants and/or is in a format that is ill-suited to inform their decisions.

Conversely, peasant-to-peasant knowledge exchange often addresses issues deemed more relevant and more fitted to peasants’ true concerns and resources (Groupe Mbogayife 14/06/2019). Pape Maysall (17/02/2017), an elder male peasant, intellectual and activist from Tattaguine, defended that “what makes the chick is already in the egg”, meaning that what makes peasants autonomous and sovereign is already in their knowledge, their connections and their environment. “One needs to know how to share, learn, observe and

work hard.” Pape Maysall noticed that, at meetings, peasants often asked what to do, yet to him the answer to this question ought to be found between peasants, by them and for them. Moreover, answers could not be sought in restricted groups but rather had to be understood in their context, considering the agricultural, nutritional, political, social matters they affected and were affected by.

“The best of knowledges is the one that leads Man towards Men”⁷⁹ (Badian 1972: 37). Knowledge exchange between peasants relies on a shared vision, transparency, openness, experimentation and co-learning and, above all, it is built on trust (Sarrouy Kay 2017d). Contrary to agriculture relying on exogenous chemical inputs, agroecological knowledge is based on endogenous resources, observations and approaches, and therefore its sharing strengthens community health and wellbeing. Increasing group knowledge, based on memory and social learning, is paramount to coping with and adapting to social and environmental change now and in the future.

Participatory videos made during this project did not all have the goal of sharing peasant knowledges and experiences widely, but they are all a window to peasant lives and wisdoms. Many videos address spectators directly, presenting a subject and information deemed relevant (Figure 157, p. 207).

The *Association Sénégalaise de Producteurs de Semences Paysannes* (Senegalese Association of Peasant Seed Producers — hereinafter ASPSP) is an umbrella organisation that defends the importance of traditional crop varieties for the seed autonomy of peasants. The organisation promotes healthy, sustainable, agroecological agriculture and encompasses fifteen peasant organisations, approximately 63,000 members with a majority of women.

As stated by Salamata Pame, an influential agroecology peasant and activist from Timtimol (Guédé Chantier) (Figure 158, p. 208), in the participatory video dedicated to peasant seeds, ASPSP set itself the mission of working as a sentinel for the defence of nature and for the recovery by peasants of the right to reproduce their own seeds (Groupe de Vidéo Participative de Casamance 2018). ASPSP defends a horizontal approach, based on trust, decentralisation, co-construction and knowledge-sharing and its main tool is the organisation of peasant seed fairs.

ASPSP organises multiple times a year regional and national peasant seed fairs, hosted by local peasant organisations. Every two years, ASPSP and its partners organise the West-African Peasant Seed Fair in Djimini, a small village in the Casamance region (south of Senegal). Importantly, the fairs are set in small villages, participants are housed by the local villagers and the food eaten is grown and prepared locally. ASPSP considers this essential for participants to feel welcome and at ease, in settings they can identify to and from which they can easily imagine adapting techniques to their own specific environments. As Fatou Thiaw

⁷⁹ “La meilleure des connaissances est celle qui mène l'homme vers les hommes.”

(14/06/2019), president of Groupe Mbogayife, put it: “All the peasants in the world are united by the land. It is the same agriculture only the water systems change but what we learn [in Fouta] or in Casamance is useful in Ndiémane.”



<https://youtu.be/LiFZRzDBvGA>

« On behalf of the Timtimol Group, we come here to present a film to you about the difficulties of agriculture nowadays and the solutions offered. Baba Galé came to ask for advice on agriculture regarding the use of chemical fertilisers and pesticides. It is our current problem. We need to rethink our approach. We need to reflect on the situation. [...] I summon you in peace to talk about today's agriculture, today's health and today's remedies. [...] We bring this theme to inform you of the harmful consequences of these chemical inputs. I ask for your attention; most illnesses nowadays are not natural. Illnesses are caused by the chemical products that we consume. [...] It is the same with the soil. My brothers and sisters, you who follow us, what the good God gave us, nothing has changed, everything is here. There is a remedy for all the problems. I advise you not to abandon these ancestral practices. Avoid using chemical inputs. What we do is good. May God give us the strength and intelligence of these good practices to restore our ancestral values. » (Timtimol 2017)

« My name is Sara Camara. I am a producer and at the same time I coordinate the activities of the UCEM. UCEM is the Union of Ecological Committees of the Mininky Valley of Koungeul, a peasant organisation that intervenes in the three municipalities of the district of Ida Mouride, [...] Kaffrine region. So UCEM works in the fight against food insecurity and debt, through the promotion of agroecology. Regarding work with male and female peasants, within villages, we have set up village ecological committees. We work on food insecurity, the hunger gap, via Solidarity Calabashes, collective fields, local conventions anti-wastage during celebrations, fair trade and ecological agriculture. Moreover, here people can share about the notion of agroecology, which is a fairly new concept in the area [...].

The goal of the fair is to share with our members the relevance of peasant seeds, conservation and exchange. Because today, you know, agriculture as such is threatened and the first threat is on seeds. »

(Sarrouy Kay 2017d)



<https://youtu.be/AA-VOgqWCnI>



<https://youtu.be/2KPEciMw2mE>

« I salute every peasant who practices agroecology. I was doing some research during this rainy season regarding my previous approach to see how the rainy season will evolve and to compare to future rainy seasons and better understand the changes in farming year by year, in my work setting. And I wanted to share with you this humble research.

But I want to review our approach for the next rainy season and always seek knowledge. I'd like to exchange regarding the rainy season. The images I took for this film are of the people who live in the village of Ndiémane. The youngsters of the village, the women. My fields and the fields of other peasants. I directed the film and, to edit, Carla helped me do the editing. I filmed and shared with Carla and together we edited the film to share it with you. » (Diouf 2019a)

Figure 157. Screenshots, QR codes and quotes from participatory videos addressing peasant-to-peasant knowledge sharing.



Figure 158. Photos from the Thiakho Peasant Seed Fair 2017. From left to right, top to bottom: welcome sign for the fair; Salamata Pame (influential agroecology peasant and activist from Timtimol (Fouta)); village setting; peasant seed demonstrations; women attending a talk; Pape Maysall (peasant/intellectual/activist from UCT (Fatick)); Youssou Sarr (coordinator, Centre AFAFA (Thiès)), Mbaye Diouf (coordinator, UGPM (Thiès)), Fatou Thiaw and Mamadou Ndour (peasants, Groupe Mbogayife (Thiès)); banner promoting peasant seeds; participatory workshop led by Francisca Diouf (influential agroecology peasant and activist from Association Baragnini de Madina Wandifa (Casamance)); peasant corn seeds; Manding mask; group photo of the participants of two workshops on peasant seeds and agroecology © Carla Sarrouy Kay 2017

Although there may be panels with speakers including peasants, political actors, academics, NGO staff and activists, no jargon is to be used, discussions are held in a way and about matters that interest directly peasants, using words that everyone understands. Equally, there is no hierarchy of languages and every participant is welcome to speak in their own native language and, if need be, somebody will translate them

(Sarrouy Kay 2019g). Despite clear efforts to centre the fair around women and the youth, welcoming all ethnic groups and languages, my observation is that social norms are still very strong and that very few women and young people speak out in large mixed gender and age groups and that most panellists continue to be older men. Salamata Pame, Francisca Diouf (Figure 158, p. 208) and Adalbert Diouf⁸⁰ are happy exceptions.

In peasant seed fairs, all the seeds are to be exchanged or given, but never sold.⁸¹ Peasants bring their own seeds and share information such as the variety name and how to sow, grow, harvest, process, and store them. For Groupe Mbogayife, these peasant seed fairs are unique opportunities to leave the village and travel around the country to meet like-minded peasants. “Opening our spirits made us realise that the world does not end at the borders of Ndiémane” (Groupe Mbogayife 14/06/2019). And because ASPSP subsidises the participation of female peasants and promotes workshops on women’s rights to land tenure and local recipes, for example, these are unique opportunities for female emancipation and empowerment.

The focus on peasant seeds, women and the youth is not trivial; it is the linking of tradition and innovation, of past and present, of conception and life to come:

« Women are the guardians of seeds. Even in our fields, it is recommended that it is a woman who is the first to sow, to hope to have a good harvest. [...] These seeds of life, these seeds of the terroir, these seeds growing in natural and living ecosystems, as the generations that came before us, we have the duty to pass on to our children, and to the children of our children, the possibility of keeping and choosing the future. » (Groupe de Vidéo Participative de Casamance 2018)

6.5.4. External Help Requests

The second main socio-cultural approach is the request for external help. This was especially strong with Groupe Mbogayife and – I believe – directly related to projected, involuntary, yet inescapable positionalities. Groupe Mbogayife’s participatory videos, contrary to any other male-led participatory videos made in Ndiémane or in any other location, always contained a call for external help: “If somebody wants to help, they can help us especially in agriculture and animal rearing” (Groupe Mbogayife 2017b); “Whoever wants to help us, especially us women, they can help us with what we do: farming” (Groupe Mbogayife 2017a). The last video, made at the end of an extremely harsh dry season and with poor prospects for a bountiful rainy season, contains a more desperate call for help that reflects the feeling of powerlessness in which these elder women were finding themselves:

« We wished you could help us overcome these hard and lean times. We ask for your support. We are totally overwhelmed by this lack of water. We are here powerless facing this situation.

⁸⁰ Project Manager and peasant seed expert at *Yeasal Agri Hub*, an agriculture and technology start-up in Senegal.

⁸¹ Participants are welcome though to bring other cultural, homemade, traditional, or innovative items such as amulets and soaps that can be sold.

We don't know what to do, where to go, where to find our bearings. Each day that God makes, we are here powerless facing this situation. We need help. We are tired, we ask for help. For the grace of God, please help us because the situation is becoming harder and harder for us mothers. The situation is so catastrophic that all we ask for is to be supported. By the grace of God, we launch an appeal to good willing people who have more means than us, to help us overcome this period. [...] We wait eagerly this type of person who would help us solve these problems caused by several factors to which we are confronted daily. [...] We, women, have to stay at home and face the problems. » (Groupe Mbogayife 2019)

Although the question of positionality and the reality of participatory work has already been discussed in the Methodology⁸², it is worth reiterating here that there is a deep-seated association between the outside world (i.e., beyond Ndiémane) and support. As with every trip one does outside the village, those who stay remind the person leaving to bring them presents, when making participatory videos, Groupe Mbogayife addressed the *other* and asked for help.

Interestingly, although women are extremely knowledgeable in agriculture and find it impossible to practice in times of drought, the only help they were asking for was agriculture related. This might seem redundant and ineffective, yet it stresses the importance placed on the peasant identity and activity that, first and foremost, makes the community who they are.

Calls for help in videos were not specific though and when I asked Groupe Mbogayife what sort of help they would need, they mentioned boreholes and electric mills as the other neighbourhoods have them but not Ndiémane Malaoubé. They also mentioned they would like to do dye, though they admitted not remembering how to do it and never having been proficient at it. Finally, they were interested in receiving cash to satisfy the needs of the commodified food system and society they were now integrated in (Groupe Mbogayife 10/10/2019, Youssou Sarr 16/06/2019).

⁸² See chapter 4, p. 47.

6.6. Spiritual Resources

Villagers defend a strong connection between people, land, and life and spirituality. Spiritual resources may be intangible – such as faith – but they may also be embodied and objectified – such as in sowing rituals (Bourdieu 1986). Behind daily actions, habits and rituals, there is a spiritual meaning, a traditional explanation, that may or may not still be known and understood but that guides the daily lives in Ndiémane. As stated by the anthropologist Germaine Dieterlen, “[i]n Black Africa’s beliefs and thought systems, no room is made for what we call the profane”⁸³ (Kerharo 1975: 7).

6.6.1. Seereer Siin: Ethnic Identity as the Pivotal Spiritual Marker

Ndiémane Malaoubé’s villagers are first and foremost Seereer Siin. In a context of few inalienable certainties, villagers – young and old, women and men – proudly claimed they were and would always be Seereer. Participatory videos repeatedly link the directors and actors to their ethnic group in the title (Groupe Mboga’Yiif 2017b, 2017c, Groupe Mbogayife 2017a, 2017b), the content (Groupe Mbogayife 2017a, 2017b, Groupe Mboga’Yiif 2017b, 2017c, Groupe de Vidéo Participative de Casamance 2018, Diouf 2019a, 2020a, 2020b) or the background music (Diouf 2019a). Being Seereer is lived as a protected and lived identity, a spiritual connection, immutable no matter the circumstances. Seereer Siin are peasants by essence, and they draw their identity and culture from the link to the land.

6.6.2. Animism: The Remnants of a Religion Often Appropriated by Islam

The second most important spiritual connection and identity trait for Ndiémane’s villagers is directly related to religion. Before the expansion of Islam and Christianity, Animism was the dominant religion in Senegal. Animism is the belief that all things – from animals to stones, from constructions to the weather – are animated and have a spirit or life (“anima” in Latin). All things are alive, they all have a spirit, and they have agency. Furthermore, there is no real distinction between the physical world and the spiritual world.

Although Animism is not supported by Islam nor Christianity, it remains present, deeply rooted, and influential in daily lives in Ndiémane and has to some extent been appropriated by these subsequent religions. Animism is a general term and its Seereer approach was named Traditional Seereer Religion. Added to the belief that all things have a spirit, the Seereer Religion believes in a single God (*Roog*), ancestral spirits (*Pangool*, *Poonook*) and life after death. The belief in good and evil spirits, in spells and curses, remains strong.

⁸³ “Dans les croyances et systèmes de pensée d’Afrique Noire, aucune place n’est faite à ce que nous nommons le profane.”

For example, in a participatory video made in Lissar about deforestation and the importance of protecting trees, one character expresses their concern regarding the impact of deforestation on spirits: “For many trees have disappeared, even the ones where spirits lived, whom now have had to move elsewhere” (Groupe Deggo 2017b). Spirits are believed to live in trees and the absence of trees creates a lack of spirits that hinders lives. Bringing back trees would not only have environmental benefits, but it would also have spiritual ones.

Another video also mentions spirits, this time showing the close connection and overlap between Animism and Islam. When observing that her daughter is seriously ill, a woman tells her sister: “I’m worried of spirits.” To which the sister responds: “That’s not it. God is great, she will get better.” (Tintimol 2017) This simple exchange reveals how the fear of unpredictable spirits is overtaken by the faith in a single, unifying and healing God in Islam.

6.6.3. Islam: The Uniting Religion and Social Bond

Senegal has a fascinating religious history, and Islam expanded often as a religion of Black people, as opposed to Christianity seen as a religion of White people, imposed by colonisers. Colonisers misunderstood and underestimated the power of Islam in Senegal. In Ndiémame Malaoubé, all villagers are *Mouride*, following the neighbourhood’s conversion by the imam Ousseynou Ndour in the 1960s. *Mouridism* is the most important Muslim brotherhood in Senegal, and it follows the teachings of Sheikh Amadou Bamba.

Islam features prominently in participatory videos, through the ceremonies portrayed, clothing, discourse and even concluding prayers as in Figure 159 (Groupe Mbogayife 2017b, 2017a, Groupe Djoubo 2017a, Diouf 2019a, Groupe Mboga’Yiif 2017c).



« We extend our arms, we all pray our good God to give us peace, prosperity, success and health to all. To all those who participated in this training workshop, may God almighty guide our steps and grant us his grace. » [Recitation of Quranic verses and formulation of prayers for all.]

Figure 159. Screenshot, QR code and quote from the participatory video Rew Wa Mbagna Yo Thiossane No Serere (Women Who Master the Seereer Tradition) (Groupe Mbogayife 2017b) <https://youtu.be/TOoiUv9hyFQ>

Religion is lived as a communion uniting all villagers as all genders and all generations place their faith in one same God. Submitting to God is seen as a simple, unifying, and gratifying endeavour. Yet, trust in God is often simply ignored in scientific research or perceived by researchers as fatalism and inaction. Whilst researchers may talk about climate change, villagers talk about God...

In Ndiémane there were important apparent discrepancies that tested – or rather, strengthened – people’s faith. When asked why it rained around Ndiémane at times, but not *in* Ndiémane, or why two very close wells were one dry and the other full, or two fields were one empty and the other bursting with maturing cereal, people’s answer was: “Ah, that’s God!” (Youssou Sarr 16/06/2019) or “Only God knows!” (Michel Diouf 25/06/2019). As stated by Anne-Marie Dieng (10/10/2019), a female elder, “if we can’t understand, it is God’s action.”

Peasants believe that being good at heart is an essential prerequisite to have good harvests. God recognises those who are good at heart and, even if some people may cast evil spells, God rewards and protects those with good intentions and pure hearts (Mbaye Diouf 21/06/2017, Youssou Sarr 10/10/2019). Contrary to God’s unchanging omnipresence, humans change their actions and beliefs, and it is this inconsistency that makes God reward or punish behaviours.

It is important to recognise that blind faith and fatalism can have dire consequences; however, simply dismissing these explanations and therefore such an important part of people’s lives is arrogant and even unethical. Faith is an essential coping mechanism to deal with life’s hardship (Figure 160). Faith in deities and spirits brings meaning and hope to lives; it connects believers to a higher cause that helps surpass life’s daily hurdles. Faith should not be dismissed simply because it does not fit the researchers’ (lack of) spirituality or positivist science conditions. Believing is not the same as not understanding, and spirituality is not a paucity, or total absence, of rationality (Kimmerle 2016).



« —I’ll stay here and wait. God is great. [...] Maybe before 3 pm we will find the expenses to cook.
—You have nothing to cook?
—No, not yet... [...] Dad left nothing. Let’s wait for our good God. [...] We must have faith. »

Figure 160. Screenshot, QR code and quote from the participatory video Djiguene ak Diafe Diafe Say Thie Biir Keur Ram (*The Woman and Her Household's Issues*) (Groupe Djoubo 2017b) <https://youtu.be/BfvRRuOwIkA>

6.6.4. Expressions of Spirituality

Spirituality is closely linked to food systems, be it with food as an offering, a sacrifice, thanksgiving or an ailment. The two most important Muslim celebrations – *Korité*⁸⁴ and *Tabaski*⁸⁵ – are connected either to fasting or to animal sacrifices and both include prayer, forgiveness, and large family reunions and celebrations with communion around copious meals.

Closer to the Seereer Animist faith, the *Xooy* is an annual Seereer divination ceremony held in May or June, just before the start of the rainy season. During these ceremonies *saltigés* (traditional priests/priestesses or healers) divine the future. Divinations focus on Seereer lifestyles and therefore on agricultural matters such as the weather, sowing dates and crops to be favoured. Peasants are attentive to the predictions given by their favourite *saltigé(s)* and consider these when farming.

Below are three examples of spirituality featured prominently in participatory videos, in the context of weddings, sowing rituals, and rain invocations.

6.6.4.1. Weddings and The Seeds of Reproduction

During traditional wedding ceremonies, it is seeds that create the link between past and future, physical and spiritual, food and offspring. As shown in Groupe Mboga'Yiif's (2017c) participatory video about traditional Seereer weddings, important prayers are made whilst pouring seeds over the bride's head (Figure 161, p. 215). When a woman marries a man, she takes to his household seeds that she has the responsibility to keep and reproduce. When selecting seeds to sow, the woman mixes some of her seeds and some from the household of her husband. It is hoped that she will (re)produce like those seeds, that she will have good harvests and many children. The new, combined seeds will also be used for the christening of her children and they will be a constant in her life that she hopes to pass on to her children.

Households that do not keep their own family's seeds anymore have kept this tradition of using seeds in marriages and christenings though. They may buy seeds from shops to perform the same rituals. This however is criticised because it is seen as performing rituals without fully understanding their meaning, importance, and symbolism.

Saving seeds, marrying children with the family seeds, and then christening grandchildren with the seeds carefully saved, inscribes these seminal moments in a continuum of life and heritage. The responsibility of saving is only temporal, ephemeral, yet paramount because it bridges ancestors and generations to come.

⁸⁴ Festival of Fast-breaking or *Eid-al-Fitr*.

⁸⁵ Feast of Sacrifice or *Eid-al-Adha*.



Figure 161. Screenshot and QR code from the participatory video *Da Ñuy Yengatu Cicosân Ak Aada Céet (We are active in the traditional practices of marriage)* (Groupe Mboga'Yiif 2017c) <https://youtu.be/ErLISV91BWo>

6.6.4.2. Sowing with Blessed Hands

In the participatory video dedicated to the selection and the conservation of traditional seeds, Groupe Mbogayife (2017a) enacted the ritual of going to a field to sow seeds for the first time. Women are responsible for seeds because they are the producers in the community, the ones who give life. According to the tradition, a child or a young virgin woman with a bracelet in her mouth carries the seeds over her head to the field. She ought to walk in a straight line, without hesitation and without looking aside or back (Youssou Sarr 28/06/2017). Groupe Mbogayife continues this tradition, with the difference that it might be the female head of household who takes the seeds to the field and is the first one to sow (Figure 162) (Groupe Mbogayife 08/10/2019).



« We came to announce [to the earth] that we will start sowing millet soon. We have only come to start it. Ami Sen, come and bury some seeds, we don't know which hand God has blessed. Come. In the name of God, we pray and hope that God will give us a long life so that everyone is here again next year. In the name of God, the most gracious, the most merciful, may everyone have good health and may God bless these seeds. »

Figure 162. Screenshot, QR code and quote from the participatory video *A Thiile Fa A Kheeck Akhe Thioossane (The Selection and Conservation of Traditional Seeds)* (Groupe Mbogayife 2017a) https://youtu.be/H8CaGd_7Xos

When sowing, peasants never go to the field and sow at once. They must first inform the earth that they plan to sow. As expressed in Seereer, peasants “buy a day” (*ka l djicka bess*), i.e., they inform the earth that they plan to come back in the future to sow the whole field and therefore ask permission to do so. On the first day, only some brief, scattered sowing is done, and peasants leave shortly after.

Sowing is done by several people, especially women and children. Everyone participates because, as mentioned in the video, “we don’t know which hand God has blessed” (Groupe Mbogayife 2017a) and a blessed hand sows seeds that will grow healthily and vigorously. Sowing is accompanied by singing and prayers wishing health, prosperity, and wellbeing to the family. Peasants pray asking to have the same people performing the sowing ritual the following year. This ritual shows how farming is so closely linked to the wellbeing of households, health and faith.

6.6.4.3. *Baonan* or The Invocation of Rains

In the rainy season of 2018 in Ndiémane, the first rains were followed by a long dry spell. The villagers of Ndiémane decided to gather to perform a traditional celebration called *Baonan* for the invocation of rains (Figure 163). The celebrations are headed by a *saltigé* who leads the prayers and participates in the dancing and singing. Villagers, young and old, gather at a dry pond and walk around it in a specific direction and a determined number of times. The procession also gathers around the main trees of the village to pray, sing, and dance. People cross-dress, chant together and play the tom-toms. Sweet millet is offered to the children. It is a joyful celebration; it is in a festive mood that the rain is called upon (Blaise Diouf 23/10/2019).



Figure 163. Screenshots from the video Film témoignage de 2018, une année sans pluie (Testimony film of 2018, a year without rain) (Diouf 2019a) showing aspects of the traditional ceremony Baonan. From left to right, top to bottom: people dressed up and with makeup dancing and demonstrating, men dressed as women and women as men, and the saltigé leading the ceremony is dressed in yellow and has a hat and a stick; dances with tree representations; young men play the traditional drums; saltigé and village children walk thrice around a dry pond; offerings ready to be distributed; woman distributing sweet millet to children.

6.6.5. Spiritual Resources Management

Even though Ndiémane only converted to Islam in the past five decades, and despite the multiple social changes and consecutive environmental challenges, faith in God is a key adaptation approach in the village. In fact, obstacles and difficulties often reinforce faith and the belief that life has a meaning and purpose, and that God redeems those who see through and keep their faith.

Faith and superstitions guide daily lives and the connections between beings in the wider cosmos. In Ndiémane, peasants place their faith in God to help improve their livelihoods. In Ndiémane Malaoubé especially, religious belief is strong due to the legacy of the imam Ousseynou Ndour. Ethnic identity and faith involve rituals that contribute to embed the community in place and strengthen bonds between its residents. From ethnic markers to Islamic prayers together several times a day and occasional Animist celebrations, villagers fight the loss of traditions caused by globalisation and keep seeking ways to connect spiritually reinforcing their sense of being and their connection to place.

7. Discussion

7.1. Critical Reflection on Frameworks and Methodology

7.1.1. Theoretical and Conceptual Frameworks: Focus on the Sustainable Livelihoods Framework

The adaptation of the Sustainable Livelihoods Framework into a Resilient Food Systems Framework constituted the skeleton of this research and presented several advantages and challenges. This tool is very flexible, so appropriating it for intersectional participatory research on food systems was a constructive and rewarding process in itself. The tool's creation is an iterative process of constant re-analysis and questioning, which functioned well with the co-construction of the research as it created renewed opportunities for the research team to reflect on the data gradually collected and analysed, as per the agreed Code of Ethics' Principle of Active Participation⁸⁶.

Considering that the RFSF was used to organise information on four broad themes, multiple categories and different genders and generations, the tool was successful at organising complex and interconnected information in a structured manner (Figure 164, p. 221). As defended by Lemke et al. (2012), the original framework can be adapted to bridge interlinked subjects, transdisciplinary knowledges, and mixed methods.

Its graphical presentation may however give two false impressions: (1) an illusion of permanence in time and place; and (2) an illusion of uniform truth embraced by all actors. The inclusion of the distinct gender and generational perspectives along with the ranking system aim to counter these impressions and expose the plasticity of the tool used.

I echo Pasanchay and Scott's (2021) call to give stronger emphasis to cultural capital in the SLF, as done here under the socio-cultural resources of the RFSF. Moreover, spiritual resources ought to be included when researching peasant livelihoods and food systems. The importance of the sacred is not unique to Ndiémane, but its rare inclusion in research deserves further sensitive attention (Talkeu-Tounouga 2000, Agnissan 2012, Mekpo 2014). Finally, the distinction and overlap between social, cultural and spiritual is debatable, but their inclusion in research is necessary, and even essential, to better understand the meaning people give to their lives and actions.

⁸⁶ See Appendix 10.1.5.5., p. 259.

The RFSF did not aim to directly adopt the SLF to a specific research case, as in Apine et al. (2019) and Laeis and Lemke (2016) or to reorganise and reconceptualise the original, as in Rao and Rogers (2006) and Amekawa (2011). The RFSF enabled instead a system analysis highly sensitive to subjective intersectionalities and multiple knowledges. An analysis anchored in the creation of a detailed yet adaptable graphical representation. The RFSF is a very malleable framework that could be used to research the Ndiémane Food System over time and/or according to a different research group and actor perspective. It could also be used to research other food systems in the Majority and Minority Worlds, thus constituting an interesting interface for comparison and contrast between food systems.

The adoption of Intersectional Political Ecology and of Traditional Ecological Knowledges were welcomed by the team. These frameworks, discussed and consented by all the research team, meant that all felt there was space to listen to each other, dwell on different perspectives and co-construct the research. Again, the iteration and open-endedness of the process meant that relationships and trust between co-researchers could be built over time.

There were however limitations when putting into practice these frameworks in Ndiémane. Intersectionality was analysed here from the main angle of age and gender, only two of the web of intersectional identities. The choice of these two categories stemmed from the need to focus the research on central criteria that facilitated and guided the analysis of a deeply complex system. However, whenever relevant throughout the thesis, gender and age were enriched and nuanced with complementary information on marital status or religion, for example, that also greatly affect subjective identities and power dynamics. Future research would benefit from further delving into diverse intersectionalities and their impact on socio-ecological resilience.

Although the research aimed to be intergenerational, it was clear that elders were more present in the village, had fewer daily chores and therefore had more time to participate in the research. Moreover, they were interested in debating, recollecting the past and reflecting on the present and future. By contrast, the youth's presence in the village is much more fluid. They have educational or professional responsibilities that require them to leave the neighbourhood or village. They were less engaged and cooperative. On the one hand, they had some fascination in engaging in conversation with me as I come from a part of the world they are very curious about. On the other hand, it was expressed to me that, because I worked mainly with Groupe Mbogayife, they felt I was primarily associated with the female elders of the neighbourhood and they did not want to interfere with "[their] mothers' affairs".

More than generational, the real challenge in this research was engaging with the female youth. Young women are often either trying to finish their final years of education and highly involved in household chores, or already married, in which case, they are the new daughter-in-law who has the biggest load of household, child and elderly care and environmental responsibilities. These women, especially the latter, are extremely busy

and do not have much freedom to engage in co-research, even if this was based at home at more convenient times, as proposed in this research. Young women are also more socially constrained; they are less confident in French and are not interested in having their lives translated and debated with exogenous people. Therefore, the opinion and contribution of young women is limited in this study and would deserve further attention in future research.

Resilient Food Systems Framework
- Ndiémane -



Figure 164. The full Resilient Food Systems Framework for Ndiémane (source: author, adapted from DFID 1999) (continued in the next page)

RQ3. How is the Ndiémane Food System acted upon?

RQ4. How socio-ecologically resilient is the Ndiémane Food System?

FOOD SYSTEM APPROACHES				
Strategies adopted by:	Young Women	Old Women	Young Men	Old Men
NATURAL				
Compost & Manure	++	++	++	++
Field cover	+++	+++	+++	+++
Intercropping	+++	+++	++	+++
Zai-inspired techniques	+++	+++	+++	+++
Change crops sown	+++	+++	+++	+++
Food crops	++	+++	+	+++
Cash crops	+	++	+++	+++
Short-cycle varieties	+++	+++	+++	+++
Peasant seeds	++	+++	+	+++
Hybrid seeds	+	+	+++	+++
Chemical inputs			+++	+++
Tree nursery/regeneration	+	+	+	+
Green hedges	++	++	+	++
Water management	+	+	+	+
Sale of farm land				+
Decrease land laboured	+	+	++	++
Wood and straw collection	+++	+++		
Livestock sale				++
Livestock purchase				++
PHYSICAL				
Permanent metal fence			+	+
Concession constructions			++	+++
Neighbourhood mill	+++	+++		
Info&Com Techs	+++	+	+++	+
FINANCIAL				
Seasonal paid work		+++	++	+
Small local entrepreneurship	+	+++	++	
Economic migration	+		+++	
HUMAN				
Formal education	+++		+++	
Delay of marriage age	+++		+++	
SOCIO-CULTURAL				
Peasant knowledge sharing	+	+++	+	+
External help requests	+++	+++	+	+
Food purchase	+++	+++		
SPIRITUAL				
Prayer	+++	+++	+++	+++
Trad. ceremonies&divination	++	+++	++	+++

FOOD SYSTEM OUTCOMES				
Outcomes impacting on:	Young Women	Old Women	Young Men	Old Men
ENVIRONMENTAL				
Drought	+++	+++	+++	+++
Deforestation	+++	+++	+++	+++
Soil erosion & impoverishment	+++	+++	+	+++
Loss of biodiversity	++	+++	+	+++
Environmental degradation	++	+++	++	+++
Less yields and production	++	+++	++	+++
More fallow land	+	+	+	+
Loss of commons	++	++	++	++
Less time & effort farming	++	++	+++	+
SOCIAL				
Agricultural income	+	+	+	++
Non-agricultural income	+	+	+++	++
Less time & effort cooking	++	+		
Less health		++		++
Loss of farmland ownership				++
Self-sufficiency	++	++	++	++
Food security				
Food sovereignty	+++	++	+++	++
Changes in traditional household hierarchies	++	+++	+++	+++
Loss of motivation to farm	++	+	+++	+
Increased dependency on monetised economy	+++	++	+++	++
Disempowerment of peasants	++	+++	++	+++
Social shift towards Westernised habits	+++	+	+++	+
Increased standard of living	+++	++	+++	++
Increased quality of life	+++	++	+++	++
Maintenance of agri-cultural heritage	+	++	+	++
Identity permanence / evolution	+++	++	+++	++

Legend

RQ: Research Question

→ Flow of influence

Research question

Field information

Ranking system	
Symbol	Meaning
	zero
?	unknown
+	low
++	medium
+++	high

7.1.2. Methodology

The values underlying research need to be clear and honest. Research with smallholders should have smallholders' wellbeing at heart because they are the day-to-day crafters of climate change mitigation and adaptation in practice (Swiderska, Argumedo, and Pimbert 2020). In spite of the inherently global impact of climate change and the international policy arena it has awakened, research on smallholder adaptation to climate change ought to keep local initiatives and community benefits central in its approach (Reid, Chambwera, and Murray 2013). Too many projects have limited impact and adopt the top-down approach that smallholders need educating by exogenous "experts". Understandably, this leads to very low consideration and uptake from the field (Reij 1991, Azadi, Yazdanpanah, and Mahmoudi 2019). Unless involved in the whole process, grassroots groups feel unengaged from research and policy and may even boycott exogenous and imposed initiatives.

The combination of top-down and bottom-up approaches is called for to create effective change in climate change adaptation, livelihood improvements and environmental protection (Pettengell 2010). Peasants in Senegal, and around the world, gather practical everyday knowledge and experience with collective oral history. Peasants have a systems approach that encompasses all aspects of their lives and the interactions between these. Holistic approaches can unearth perspectives not discernible in pure top-down approaches, with binary questionnaires and macro perspectives.

Transdisciplinarity draws on different but complementary sources of knowledge to understand and construct a multi-faceted reality. Different tools entice different conversations and expose distinct perspectives and agendas. The use of mixed methods gave the flexibility to choose the methods that worked best for each question, adapting to different forms of expression and, in this research, to the emphasis on spoken language. It was by using mixed methods, tailored to time and space, that a holistic understanding of the issues under analysis can be reached. The idea is not easily put into practice, and in scientific research it implies resources (such as time and cost) that may not be easily available, hence the importance of triangulation (Feola et al. 2015). Triangulation is advocated as it makes it possible to corroborate research done under specific conditions with a wide set of similar projects, thus exploring the limitations of each initiative, the overarching conclusions and the individualities highlighted by each source of knowledge.

It was considered vital in this research to gather information from both the scientific literature and from the grey literature. The former has a rigorous quality-check that is essential to ensure good quality research, yet its prism is often biased towards quantitative, productivist approaches to climate change and food, as shown in the literature review. Grey literature, in turn, may not follow the rigour of the scientific method and may not be submitted to anonymous peer-reviewing but it can bring new insights to research with the expression of excluded voices.

Language itself has a strong impact on how research is conducted and its outcomes. The selection of words privileged in the research process must consider their multiple meanings, contexts and weights that might be distinct across actors. Moreover, the effort to open the literature review to different languages needs to be defended and further expanded, not forgetting that the four languages spoken by the researcher (English, French, Portuguese and Spanish) are only a small fraction of the languages spoken in the world and they all have strong colonial pasts that cannot be overlooked.

The selection of the guiding concepts and of the methods used in this research was made with the co-researchers and – although they might not have had an exact translation in Seereer – they were clearly understood and identified, they were deeply felt and lived.

The use of archives, often as a starting point for interviews and focus group discussions, exposed how (mainly colonial) research can be totally inconsiderate regarding local cultures and knowledges. Though oftentimes done in the name of exploration and science, archival descriptions are nonetheless testimony of problematic power relations.

The use of participatory video was proposed by the local research team to engage with the youth in recording and sharing local knowledges. This method became a tool of empowerment and ownership with participants confident of their own mastering of the techniques used and message vehiculated. Despite the clear challenges of using ICT (discussed in subchapter 4.3.4., p. 59), participatory video was both a process and an outcome (Mikos 2014) that created opportunities to discuss the importance of legacy (of what?, by whom?, to whom?, what for?).

The process and outcomes of this method worked especially well considering the Code of Ethics adopted and especially its Principle of Traditional Guardianship and Principle of Respect⁸⁷ enabling participants to choose which and how traditional knowledges were shared. Moreover, the body and voice presence on camera and the naming of participants in the credits complied with the Principle of Acknowledgement and Due Credit⁸⁸ and further increased the sense of responsibility, ownership, and pride of participants and even their relatives.

This thesis has a strong audio-visual emphasis. The use of diagrams facilitated the communication of complex quantitative and qualitative information. The care and attention given to visual communication aimed to reinforce the restitution of knowledge in a clear way, and a continuing intercultural and transdisciplinary dialogue between academia and peasantry. Though potentially feeling alienated from the prospect of a doctoral thesis written in English, participants felt deeply involved in the research process and its outcomes

⁸⁷ See Appendices 10.1.5.4. (p. 259) and 10.1.5.9. (p. 260), respectively.

⁸⁸ See Appendix 10.1.5.16. (p. 261).

thanks to the iterative co-construction and analysis of research outcomes through Visualisation in Participatory Programmes⁸⁹ (McKee 1993).

Listening and being listened to were central in this participatory research. Lack of understanding – or even conflict – between local actors, research, and policy actors, is often caused by miscommunication between worlds that use different languages, that are based in different geographies, and that have different experiences and values (Reid et al. 2015a, Sova et al. 2015). Reinforcing the links between these actors, acknowledging that their roles are not rigid and often overlap, helps promote connections and understanding in a way that improves the outcomes of the initiatives undertaken. This is not easy to implement – especially by those who place scientific/academic research on a pedestal –, but some research analysed in the literature review and more work done afield showcases the importance of supporting local actors and initiatives to improve adaptation in the environment that they know best (Castillo-Burguete et al. 2008, Enda Pronat, YNW, and RNFR 2010).

Conflicts are common in communities and they were widely addressed in participatory videos (Groupe Mboga'Yiif 2017c, Groupe Djoubou 2017b, 2017a). Far from the danger of romanticizing the local as harmonious (Kapoor 2004), participatory action research has clearly exposed the challenges faced by all participants to conduct cooperative, constructive research. Widespread conflicts stemmed mainly from power relations between genders, generations, and neighbours, and they ranged across all domains, from within households, to the neighbourhood, the village and beyond. Participants expressed repeatedly the importance of comparison and imitation in their lives, and the perpetual fine balancing act between praise/understanding and competition/confrontation.

Beyond the power relationships within and between families, participants were clear that competition is strong within Ndiémane Malaoubé, and that “everyone wants to be seen eating the best food and wearing the best clothes”, with the implication that these are the ones that are exogenous to the village and its culture (Groupe Mbogayife 13/06/2019). Ndiémane Malaoubé neighbours also felt they had to live up to the reputation of their former imam and, to a certain extent, Centre AFAFA, but that there were conflicting views on the heritage left and what could follow (Groupe Mbogayife 14/06/2019).

Due to the strong bonding social capital, the main power dynamics extended as far as the whole village and the relationship between its five neighbourhoods. Ndiémane Malaoubé has historically had a complicated

⁸⁹ See subchapter 4.3.6.1. (p. 69). For further information on the Ethics Code principles relating to the importance of co-constructing research and communicating it iteratively and in a manner adapted to all participants see Appendices 10.1.5.6. Principle of Full Disclosure (p. 259), 10.1.5.12. Principle of Reciprocity, Mutual Benefit and Equitable Sharing (p. 260), 10.1.5.13. Principle of Supporting Indigenous Research (p. 261), and 10.1.5.14. Principle of The Dynamic Interactive Cycle (p. 261).

relationship with the village chief and competition and jealousies between neighbourhoods can be so strong that, oftentimes, it can be asphyxiating and debilitating for all parties.

Research participants felt at times that it was preferable to sabotage cooperation opportunities with other neighbourhoods than to collectively increase the pool of knowledges, skills, and resources. A clear example of this was felt when the opportunity arose to train two further neighbourhoods in participatory video. Although Ndiémane Malaoubé participants were happy to make participatory videos to share with fellow peasants, when they found out that their direct neighbours could have the same opportunity, they were very concerned: “What if they make films better than ours?” (Ndiémane Malaoubé participants 17/10/2019).

Typical of the prisoner’s dilemma, cooperation between the groups would have potentially created fascinating videos of knowledge- and experience-sharing that would have enabled fruitful discussions and strengthened understanding between participants. However, competition and the associated fear of losing are so strong that both Ndiémane Marché and Ndiémane Chéinka’s groups desisted from the idea of being trained (despite having requested it themselves), thus succumbing to pressures from Ndiémane Malaoubé. This strategic decision made sense considering neighbours interact all the time. The preservation and tempering of their relationships are more important than the promise of potential livelihood improvements brought by participatory videos. It is simply a matter of choosing battles.

This (ab)use of power was felt by Ndiémane Malaoubé women too as those involved in participatory filmmaking felt pressure and censorship from their own fathers, husbands, and sons. On multiple occasions, men exerted their power over women by forbidding gatherings, discussions, filmmaking, or film sharing.

Finally, and added to the complexity of human relationships, there is the impact of Islam and Animism as participants often referred to their fear of evil eyes and evil spells, *maraboutage*, curses and punishments as a reason not to engage in participatory research and filmmaking (Ndiémane participants 21/10/2019).

Conflict can sometimes be a rite of passage to build and challenge identities, a test to problem solving. Sabotage and the loss of solidarity were in part due to a lack of leadership with the capacity to unite people. The lack of a clear, empowering, positive and constructive vision for the future of the neighbourhood and its inhabitants often left Groupe Mbogayife’s members wondering what the future would bring and what legacy would be left for their children. The construction of strong social organisations is, more than ever, essential to protect and enhance strong food system socio-ecological resilience.

7.2. Critical Reflection on the Notion of Socio-Ecological Resilience

To address research question 4 (How socio-ecologically resilient is the Ndiémane Food System?), I explore here how the resource management approaches adopted have impacted on the different intersectionalities (Figure 165). This subchapter encompasses the critical analysis with local co-researchers of the data collected and its meanings, and an academic discussion relating it to the broader study of livelihoods around the world.

FOOD SYSTEM OUTCOMES				
Outcomes impacting on:	Young Women	Old Women	Young Men	Old Men
NATURAL				
Drought	+++	+++	+++	+++
Deforestation	+++	+++	+++	+++
Soil erosion & impoverishment	+++	+++	+	+++
Loss of biodiversity	++	+++	+	+++
Environmental degradation	++	+++	++	+++
Less yields and production	++	+++	++	+++
More fallow land	+	+	+	+
Loss of commons	++	++	++	++
Less time & effort farming	++	++	+++	+
SOCIAL				
Agricultural income	+	+	+	++
Non-agricultural income	+	+	+++	++
Less time & effort cooking	++	+		
Less health		++		++
Loss of farmland ownership				++
Self-sufficiency	++	++	++	++
Food security				
Food sovereignty	+++	++	+++	++
Changes in traditional household hierarchies	++	+++	+++	+++
Loss of motivation to farm	++	+	+++	+
Increased dependency on monetised economy	+++	++	+++	++
Disempowerment of peasants	++	+++	++	+++
Social shift towards Westernised habits	+++	+	+++	+
Increased standard of living	+++	++	+++	++
Increased quality of life	+++	++	+++	++
Maintenance of agri-cultural heritage	+	++	+	++
Identity permanence / evolution	+++	++	+++	++

Legend	
RQ: Research Question	

Ranking system	
Symbol	Meaning
	zero
?	unknown
+	low
++	medium
+++	high

Figure 165. Detail of the Ndiémane's Resilient Food Systems Framework addressing the Outcomes (RQ4) impacting on the different intersectionalities under study (source: author, adapted from DFID 1999)

7.2.1. The Disempowerment of Peasants

Ndiémane's villagers are conscious of the changes occurring on their land and of the consequences of theirs and their ancestors' actions. Firstly, the lack of concerted water management and erosion control techniques

and the weak and unsuccessful tree regeneration efforts so far have all led to the gradual yet undeniable destruction of Ndiémane's natural environment.

Secondly, and despite the persistence and evolution of agroecological techniques being used in Ndiémane, the gradual imposition of chemical inputs and hybrid seeds used by men has led to overall land degradation. Villagers acknowledge that spraying fields with chemicals is a search for simplicity that ultimately has a devastating impact environmentally, and that locks the peasant in a dependency to purchase more chemicals and thus further deplete their land.

Finally, the traditional firewood collection and the more recent and intensified straw collection practiced by women and children have reinforced the destruction cycle, further promoting deforestation and land degradation. Groupe Mbogayife (10/10/2019) clearly foresee the degradation created by firewood and straw collection if undertook intensively over several years and adopt it as a short-term solution waiting for better days.

This conjunction of approaches though has led to the destruction of the positive flow of sources, products and uses on which soil fertilisation depends, as represented in Figure 166 (p. 229). Farming has thus become a high-risk activity that struggles to feed its people, physically and spiritually. Poor soils cannot feed spirits.

The changes observed in the food system have meant that *peasants* have progressively become *farmers*. According to Wolf (1999: xxii cited in Tilzey (2018: 321–322)), peasants aim above all for subsistence and social status within their narrow and close knit network. Peasants' practice is based on traditional arrangements for access to land and to labour from kin and neighbours. Peasants' relationship with the market is only occasional, ensuring first and above all their source of livelihood, and only after, the potential sale of surplus.

The close connection – and consequent dependency – on the market turns peasants into farmers. These embrace markets fully, they subject their land and labour to open competition, and submit their livelihoods to the market's offer and demand vagaries. Rather than minimising risk, the goal of farmers is to maximise profit. Their status depends on a wider social network, less linked to solidarity and community self-help, but rather enhanced by economic success (Othniel Yila and Resurreccion 2013).

Lamine Biaye (18/02/2017), elder male peasant and president of the Senegalese Association for Peasant Seed Producers, laments the promotion in Senegal of the notion of "agricultural entrepreneur": a "bureaucratic farmer", obedient to orders of technicians, cementing the commodification of food and ignoring peasant livelihoods. The "virtual eradication of the peasantry and the adoption of the "farmer" road to capitalism" (Tilzey 2018: 322) has led to a discredit of the peasantry as now incapable to produce enough to feed themselves, let alone produce for a competitive and demanding market (Pape Maysall 17/02/2017, McKeon 2014).

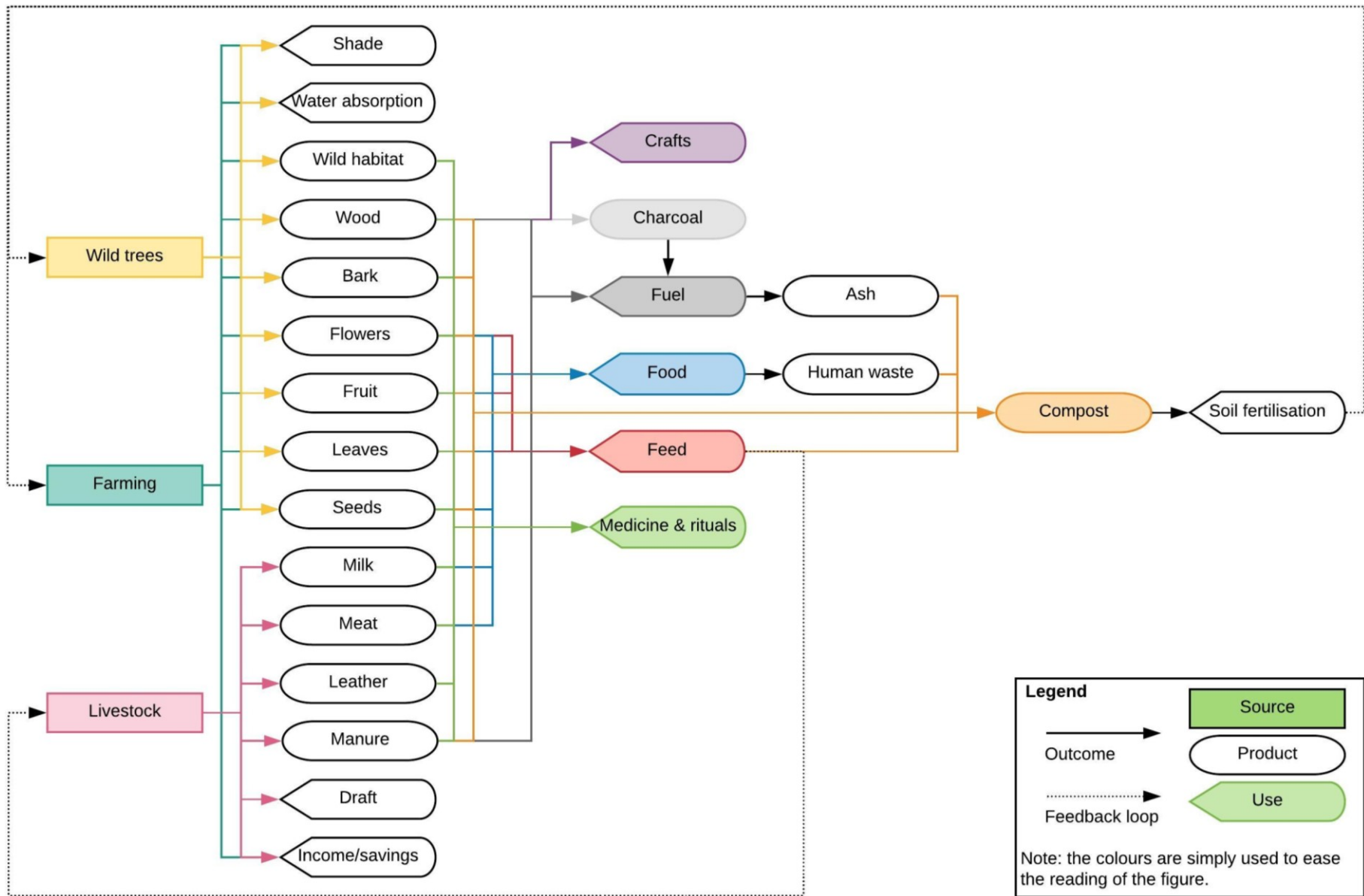


Figure 166. Positive flow of sources, products and uses leading to soil fertilisation (source: author)

Yet important questions need to be asked about the industrialisation of agriculture, the past Green Revolution mainly in Asia and Latin America, and the revamped and heavily backed by big business Green Revolution for Africa⁹⁰ (FONGS 2010, Patel 2013, Holt-Giménez and Shattuck 2011). Extensive research, conducted in different continents and contexts, has shown the glaring limitations of industrial agriculture, especially in Majority Countries where peasants and their families are most vulnerable to environmental degradation and social defragmentation (Altieri and Koohafkan 2008, Rogé et al. 2014, Patel 2013, 2007, Pretty et al. 2001). As mentioned by Holt-Giménez et al. (2012: 529), “[t]he conventional methods already employed for decades by poor farmers have a poor track record in [combating poverty and ensuring sustainable livelihoods].”

In Senegal, the move towards industrial agriculture with the use of chemical inputs, mass deforestation for greater field access and the gradual homogenisation of crops grown, has been showing clear signs of environmental degradation and decreasing productivity. The use of chemical inputs often offers a quick and easy solution to a farming problem, yet it encompasses financial costs, health threats and soil impoverishment. Farmers are conscious of this dilemma but feel trapped in social conventions and pressure to “modernise” and do like their fellow farmers (Feola, Gallati, and Binder 2012).

There are multiple voices, both nationally and globally, calling for the increased commercialisation of food production and the development of markets (The Montpellier Panel 2012, CNCR 2008, AGRA 2019). However, as Poole et al. (2013: 17) warn, this “commercialising metanarrative is much riskier than subsistence farming, rural wage labour and/or migration, and may not be an attractive profession.” The focus on maximising yields for profit makes peasants individually dependent on a bottleneck of (trans)national food retailers, and vulnerable to unstable market prices (Macfadyen et al. 2015, Gregory, Ingram, and Brklacich 2005).

Farmers are pressed to produce for sale to be able to buy food yet this logic is flawed, as the big losers of capitalistic food trade are small producers who ultimately cannot afford food (Holt-Giménez et al. 2012). Food expenses are the main outgoings of Senegalese households and whilst households in the capital only allocate 39% of their budget to food, in rural areas this rises to 68% (ANSD 2013: 23). Oumar Diop (2006: 45) calculated in 2006 that poor rural households spent 55% of their income on purchasing grains, and 39% on rice alone. Although this data is more than fifteen years old, it seems to reflect the current situation in Ndiémane, and it shows the devastating economic impact of a gradual dependence on a single staple food that cannot be produced locally and now constitutes people’s acquired diet habits.

Whilst elders talked about the negative dependency on external inputs and markets, younger male peasants saw no other way to do market gardening (Diouf 2020d). Elders draw their knowledge from decades of

⁹⁰ See AGRA (2020).

agricultural practice, they have seen changes in the environment and the advent of market gardening and chemical inputs in the area.

Younger farmers have less experience, they inherit deforested plots, impoverished soils, and pressure to modernise, to contract debt, and to grow for sale. In this context, understandably, a vision to regenerate the environment and increase self-sufficiency and food sovereignty seems hard to grasp. As expressed by the FONGS⁹¹ (2010: 44), “the problem with the rural youth is that they do not manage to project their dream on the rural space, and therefore they leave it. Giving back hope to the peasant requires thus helping them to rethink their relationship with space.”

Policy should endeavour to ensure the availability of healthy and diversified food, people’s access to it, the means to utilise it and its stability over time. Moreover, policy should not take away people’s capacity to *choose* the food they favour, how and by whom it is produced, i.e., people’s food sovereignty (Weis 2020). It is by defending and improving both nutrition security and food sovereignty that policy can have a sustainable impact protecting small producers and hopefully avoiding the double burden of rural undernutrition and urban overnutrition (IAASTD 2009).

However, the concept of food sovereignty was not selected in this research. Not because it was deemed irrelevant as, in fact, there is a Wolof expression often translated into food sovereignty: “*bay ndundé*”, meaning literally “cultivate, feed oneself” or feed yourself of what you produce. Yet, as expressed by Mme Thialo (26/02/2017), a female peasant, Senegalese peasants easily perceive the concept of *bay ndundé*, but they struggle to understand the concept of *right to food*. The policy angle of the concepts of right to food and food sovereignty are perceived by peasants as top-down approaches, emanating from political spheres to which they do not belong and that they feel are out of touch with their realities (Youssou Sarr 26/02/2017).

Therefore, though present in the background of discussions and reasoning, the concept of food sovereignty was not given a central position in this research to better reflect the food system perception and construction of peasant participants at present. Villagers considered the term and framework potentially more relevant in a later stage of their reflection and commitment and, thus, food sovereignty could feature prominently in the local research team’s priorities in the future.

I believe the inclusion of food sovereignty in the concept portfolio of research on food system resilience in Ndiémane would give a new meaning and relevance to the research and would reflect the evolution of the participants’ political engagement and empowerment. Also, the adoption of PAR with a food sovereignty conceptual framework has the potential to strengthen the understanding of interweaved intersectionalities within complex food system dynamics. It would highlight the poor linking social capital of the group and would

⁹¹ *Fédération des Organisations Non-Gouvernementales du Sénégal* (Federation of Senegal’s Non-Governmental Organisations)

encourage reflection on how to enhance it and what would be the benefits of doing so. Moreover, giving emphasis to the concept of food sovereignty could reinforce the empowerment of peasants – and especially female peasants – by increasing the consciousness of their primordial role in feeding populations, environmental safeguarding, and cultural heritage transmission.

7.2.2. Loss of Tradition and the Role of Formal Education

With the increased opening of the village to external influences, the village itself is changing and the cosmovisions that guide the social and spiritual communities are mutating at a speed never experienced before. Villagers recalled countless traditional activities and celebrations that have been lost in the past few decades, both from Seereer and Animist ancestry and Muslim heritage. There are no more circumcision events being held in the village, no more tom-toms being used to communicate messages, even the sound of pestles and mortars is gradually disappearing from village life. The village square is empty and opportunities to exchange knowledge, experiences and memories are now scarce (Groupe Mbogayife 13/06/2019).

Diene Kama (13/06/2019), a male elder, regrets the loss of history because it is not being transmitted orally anymore and it has never been recorded in the written form. Diene worries about the loss of historical references so important for children and the conception and construction of their identities and futures.

The most important traditional values villagers felt were being gradually lost were solidarity and respect for elders. Cooperation between peasants has decreased (Figure 148, p. 184). With cash crops, farming becomes progressively an activity peasants compete for, rather than cooperate on (Mackintosh 1989). Income from market gardening and wages from employment are given to individuals, irrespective of household hierarchies.

Respect for the elders is best expressed in Seydou Badian's (1972: 27) novel "Caught in the Storm":

« Au village, les jeunes entourent de respect et de sollicitude leurs aînés. Ils vénèrent les anciens et tout ce qui a été établi par eux. Ils les écoutent religieusement quand ils leurs racontent les faits passés ou quand ils leurs enseignent les fruits de leur expérience et de celle de ceux qui les ont précédés. Jamais, entre cadet et aîné, il n'y a la moindre discussion ; toute la vie est régie par une seule loi, celle de la hiérarchie de l'âge, de l'expérience et de la sagesse. »

« At the village, young people encircle their elders in respect and solicitude. They worship the elders and everything established by them. They listen to them religiously when they tell past events or when they teach the fruits of their experience and that of those who preceded them. Never, between young and old, there is the slightest discussion; all life is determined by a single law, that of the hierarchy of age, experience and wisdom. »

Although elders may be physically weaker than their younger counterparts, they possess valuable knowledge and experience (Nasuti et al. 2013). Elders are the custodians of knowledge relating the past with the present; they deserve respect and reverence for they are the enablers of the present. There are innumerable African sayings celebrating the importance of age and wisdom such as "when an elder dies, a library burns down".

Yet, in Badian's novel as in Ndiémane, times are changing and as Seynabou Diouf (13/06/2019), a female elder, put it: the order has been reversed and it is as if now "the ducklings were walking in front of the duck"... Relationships between elders and youth are somewhat inversed and it is now the family dependents who provide for the family, and not the family head (RuralStruc (2007) in FONGS (2010)).

Youngsters feel that the world brought by elders does not make sense anymore, fast changes require fast adaptations and it is for them now to create new worlds with new meanings (Mamadou Ndour 09/10/2019, Male Youth 23/10/2019). Yet, change does not necessarily mean a total break from the past. Despite the potential irreversibility of resource loss, the effort to rebuild peasant-to-peasant exchange opportunities and the motivation to remain in the village (even if only by proxy) show that the evolution of the community and the construction of its resilience are iterative, experimental, fluid processes.

As Guissé et al. (2016: 240) point out: « the agrarian domestic community rests upon collective work, collective appropriation of production means, despite the current forms of possession; it is socially based on the importance of family and kinship, lineage and alliance and on the hierarchies elder/youth, men/women, masters of knowledge and members of the community, natives and immigrants.»⁹²

So, more than change itself, what is being criticised here is the process of change, i.e., the fear that its speed means old wisdoms are being trampled on (Badian 1972: 172):

« Les vieux sont plutôt malheureux. Imaginez un homme qui, encore très riche hier, se trouve aujourd'hui sans rien. On lui annonce que ses richesses n'ont plus de valeur ; ses greniers sont pleins de mil, on lui dit que le mil ne vaut plus rien; il possède du bétail, on lui annonce que le bétail n'a plus de valeur. Et cela sans préparation aucune, avec la brutalité d'une pluie d'été; les vieux sont cet homme-là. Hier encore on croyait en eux, on croyait à leur parole, on adorait leur dieu. Aujourd'hui on crie sur les toits que rien de ce qui leur était cher ne mérite notre attention. Les vieux sont au désarroi et vous, vous les décevez, car ce qu'ils attendaient de vous, c'était des gestes de consolation, une initiation prudente et sage au système qui s'impose à eux. »

« Elders are rather sorrowful. Imagine a man who, still very rich yesterday, finds himself with nothing today. He is told his riches have no more value; his granaries full of millet, he is told millet is worth nothing; he has cattle, he is told cattle has no more value. And this without any warning, with the brutality of a summer rain; elders are this man. Yesterday still we believed in them, we believed in their word, we worshiped their god. Today we shout from the rooftops that nothing that mattered to them deserves our attention. Elders are in disarray and you, you disappoint them, for what they expected from you, were gestures of consolation, a prudent and wise initiation to the system that is imposed to them. »

As shown in Figure 169 (p. 235), in participants' living memories and the knowledge passed on to them, from a very young age, children contributed to the collective through farming, animal rearing and housework with

⁹² "La solidité de la structure communautaire. La communauté domestique agraire repose sur le travail collectif, l'appropriation collective des moyens de production en dépit des formes de possession actuelle ; elle est fondée socialement sur l'importance de la famille et des liens de parenté, descendance et alliance et sur les hiérarchies aînés/cadets, hommes/femmes, maîtres du savoir et membres de la communauté, autochtones et immigrants. "

activities such as scaring birds off cereal crops, harvesting fruit or fetching water (Figure 167 and Figure 168). Nowadays these traditional activities have become secondary, and the knowledge transfer processes that naturally occurred during those activities are weakened, if not broken.

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Figure 167. Children returning from work in the fields (Sidibé 2005: 44)

*Figure 168. Children harvesting mangoes
© Carla Sarrouy Kay 2015*

Formal education has become the main responsibility of all non-married children, male and female. Yet, Groupe Mbogayife and other elder research participants, had negative opinions about the existing formal schooling system. Understandably, elders struggle to accept that their children, once considered an important family connector and a valuable labour force, spend most of their days disconnected from their families learning things that their elders do not understand nor value.

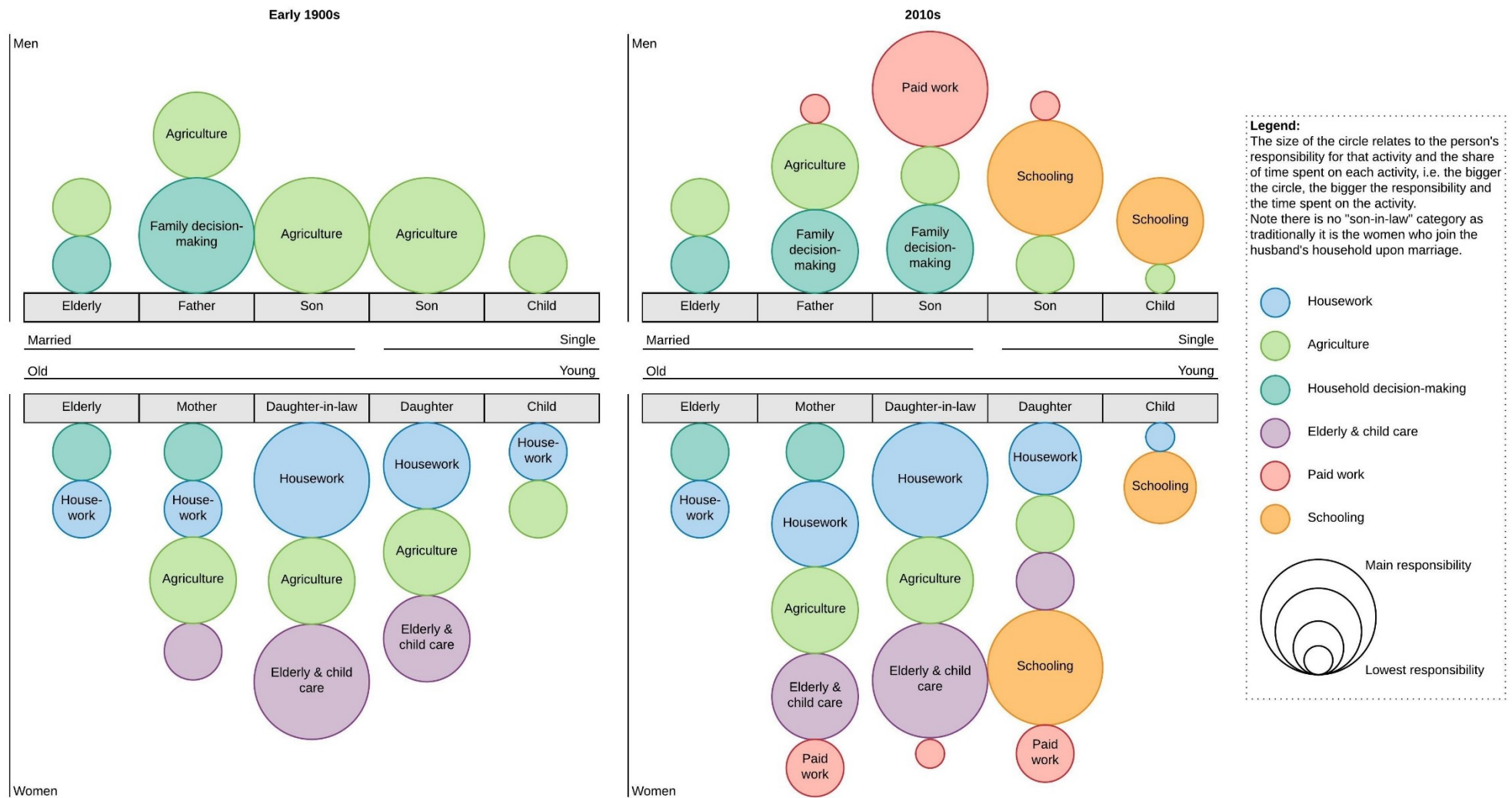


Figure 169. Household responsibilities, past and present, depending on gender, age, and marital status (source: author)

Figure 169 (p. 235) shows how the move toward formal education for children coincides with the advent of paid work and the decline of agriculture. These social shifts are directly linked to Senegal's past under imperialist powers and the imposition of exogenous values and worldviews on its population. As Linda Tuhiwai Smith (1999) argues, external influences have led to the deliberate undervaluing or destruction of peoples' culture and heritage, and children are targeted through colonial education further cementing the loss of identity.

The dilemma of parents wishing to give opportunities to their children but fearing the identity schism it might create is clearly expressed in the novel "Caught in the Storm" (Badian 1972: 16) when old father Benfa tells his son: "I put you in school so that you can read. I have never wanted you to become a White."⁹³ There is a genuine concern in rural elders that "if our children go to school, we will lose them" (Cissokho 2014: 8).

The motivation to copy the West is often deeply engrained in a feeling of inferiority: inferiority for living in rural areas, off the land, and belonging to a minority ethnic group with its own minority language. By investing in the formal education of their children, and as promoted by the state, parents hope to create opportunities for their children to join the capitalist work market. Schooling is a long-term investment for which parents only get a return when children are old enough to work and if they bring back money to the household. "Parents purchase a slate, a book, a computer, and the children leave to study and work but when they earn money, they don't come back to the source to help the parents" (Groupe Mbogayife 09/10/2019).

Meanwhile, a wealth of knowledge on the environment, society, and spirituality could be found directly at home and in the village. When discussing this subject, Yako Ndour (09/10/2019), an elderly peasant and father of twelve, shared this parable:

« Mother jackal wanders in the bush with her pup. The young jackal tells its mother: "Mum, we need to head back soon to be able to get home before it gets too dark!" Mother jackal replies: "We are in the bush, which is our home, so we are at home everywhere! »

Ndiémane Malaoubé's older peasants see their neighbourhood and inhabitants as huge sources of knowledge and thus formal schooling is only filling the already filled (Freire 1970), albeit with different, exogenous, imperialist and homogenising content.

Senegal faces the challenge that half its population is under nineteen years old (UN 2020), yet this can be an opportunity if the youth joining the labour market is skilled to answer the needs of the country. More than access to formal education, Senegal's policy should focus on improving its quality, potentially increasing technical and practical training at a young age. Training should be tailored to the local cultures and nurture identities, rather than impose endogenous knowledges and cosmovisions.

⁹³ "Je t'ai mis à l'école pour que tu saches lire. Je n'ai jamais voulu que tu deviennes un Blanc."

7.2.3. Food System Socio-Ecological Resilience and Identity Permanence

If, according to Tendall et al. (2015: 19), food system resilience is “the capacity over time of a food system and its units at multiple levels, to provide sufficient, appropriate and accessible food to all, in the face of various and even unforeseen disturbances”, then the multiple resource management approaches adopted within the Ndiémane food system have indeed ensured its resilience. The flexibility to try other sources of food and livelihood (such as migration and trade) have safeguarded a fairly constant and appropriate supply of food in bowls in the village.

However, when discussing socio-ecological resilience, all villagers through all intersectionalities were clear that they centre their resilience on identity permanence: “We are Seereer Siin”, the specific branch of the Seereer ethnic group they belong to, and resilience depends on being able to maintain this identity. This ethnicity-centred identity contrasts completely with Mamadou Bouna Timera’s (2009) analysis that Senegalese identities are increasingly based on the simple urban/rural dichotomy, overlooking ethnic heritages.

Interestingly, when Groupe Mbogayife’s elders (18/10/2019) reflected on their identity as Seereer Siin, they only referred to past identity markers that have now been lost. Women described being Seereer Siin as eating a sorghum variety from Mbodiène (a nearby town) which they do not eat anymore. Elders said that when true Seereer Siin peasants were working in the fields and their wives brought lunch, they would simply put their *iler*⁹⁴ on the ground and eat on the spot. This has been lost and “peasants now look for a shady, comfortable spot to have their lunch breaks” (Groupe Mbogayife 18/10/2019). Another example, also lost, relates to Seereer women traditionally wearing silver bracelets on the right wrists and right ankles and amulets in the hair. Adama Ndour (18/10/2019), a female elder, said that when she came to the village upon marriage, there were basins with water and calabashes to play music in the neighbourhood, but this too ended when the imam converted the neighbourhood to Islam and disapproved of music.

Yet, despite the loss of these identity markers that women considered relevant, women still consider themselves fully Seereer Siin. They claim that even the children who grew up without music in the neighbourhood, recognise instantly traditional Seereer music because they know it and “have it in them”. Also, not all traditions are lost, some, like the initiation of the bride by fellow married Seereer women continues strong and is practiced at every wedding.

So, what is being a Seereer Siin peasant nowadays? It is a set of values that connects each individual to the community and the land; values that villagers struggled to delineate but that they felt were deeply entrenched

⁹⁴ Traditional manual farming tool.

in their beings, beyond their will and actions (Groupe Mbogayife 18/10/2019, Male Youth 06/03/2020). In Senegal as in the rest of the world, “[t]he [peasant] does not face their activity as a profession, but instead as a condition, a social status”⁹⁵ (Nasuti et al. 2013: 398). As Curry et al. (2015: 1) put it, being a peasant is “a ‘way of life’ that provides status, identity and a moral order, and which is therefore highly resistant to change.” Peasant agriculture is based on family agriculture and therefore on the reproduction of the family unit in ethnically homogenous village communities sharing the same agricultural terroir (FONGS 2010).

Nevertheless, young people feel torn between what they see as preserving the local past and embracing fully the global future. To express this conflict, male youth (06/03/2020) referred me to the following passage from Seydou Badian’s (1972: 142–143) novel in which a wise elder guides a young man about life choices:

« [...] vous avez tort de vouloir tout laisser tomber. Vous avez tort de vouloir imiter les Européens en tout. Comprends-moi bien. L'homme européen n'est qu'un des multiples aspects de l'homme. On ne vous demande pas d'être Européens. On ne vous demande pas de vous défigurer. [...] Il n'est pas question pour vous de fuir votre milieu. Cherchez plutôt à agir sur lui. Cherchez à sauver ce qui doit être sauvé et essayez d'apporter vous-mêmes quelque chose aux autres. [...] Il ne s'agit pas évidemment de tout accepter. Mais faites un choix. Les coutumes sont faites pour servir les hommes, nullement pour les asservir. Soyez réalistes ; brisez tout ce qui enchaîne l'homme et gêne sa marche. Si vous aimez réellement votre peuple, si vos cris d'amour n'émanent pas d'un intérêt égoïste, vous aurez le courage de combattre toutes ses faiblesses. Vous aurez le courage de chanter toutes ses valeurs. »

« [...] you are wrong to want to let go of everything. You are wrong to want to imitate Europeans in everything. Understand me well. The European man is but one of the multiple aspects of man. You are not being asked to be European. You are not being asked to disfigure yourself. [...] It is not a matter for you to flee your environment. Seek instead to act on it. Seek to save what ought to be saved and try to bring something to others. [...] It is obviously not a matter of accepting everything. But make a choice. Customs are made to serve men, by no means to subjugate them. Be realistic; break everything that chains man and disturbs his path. If you truly love your people, if your cries of love do not emanate from a selfish interest, you will have the strength to fight all its flaws. You will have the courage to sing all its values. »

Despite the strong influence from exogenous cosmovisions, young people still refer to being a Seereer Siin peasant from Ndiémane as their core identity. Even if they one day leave the village to make a living, younger generations are also acutely aware of their cultural and spiritual heritage and their role in passing on the flame to next generations which they hope will remain physically and spiritually rooted to Ndiémane. This identity protective behaviour is not based on denial as in Geoff Kuehne’s (2014) research, but instead on a survival instinct that requires the exploration of livelihoods beyond Ndiémane to protect the village as the central and defining home.

⁹⁵ “O agricultor não encara sua atividade como uma profissão, mas sim como uma condição, uma posição social”. NB: It is debatable here whether the word “agricultor” should be translated as “farmer” or “peasant”, but I chose not to translate into farmer as these tend to consider their activity as a profession.

The collaborative adoption of approaches, by which certain members of the household stay in the village whilst others leave and send back remittances, means that together the household members are able to survive in a monetised economy *and* still live in the village and keep a link to traditions. This assessment asks for a revision of Figure 148 (p. 184) into Figure 170 (below) by which, although there is less farming in Ndiémane, there is *still* farming and therefore the core identity marker of Seereer Siin peasants is alive. The approaches adopted by villagers ensure the *short-term survival* of their community, albeit with less self-sufficiency and a higher dependence on the monetised economy (green area in Figure 170). Yet, villagers are clear that this short-term survival is done at the expense of *long-term destruction*, with unsustainable environmental practices and eroding human, socio-cultural and spiritual resources essential to the construction of their identities in time and place (red area in Figure 170).

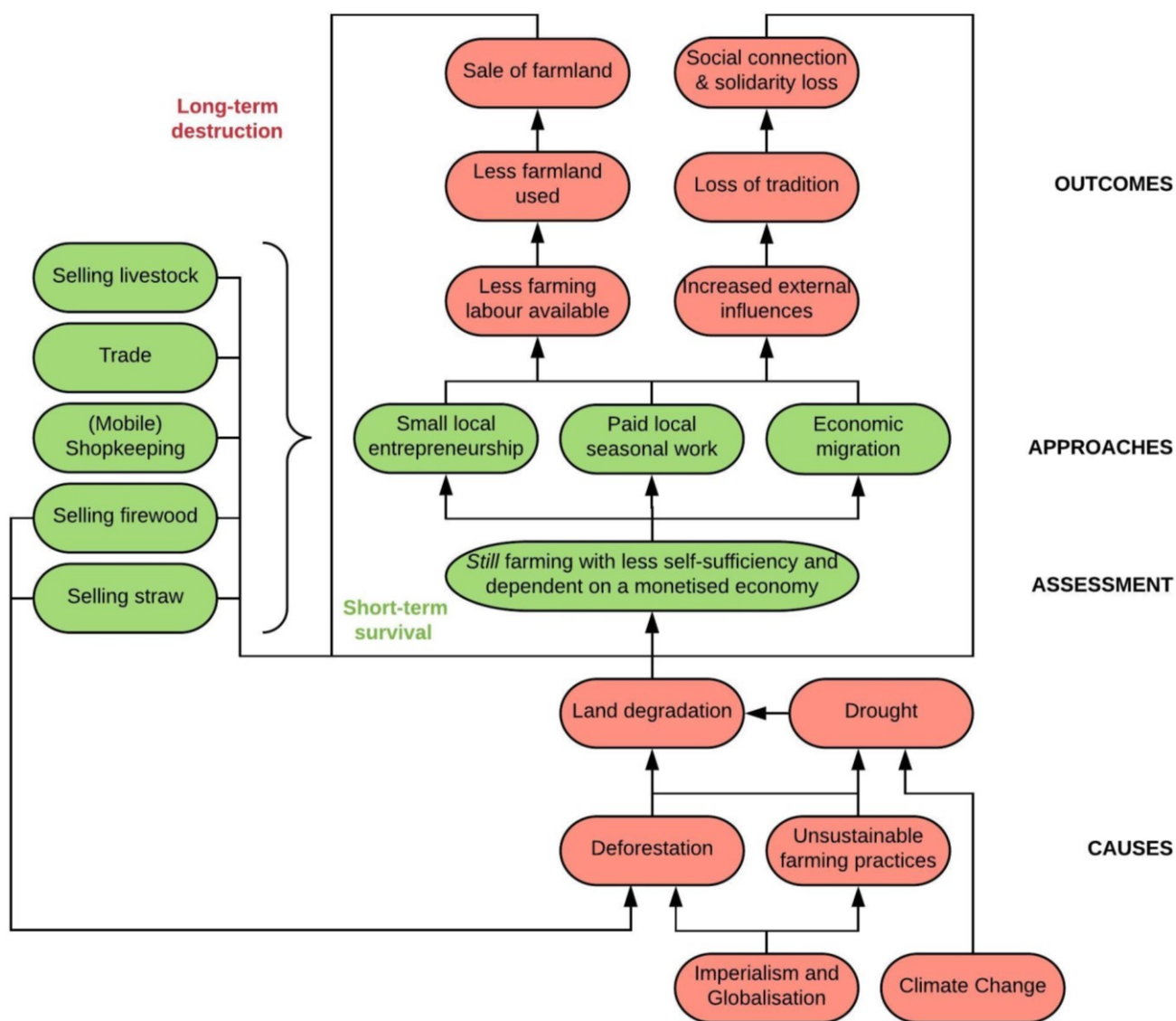


Figure 170. Villagers are still farming, with short-term survival approaches (green) and long-term destruction cycles (red) (source: author)

Villagers feel Seereer Siin, and therefore they identify themselves to the peasantry as their ancestral activity, no matter what modern life has brought. “Once a peasant, always a peasant”, even if those working the land are now closer to the farmer practice analysed earlier. Moreover, “the stay in the water does not turn the tree trunk into a crocodile”⁹⁶, and even those who have left the fields of the village and now work in urban areas in non-agricultural activities still feel – and are perceived as – peasants. So, though arguably environmentally unsustainable and not sovereign, villagers consider the food system resilient, inasmuch as it is able to ensure people’s Seereer Siin identity.

The double exposure of agriculture to globalisation and climate change does not mean peasant agriculture is incompatible with development and modernisation. As defended by the FONGS (2010: 11), it means instead that this process ought to take into consideration “the sustainability of agricultural development, the safeguarding of the environment and natural resources, and the dynamization of the social and economic fabric of the rural world”.

But how does the population deal with the apparent contradiction of safeguarding identity-centred resilience in a way that is not perceived as sustainable and that does not promote food sovereignty?

The future lies in *faith*, in *time*, and in *life* with all their fluidity and complexity. Contrary to positivist-inspired research, villagers envisage their future and their resilience through their faith in god and through time. God is generous and fair. Time helps with healing and construction processes. Life is cyclical and beyond individualistic conceptions. Though based on human everyday action, the villagers’ socio-ecological resilience is imbued in a transcendental connection unifying all intersectionalities in Ndiémane.

Trust in faith, time and life is not in any way synonym with inaction and irresponsibility. On the contrary, it is accompanied in Ndiémane with a sense of humility and deep responsibility regarding peoples’ active role in the erosion of traditional values and the health of its environment. God rewards good deeds, and these include looking after god’s creation. Time may bring good harvests, but seeds need to be planted for plants to reach maturity. As in Cissokho’s (2010) provocative book title, “God is not a Peasant”, peasants as “friends of life” (Segnane 2019: 6) need to – and do – act to protect and enrich their identities and environments.

Though seeking quick fixes, villagers are also exploring old and new ways to regenerate their environment and strengthen their social connections. “To survive one improvises all the time” (Visvanathan 2009: 5) and few activities showcase this as strongly as farming. Ndiémane’s understanding and experiencing of resilience is complex, non-linear, even chaotic and apparently contradictory. Yet, the preservation of their identity as Seereer Siin, whilst in constant evolution and reinterpretation, is an ultimate goal unifying women and men, old and young, past, present and future.

⁹⁶ “Le séjour dans l'eau ne transforme pas un tronc d'arbre en crocodile.” (Badian 1972: 56)

8. Conclusion

Climate change – as opposed to climate variability – is due to human activities that affect the composition of the global atmosphere (IPCC 2014), and agriculture is one of the activities that has most contributed to it and that is most affected by it. “[Climate change] adaptation is not an option, but a necessity” (Armah et al. 2011: 301).

In Senegal, climate change is both perceived by peasants and observed in regional and national data. The main concern for Ndiémane is droughts. Temperatures have increased and rainfall has decreased during the past century. The multiplication of years with poor quality and quantity of water in wells makes farming extremely challenging and brings health and hygiene concerns to households. Both cause and consequence, tree cover has decreased dramatically (mainly to give way to peanut production), and the consequent soil degradation presents an added challenge to Ndiémane’s villagers. Peasants feel overwhelmed by these climatic and environmental challenges, especially considering that national policies lean toward the industrialisation of agriculture, increasing scale and specialisation, and thus further promoting rural exodus.

This tapestry context impacts women, men, children and the elderly differently. This research aimed to go beyond climate change, adopting a holistic approach, aware of the interconnectedness of the different aspects of people’s lives, varying in time and place, between genders and generations. This complex subject and holistic approach called for research framed by the Sustainable Livelihoods Framework, imbued in Feminist Political Ecology, valuing Traditional Ecological Knowledges, and embracing Participatory Action Research.

A Wolof saying states: “If you don’t know where you’re going, go back to where you came from.”⁹⁷ The storytelling analysis of the context of Ndiémane (Chapter 5, p. 84) presented where Ndiémane’s food system “came from”. This analysis, complemented with the assessment of its present characteristics and approaches (Chapter 6, p. 130), enabled the exploration of and debate on “where it is going to” (Subchapter 7.1., p. 218).

Senegal has a rich history, marked by flows of ethnic groups, empires, and belief systems. Its geostrategic position at the westernmost point of continental Africa made it a coveted location for imperial domination from the fifteenth to the seventeenth century. Multiple colonial powers sought control of the Green Cape (where Dakar is situated) and in 1677 France took control of the region and exploited it for almost three centuries till independence in 1960. National agriculture is heavily influenced by the country’s colonial past; it is oriented to exports at the expense of self-sufficiency and nowadays Senegal does not produce enough food to feed its fast-growing population.

⁹⁷ “Boo khamoul fo djém; ga délou faga dioguéwone.”

The analysis of Ndiémane's food system resources and management approaches highlighted that these are multiple and complementary. Environmental resources may be degraded but they remain diverse. Complexity is their main strength. Their flexible and ingenious use reveals that villagers still rely heavily on them for their livelihoods. Physical resources have evolved quickly in the past few decades, new resources have brought opportunities overall welcomed by the village. Financial resources remain scarce. They rely on informality and the strong bonds within families and between families and friends. Financial approaches are diverse, they focus mainly on the monetised economy and often require migration, especially of young men.

Human resources have evolved with the expansion and improvement of health and formal education, yet their main and invaluable strength is local knowledges. These are extremely rich but nonetheless at risk of becoming irrelevant and/or of being lost. Socio-cultural resources are mainly based on bonds in families and friendships, i.e., strong horizontal and homogenous connections. The more distant, heterogenous and vertical a connection is, the feebler it becomes. Ndiémane's villagers feel an extremely weak – if not inexistent – link with national governance, for example. The motivation to nurture family bonds is strong though, as is the drive to promote peasant-to-peasant knowledge sharing. Finally, spiritual resources are paramount in the construction of the villagers' sense of identity, expression, and outlook on the future. These are centred on the key notions of ethnicity and religion.

The gendered analysis of resources and approaches revealed that women generally have less material resources, or at least they may use resources, but they do not control them. Immaterial resources – though differentiated – are strong for both genders. As for the generational approach, a privilege is given to age and its perceived associated wisdom. Young people – female and male – tend to have less access to resources though with the hope that one day they too will become old and wise. After male elders, privilege is typically given to female elders or to male youths, depending on the resource under analysis. Young women tended to figure last in this society based on male and elder privilege.

The villagers' resource management approaches have meant that farming has become a high-risk activity. The gradual shift from peasantry to "agricultural entrepreneurship" has led to the disempowerment of peasants in favour of more economically rewarding activities, totally dependent on the monetised economy. The changes occurred with colonialism, and sped up since independence, have led to a shift in food systems. Villagers associate loss of self-sufficiency and reliance on external farming inputs and food ingredients with health deterioration. Moreover, because farming is so intrinsically related to people's existence and identity, these shifts are believed to lead to the loss of traditions, especially in the form of solidarity and respect for the elders.

Yet, this research has revealed that when reflecting on food system socio-ecological resilience – and even livelihood resilience – villagers place their Seereer Siin identity as their core defining trait. The Seereer Siin

identity and the more recent conversion to Islam are ever evolving traits, but the villagers' capacity to preserve them means they consider themselves resilient to climate change and social changes. Identity and faith are Ndiémane's villagers' fundamental bedrock. Villagers see their existence here and now as a continuum of space and time. Individual life is perceived as a temporary responsibility toward the whole; trusting God gives a meaning to life.

It would be relevant to pursue future research on resilience and food systems in Ndiémane and beyond, continuing the transdisciplinary approach and more deeply imbued with the literature of indigenous scholars around decolonisation. For example, further acknowledging and encompassing spirituality, the invisible, "the hidden half of nature" (Julia Wright 2021, Haider and van Oudenhoven 2018), and exploring further the multiple facets of intersectionality and the notion of identity and its malleability (Hill Collins and Bilge 2020). Methodologically, it would be worth adopting and adapting the RFSF to new settings to see how it could be populated and which messages it would highlight. Although the dissemination of research outputs is ongoing, mainly with the participatory videos available online for streaming, future collaborations are envisioned with the Ndiémane Research Team and its wider community to reflect on the research's learnings and on recommendations worth disseminating broadly for the direct benefit of peasant knowledge-sharing but also to raise awareness in policy and scientific research arenas.

No research is neutral, each actor involved in the process has specific interests and goals. There is need to understand people's embodied and embedded knowledge and experience (Madhavan and Grover 1998) to better comprehend their contribution and limitations. There is also need for activist scholarship that does not dispense with high quality scientific research but does so with transparency regarding one's agenda and funding. There is often criticism that if research is too sympathetic of its subject and subjects then it loses its quality, scientificity, and thus relevance. I argue that empathy and trust are essential elements to engage with the actors involved in the research – especially when conducting PAR – and that this can be achieved in an open and transparent way that informs of the activist scholar's willingness to understand the world and make it more sustainable.

By adopting a participatory and intersectional approach, and socio-ecological resilience as a conceptual framework, this research has revealed perspectives on resilience that connect body and soul, everyday actions and spirituality.

9. References

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10. Appendices

10.1. Code of Ethics of the Action Research Team of Ndiémane

This code of ethics is based on: International Society of Ethnobiology (2006). ISE Code of Ethics (with 2008 additions). Online: <http://ethnobiology.net/code-of-ethics/>

10.1.1. Executive Summary

The Code of Ethics of the Action Research Team of Ndiémane reflects the vision of the team and provides a framework for decision-making and conduct for ethnobiological action research and related activities. The goals are to facilitate ethical conduct and equitable relationships, and foster a commitment to meaningful collaboration and reciprocal responsibility by all parties. The Code of Ethics is a living document that will adapt over time to meet changing understandings and circumstances. All Members of the Action Research Team of Ndiémane are bound in good faith to abide by the Code of Ethics as a condition of membership.

The Code of Ethics is comprised a Preamble, Purpose, 17 Principles, 12 Practical Guidelines and a Glossary of Terms. The Principles include:

- Prior Rights and Responsibilities
- Self-Determination
- Inalienability
- Traditional Guardianship
- Active Participation
- Full Disclosure
- Educated Prior Informed Consent
- Confidentiality
- Respect
- Active Protection
- Precaution
- Reciprocity, Mutual Benefit and Equitable Sharing
- Supporting Indigenous Research
- The Dynamic Interactive Cycle
- Remedial Action
- Acknowledgement and Due Credit
- Diligence

The fundamental value underlying the Code of Ethics is the concept of mindfulness – a continual willingness to evaluate one's own understandings, actions, and responsibilities to others. The Code of Ethics acknowledges that biological and cultural harms have resulted from research undertaken without the consent of Indigenous peoples. It affirms the commitment of the Action Research Team of Ndiémane to work collaboratively, in ways that: support community-driven development of Indigenous peoples' cultures and languages; acknowledge Indigenous cultural and intellectual property rights; protect the inextricable linkage between cultural, linguistic and biological diversity; and contribute to positive, beneficial and harmonious relationships in the field of ethnobiology.

The Code of Ethics applies to all research, collections, databases, publications, images, audio or video recordings, or other products of research and related activities undertaken, especially that which concerns collation and use of traditional knowledge or collections of flora, fauna, or other elements of biocultural heritage found on community lands or territories.

The Principles and Practical Guidelines are based on the concept of traditional resource rights. They facilitate compliance with the standards set by national and international law and policy and customary practice. They recognize traditional and customary laws, protocols, and methodologies extant within the communities where collaborative research is proposed. They are intended to support and enable but not over-ride community-level processes and decision-making structures, recognizing that Indigenous, traditional or local

peoples conducting research within their own communities, for their own uses, may need to comply with their own cultural protocols and practices. In the event of inconsistency between such local requirements and the Action Research Team of Ndiémane Code of Ethics, all parties involved are encouraged to work collaboratively to develop appropriate practices.

10.1.2. Action Research Team of Ndiémane Code of Ethics

This Code of Ethics was adopted by the Action Research Team of Ndiémane during the team meeting held at Ndiémane the 19th and 25th of February 2017. The Code of Ethics of the Action Research Team of Ndiémane provides a framework for decision-making and conduct for ethnobiological research and related activities. This Code of Ethics is based on the Code of Ethics of the International Society of Ethnobiology (ISE), which has its origins in the Declaration of Belém agreed upon in 1988 at the Founding of the International Society of Ethnobiology (in Belém, Brazil). It has been developed over the course of more than a decade and is the culmination of a series of consensus-based fora and discussion processes involving the ISE Membership.

The Code of Ethics is comprised of five parts: (i) Preamble, (ii) Purpose, (ii) Principles, (iv) Practical Guidelines, and (iv) Glossary of Terms.

The Code of Ethics reflects the vision of the Action Research Team of Ndiémane as stated in Article 2.0 of the ISE Constitution:

The ISE is committed to achieving a greater understanding of the complex relationships, both past and present that exist within and between human societies and their environments. The Society endeavors to promote a harmonious existence between humankind and the Bios for the benefit of future generations. Ethnobiologists recognize that Indigenous peoples, traditional societies, and local communities are critical to the conservation of biological, cultural and linguistic diversity.

All Members of the Action Research Team of Ndiémane are bound in good faith to abide by the Code of Ethics as a condition of membership.

10.1.3. Preamble

The concept of ‘mindfulness’ is an important value embedded in this Code, which invokes an obligation to be fully aware of one’s knowing and unknowing, doing and undoing, action and inaction. It is acknowledged that much research has been undertaken in the past without the sanction or prior informed consent of Indigenous peoples, traditional societies and local communities and that such research has caused harm and adversely impacted their rights and responsibilities related to biocultural heritage

The Action Research Team of Ndiémane is committed to working in genuine partnership and collaboration with Indigenous peoples, traditional societies and local communities to avoid perpetuating these past injustices and build towards developing positive, beneficial and harmonious relationships in the field of ethnobiology.

See Glossary of Terms for a definition of biocultural heritage.

The Action Research Team of Ndiémane recognises that culture and language are intrinsically connected to land and territory, and cultural and linguistic diversity are inextricably linked to biological diversity. Therefore, the Action Research Team of Ndiémane recognizes the responsibilities and rights of Indigenous, traditional and local peoples to the preservation and continued development of their cultures and languages and to the control of their lands, territories and traditional resources as key to the perpetuation of all forms of diversity on Earth.

10.1.4. Purpose

The Purpose of this Code of Ethics is to facilitate establishing ethical and equitable relationships:

- i. to optimise the positive outcomes and reduce as much as possible the adverse effects of research (in all its forms, including applied research and development work) and related activities of ethnobiologists that can disrupt or disenfranchise Indigenous peoples, traditional societies and local communities from their customary and chosen lifestyles; and
- ii. to provide a set of principles and practices to govern the conduct of all Members of the Action Research Team of Ndiémame who are involved in or proposing to be involved in research in all its forms, especially that concerning collation and use of traditional knowledge or collections of flora, fauna, or any other element of biocultural heritage found on community lands or territories.

The Action Research Team of Ndiémame recognises, supports and prioritises the efforts of Indigenous peoples, traditional societies and local communities to undertake and own their research, collections, images, recordings, databases and publications. This Code of Ethics is intended to enfranchise Indigenous peoples, traditional societies and local communities conducting research within their own society, for their own use.

This Code of Ethics also serves to guide ethnobiologists and other researchers, business leaders, policy makers, governments, non-government organisations, academic institutions, funding agencies and others seeking meaningful partnerships with Indigenous peoples, traditional societies and local communities and thus to avoid the perpetuation of past injustices to these peoples. The Action Research Team of Ndiémame recognises that, for such partnerships to succeed, all relevant research activities (i.e., planning, implementation, analysis, reporting, and application of results) must be collaborative. Consideration must be given to the needs of all humanity, and to the maintenance of robust scientific standards, whilst recognizing and respecting the cultural integrity of Indigenous peoples, traditional societies and local communities.

A commitment to meaningful collaboration and reciprocal responsibility by all parties is needed to achieve the purpose of this Code of Ethics and the objectives of the Action Research Team of Ndiémame.

This Code of Ethics recognizes and honors traditional and customary laws, protocols, and methodologies extant within the communities where collaborative research is proposed. It should support and enable but not over-ride such community-level processes and decision-making structures. It should facilitate the development of community-centered, mutually-negotiated research agreements that serve to strengthen community goals.

10.1.5. Principles

The Principles of this Code embrace, support, and embody the concept and implementation of traditional resource rights as articulated in established principles and practices of international instruments and declarations including, but not limited to, those documents referred to in Appendix 2 of the ISE Constitution. The Principles also facilitate compliance with the standards set by national and international law and policy and customary practice. The following Principles are the fundamental assumptions that form this Code of Ethics.

10.1.5.1. Principle of Prior Rights and Responsibilities

This principle recognises that Indigenous peoples, traditional societies, and local communities have prior, proprietary rights over, interests in and cultural responsibilities for all air, land, and waterways, and the natural resources within them that these peoples have traditionally inhabited or used, together with all knowledge, intellectual property and traditional resource rights associated with such resources and their use.

10.1.5.2. Principle of Self-Determination

This principle recognises that Indigenous peoples, traditional societies and local communities have a right to self-determination (or local determination for traditional and local communities) and that researchers and associated organisations will acknowledge and respect such rights in their dealings with these peoples and their communities.

10.1.5.3. Principle of Inalienability

This principle recognises the inalienable rights of Indigenous peoples, traditional societies and local communities in relation to their traditional territories and the natural resources (including biological and genetic resources) within them and associated traditional knowledge. These rights are collective by nature but can include individual rights. It shall be for Indigenous peoples, traditional societies and local communities to determine for themselves the nature, scope and alienability of their respective resource rights regimes.

10.1.5.4. Principle of Traditional Guardianship

This principle recognises the holistic interconnectedness of humanity with the ecosystems of our Sacred Earth and the obligation and responsibility of Indigenous peoples, traditional societies and local communities to preserve and maintain their role as traditional guardians of these ecosystems through the maintenance of their cultures, identities, languages, mythologies, spiritual beliefs and customary laws and practices, according to the right of self-determination.

See Glossary of Terms for a definition of traditional resources rights.

10.1.5.5. Principle of Active Participation

This principle recognises the crucial importance of Indigenous peoples, traditional societies and local communities to actively participate in all phases of research and related activities from inception to completion, as well as in application of research results. Active participation includes collaboration on research design to address local needs and priorities, and prior review of results before publication or dissemination to ensure accuracy of information and adherence to the standards represented by this Code of Ethics.

10.1.5.6. Principle of Full Disclosure

This principle recognises that Indigenous peoples, traditional societies and local communities are entitled to be fully informed about the nature, scope and ultimate purpose of the proposed research (including objective, methodology, data collection, and the dissemination and application of results). This information is to be given in forms that are understood and useful at a local level and in a manner that takes into consideration the body of knowledge, cultural preferences and modes of transmission of these peoples and communities.

10.1.5.7. Principle of Educated Prior Informed Consent

Educated prior informed consent must be established before any research is undertaken, at individual and collective levels, as determined by community governance structures. Prior informed consent is recognised as an ongoing process that is based on relationship and maintained throughout all phases of research. This principle recognises that prior informed consent requires an educative process that employs bilingual and intercultural education methods and tools, as appropriate, to ensure understanding by all parties involved.

Establishing prior informed consent also presumes that all directly affected communities will be provided complete information in an understandable form regarding the purpose and nature of the proposed programme, project, study or activities, the probable results and implications, including all reasonably foreseeable benefits and risks of harm (be they tangible or intangible) to the affected communities. Indigenous peoples, traditional societies and local communities have the right to make decisions on any programme, project, study or activities that directly affect them. In cases where the intentions of proposed research or related activities are not consistent with the interests of these peoples, societies or communities, they have a right to say no.

10.1.5.8. Principle of Confidentiality

This principle recognises that Indigenous peoples, traditional societies and local communities, at their sole discretion, have the right to exclude from publication and/or to have kept confidential any information concerning their culture, identity, language, traditions, mythologies, spiritual beliefs or genomics. Parties to the research have a responsibility to be aware of and comply with local systems for management of knowledge and local innovation, especially as related to sacred and secret knowledge.

Furthermore, such confidentiality shall be guaranteed by researchers and other potential users. Indigenous peoples, traditional societies and local communities also have the rights to privacy and anonymity, at their discretion.

10.1.5.9. Principle of Respect

This principle recognises the necessity for researchers to respect the integrity, morality and spirituality of the culture, traditions and relationships of Indigenous peoples, traditional societies, and local communities with their worlds.

10.1.5.10. Principle of Active Protection

This principle recognises the importance of researchers taking active measures to protect and to enhance the relationships of Indigenous peoples, traditional societies and local communities with their environment and thereby promote the maintenance of cultural and biological diversity.

10.1.5.11. Principle of Precaution

This principle acknowledges the complexity of interactions between cultural and biological communities, and thus the inherent uncertainty of effects due to ethnobiological and other research. The precautionary principle advocates taking proactive, anticipatory action to identify and to prevent biological or cultural harms resulting from research activities or outcomes, even if cause-and-effect relationships have not yet been scientifically proven. The prediction and assessment of such biological and cultural harms must include local criteria and indicators, thus must fully involve indigenous peoples, traditional societies, and local communities. This also includes a responsibility to avoid the imposition of external or foreign conceptions and standards.

10.1.5.12. Principle of Reciprocity, Mutual Benefit and Equitable Sharing

This principle recognises that Indigenous peoples, traditional societies, and local communities are entitled to share in and benefit from tangible and intangible processes, results and outcomes that accrue directly or indirectly and over the shorter and longer term for ethnobiological research and related activities that involve

their knowledge and resources. Mutual benefit and equitable sharing will occur in ways that are culturally appropriate and consistent with the wishes of the community involved.

10.1.5.13. Principle of Supporting Indigenous Research

This principle recognizes and supports the efforts of Indigenous peoples, traditional societies, and local communities in undertaking their own research based on their own epistemologies and methodologies, in creating their own knowledge-sharing mechanisms, and in utilising their own collections and databases in accordance with their self-defined needs. Capacity-building, training exchanges and technology transfer for communities and local institutions to enable these activities should be included in research, development and co-management activities to the greatest extent possible.

10.1.5.14. Principle of The Dynamic Interactive Cycle

This principle recognises that research and related activities should not be initiated unless there is reasonable assurance that all stages can be completed from (a) preparation and evaluation, to (b) full implementation, to (c) evaluation, dissemination and return of results to the communities in comprehensible and locally appropriate forms, to (d) training and education as an integral part of the project, including practical application of results. Thus, all projects must be seen as cycles of continuous and on-going communication and interaction.

10.1.5.15. Principle of Remedial Action

This principle recognises that every effort will be made to avoid any adverse consequences to Indigenous peoples, traditional societies, and local communities from research and related activities and outcomes. Notwithstanding the application of standards set out by this Code of Ethics, should any such adverse consequence occur, discussion will be had with the local peoples or community concerned to decide on what remedial action may be necessary to redress or mitigate adverse consequences. Any such remedial action may include restitution, where appropriate and agreed.

10.1.5.16. Principle of Acknowledgement and Due Credit

This principle recognises that Indigenous peoples, traditional societies and local communities must be acknowledged in accordance with their preference and given due credit in all agreed publications and other forms of dissemination for their tangible and intangible contributions to research activities. Co-authorship should be considered when appropriate. Acknowledgement and due credit to Indigenous peoples, traditional societies and local communities extend equally to secondary or downstream uses and applications and researchers will act in good faith to ensure the connections to original sources of knowledge and resources are maintained in the public record.

10.1.5.17. Principle of Diligence

This principle recognises that researchers are expected to have a working understanding of the local context prior to entering into research relationships with a community. This understanding includes knowledge of and willingness to comply with local governance systems, cultural laws and protocols, social customs and etiquette. Researchers are expected to conduct research in the local language to the degree possible, which may involve language fluency or employment of interpreters.

10.1.6. Practical Guidelines

The following guidelines are intended as a practical application of the preceding Principles. Recognising that this Code of Ethics is a living document that needs to adapt over time to meet changing understandings and circumstances, if guidelines have not yet been articulated for a given situation, the Principles should be used as the reference point for developing appropriate practices.

Similarly, it is recognized that Indigenous, traditional or local peoples conducting research within their own communities, for their own uses, may need to comply with their own cultural protocols and practices. In the event of inconsistency between such local requirements and these guidelines, all parties involved will commit to work collaboratively to develop appropriate practices.

The Practical Guidelines apply to any and all research, collections, databases, publications, images, audio or video recordings, or other products of research and related activities undertaken.

- 1) Prior to undertaking any research activities, a good understanding of the local community institution(s) with relevant authority and their interest in the research to be undertaken, as well as knowledge of cultural protocols of the community shall be developed. A thorough effort shall be made in good faith to enhance such understandings through ongoing communication and active participation throughout the duration of the research process.
- 2) Educated prior informed consent must be established prior to undertaking any research activities. Such consent is ideally represented in writing and/or tape recording, uses language and format that are clearly understood by all parties to the research, and is developed with the persons or deliberating bodies identified as the most representative authorities from each potentially affected community.
- 3) As a component of educated prior informed consent, there will be full disclosure to potentially affected communities and mechanisms to ensure mutual understanding of the following, based on the reasonably foreseeable effects:
 - a. The full range of potential benefits (tangible and intangible) to the communities, researchers and any other parties involved;
 - b. The extent of reasonably foreseeable harms (tangible and intangible) to such communities;
 - c. All relevant affiliations of the individual(s) or organization(s) seeking to undertake the activities, including where appropriate the contact information of institutional research ethics boards and copies of ethics board approvals for research;
 - d. All sponsors of the individual(s) or organization(s) involved in the undertaking of the activities.
 - e. Any intent to commercialise outcomes of the activities, or foreseeable commercial potential that may be of interest to the parties involved in the project, and/or to third parties who may access project outcomes directly (e.g., by contacting researchers or communities) or indirectly (e.g., through the published literature).
- 4) Prior to undertaking research activities, the following must be ensured by research proponents:
 - a. Full communication and consultation has been undertaken with potentially affected communities to develop the terms of the research in a way that complies with the Principles.
 - b. Approval is granted in the manner defined by the local governance system of each affected community.
 - c. Permissions and approvals have been granted from government as well as other local and national authorities, as required by local, national or international law and policy.
- 5) All persons and organizations undertaking research activities shall do so throughout in good faith, acting in accordance with, and with due respect for, the cultural norms and dignity of all potentially affected communities, and with a commitment that collecting specimens and information, whether of a zoological, botanical, mineral or cultural nature, and compiling data or publishing information thereon, means doing so only in the holistic context, respectful of norms and belief systems of the relevant communities. This includes supporting or creating provenance mechanisms to ensure collections are clearly traceable to their origins for purposes of due credit and acknowledgement, establishing “prior art” in the event of future ownership claims, and facilitating a re consent process to develop new mutually agreed terms for further

use or applications of collections or derivatives of collections. Researchers are encouraged to register collected information in local databases and registries where they exist, and explore mechanisms such as community certificates of origin linked to databases. Researchers are encouraged to support and build capacity for community-based data management systems to the extent possible. Any intellectual property ownership claim or application related to the knowledge or associated resources from the collaboration research should not work against the cultural integrity or livelihood of communities involved.

- 6) Mutually-agreed terms and conditions of the research shall be set out in an agreement that uses language and format clearly understandable to all parties. The agreement will address and adhere to the following standards:
 - a. Will be represented in writing and/or tape recording if permitted by the community, using local language whenever possible. If writing or tape-recording are culturally prohibited, the parties shall work in collaboration to find an acceptable alternative form of documenting the terms of the agreement.
 - b) Will be made with each potentially affected community after full disclosure, consultation, and establishment of educated prior informed consent regarding mutual benefit and equitable sharing, compensation, remedial action and any other issues arising between parties to the research.
 - c) Will address the elements outlined in (6b) above as related to all foreseeable uses and property ownership issues of the research outcomes, including derivative forms they may take such as biological and other samples, photos, films, videotapes, audiotapes, public broadcasts, translations, communications through the electronic media, including the internet. This includes clear agreement on rights and conditions related to who holds, maintains, uses, controls, owns, and has rights to the research processes, data, and outcomes (direct and indirect).
 - d) Will specify attribution, credit, authorship, co-authorship, and due acknowledgement for all contributors to the research processes and outcomes, recognizing and valuing academic as well as cultural and local expertises;
 - e) Will specify how and in what forms the resulting information and outcomes shall be shared with each affected community, and ensure that access and forms are appropriate and acceptable to that community. Community data and information management systems, such as local registries and databases, shall be supported to the greatest extent possible.
 - f) Will represent what understandings have been reached regarding what is potentially sacred, secret or confidential and how such will be treated and communicated, if at all, within and beyond the direct parties to the research.
- 7) Objectives, conditions and mutually-agreed terms should be totally revealed and agreed to by all parties prior to the initiation of research activities. It is recognised that collaborative research, by design, may be iterative, emergent and require modifications or adaptations. When such is the case, these changes shall be brought to the attention of and agreed to by all parties to the research.
- 8) All members of the Action Research Team of Ndiémame or affiliated organizations shall respect and comply with moratoriums by communities and countries on collection of information or materials that they would otherwise intend to include in their research, unless such moratorium is lifted to allow the research.
- 9) All educational uses of research materials shall be consistent with a good faith respect for the cultural integrity of all affected communities, and, as much as practical, developed in collaboration with such communities for mutual use.
- 10) All existing project materials in the possession, custody or control of an Action Research Team of Ndiémame member or affiliated organization shall be treated in a manner consistent with this Code of Ethics. All affected communities shall be notified, to the extent possible, of the existence of such materials, and their right to equitable sharing, compensation, remedial action, ownership, repatriation or other entitlements, as appropriate. Prior informed consent shall not be presumed for uses of biocultural information in the “public domain” and diligence shall be used to ensure that provenance or original source(s) of the knowledge and associated resources are included and traceable, to the degree possible, in further publications, uses and other means of dissemination.

- 11) If during the cycle of a project it is determined that the practices of any parties to the research are harmful to components of an ecosystem, it shall be incumbent upon the parties to first bring such practices and the impacts thereof to the notice of the offenders and attempt to establish a mutually agreed conflict resolution process, prior to informing the local community and/or government authorities of such practices and impacts.
- 12) The Action Research Team of Ndiémame's members shall in good faith endeavour to consider and ensure that project proposals, planning, and budgets are appropriate to collaborative interdisciplinary and cross cultural research that complies with the Action Research Team of Ndiémame Code of Ethics. This may require prior consideration of elements such as: extended timeframes to enable permissions, development of mutually agreed terms and ongoing communication; additional budget categories; research ethics and intellectual property ownership considerations that are in addition to or even inconsistent with policies of sponsoring institutions; additional reporting requirements and sharing of outcomes; and mechanisms and forms of communication with parties to the research activities, including the potential need for language fluency and translation. The Action Research Team of Ndiémame members shall also endeavour to raise awareness among funding bodies, academic institutions and others about the increased time and costs that may be involved in adhering to this Code of Ethics.

10.1.7. Glossary of Terms

“Biocultural heritage” is the cultural heritage (both the tangible and intangible including customary law, folklore, spiritual values, knowledge, innovations and practices) and biological heritage (diversity of genes, varieties, species and ecosystem provisioning, regulating, and cultural services) of Indigenous peoples, traditional societies and local communities, which often are inextricably linked through the interaction between peoples and nature over time and shaped by their socio-ecological and economic context. This heritage includes the landscape as the spatial dimension in which the evolution of Indigenous biocultural heritage takes place. This heritage is passed on from generation to generation, developed, owned and administered collectively by stakeholder communities according to customary law.

“Community certificate of origin” is a community generated attestation to the origin of information or material.

“Intellectual property” is a legal term for a creation of the intellect that has potential commercial value, and may have a right to protection under law relating to copyright, patent, trademark or trade secret (e.g., inventions, technological know-how, literary and artistic works, symbols, names, images, and designs)

“Prior art” is a term used in patent law that refers to pre existing knowledge. Establishing prior art can impact the validity of a patent claim by negating novelty and obviousness requirements.

“Provenance” is the place of origin, including history of ownership.

“Public domain” is intellectual property that is not protected by copyright, patent or other restrictions on use and is subject to appropriation by anyone.

“Traditional resources rights” is defined in “Beyond Intellectual Property Rights: Toward Traditional Resource Rights For Indigenous Peoples and Local Communities” by Posey and Dutfield (1996:3) as follows: the term ‘traditional’ refers to the cherished practices, beliefs, customs, knowledge and cultural heritage of indigenous and local communities who live in close association with the Earth; ‘resource’ is used in its broadest sense to mean all knowledge and technology, aesthetic and spiritual qualities, tangible and intangible sources that together, are deemed by local communities to be necessary to ensure healthy and fulfilling lifestyles for present and future generations; and ‘rights’ refers to the basic inalienable guarantee to all human beings and the collective entities in which they choose to participate of the necessities to achieve and maintain the dignity and well-being of themselves, their predecessors, and their descendants.

10.2. Coventry University Ethics Documentation

10.2.1. Certificate of Ethical Approval for Research



Certificate of Ethical Approval

Applicant:

Carla Kay

Project Title:

Smallholder adaptation to climate change in West Africa: Pathways to social and environmental resilience

This is to certify that the above named applicant has completed the Coventry University Ethical Approval process and their project has been confirmed and approved as Low Risk

Date of approval:

18 March 2016

Project Reference Number:

P42307

10.2.2. Certificate of Ethical Approval for Exploratory Fieldwork (February 2017)



Certificate of Ethical Approval

Applicant:

Carla Kay

Project Title:

Exploratory Fieldwork in Senegal

This is to certify that the above named applicant has completed the Coventry University Ethical Approval process and their project has been confirmed and approved as Medium Risk

Date of approval:

08 April 2017

Project Reference Number:

P51125

10.2.3. Certificate of Ethical Approval for Fieldwork 1 (May-July 2017)



Certificate of Ethical Approval

Applicant:

Carla Kay

Project Title:

Fieldwork in Senegal #1

This is to certify that the above named applicant has completed the Coventry University Ethical Approval process and their project has been confirmed and approved as Medium Risk

Date of approval:

26 April 2017

Project Reference Number:

P52553

10.2.4. Certificate of Ethical Approval for Fieldwork 2 (June 2019)



Certificate of Ethical Approval

Applicant:

Carla Kay

Project Title:

Smallholder adaptation to climate change in Senegal, West Africa: pathways to social and ecological resilience

This is to certify that the above named applicant has completed the Coventry University Ethical Approval process and their project has been confirmed and approved as Medium Risk

Date of approval:

18 May 2019

Project Reference Number:

P90399

10.2.5. Certificate of Ethical Approval for Fieldwork 3 (October 2019)



Certificate of Ethical Approval

Applicant:

Carla Kay

Project Title:

Smallholder adaptation to climate change: pathways to social and ecological
resilience

This is to certify that the above named applicant has completed the Coventry University Ethical Approval process and their project has been confirmed and approved as Medium Risk

Date of approval:

11 November 2019

Project Reference Number:

P94045

10.2.6. Certificate of Ethical Approval for Fieldwork 4 (March 2020)



Certificate of Ethical Approval

Applicant:

Carla Kay

Project Title:

Smallholder adaptation to climate change in West Africa: Pathways to social and environmental resilience

This is to certify that the above named applicant has completed the Coventry University Ethical Approval process and their project has been confirmed and approved as Medium Risk

Date of approval:

19 February 2020

Project Reference Number:

P100339

10.2.7. Fieldwork Risk Assessment



STUDENT RESEARCH PROJECT RISK ASSESSMENT

Person(s) undertaking project:	Carla Sarrouy Kay
Project supervisor:	Michel Pimbert

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10.2.8. Research Leaflet

Partners:

About the research:

We are researching agroecological training in Senegal, using the village of Ndiémame as an example of food system resilience.

This project involves the Ndiémame peasant group, the villagers of Ndiémame, the Centre AFAFA and Carla Sarrouy Kay, a PhD student from the UK. Together we are analysing what makes Ndiémame a village with strong social networks and a prosperous and sustainable agricultural environment.

The main goals of the research are:

- To analyse how the Ndiémame oases were started and how they have evolved in the past decades
- To understand which agroecological practices are being used in Ndiémame
- To explore which agroecological knowledge is valued and how it is shared among peasants
- To assess how these practices are affecting the food system resilience of the village



Centre Aide aux Forces vives Africaines par la Formation à l'Agroécologie, Senegal



ASPSP

Association Sénégalaise des Producteurs de Semences Paysannes (ASPSP), Senegal



Centre for Agroecology, Water and Resilience
Coventry University, United Kingdom



Participatory Research in Ndiémame



Participatory Research in Ndiémame

Why have you been approached?

You have been invited to complete this questionnaire because we would like to learn how households in the village of Ndiémame are organised.

Do you have to take part?

No, taking part in the research is entirely voluntary. If you do decide to take part you are still free to change your mind at any time and without giving a reason. You don't have to answer all the questions if you don't want to.

What do you have to do?

Just answer the questions which our researchers will put to you – they are mainly about your household characteristics and your agricultural practices.

What are the risks associated with the project?

There are no risks – the information you give will remain anonymous.



What are the benefits of taking part?

By taking part, you will help the project and the members of the Ndiémame peasant group to better understand the social characteristics of the group and the way agricultural plots are being managed.

Data protection and confidentiality:

The information you provide will be kept securely in a locked cabinet and/or in a password protected computer system. Your name will not be attributable to the information you provide.

What if things go wrong?

If you have any concerns, please speak to a member of the research team. However, if you are still not satisfied regarding your concerns you can contact: Professor Moya Kneafsey, Coventry University, Coventry, CV1 5FB, U.K. Tel. +44 2477 651 608.

What will happen to the results of this work?

The data you provide will be jointly analysed by the research team and will contribute to the analysis of food system resilience in Ndiémame. The results will be presented to the village of Ndiémame. Information will be shared more widely (regionally or internationally) only with the participants prior consent. The information may be included in project reports and also in academic journal articles. A summary of the information may also appear on the project website and in other material.



Who has reviewed this study?

The Ndiémame peasant group, the Centre AFAFA and the ASPSP. Coventry University Ethics panel has authorized the research team to proceed with this study.

Should you require any further information about this research please contact:

Carla Sarrouy Kay
07 68 62 37 90 | carla.kay@coventry.ac.uk
Youssou Sarr
07 72 25 49 76 | youssou17@hotmail.fr

10.2.9. Consent Form

Participatory Research in Ndiémane

Consent Form

Please indicate whether you agree with the following statements, either with a tick or by verbal agreement to the researcher:

- I have been given the Participant Information leaflet.
- I am aged 18 or over and agree for you to use the data I provide in this interview or focus group discussion.
- I understand that the data I provide will be reported in anonymous form.
- I understand that my participation is completely voluntary, and I can ask any questions about the project at any stage.
- I give full permission to the use of my video images/photographs/audio recordings.

Name:

Signature:

Researcher Name:

Researcher Signature:

Date:

10.3. List of the Activities Conducted During the Research

Table 5. Detailed list of the activities undertaken during the research project (source: author)

Date	Method	Town	Location	Goal/Topic	Young Women	Young Men	Old Women	Old Men
17/02/2017	Meeting	Ndiémane	Centre AFAFA	First meeting, water concerns	0	1	4	4
17/02/2017	Meeting	Dioral	UCT	First meeting, building trad. granary, discuss project Dioral	4	2	4	6
18/02/2017	Meeting	Thiès	Hotel Massa Massa	Work process, transparency, participatory, supervision, ethics	0	0	0	2
18/02/2017	Film projection	Thiès	ASPSP offices	Reverdir le Sahel, ASPSP's philosophy	0	0	0	4
20/02/2017	Meeting	Dioral	UCT	UCT budget	2	2	0	6
21/02/2017	Meeting	Saly	Youssou Sarr's house	PhD equipment, structure, funding, polygamy	0	0	0	1
24/02/2017	Meeting	Dioral	UCT	Discussion about preparation of peasant fair	1	2	0	7
25/02/2017	Meeting	Ndiémane	Fatou Thiaw's house	PhD project, PV	0	0	3	1
26/02/2017	Field visit	Saly	Horticulture fields	Squatted fields around water sewage facilities.	0	1	0	3
27/02/2017	Interview	Saly	Youssou Sarr's house	Life history, agroecology in Senegal, Bay Ndundé.	0	0	0	1
02/05/2017	Meeting	Saly	Youssou Sarr's house	Fieldwork planning, accommodation, travels	0	0	0	1
07/05/2017	Field visit	Guédé Chantier	Timtimol's field	Field visit	3	0	6	2
09/05/2017	Field visit	Ndiémane	Mamadou Ndour's field	Visit, natural pesticides	0	2	0	0
09/05/2017	PV	Ndiémane	Mamadou Ndour's field	Participatory Video filming	0	2	0	0
09/05/2017	Film projection	Ndiémane	Centre AFAFA	Footage projection	1	2	1	1
09/05/2017	Meeting	Ndiémane	Fatou Thiaw's house	Koungheul Fair participants	0	2	5	1
09/05/2017	FGDW	Ndiémane	Centre AFAFA	Marriage and Seereer traditions	1	2	0	0
11/05/2017	Peasant Fair	Koungheul	Thiakho	Thiakho Seed Fair	4	4	3	6
12/05/2017	PV training	Koungheul	Thiakho	PV training to film Thiakho Seed Fair.	4	4	3	6
12/05/2017	Peasant Fair	Koungheul	Thiakho	Thiakho Seed Fair	4	4	3	6
12/05/2017	PV	Koungheul	Thiakho	Participatory Video filming	4	4	3	6
12/05/2017	Film projection	Koungheul	Thiakho	Film projection from PV training for Thiakho fair	5	5	4	7
12/05/2017	FGDW	Koungheul	Thiakho	Religion and the role of women in religion	0	1	0	1
13/05/2017	Meeting	Kaolack	Caritas	Discuss PhD, accommodation in Ndiémane, problems with AFAFA.	0	0	0	2
14/05/2017	Seminar	Kaolack	Caritas	Caritas Seminar on Food Sovereignty and Peasant Seeds	4	4	3	6
14/05/2017	PV	Kaolack	Caritas	Participatory Video filming	4	4	3	6
15/05/2017	Meeting	Saly	Youssou Sarr's house	Project and logistics, references, translations, wealth, polygamy	0	0	0	1
16/05/2017	WP training	Thiès	ASPSP offices	WordPress training	1	1	0	2
19/05/2017	Field visit	Ndiémane	Michel Diouf's field	Field visit	0	0	0	2
19/05/2017	Field visit	Ndiémane	Mamadou Ndour's field	Field visit	0	1	0	1
19/05/2017	Field visit	Ndiémane	Blaise Diouf's field	Field visit	0	1	0	1
22/05/2017	WP training	Thiès	ASPSP offices	WordPress training	1	1	0	3

06/06/2017	Meeting	Ndiémane	Centre AFAFA	Participatory Video training planning	0	1	4	3
07/06/2017	PV training	Ndiémane	Centre AFAFA	Participatory Video training.	4	2	5	1
08/06/2017	PV training	Ndiémane	Centre AFAFA	Participatory Video training.	4	2	5	0
09/06/2017	PV training	Ndiémane	Centre AFAFA	Participatory Video training.	4	3	5	1
09/06/2017	Meeting	Ndiémane	Centre AFAFA	Discuss PV equipment use and ownership.	0	1	4	1
09/06/2017	Film projection	Ndiémane	Fatou Thiaw's house	Film projection from PV training.	0	1	1	1
09/06/2017	Film projection	Ndiémane	Daouda Ndour's house	Film projection from PV training.	5	5	10	6
09/06/2017	FGDW	Ndiémane	Centre AFAFA	Marriage, polygamy, youth	0	1	0	0
15/06/2017	PV training	Diouroup	UCT	Participatory Video training.	2	2	2	1
16/06/2017	PV training	Diouroup	UCT	Participatory Video training.	2	2	2	1
17/06/2017	PV training	Diouroup	UCT	Participatory Video training.	2	2	2	1
17/06/2017	Film projection	Diouroup	UCT	Film projection from PV training.	2	2	2	1
20/06/2017	PV training	Lissar	UGPM	Participatory Video training.	28	0	15	1
21/06/2017	PV training	Lissar	UGPM	Participatory Video training.	28	0	15	1
22/06/2017	PV training	Lissar	UGPM	Participatory Video training.	28	0	15	1
22/06/2017	Film projection	Lissar	UGPM	Film projection from PV training.	30	10	20	8
02/07/2017	PV training	Guédé Chantier	Demba Ba	Participatory Video training.	6	3	2	0
03/07/2017	PV training	Guédé Chantier	Demba Ba	Participatory Video training.	6	3	2	0
04/07/2017	PV training	Guédé Chantier	Demba Ba	Participatory Video training.	6	3	2	0
04/07/2017	Film projection	Guédé Chantier	Timtimol's president's house	Film projection from PV training.	10	10	15	10
10/07/2017	Field visit	Ndiémane	Mamadou Ndour's field	Sowing aubergines.	0	2	0	1
10/07/2017	Meeting	Ndiémane	Centre AFAFA	Discuss arrangements in the field.	0	1	5	1
10/07/2017	Field visit	Ndiémane	Groupe Mbogayife's field	Visit field, children sowing maize.	1	3	1	1
14/07/2017	Film projection	Ndiémane	Rokhie Ndiaye's house	Film projection from PV training.	6	6	10	6
16/07/2017	Interview	Saly	Car	Young life as a fisherman.	0	1	0	0
11/06/2019	Meeting	Saly	Youssou Sarr's house	Creation of AFAFA, village chief, neighbourhoods.	0	0	0	1
12/06/2019	Meeting	Ndiémane	Fatou Thiaw's house	Touch base after 2 years, Agridape article, water, village history	0	1	8	2
13/06/2019	FGDW	Ndiémane	Fatou Thiaw's house	Village history, food crises	0	0	8	1
14/06/2019	Interview	Ndiémane	Fatou Thiaw's house	Village history	0	0	0	1
14/06/2019	VIPP	Ndiémane	Fatou Thiaw's house	Google Maps	0	0	5	2
14/06/2019	FGDW	Ndiémane	Fatou Thiaw's house	Village history, road, mobile phones, TV, electricity, Islam	0	0	5	2
15/06/2019	Field visit	Ndiémane	Groupe Mbogayife's field	Field visit	1	1	0	0
15/06/2019	Field visit	Ndiémane	Mamadou Ndour's field	Field visit	0	1	0	0
15/06/2019	Field visit	Ndiémane	Gabriel Wali Diouf's field	Field visit	0	1	0	0
16/06/2019	Interview	Saly	Youssou Sarr's house	Centre AFAFA history.	0	0	0	1
17/06/2019	WP training	Thiès	ASPSP offices	WordPress training	0	0	0	3
17/06/2019	Interview	Thiès	ASPSP offices	Centre AFAFA, Djimini Fair.	0	0	0	1
18/06/2019	VIPP	Ndiémane	Fatou Thiaw's house	Daily and seasonal activities.	0	0	6	2

18/06/2019	FGDW	Ndiémane	Fatou Thiaw's house	Meaning of Groupe Mbogayife	0	0	6	2
19/06/2019	FGDW	Ndiémane	Fatou Thiaw's house	Village history, land grabbing, GM logo	0	0	6	2
19/06/2019	Interview	Ndiémane	Fatou Thiaw's house	Rural exodus, fishing	0	1	0	0
19/06/2019	PV film	Ndiémane	Groupe Mbogayife's field	Ô Feiñe	0	1	5	1
19/06/2019	Film projection	Ndiémane	Fatou Thiaw's house	Ô Feiñe	0	2	5	1
21/06/2019	VIPP	Ndiémane	Fatou Thiaw's house	Photodiary of cooking ceebu dien.	1	0	0	0
24/06/2019	Meeting	Saly	Youssou Sarr's house	Groupe Mbogayife, leadership, tension.	0	0	0	1
24/06/2019	Interview	Ndiémane	Blaise Diouf's house	Video editing	0	1	0	0
25/06/2019	Field visit	Ndiémane	Michel Diouf's field	Field visit	0	2	0	1
25/06/2019	Field visit	Ndiémane	Assane Sarr's field	Field visit of the field where Assane Sarr works.	0	2	0	0
26/06/2019	FGDW	Ndiémane	Fatou Thiaw's house	Consent	0	1	6	1
26/06/2019	Film projection	Ndiémane	Fatou Thiaw's house	Ô Feiñe, Baonan	4	6	7	3
27/06/2019	Interview	Ndiémane	Ablaye Sarr's house	Food, future, changes.	0	1	0	1
27/06/2019	Cooking session	Ndiémane	Fatou Thiaw's house	Kassu (cabbage soup)	0	0	0	1
28/06/2019	WP training	Thiès	ASPSP offices	WordPress training, mainly answering questions.	0	0	0	3
28/06/2019	Meeting	Thiès	ASPSP offices	Mediacom videos	0	0	0	1
08/10/2019	Meeting	Saly	Youssou Sarr's house	Catch up after 4 months of absence. Planning for new fieldwork.	0	0	0	1
08/10/2019	FGDW	Ndiémane	Fatou Thiaw's house	Welcome. Ethics. Work agreement, participatory process, exchange.	0	0	4	0
09/10/2019	FGDW	Ndiémane	Fatou Thiaw's house	Ethics, Food systems and resilience. Education and future generations.	0	1	4	1
10/10/2019	FGDW	Ndiémane	Fatou Thiaw's house	Sustainable agricultural practices, migration, food crises	0	0	3	1
10/10/2019	Field visit	Ndiémane	Several fields	Marie Djogoul, Adama Ndour, Rokhie Ndiaye's fields.	4	2	4	1
10/10/2019	Field visit	Ndiémane	Michel Diouf's field	Update on Michel Diouf's field	0	1	0	1
11/10/2019	FGDW	Ndiémane	Anne-Marie Dieng's house	Village history	4	1	4	0
11/10/2019	VIPP	Ndiémane	Anne-Marie Dieng's house	Daily activities	4	1	4	0
11/10/2019	Film projection	Ndiémane	Anne-Marie Dieng's house	Some Groupe Mbogayife, Lissar, Diouroup, Guédé Chantiers films	4	1	4	0
12/10/2019	Interview	Ndiémane	Fatou Thiaw's house	Life history; Yako Ndour	0	0	0	1
12/10/2019	Meeting	Saly	Youssou Sarr's house	Catch up meeting about first week of fieldwork.	0	0	0	1
14/10/2019	Interview	Ndiémane	Michel Diouf's house	Michel Diouf's mother memories of food crises and the village	0	1	1	1
14/10/2019	FGDW	Ndiémane	Michel Diouf's house	Village history, food crises, preparing baobab leaves	2	1	2	2
14/10/2019	PV	Ndiémane	Michel Diouf's house	Rain!	2	1	2	2
14/10/2019	Interview	Ndiémane	Michel Diouf's house	Michel's origins and fields, seeds, wells.	0	0	0	2
14/10/2019	VIPP	Ndiémane	Michel Diouf's house	Google Earth of Malaoubé and of Michel's field	0	0	0	2
14/10/2019	Field visit	Ndiémane	Michel Diouf's field	Update on Michel Diouf's field	0	1	0	2
14/10/2019	Interview	Ndiémane	Fatou Thiaw's house	Family tree, family ancestry	0	0	0	1

15/10/2019	Interview	Ndiémane	Marie Djogoul's house	Life history	0	3	5	2
15/10/2019	Cooking session	Ndiémane	Marie Djogoul's house	Cooking lakh (traditional dish)	0	3	5	2
15/10/2019	FGDW	Ndiémane	Marie Djogoul's house	Food produced, bought, exchanged, foraged	0	3	5	2
16/10/2019	Market visit	Nguéniène	Nguéniène market	Market stalls and items.	0	1	1	1
16/10/2019	Film projection	Ndiémane	Michel Diouf's house	Nguéniène market, Groupe Mbogayife's films and Diouroup.	2	2	2	1
17/10/2019	FGDW	Ndiémane	Adama Ndour's house	Village history, financial support	5	1	7	0
17/10/2019	VIPP	Ndiémane	Adama Ndour's house	Google Earth of Malaoubé	5	1	7	0
18/10/2019	FGDW	Ndiémane	Rokhie Ndiaye's house	Being Seereer	0	0	3	1
18/10/2019	Interview	Ndiémane	Fatou Thiaw's house	God. Islam and Christianity.	0	1	0	0
18/10/2019	VIPP	Ndiémane	Rokhie Ndiaye's house	Drawings on organisation of concessions	0	1	3	1
19/10/2019	FGDW	Ndiémane	Binta Sen's house	Religion and internal politics	1	2	4	0
20/10/2019	FGDW	Ndiémane	Fatou Thiaw's house	Cancelled. Nobody turned up.	0	0	0	0
20/10/2019	Interview	Ndiémane	Wali Diouf's house	Paid work at the local Spanish watermelon farm.	0	0	0	1
20/10/2019	Interview	Ndiémane	Michel Diouf's house	Life, marriage arrangements, PV training.	0	1	0	0
20/10/2019	Film projection	Ndiémane	Fatou Thiaw's house	Films: Ô Feiñe, Baonan.	3	3	3	1
21/10/2019	PV training	Ndiémane	Michel Diouf's house	Little done.	2	2	2	1
22/10/2019	PV training	Ndiémane	Michel Diouf's house	Nobody turned up.	2	2	2	1
22/10/2019	PV	Ndiémane	Djokel Diouf's field	Film of Djokel watering his field.	0	1	0	0
23/10/2019	FGDW	Ndiémane	Fatou Thiaw's house	Family trees. Life expectations. Being from Ndiémane.	0	5	0	0
23/10/2019	interview	Ndiémane	Fatou Thiaw's house	Life. Family. Ndiémane.	0	1	0	0
23/10/2019	Meeting	Ndiémane	Blaise Diouf's house	Internal politics and life goals.	0	1	0	0
23/10/2019	Field visit	Ndiémane	Blaise Diouf's fields	Fallow field and green hedges and lime trees planted.	0	1	0	0
23/10/2019	Field visit	Ndiémane	Antoine Marone's field	Crop covers.	0	2	0	0
24/10/2019	Market visit	Mbour	Mbour market	Visit of fish and vegetable areas.	0	1	0	0
24/10/2019	Film projection	Ndiémane	Michel Diouf's house	Djokel's film + consent.	2	2	1	1
24/10/2019	Cooking session	Ndiémane	Fatou Thiaw's house	Cooking "Portuguese" food: fish&potatoes	3	0	1	0
25/10/2019	Meeting	Saly	Youssou Sarr's house	Catch up about second and third week.	0	0	0	1
26/10/2019	Meeting	Thiès	ASPSP offices	Internal politics and challenges of Ndiémane, leadership.	0	0	0	2
26/10/2019	Film projection	Thiès	ASPSP offices	Djokel's film, Casamance film.	0	0	0	2
02/03/2020	Interview	Ndiémane	Fatou Thiaw's house	Young peasant perspectives	0	1	0	0
03/03/2020	FGDW	Ndiémane	Fatou Thiaw's house	Discuss work at Ndiass	0	0	5	0
03/03/2020	FGDW	Ndiémane	Fatou Thiaw's house	Discuss final celebration	0	1	1	1
03/03/2020	Interview	Ndiémane	Fatou Thiaw's house	Discussion about historical droughts	0	0	0	1
04/03/2020	Market visit	Mbour	Mbour market	Observation shopping for celebrations	0	0	1	0
04/04/2020	Cooking session	Ndiémane	Fatou Thiaw's house	Cooking and eating final celebratory meal.	8	15	15	10

04/04/2020	Film projection	Ndiémane	Fatou Thiaw's house	Watching PV films and photos	8	15	15	10
05/04/2020	PV	Ndiémane	Blaise Diouf's house/shop	Discussion with Aliou Diouf and with Antoine Sarr	0	3	0	0
05/04/2020	FGDW	Ndiémane	Blaise Diouf's house/shop	Discussion with Maurice and Séni	0	2	0	0
06/03/2020	Field visit	Ndiémane	Gabriel Wali Diouf's field	Preparation for new growing season	0	0	0	1
06/03/2020	Meeting	Ndiémane	Fatou Thiaw's house	Looking at archival photos of Ndour family	3	2	0	0
06/03/2020	FGDW	Ndiémane	Fatou Thiaw's house	Meaning of being Seereer (youngsters)	0	2	0	0
06/03/2020	Meeting	Ndiémane	Fatou Thiaw's house	Discussion about "Kings and Resistant Fighters of Africa" poster. African history and pride.	4	4	1	1
06/03/2020	Interview	Ndiémane	Village square	African history, slavery, colonialism	0	1	0	0
09/03/2020	Interview	Ndiémane	Blaise Diouf's house/shop	Charity work and export chemical ag	0	0	0	1
09/03/2020	Interview	Ndiémane	Blaise Diouf's house/shop	Meaning of marriage and religion	0	1	0	0
10/03/2020	PV	Ndiémane	Blaise Diouf's house/shop	Video editing	0	1	0	0
11/03/2020	PV	Ndiémane	Blaise Diouf's house/shop	Video editing	0	1	0	0
12/03/2020	FGDW	Ndiémane	Secondary school	Quality of formal education in Senegal	0	2	0	4
12/03/2020	Cooking session	Ndiémane	Village square	Cooking for wedding on Saturday	6	0	7	0
12/03/2020	Film projection	Ndiémane	Blaise Diouf's house/shop	Blaise Diouf's films projection	5	7	5	4
13/03/2020	Interview	Ndiémane	Village square	Discussion about HE in Senegal	0	1	0	0
13/03/2020	Interview	Ndiémane	Fatou Thiaw's house	Discussion about land grabbing and urban sprawl.	0	0	0	1

Notes:

The author participated in every activity mentioned.

The number of participants for wide group activities (such as village film projections) is estimated.

Innumerable walks in and around the village are not included in this table.

Innumerable informal visits in houses and fields, impromptu conversations, drinks and meals are not included in this table.

Table 6. Summary of activities conducted during the research (source: author)

Activity	Occurrences
Meeting	25
Field visit	19
FGD	24
Interview	24
PV training	15
Film projection	17
VIPP	7
PV	8
WP training	4
Cooking session	5
Market visit	3
Peasant Fair	2
Total	153

10.4. List of Research Participants

The list below gives the names of all the direct research participants, in accordance with their explicit request to be acknowledged as sources of information and thus not be anonymised (see subchapter 4.3.3. Iterative Ethics and the Cycles of PAR Inquiry, p. 54). The table is organised by alphabetical order of residence, organisation, surname and name and it does not show the relative contribution of each participant. Due to my longer stays and interactions in Ndiémame, contributions from those residents weighed much more in the research than those of other locations visited.





Table 7. List of research participants (source: author)








Residence	Organisation	Surname	Forename	Generation		Gender	
				Young	Old	Female	Male
Diouroup	UCT	Faye	Nogoye		X	X	
Diouroup	UCT	Faye	Seynabou	X		X	
Diouroup	UCT	Mbaye	Ndeye	X		X	
Diouroup	UCT	Ndour	Daouda	X			X
Diouroup	UCT	Sarr	Rokhaya		X	X	
Diouroup	UCT	Senghor	Mamadou	X			X
Diouroup	UCT	Thioune	Marie-Noëlle	X		X	
Guédé Chantier	Timtimol	Ba	Adama	X		X	
Guédé Chantier	Timtimol	Ba	Bana	X		X	
Guédé Chantier	Timtimol	Ba	Demba		X		X
Guédé Chantier	Timtimol	Ba	Harouna	X			X
Guédé Chantier	Timtimol	Ba	Kadiata	X		X	
Guédé Chantier	Timtimol	Dia	Ramata	X		X	
Guédé Chantier	Timtimol	Dieng	Aminata		X	X	
Guédé Chantier	Timtimol	Kidane	Penda	X		X	
Guédé Chantier	Timtimol	Ndiaye	Ablaye	X			X
Guédé Chantier	Timtimol	Ndiaye	Aïssata	X		X	
Guédé Chantier	Timtimol	Pame	Salamata		X	X	
Lissar	UGPM	Ba	Binta	X		X	
Lissar	UGPM	Bey	Ami	X		X	
Lissar	UGPM	Chou	Bintou	X		X	
Lissar	UGPM	Diene	Nogoye	X		X	
Lissar	UGPM	Dieng	Assou	X		X	
Lissar	UGPM	Dieng	Fatim	X		X	
Lissar	UGPM	Dieng	Fatou	X		X	
Lissar	UGPM	Dieng	Mbayang	X		X	
Lissar	UGPM	Dieng	Ngoye	X		X	
Lissar	UGPM	Diop	Anta	X		X	
Lissar	UGPM	Diop	Coumba	X		X	
Lissar	UGPM	Diop	Déguène	X		X	
Lissar	UGPM	Diop	Ndaya	X		X	
Lissar	UGPM	Diouf	Ada	X		X	
Lissar	UGPM	Diouf	Bassine	X		X	
Lissar	UGPM	Diouf	Kene	X		X	
Lissar	UGPM	Diouf	Mbaye		X		X
Lissar	UGPM	Fall	Mane	X		X	
Lissar	UGPM	Gueye	Fatim	X		X	
Lissar	UGPM	Gueye	Fatou	X		X	
Lissar	UGPM	Jine	Nogoy	X		X	
Lissar	UGPM	Joob	Kuumba	X		X	
Lissar	UGPM	Joob	Moudou	X		X	
Lissar	UGPM	Mbaay	Astor	X		X	
Lissar	UGPM	Mbaye	Assou	X		X	
Lissar	UGPM	Mbaye	Khadi	X		X	
Lissar	UGPM	Ndiaye	Amu	X		X	
Lissar	UGPM	Ndiaye	Awa	X		X	
Lissar	UGPM	Ndiaye	Penda	X		X	
Lissar	UGPM	Ndiaye	Yo	X		X	
Lissar	UGPM	Ndiengue	Fatou	X		X	
Lissar	UGPM	Ngom	Fatou	X		X	







Residence	Organisation	Surname	Forename	Generation		Gender	
				Young	Old	Female	Male
Lissar	UGPM	Niengue	Ndoumbi	X		X	
Lissar	UGPM	Njaay	Jora	X		X	
Lissar	UGPM	Njing	Ndoumbe	X		X	
Lissar	UGPM	Sall	Fatou	X		X	
Lissar	UGPM	Sall	Maïssa Mbaye	X		X	
Lissar	UGPM	Sarr	Fatim	X		X	
Lissar	UGPM	Sarr	Fatou	X		X	
Lissar	UGPM	Sarr	Khadi	X		X	
Lissar	UGPM	Sow	Mbene	X		X	
Lissar	UGPM	Thiaw	Fatou	X		X	
Lissar	UGPM	Thioune	Binetou	X		X	
Mbodiène	-	Diouf	Aliou	X			X
Ndiémame	-	Sarr	Antoine	X			X
Ndiémame Chéinka	-	Diouf	Dib		X	X	
Ndiémame Chéinka	-	Diouf	Djokel	X			X
Ndiémame Chéinka	-	Diouf	Gabriel Wali		X		X
Ndiémame Chéinka	-	Diouf	Maman		X	X	
Ndiémame Chéinka	-	Diouf	Michel		X		X
Ndiémame Chéinka	-	Sene	Mbaye	X			X
Ndiémame Malaoubé	-	Kama	Diene		X		X
Ndiémame Malaoubé	-	Kama	Ibrahima	X			X
Ndiémame Malaoubé	-	Ndour	Abdou	X			X
Ndiémame Malaoubé	-	Ndour	Abdoulaye	X			X
Ndiémame Malaoubé	-	Ndour	Amadou	X			X
Ndiémame Malaoubé	-	Ndour	Babacar	X			X
Ndiémame Malaoubé	-	Ndour	Cheikh	X			X
Ndiémame Malaoubé	-	Ndour	Daouda		X		X
Ndiémame Malaoubé	-	Ndour	Fallou	X			X
Ndiémame Malaoubé	-	Ndour	Matar	X			X
Ndiémame Malaoubé	-	Ndour	Moussa	X			X
Ndiémame Malaoubé	-	Ndour	Yako		X		X
Ndiémame Malaoubé	-	Sarr	Ablaye		X		X
Ndiémame Malaoubé	-	Sarr	Ousseynou	X			X
Ndiémame Malaoubé	Mbogayife	Diouf	Seynabou		X	X	
Ndiémame Malaoubé	Mbogayife	Djogoul	Binta		X	X	
Ndiémame Malaoubé	Mbogayife	Djogoul	Marie		X	X	
Ndiémame Malaoubé	Mbogayife	Faye	Mben		X	X	
Ndiémame Malaoubé	Mbogayife	Kama	Ami	X		X	
Ndiémame Malaoubé	Mbogayife	Ndiaye	Rokhie		X	X	
Ndiémame Malaoubé	Mbogayife	Ndour	Adama		X	X	
Ndiémame Malaoubé	Mbogayife	Ndour	Adama	X		X	
Ndiémame Malaoubé	Mbogayife	Ndour	Astou	X		X	
Ndiémame Malaoubé	Mbogayife	Ndour	Awa Ndèye	X		X	
Ndiémame Malaoubé	Mbogayife	Ndour	Demba	X			X
Ndiémame Malaoubé	Mbogayife	Ndour	Mamadou	X			X
Ndiémame Malaoubé	Mbogayife	Ndour	Ndèye Djakher	X		X	
Ndiémame Malaoubé	Mbogayife	Ndour	Oumi		X	X	
Ndiémame Malaoubé	Mbogayife	Ngom	Marie		X	X	
Ndiémame Malaoubé	Mbogayife	Sen	Binta		X	X	
Ndiémame Malaoubé	Mbogayife	Sene	Diang		X	X	
Ndiémame Malaoubé	Mbogayife	Sene	Khadi	X		X	
Ndiémame Malaoubé	Mbogayife	Thiaw	Diara	X		X	
Ndiémame Malaoubé	Mbogayife	Thiaw	Fatou		X	X	
Ndiémame Malaoubé	Mbogayife	Traoré	Astou	X		X	
Ndiémame Marché	-	Dieng	Anne-Marie		X	X	
Ndiémame Marché	-	Diouf	Blaise	X			X
Ndiémame Marché	-	Diouf	Saliou		X		X
Ndiémame Marché	-	Diouf	Seynabou	X		X	
Ndiémame Marché	-	Faye	Émilie	X		X	
Ndiémame Marché	-	Faye	Rama	X		X	
Ndiémame Marché	-	Ndior	Ndèye		X	X	
Ndiémame Peulh	-	Diouf	Omar	X			X
Saly	AFAFA/ASPSP	Sarr	Youssou		X		X
Thiakho	UCEM	Camara	Sara		X		X






Residence	Organisation	Surname	Forename	Generation		Gender	
				Young	Old	Female	Male
Thiès	ASPSP	Biaye	Lamine		X		X
Thiès	ASPSP	Diouf	Adalbert	X			X
Thiès	ASPSP	Pam	Khadidiah	X		X	
Thiès	ASPSP/AFAFA	Ndiaye	Alihou		X		X







10.5. List of All Films Made During the Doctoral Research






Entity	Original film title (English title)	Location Date Duration	Actors	Directors	Editors	Language (Subtitles)	Participatory Consent #views (18/03/2021)	QR code Link
Association Sénégalaise de Producteurs de Semences Paysannes (ASPSP)	Foire de Semences Paysannes de Djimini 2020 (Djimini Peasant Seed Fair 2020)	Thiès 17/06/2019 2 :54	Alihou Ndiaye	Carla Sarrouy Kay	Carla Sarrouy Kay	French (English, French)	No Public 104 views	 https://youtu.be/xOgxrKKoPJE
Association Sénégalaise de Producteurs de Semences Paysannes (ASPSP)	Historique de la Foire Ouest-Africaine de Semences Paysannes de Djimini, Sénégal, avec Alihou Ndiaye	Thiès 17/06/2019 13 :46	Alihou Ndiaye	Carla Sarrouy Kay	Carla Sarrouy Kay	French (None)	No Public 81 views	 https://youtu.be/-bagsENS0gE
Association Sénégalaise de Producteurs de Semences Paysannes (ASPSP)	Parcours de Vie: Alihou NDIAYE (Life paths : Alihou Ndiaye)	Thiès 17/06/2019 36 :30	Alihou Ndiaye	Carla Sarrouy Kay	Carla Sarrouy Kay	French (None)	No Public 34 views	 https://youtu.be/BalQHlPq6QM
Association Sénégalaise de Producteurs de Semences Paysannes (ASPSP)	Peasant Seed Fair of Thiakho (Senegal): Sara Camara (UCEM coordinator)	Thiakho 13/05/2017 03:25	Sara Camara, Adalbert Diouf	Carla Sarrouy Kay	Carla Sarrouy Kay, Adalbert Diouf, Youssou Sarr	French (English, French)	Participatory Public 100 views	 https://youtu.be/AA-VOgqWCnl
Blaise Junior Diouf	Conservation du haricot niébé (Cowpea conservation)	Ndiémane 10/11/2019 5 :49	Seynabou Diouf	Blaise Junior Diouf	Carla Sarrouy Kay, Blaise Junior Diouf	Seereer, Wolof (None)	Participatory Private N/A	

Entity	Original film title (English title)	Location Date Duration	Actors	Directors	Editors	Language (Subtitles)	Participatory Consent #views (10/09/2020)	QR code Link
Blaise Junior Diouf	Discussion sur les Semences et L'Hivernage avec Antoine Sarr et Aliou Diouf (Discussion about seeds and the rainy season with Antoine Sarr and Aliou Diouf)	Ndiémane 05/03/2020 12 :23	Antoine Sarr, Aliou Diouf, Blaise Junior Diouf	Blaise Junior Diouf	Carla Sarrouy Kay, Blaise Junior Diouf	Seereer, Wolof (None)	Participatory Public 135 views	 https://youtu.be/Kh9_7soFb38
Blaise Junior Diouf	Film témoignage de 2018 (Testimony film for 2018)	Ndiémane 01/09/2018 24 :35	Ndiémane villagers	Blaise Junior Diouf	Carla Sarrouy Kay, Blaise Junior Diouf	Seereer (None)	Participatory Public 70 views	 https://youtu.be/2KPEcjMw2mE
Blaise Junior Diouf	Hivernage 2019/2020 à Ndiémane, Sénégal (Rainy Season 2019/2020 in Ndiémane, Senegal)	Ndiémane 14/03/2020 4 :05	Blaise Junior Diouf and the Ndiémane villagers	Blaise Junior Diouf	Carla Sarrouy Kay, Blaise Junior Diouf	Seereer, Wolof (None)	Participatory Public 276 views	 https://youtu.be/gg8-Vorsmxo
Blaise Junior Diouf	La récolte, le battage et la conservation de sorgho (Sorghum Harvesting, Threshing, and Conservation)	Ndiémane 04/02/2020 5 :00	Ndiémane villagers	Blaise Junior Diouf	Carla Sarrouy Kay, Blaise Junior Diouf	Seereer, Wolof (None)	Participatory Public 215 views	 https://youtu.be/RdHrX3sbl-Y
Blaise Junior Diouf	Le nouveau champ de citronniers de la famille Diouf (The new lime orchard of the Diouf family)	Ndiémane 12/09/2019 4 :11	Blaise Junior Diouf, Saliou Diouf and the Ndiémane villagers	Blaise Junior Diouf	Carla Sarrouy Kay, Blaise Junior Diouf	Seereer, Wolof (None)	Participatory Public 1,753 views	 https://youtu.be/4MBI5kwE-AI
Carla Sarrouy Kay	A day as a PhD student... editing videos in the office	Coventry 24/06/2017 0 :42	Carla Sarrouy Kay	Carla Sarrouy Kay	Carla Sarrouy Kay	English (None)	No Public 36 views	 https://youtu.be/bOM1ZX6gOU
Carla Sarrouy Kay	A day as a PhD student... giving Participatory Video training in Senegal	Lissar 26/06/2017 1 :15	Carla Sarrouy Kay	Carla Sarrouy Kay	Carla Sarrouy Kay	English (None)	No Public 140 views	 https://youtu.be/dvK04_7OHGo

Entity	Original film title (English title)	Location Date Duration	Actors	Directors	Editors	Language (Subtitles)	Participatory Consent #views (10/09/2020)	QR code Link
Carla Sarrouy Kay	A day as a PhD student... packing for my next Participatory Video fieldwork in Senegal	Coventry 05/06/2019 1 :38	Carla Sarrouy Kay	Carla Sarrouy Kay	Carla Sarrouy Kay	English (None)	No Public 17 views	 https://youtu.be/ BokAb0A2izk
Carla Sarrouy Kay	A day as a PhD student... sowing aubergine in Senegal	Coventry 10/07/2019 1 :21	Carla Sarrouy Kay	Carla Sarrouy Kay	Carla Sarrouy Kay	English (None)	No Public 52 views	 https://youtu.be/ 87I_oT6ddHs
Carla Sarrouy Kay	Arrosage du champ d'aubergines de Djokel Diouf (Watering the aubergine field of Djokel Diouf)	Ndiémane 22/10/2019 19 :35	Djokel Diouf	Carla Sarrouy Kay	Carla Sarrouy Kay	Seereer (None)	No Unlisted N/A	
Carla Sarrouy Kay	C'est l'heure du retour! (Time to go back home!)	Thiès 26/10/2019 1 :15	Carla Sarrouy Kay	Carla Sarrouy Kay	Carla Sarrouy Kay	French (None)	No Public 13 views	 https://youtu.be/g odk-1hNnZs
Carla Sarrouy Kay	Time to head back home!	Thiès 26/10/2019 1 :13	Carla Sarrouy Kay	Carla Sarrouy Kay	Carla Sarrouy Kay	English (None)	No Public 18 views	 https://youtu.be/ 797gcnNKX6s
Carla Sarrouy Kay	Une journée comme doctorante...faisant mes bagages pour mon prochain voyage au Sénégal (A day as a PhD student... packing for my next trip to Senegal)	Coventry 05/06/2019 1 :54	Carla Sarrouy Kay	Carla Sarrouy Kay	Carla Sarrouy Kay	French (None)	No Public 17 views	 https://youtu.be/L DHPCirTP7o

Entity	Original film title (English title)	Location Date Duration	Actors	Directors	Editors	Language (Subtitles)	Participatory Consent #views (10/09/2020)	QR code Link
Dental Tintimol Mbo Guédé Chantier	Ndéamaméne É Safareméne Handé (Agriculture is our remedy of today)	Guédé Chantier 04/07/2017 9 :56	Salamata Pame, Penda Kidane, Aminata Dieng, Aïssata Ndiaye, Kadiata Ba, Harouna Ba, Ablaye Ndiaye	Salamata Pame, Penda Kidane, Aminata Dieng, Aïssata Ndiaye, Kadiata Ba, Harouna Ba, Ablaye Ndiaye, Khadidiah Pam, Carla Sarrouy Kay	Carla Sarrouy Kay, Salamata Pame, Penda Kidane, Aminata Dieng, Aïssata Ndiaye, Kadiata Ba, Harouna Ba, Ablaye Ndiaye, Khadidiah Pam, Youssou Sarr	Fulah (English, French)	Participatory Public 297 views	 https://youtu.be/LfZRzDBvGA
Dental Tintimol Mbo Guédé Chantier	Thiadélé Debbo É Ndér Déwgal (Complications of the Spouse in her Household)	Guédé Chantier 03/07/2017 9 :37	Salamata Pame, Penda Kidane, Adama Ba, Aminata Dieng, Aïssata Ndiaye, Kadiata Ba, Harouna Ba, Ablaye Ndiaye, Ramata Dia	Salamata Pame, Penda Kidane, Aminata Dieng, Aïssata Ndiaye, Kadiata Ba, Harouna Ba, Ablaye Ndiaye, Coumba Ba, Khadidiah Pam, Carla Sarrouy Kay	Carla Sarrouy Kay, Salamata Pame, Penda Kidane, Aminata Dieng, Aïssata Ndiaye, Kadiata Ba, Harouna Ba, Ablaye Ndiaye, Adama Ba, Khadidiah Pam, Youssou Sarr	Fulah (English, French)	Participatory Public 318 views	 https://youtu.be/jPtweyq--4s
Groupe Bismillaye de Ndiémane	Wena niowo datayoo oh rime (Those who multiply the seed)	Ndiémane 08/06/2017 3:49	Mamadou Ndour, Blaise Diouf, Souley Ndour	Blaise Diouf, Mamadou Ndour	Carla Sarrouy Kay, Mamadou Ndour, Diokele Diouf	Seereer (English, French)	Participatory Public 93 views	 https://youtu.be/7jKkLMThNvc
Groupe Deggo – Union des Groupements de Paysans de Mékhé (UGPM)	Aar Aleu-bi (To Protect the Forest)	Lissar 22/06/2017 11:51	Assou Mbaye, Amy Beye, Ngoye Dieng, Mbene Sow, Assou Dieng, Coumba Diop, Ndoumbi Niengue, Fatou Ndiengue, Fatim Sarr, Mbayang Dieng, Binetou Thioune, Ndack Diop, Bassine Diouf, Fatou Dieng, Fatim Gueye	Ngoye Dieng, Khady Sarr, Amy Beye, Bassine Diouf, Mbene Sow	Carla Sarrouy Kay, Khadidiah Pam	Wolof (English, French)	Participatory Public 882 views	 https://youtu.be/mO4Mh6o1Nml
Groupe Deggo – Union des Groupements de Paysans de Mékhé (UGPM)	Mbaye ak Sameu (Agriculture and Animal Rearing)	Lissar 21/06/2017 12 :01	Khadi Sarr, Ami Bey, Basin Diouf, Fatou Ngom, Ndoumbe Njing, Bintou Chou, Kuumba Joob, Astor Mbaay, Jora Njaay, Binta Ba, Mane Fall, Ada Diouf, Nogoy Jine, Moudou Joob, Fatou Dieng, Khadidiah Pam, Ngoy Dieng, Carla Sarrouy Kay	Ada Diouf, Ngoy Dieng, Khadi Sarr, Ami Bey, Nogoy Jine, Jora Ngaay, Carla Sarrouy Kay, Khadidiah Pam	Carla Sarrouy Kay, Khadidiah Pam	Wolof (English, French)	Participatory Public 1,314 views	 https://youtu.be/kcvhkoC-V4g

Entity	Original film title (English title)	Location Date Duration	Actors	Directors	Editors	Language (Subtitles)	Participatory Consent #views (10/09/2020)	QR code Link
Groupe Djoubou – Union des Groupements de Paysans de Mékhé (UGPM)	Djiguene ak Diafe Diafe Say Thie Biir Keur Ram (The Woman and Her Household's Issues)	Lissar 21/06/2017 10 :22	Awa Ndiaye, Fatou Sarr, Fatou Sall, Penda Ndiaye, Anta Diop, Deguene Diop, Kene Diouf, Maïssa Mbaye Sall, Mbayang Dieng, Fatim Sarr, Fatim Gueye	Awa Ndiaye, Fatou Sarr	Carla Sarrouy Kay, Youssou Sarr, Mamadou Diop	Wolof (English, French)	Participatory Public 5,179 views	 https://youtu.be/ BfvRRuOwika
Groupe Djoubou – Union des Groupements de Paysans de Mékhé (UGPM)	Yakh Yakh Djiguène Thi Khew Yi Nguenté Ak Thiéte (Women's Wastage in Ceremonies : Baptisms and Weddings)	Lissar 22/06/2017 21 :11	Maïssa Mbaye Sall, Fatou Gueye, Déguène Diop, Anta Diop, Penda Ndiaye, Fatim Dieng, Ada Diouf, Fatou Sarr, Yo Ndiaye, Khadi Mbaye, Fatou Thiaw, Amu Ndiaye, Fatou Sall, Nogoye Diene, Ndaya Diop, Binta Ba	Awa Ndiaye, Ada Diouf, Fatou Gueye	Carla Sarrouy Kay, Youssou Sarr	Wolof (English, French)	Participatory Public 3,836 views	 https://youtu.be/ YRfxQg3uKUB
Groupe Mbogay'Yiif – Union des Collectivités de Tattaguine (UCT)	Da Ñuy Yengatu Cicosân Ak Aada Céet (We are active in the traditional practices of marriage)	Diouroup 17/06/2017 7 :55	Ndeye Mbaye, Rokhaya Sarr, Seynabou Faye, Nogoye Faye, Youssou Sarr	Seynabou Faye, Nogoye Faye, Rokhaya Sarr, Youssou Sarr	Carla Sarrouy Kay, Rokhaya Sarr, Ndeye Mbaye, Seynabou Faye, Nogoye Faye, Youssou Sarr	Wolof, Seereer (English, French)	Participatory Public 30,825 views	 https://youtu.be/ ErLISV91BWo
Groupe Mbogay'Yiif – Union des Collectivités de Tattaguine (UCT)	O Djirigne A Yaara Thieck Kaam Mbind (The importance of chicken farming for the household)	Diouroup 16/06/2017 3 :25	Ndeye Mbaye, Rokhaya Sarr	Ndeye Mbaye, Rokhaya Sarr, Nogoye Faye	Carla Sarrouy Kay, Youssou Sarr	Seereer, Wolof (English, French)	Participatory Public 1,861 views	 https://youtu.be/ cE5Zv_YfmA
Groupe Mbogayife	A Thiile Fa A Kheek Akhe Thioossane (The Selection and Conservation of Traditional Seeds)	Ndiémane 09/06/2017 7:37	Fatou Thiaw, Mben Faye, Rokhie Ndiaye, Diara Thiaw, Khadi Sene, Fallou Ndour, Alihou Ndour	Ami Kama, Carla Sarrouy Kay	Carla Sarrouy Kay, Youssou Sarr	Seereer (English, French)	Participatory Public 1,490 views	 https://youtu.be/ H8CaGd_7xos
Groupe Mbogayife	Ô Feiñe (The Drought)	Ndiémane 20/06/2019 8 :49	Adama Ndour, Mben Faye, Rokhie Ndiaye, Fatou Thiaw	Adama Ndour, Mben Faye, Rokhie Ndiaye, Fatou Thiaw, Mamadou Ndour, Youssou Sarr, Carla Sarrouy Kay	Carla Sarrouy Kay, Youssou Sarr	Seereer (English, French, both not finished)	Participatory Public 1,356 views	 https://youtu.be/ ZcJrdshGWBA

Entity	Original film title (English title)	Location Date Duration	Actors	Directors	Editors	Language (Subtitles)	Participatory Consent #views (10/09/2020)	QR code Link
Groupe Mbogayife	Rew Wa Mbagna Yo Thissane No Serere (Women who master the Seereer tradition)	Ndiémane 08/06/2017 7:32	Fatou Thiaw, Khadi Sene, Ami Kama, Mbene Faye, Marie Diogoul, Rokhie Ndiaye, Sayenabou Diouf, Diang Sene, Oumi Ndour, Rokhie Ndour, Marie Ngome	Ami Kama, Mben Faye, Carla Sarrouy Kay	Carla Sarrouy Kay, Mamadou Ndour, Youssou Sarr	Seereer (English, French)	Participatory Public 5,792 views	 https://youtu.be/TOoUv9hyFQ
Mbootay Baykat Derr – Union des Collectivités de Tattaguine (UCT)	Mbayumtaamat (Tomato Growing)	Diouroup 17/06/2017 11 :01	Daouda Ndour, Mamadou Senghor	Daouda Ndour, Mamadou Senghor, Carla Sarrouy Kay	Carla Sarrouy Kay, Mamadou Senghor, Daouda Ndour, Youssou Sarr	Wolof (French, English)	Participatory Public 632 views	 https://youtu.be/Uvg9RPLVQOI
Senegalese Female Peasant Participatory Video Group	L'importance des semences paysannes (The importance of peasant seeds)	Casamance 01/01/2018 9:30	Senegalese Female Peasant Participatory Video Group	Senegalese Female Peasant Participatory Video Group	Senegalese Female Peasant Participatory Video Group	Wolof, French (English, French)	Participatory Public 131 views	 https://youtu.be/Ffi_cXBCrPo
Union des Collectivités de Tattaguine (UCT)	A Khookh Maalo No Thioosane Serere (Cultivating Rice According to Traditional Seereer Practices)	Diouroup 16/06/2017 4 :12	Marie-Noëlle Thioune, Seynabou Faye, Nogoye Faye, Daouda Ndour	Marie-Noëlle Thioune, Seynabou Faye, Nogoye, Carla Sarrouy Kay	Carla Sarrouy Kay, Marie-Noëlle Thioune, Seynabou Faye	Seereer (English, French)	Participatory Public 391 views	 https://youtu.be/etyuUJgR8o
Union des Collectivités de Tattaguine (UCT)	La Culture de la Tomate (Tomato Growing)	Diouroup 17/06/2017 10 :12	Daouda Ndour, Mamadou Senghor	Daouda Ndour, Mamadou Senghor, Carla Sarrouy Kay	Carla Sarrouy Kay, Mamadou Senghor, Daouda Ndour, Youssou Sarr	French (French, English)	Participatory Public 196 views	 https://youtu.be/zGu8pTWaRgM

10.6. List of the Participatory Video Equipment Used

Table 8. List of Participatory Video equipment used (source: author)

Category	Equipment	Brand	Model	Funder	Ownership	Quantity
Camera	Battery charger	MaximalPower	FC500	Grant	AFAFA	2
Camera	Cable	USB	USB-USB	Grant	AFAFA	1
Camera	Camera	Sony	HDR-PJ410	Grant	AFAFA	2
Camera	Camera bag	Sony	x	Grant	AFAFA	2
Camera	Camera rain protection	EMIUP	Professional	Grant	AFAFA	2
Camera	Cleaning brush	MyArmor	Professional Lens Cleaning	Grant	AFAFA	1
Camera	Plug converter for battery charger	Ikits	Quick charge	Grant	AFAFA	2
Camera	Tripod	Velbon	DV-7000	Grant	AFAFA	2
Camera	Tripod bag	Velbon	Normal Case 700	Grant	AFAFA	2
Camera	USD cards	Sony	64GB	Grant	AFAFA	4
Laptop	External hard drive	Transcend	2 TB	Grant	AFAFA	1
Laptop	External hard drive bag	Caselogic	x	Grant	AFAFA	1
Projector	4-socket extension reel			Grant	AFAFA	1
Projector	Speakers	Braven	BRV-X	Grant	AFAFA	1
Projector	Speakers bag	Duragadget	BRV-1M	Grant	AFAFA	1
Cables	Cable	x	HDMI-miniHDMI	CAWR	CAWR	1
Cables	Cable	x	MiniJack-MiniJack	CAWR	CAWR	1
Cables	Cable	x	USB-MiniUSB	CAWR	CAWR	1
Cables	Cable	x	USB-twisted	CAWR	CAWR	1
Cables	Cable	x	USB-USB	CAWR	CAWR	1
Cables	Cable	x	VGA-MiniVGA	CAWR	CAWR	1
Cables	Cable	Zoom	USB-MiniUSB	CAWR	CAWR	1
Cables	Cable	x	USB-MiniUSB	CAWR	CAWR	1
Cables	Plug	x	USB-Fr	CAWR	CAWR	1
Cables	Plug converter	x	UK-Fr	CAWR	CAWR	3
Camera	Battery charger	Battery charger	x	CAWR	CAWR	1
Camera	Battery charger	Canon	x	CAWR	CAWR	1
Camera	Battery charger	Top-Max	LP-E6	CAWR	CAWR	1
Camera	Camera	Canon	70D	CAWR	CAWR	1
Camera	Camera bag	Lowepro	x	CAWR	CAWR	1
Camera	Camera bag	Lowepro beige	x	CAWR	CAWR	1
Camera	Camera rain protection	Canon	70D	CAWR	CAWR	1
Camera	Cleaning brush	Lenspen	Classic	CAWR	CAWR	1
Camera	Plug converter	x	x	CAWR	CAWR	1
Camera	Plug converter for battery charger	x	UK-Fr	CAWR	CAWR	1
Camera	Tripod	Manfrotto	290extra	CAWR	CAWR	1
Camera	Tripod bag	Manfrotto	80 cm Unpadded	CAWR	CAWR	1
Camera	Tripod light	Amazonbasics	x	CAWR	CAWR	1
Camera	Tripod light bag	x	x	CAWR	CAWR	1
Camera	USD cards	SanDisk	Ultra 64 GB SDXC	CAWR	CAWR	2

Category	Equipment	Brand	Model	Funder	Owner-ship	Quantity
Editing	Post-its for editing	x	x	CAWR	CAWR	1
Laptop	Laptop	Apple	Mac	CAWR	CAWR	1
Laptop	Laptop bag	HP	x	CAWR	CAWR	1
Laptop	Mouse			CAWR	CAWR	1
Laptop	Multicard reader	Popamazing	Portable USB 2.0 Adapter	CAWR	CAWR	1
Power	Cable long	Ravpower	USB-MiniUSB	CAWR	CAWR	1
Power	Cable short	Ravpower	USB-MiniUSB	CAWR	CAWR	1
Power	Multi socket	Surge Guard	x	CAWR	CAWR	1
Power	Solar charger	Ravpower	x	CAWR	CAWR	1
Projector	Cable old projector-laptop	KabelDirekt	VGA-VGA	CAWR	CAWR	1
Projector	Cable old projector-laptop	VGA	VGA-VGA	CAWR	CAWR	1
Projector	Cable projector-laptop	HDMI	HDMI-HDMI	CAWR	CAWR	1
Projector	Cable projector-laptop	x	HDMI-HDMI	CAWR	CAWR	1
Projector	Plug converter for projector	x	USA-Fr	CAWR	CAWR	1
Projector	Plug converter for speaker	x	x	CAWR	CAWR	1
Projector	Projector	Aaxa Technologies	P300	CAWR	CAWR	1
Projector	Projector bag	Caseling	x	CAWR	CAWR	1
Projector	Projector cable	MiniJack to 3 round	x	CAWR	CAWR	1
Projector	Projector charger cable	Aaxa Technologies	x	CAWR	CAWR	1
Projector	Projector tripod	x	x	CAWR	CAWR	1
Sound	AC Adapter	Zoom	H1	CAWR	CAWR	1
Sound	Batteries	Duracell	AA	CAWR	CAWR	6
Sound	Batteries for recorder	Duracell	AAA	CAWR	CAWR	1
Sound	Batteries for recorder	Duracell	AAA	CAWR	CAWR	1
Sound	Batteries for recorder	Duracell	AAA	CAWR	CAWR	1
Sound	Batteries for recorder	Duracell	AAA	CAWR	CAWR	1
Sound	Battery charger	Duracell	AA	CAWR	CAWR	1
Sound	Deadcat	Rode	Deadcat VMPR	CAWR	CAWR	1
Sound	Deadcat C	Rode	Deadcat VMPR	CAWR	CAWR	1
Sound	Foam dead cat	Zoom	H1	CAWR	CAWR	1
Sound	Headphones	Sennheiser	HD201	CAWR	CAWR	1
Sound	Mic clip adapter	Zoom	H1	CAWR	CAWR	1
Sound	Microphone	Rode	VideoMicPro	CAWR	CAWR	1
Sound	Microphone C	Rode	VideoMicPro	CAWR	CAWR	1
Sound	Mini-tripod	Zoom	H1	CAWR	CAWR	1
Sound	Plug converter	x	UK-Fr	CAWR	CAWR	1
Sound	Plug converter for sound recorder	x	x	CAWR	CAWR	1
Sound	Plug UK	Zoom	H1	CAWR	CAWR	1
Sound	Sound recorder	Zoom	H1	CAWR	CAWR	1
Sound	Sound recorder case	Zoom	H1	CAWR	CAWR	1
Sound	Speaker	JBL	Xtreme	CAWR	CAWR	1
Sound	Speaker bag	CU	CAWR	CAWR	CAWR	1
Sound	Speaker cable	x	MiniJack-MiniJack	CAWR	CAWR	1
Sound	Speaker charger	JBL	x	CAWR	CAWR	1
Sound	Speaker sound cable	JBL	MiniJack-MiniJack	CAWR	CAWR	1
Sound	USB cable	Zoom	H1	CAWR	CAWR	1

Category	Equipment	Brand	Model	Funder	Owner-ship	Quantity
Sound	USD cards	SanDisk	Micro 32 GB	CAWR	CAWR	1
Sound	Wind screen	Zoom	H1	CAWR	CAWR	1
Storage	External hard drive	Transcend	2 TB	CAWR	CAWR	1
Storage	External hard drive bag	Caselogic	x	CAWR	CAWR	1
Storage	USD card	SanDisk	64 GB	CAWR	CAWR	1
Suitcase	Suitcase	x	x	CAWR	CAWR	1
Cables	Cable bag	Lynx	x	CSK	CSK	1
Camera	Cable converter	Matric	x	CSK	CSK	1
Laptop	Cable laptop Fr	Toshiba	3-Fr	CSK	CSK	1
Laptop	Laptop	Toshiba	Satellite	CSK	CSK	1
Laptop	Laptop bag	Sandstorm	x	CSK	CSK	1
Laptop	Mouse			CSK	CSK	1
Laptop	Plug converter	x	x	CSK	CSK	1
Light	Light torch	Suaoki	x	CSK	CSK	1
Light	Lght torch cable	MiniHDMI-USB	x	CSK	CSK	1
Mobile	Mobile	Nokia	x	CSK	CSK	1
Mobile	Mobile	Samsung	S6 Edge	CSK	CSK	1
Mobile	Mobile phone cover	x	x	CSK	CSK	1
Power	Cable long	Ravpower	USB-MiniUSB	CSK	CSK	1
Power	Cable short	Ravpower	USB-MiniUSB	CSK	CSK	1
Power	Power bank	Anker	x	CSK	CSK	1
Power	Power bank	Milliken	x	CSK	CSK	1
Power	Power bank bag	Anker	x	CSK	CSK	1
Power	Solar charger	Ravpower	x	CSK	CSK	1
Storage	External hard drive	Transcend	2 TB	CSK	CSK	1
Storage	External hard drive bag	Caselogic	x	CSK	CSK	1
Storage	USB Key	huber	3 GB	CSK	CSK	1
Storage	USB Key	Infineum	1 GB	CSK	CSK	1
Storage	USB Key	Kingston	16 GB	CSK	CSK	1
Storage	USB Key	Matric	4 GB	CSK	CSK	1
Storage	USB Key	SanDisk	4 GB	CSK	CSK	1
Storage	USD card	SanDisk	Micro 2 GB	CSK	CSK	1
Storage	USD card	SanDisk	Micro 64 GB	CSK	CSK	1
Storage	USD card adapter	SanDisk	x	CSK	CSK	1

Legend:

AFAFA: Centre AFAFA (Senegal)

CAWR: Centre for Agroecology, Water and Resilience (Coventry University, United Kingdom)

CSK: Carla Sarrouy Kay



Legend:

1. Tripod
2. Camera bag
3. Water protection for camera
4. Shotgun microphone
5. Shotgun microphone dead cat
6. Hard drive + case
7. Cables
8. Camera
9. Memory card (2 x 64 GB)
10. Cleaning pen
11. Batteries
12. Laptop + editing program
13. Laptop bag
14. Headphones
15. Laptop charger
16. Mouse
17. Battery charger(s)
18. Projector
19. Projector case
20. Sound recorder case
21. Sound recorder

Figure 171. UK research centre's audio-visual equipment used during field experiences in Senegal © Carla Sarrouy Kay 2017



Legend:

1. Laptop charger
2. Laptop
3. Hard drive + case
4. Laptop bag
5. Wi-Fi box
6. Mouse
7. Mobile with Senegalese number
8. Mobile charger
9. Mobile with UK number
10. Mobile charger
11. Headphones

Figure 172. Personal audio-visual equipment used during field experiences in Senegal © Carla Sarrouy Kay 2017