Appraisal of Agricultural Climate Change Adaptation Policies in Sudan

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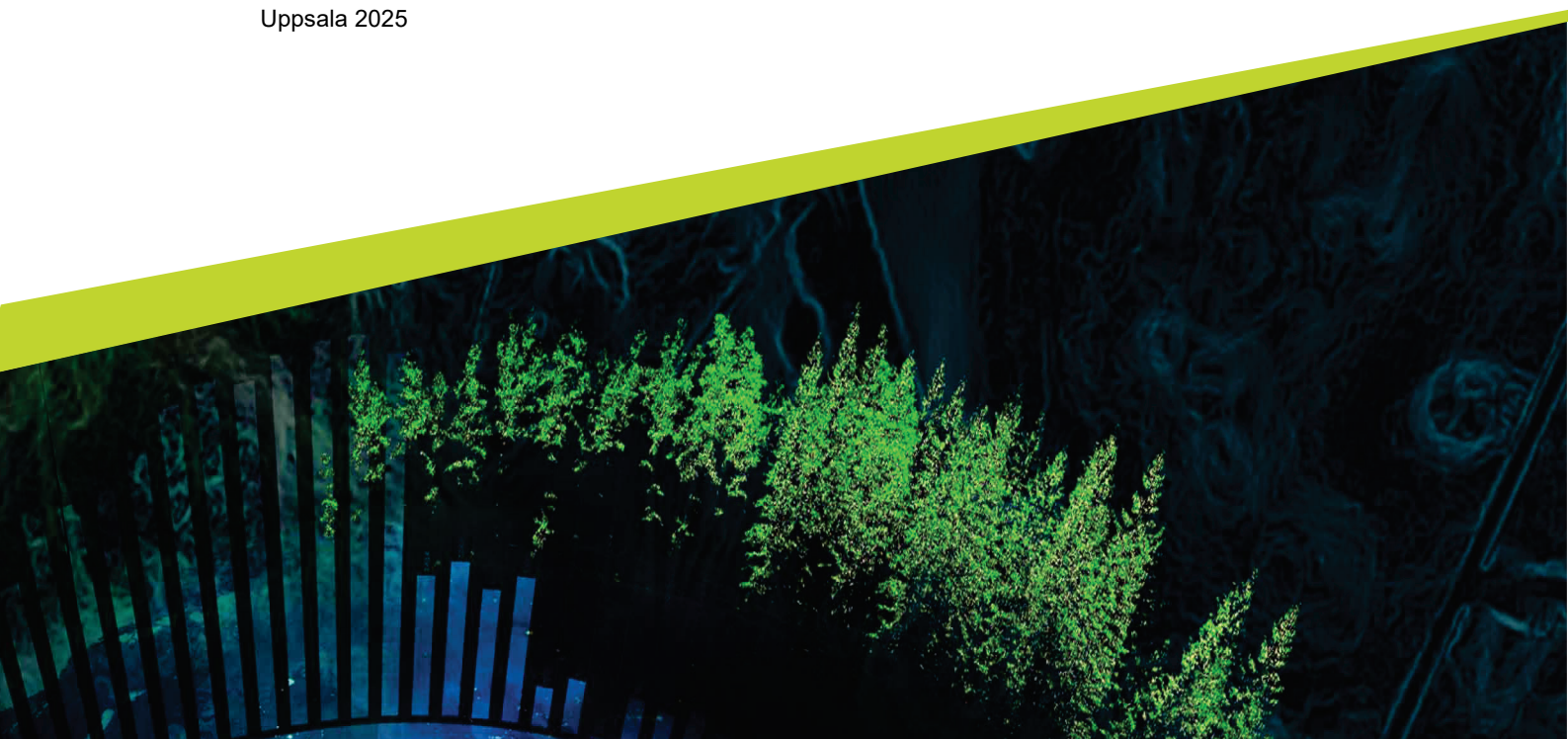
Independent project • 30 credits
Swedish University of Agricultural Sciences, SLU
Faculty of Natural Resources and Agricultural Sciences
Environmental Communication and Management - Master's Programme
Uppsala 2025



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Credits: 30 credits

Level: Second cycle, A2E

Course title: Master thesis in Environmental science, A2E

Course code: EX0897

Programme/education: Environmental Communication and Management - Master's Programme

Course coordinating dept: Department of Aquatic Sciences and Assessment

Place of publication: Uppsala

Year of publication: 2025

Online publication: https://stud.epsilon.slu.se

Keywords: Climate change, Agriculture in Sudan, National Adaptation Plan, What's the Problem Represented To Be?, GERD.

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Abstract

The economy of Sudan largely depends on agriculture. Most of the population lives in rural areas and relies on rain-fed agriculture for their livelihoods, which makes them especially vulnerable to the impacts of climate change.

Agriculture has encountered repeated crises due to climate change, compounded by extreme weather events that lead to issues such as flash floods, droughts, and unpredictable rainfall. Smallholder farmers, who are particularly reliant on rain-fed agriculture, have been significantly affected, especially by the negative consequences of recent flash floods on their farming operations.

Sudan has ratified international agreements concerning environmental governance, as a response Sudan presented the National Adaptation Plan (NAP). This thesis critically examines the existing policies aimed at enhancing the capacity of communities, particularly smallholder farmers, to adapt to the challenges posed by climate change.

The research aims to identify gaps in policies that hinder effective implementation by analyzing proposed measures to address the impact of climate change on agriculture. Policy documents are evaluated alongside interviews with stakeholders in the agricultural sector, including experts and smallholder farmers. The interviews with smallholder farmers emphasize their perceptions of climate change and the challenges they encounter in farming. Bacchi's What is the problem represented to be (WPR) theoretical framework is used to conceptualize the problem of climate change adaptation.

The findings of this thesis indicate that agricultural policy-making is significantly influenced by political decisions, which are shaped by the country's economic conditions. Climate change adaptation is not prioritized in these policies and is still not integrated into national strategic planning. A proposed solution is to build capacity by increasing agricultural production. Additionally, the perspectives of stakeholders, including smallholder farmers and experts from the agribusiness sector and educational institutions, are often overlooked in the policy-making process. Furthermore, current policies have not adequately addressed the implications of the Grand Ethiopian Renaissance Dam (GERD) and its potential positive or negative impacts on climate change risks.

Keywords: Climate change, Agriculture in Sudan, National Adaptation Plan, What’s the Problem Represented To Be?, GERD.

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Abbreviations

ARC	Agricultural Research Corporation
CDA	Critical Discourse Analysis
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Products
GERD	Grand Ethiopian Renaissance Dam
HCENR	Add Higher Council for Environment and Natural Resources
MAL	The Miscellaneous Amendments Law
NDC	Nationally Determined Contribution Under the Paris Agreement
NAP	National Adaptation Plan
NAPA	National Adaptation Plan of Action
PDA	Post-structuralist Discourse Analysis
UNFCCC	United Nations Framework Convention on Climate Change
WPR	What's the Problem Represented to Be?

1. Introduction

Agriculture is a crucial sector in the economy of Sudan. It comprises 90% of non-oil export earnings (HCENR 2021). However, climate change poses a significant challenge to the future of Agriculture because more than 95% of it rely on the rain-fed system (HCENR 2022).

Sudan is already experiencing climate change impacts, resulting in crop failures in traditional rain-fed farming over the past three decades (HCENR 2021).

In 2016, Sudan submitted the National Adaptation Plan (NAP) to the United Nations Framework Convention on Climate Change (UNFCCC), which includes policies designed to provide sustainable solutions for the vulnerability of Sudanese communities. The policies aim to build capacity for vulnerable communities that depend on agriculture as their livelihood to adapt to climate change across the country. Besides helping build institutional capacities, they are crucial in the battle against climate change risks. Despite government efforts to mitigate climate change effects, agricultural policies have failed due to numerous implementation obstacles.

This thesis aims to provide a comprehensive understanding of the reasons behind the failure of agricultural policies to achieve sustainable agriculture. Using Bacchi's approach, 'What is the problem represented to be' (WPR) to policy analysis, the study examines various stakeholders' representations of the problem and assesses the processes involved in designing and implementing agricultural policies. The study also questions how climate change adaptation issues are represented in the policies and how different actors' understandings of the problems affect the policy's effectiveness. The study was not limited to interrogating policy from documents. The study included interviews with smallholder farmers as they are the targeted segment by the policies in addition tp officers from different authorities engaged in the policy-making process. Exploring conflicts in perceptions between authorities and people leads to identifying silenced voices, unrepresented problems, and factors that motivate policy design.

1.1 Research Aim

This thesis aims to evaluate the effectiveness of policies for adapting to climate change within the agricultural governance framework in Sudan.

By using Bacchi's WPR approach, the study will analyze the National Adaptation Plan (NAP) and assess its relevance to the needs and challenges faced by smallholder farmers amid climate-related challenges. By exploring the perspectives of various key actors regarding the problem and proposed solutions, the research will identify gaps in policy implementation and funding that hinder the adaptation capabilities of smallholder farmers.

Finally, the thesis aims to develop recommendations for enhancing policy coherence and providing practical support for smallholder farmers in the context of climate change..

1.2 Research Questions

Using Bacchi's approach, "What is the problem represented to be" (WPR), this thesis examines the implicit assumptions shaping climate adaptation policy. It aims to address the problem outlined above by raising the following questions:questions:

1. How do key stakeholders in Sudanese agriculture conceptualize climate change problems?
2. What is silenced or left unproblematized in the proposed policy (NAP)?
3. What are the implications of this representation of the problem on agricultural practices in the context of climate change challenges?

1.3 Contents of the Study

This research is organized into five sections. The introduction outlines the problem formulation, research aims, and research questions.

The second section offers background information on the geopolitics of Sudan and its impact on agricultural policies. It also highlights the effects of climate change on agriculture in Sudan over the past five years, includes a brief overview of the Grand Ethiopian Renaissance Dam (GERD) and its potential implications for agriculture in Sudan, and discusses the development of agricultural policies. Following this, there is a review of related studies that illuminate the research gap and guide the selection of the study genre.

In the third section, I outline the chosen research approach, describe the data collection procedure, and introduce the analytical and theoretical framework addressing the problem. This is concluded by reflecting on the methodological choices made throughout the research.

The fourth section presents the results and analyzes both primary and secondary data, examining various perceptions of the issue among the key actors. It also

presents a discussion of the findings from the previous analysis. Finally, the concluding section summarizes the study's overall conclusions.

2. Background

The following sections outline the agricultural context of Sudan, focusing on its geographic, demographic, political, and economic circumstances. Additionally, they discuss the international agreements and frameworks that Sudan has signed related to environmental governance and climate change adaptation. This information is essential for understanding the problem formulation presented in the introduction.

Sudan is characterised by a diverse climate and various landscape characters. This diversity enriched agriculture and enabled farmers to cultivate throughout the year. Sudan encompasses an area of about 1.9 million km2. It is divided administratively into 18 states (HCENR 2021). The White Nile originating from Victoria Lake in Uganda, and the Blue Nile originating from Tana Lake in Ethiopia, meet in Khartoum, Sudan's capital, merging to become the Nile River, which flows downstream all the way to the North via Egypt to the downstream Mediterranean Sea. The Nile River, or one of its tributaries, cut through nine states.

Approximately two-thirds of Sudan's population, which accounts for 36.2 million people, live in rural agriculture areas. Agriculture is vital to the country's economy, employing 70-80% of the labour force (IFAD 2019). Agriculture became more significant in Sudan's economy after the cessation of oil exports because of South Sudan's secession in July 2011. However, agriculture has decreased to less than 40% since then (HCENR 2013).

The Sudanese government's commitment to agreements with neighboring countries has affected its ability to establish independent agricultural policies. For example, the Nile River Water Agreement allocated 18.5 cubic meters of water to Sudan while granting Egypt 55 cubic meters. This distribution has led Sudan and other upstream countries to depend on rain-fed agriculture, which is vulnerable to climate change. As a result, Sudan cannot effectively utilize water resources within its territory or build projects like dams along the Nile and its tributaries without obtaining permission from Egypt (Gelaw and Debele, 2024).

Although the government of Sudan has tried to take many measures to build the capacities of smallholder farmers to mitigate and adapt to the effects of climate change, for many reasons, these measures fail to achieve the desired goals.

2.1 Geopolitical Economy in Agricultural Context

Throughout Sudan's history, its politics and geographical location have influenced its agricultural policies.

Being situated along the Red Sea south of Egypt has made it an essential link between the Middle East and Africa. Sudan promoted itself as an agricultural investment destination, and agriculture policies were shaped to the end of attracting investors. In 1969, the president of Sudan, Al Nimeiri (1969-1985), launched the Breadbasket strategy. He promised Sudan would feed the Middle East and Africa if it could massively expand and upgrade its agriculture with Western technology and Gulf money (Sandstrom 2018). During this period, policies were designed to align with the Gulf countries' needs. Agriculture's contribution to GDP increased by expanding land under cultivation rather than productivity (Omer 2011). Crop cultivation was divided into a modern, market-oriented sector that included mechanised large-scale irrigated and rainfed farming and a traditional rainfed industry that focused on subsistence farming.

In 1989, a military coup took place, which led to the rule of the Islamic Party the National congress party. They ruled the most extended period in Sudan (1989-2019). At the beginning of their rule, they took the side of Iraq in its invasion of Kuwait, which resulted in strained relations with the Gulf states. The Gulf countries agriculturl investment decreased over time (Mahgoub 2014). In 1997, the US imposed comprehensive economic and trade sanctions against Sudan. The government had to adjust agricultural policies and replace cash export crops, especially cotton replaced with wheat, maize, and millet to secure Sudan's food self-sufficiency (ibid). The national development agenda aimed to increase agricultural productivity for self-sufficiency, reduce imports, and become an exporter of animal and plant products (FAO 2013). In 2015, President Al Bashir reiterated the invitation of the Arabs to invest in Sudanese agricultural lands (Sandstrom 2016). Al-Bashir stated during his address in Sharm El-Sheikh, the Conference on Support and Development of the Egyptian Economy, that all Arab countries possess an essential element to achieve the goal of integration, pointing to Sudan's possession of land and water, Egypt's human resources, expertise and capabilities, and the Gulf countries' financial and financing resources (ibid). This has led to foreign actors' significant acquisition of Sudanese agricultural lands. As Woertz highlighted, policies were not formed to run the farming but only to issue off-take agreements (Woertz 2011).

To summarise, agricultural policies have overlooked smallholder farmers and instead focused on attracting foreign and local investors for large-scale investments in Sudan.

2.2 Climate Change

Climate change refers to alterations in climate that are directly or indirectly caused by human activities, which modify the composition of the global atmosphere, alongside the natural climate variability that occurs over similar periods (United Nations 1992).

Sudan's climate scenario indicated that by 2060, climate warming could range from 1.5°C to 3.1°C in August and from 1.1°C to 2.1°C in January. The most vulnerable groups would be traditional rainfed farmers (Elasha et al. 2017). According to the Midseason report, normal annual rains play a crucial role in crop establishment, provide one to three irrigations in the irrigated sector, and reduce the reliance on irrigation from canals (HCENR, 2022). However, flash floods caused a significant damage to agriculture. Flooding from July to September 2020 resulted in at least 100 fatalities and the destruction of 100,000 homes, impacting over 500,000 people and prompting a declaration of a state of emergency in 2021. In mid-July 2022, flash floods exacerbated the already vulnerable situation faced by smallholder farmers affected by climate change, compared to the same period in 2021, the number of people and localities affected in 2023 has doubled (UNOCHA 2022). Waterlogging caused extensive damage to cultivated land, impacting thousands of households. The government subsequently declared these areas as disaster zones (ibid).

Heavy rainfall has increased the risk of severe erosion and landslides, negatively affecting agriculture and livelihoods in flood-prone regions. According to UNOCHA, the floods have reportedly impacted at least 238 health facilities, damaged 1,560 water sources, and washed away over 1,500 latrines. People have lost over 330 livestock, and more than 5,200 feddans (18.9 km^2) of agricultural land have become insecure (UNOCHA 2022). Additionally, water contamination has led to diseases such as cholera, malaria, dengue, and chikungunya (UNOCHA 2022).

2.3 Transboundary water governance

Sudan shares the Nile River and its tributaries with ten neighbouring countries. These nations have been in dispute over water allocation since the Nile River Agreement (1929 AND 1959), which was established by colonial powers before the Nile Basin countries gained independence (Sandstrom et al. 2016).

This situation has impacted agricultural policies in Sudan. While Egypt, despite being the last downstream country, holds the largest share of water for irrigation and dam construction for energy, the Nile is crucial to its survival (ibid). In contrast, Sudan adheres to its allocated share of water. And relies on rain-fed agriculture. Rainfall scarcity and temporal variability undermine the capacity of farmers to

cultivate and irrigate cash crops amidst the limited distribution of hydropower (Merem et al. 2020).

Countries located upstream in the Nile Basin believe they are not legally bound to honour any past water treaties, which could be interpreted as an infringement on their sovereignty unless they voluntarily waive their rights under a new deal that authorizes water transfer to their neighbours in the North (ibid). Therefore, Ethiopia began constructing the Grand Ethiopian Renaissance Dam (GERD) across the Blue Nile, located on the eastern border of Sudan in 2011. The Blue Nile represents the largest tributary to the Main Nile, providing an average annual flow of about 50 billion Cubic Meters (BCM), which is about 60% of the natural average flow of the Main Nile at Aswan in Egypt (Sandström 2016). Since then, it has become a source of controversy among the riparian countries of the Nile River (Sandstrom et al. 2016). The GERD has several direct and indirect effects related to climate change. While the dam itself does not significantly contribute to greenhouse gas emissions, its influence on regional water management, energy production, and ecosystems interacts with climate change dynamics (Habteyes et al. 2015). As the dam's construction has been completed and water filling is underway, Egypt has threatened conflict, claiming the dam will harm its water supply, agriculture, and food security. According to the Egyptian Minister of Water Resources and Irrigation, Egypt faced an annual water deficit of 21 billion cubic meters in 2022 (Barakat 2022). Meanwhile. On the other hand, Sudan has not taken a clear stance on whether to support or oppose the GERD, as it is caught between the competing interests of Egypt and Ethiopia (Mosley 21).

The GERD hydropower supply is supposed to cover the shortage of electricity in Sudan. According to Habteyes et al. GERD's considerable hydropower potential could allow Sudan to export more of its petroleum production to the international market by importing cheap and environmentally friendly hydropower from Ethiopia (2015). While the dam may benefit all the riparian countries of the Nile River, this will only happen if cooperation and participation are involved in the plans and operation stages.

2.4 Agricultural Policy drivers

Despite the importance of agriculture in Sudan's economy, it is characterized Sudanese agriculture faces challenges that lead to low land productivity and high production costs.

Key contributing factors include the lack of a strategic framework to effectively promote agricultural development (Albashir and Ahmed 2006).. This section explains how authorities develop agricultural policies in Sudan.

First, is the local economic situation. Agriculture is considered the primary source of Sudan's income, and both the economic situation and inflation

significantly influence policymaking. Consequently, the Ministry of Trade and Finance has greater leverage over agricultural policies than the Ministry of Agriculture and the Higher Council for Environment and Natural Resources (HCENR). General economic policies dictate agricultural policies (Mohamed et al. 2020). The Ministry of Trade and Finance aims to adjust inflation through macroeconomic strategies, such as implementing taxes on production inputs, controlling exchange rates, increasing agricultural yield, and imposing land and crop taxes particularly indirect taxes, which constitute a significant portion of government budget revenue (Mohamed et al. 2020). Annually, the Minister of Trade and Finance announces the new policy for the upcoming agricultural season.

Second, the local political situation. In the past five years: Sudan has gone through three different governments due to ongoing conflicts and political instability. Each change in political leadership has led to adjustments in agricultural policies, depending on the economic impact. National agriculture policies exhibit significant inconsistency and instability. This situation necessitates collaborative efforts between federal and state levels, including power-sharing arrangements and protocols for institutional coordination. Moreover, political instability and government changes often lead to replacement policies. New ministers frequently introduce different policies based on the potential income from the agriculture sector and their projected expenditures for farming seasons. As a result, the primary focus tends to be on increasing production, often at the expense of farmers. High output prices are prioritized, while farmers are left to manage the burden of escalating input costs.

Third, Sudan's international relationships also influence agricultural policies. Factors such as agreements regarding transboundary water resources, the acquisition of significant agricultural land by foreign entities in Sudan, and conflicts in neighbouring countries exert pressure on policy formation. Smallholder farmers, who depend on traditional subsistence agriculture, are not represented in policymaking institutions and are often overlooked, despite constituting most of the population. Consequently, their voices remain unheard. Sudan's international relationships could be prioritized over local agricultural needs, further marginalizing domestic farmers in policy decisions

2.5 Land Acquisition

Another area of conflict in the region centres around the balance of power and political decision-making, specifically regarding large-scale land acquisitions that significantly impacted the hydro-political landscape of the Nile Basin.

Gulf state economies also benefit from long-term strategic investments in African food, agriculture, energy and real estate. As a consequence, Riyadh and Abu Dhabi have targeted Ethiopia and Sudan (Moley 2021). These land

acquisitions, or the phenomena commonly known as land grabbing (Sandstrom 2016), can greatly influence agricultural policies, particularly in Sudan. Between 2008 and 2013, estimated agricultural land deals in Sudan totalled 2,198,842 hectares. Of these, 1,297,529 hectares were being acquired by major investors, such as Egypt, Qatar, and South Korea (Sandstrom 2016).

Other investors from outside the Nile River Basin, such as Saudi Arabia, the UAE, and China, have also participated in land acquisition in Sudan and other areas within the Nile River Basin. The extensive involvement of these external actors affects the power balance in negotiations concerning the distribution of Nile River resources.

2.6 Previous Studies

This review aims to provide insight into the context of the agriculture problem in Sudan, how the problem is being identified in the previous research, and the methodologies and their effectiveness that assist in determining the areas and methods to be studied in this thesis.

Elasha et al. emphasized the importance of agriculture for sustainable livelihoods in Sudan, particularly the critical role of smallholder farmers. It is noted that 80 per cent of the working-age population in Sudan relies on agriculture or related activities for their food and livelihood (Elasha et al. 2017). However, Elasha et al. pointed out that agricultural policies have failed due to political instability. Likewise, Callo-Concha (2018) noted that the agricultural potential of Sudan is further limited by insufficient infrastructure for large-scale irrigation.

Callo-Concha explored the perception of smallholder farmers regarding climate change risk. The study concluded that responses regarding climate change perception and adaptation are frequently subjective, conjectural, and inconsistent and that smallholders admitted climate change effects, which included adaptation policies (2018). The empirical data focussed more on coping risk measures in West Africa. The selected case study area included Sudan savannas, but the empirical data did not cover smallholder farmers from Sudan savannas. It is important to note that Sudan’s context differs from West Africa's in terms of social, cultural, and financial context, as well as the political factors that significantly influence agricultural policy decision-making. However, risks are a complex and multifaced issue, and failure in risk management may put food security in Sudan at risk. The risk may arise in one or more production phases. For instance, most of Sudan's agricultural lands are rainfed, which creates a potential risk. Sometimes, the rate of rain increases or decreases, or the date of rainfall changes. If this risk factor is not well managed, it could cause the failure of the entire farming season. Farmers may encounter risks in one of the early stages, such as preparing the land, weeding, irrigation, harvesting, and even marketing, and large segments of the farming

community will be affected. In the scientific articles and peer-reviewed scientific articles that I reviewed, I did not find any detailed study about the climate change that GERD would cause in Sudan. Still, Xinyi et al. highlighted the role of GERD in regulating future flood and drought protection in the Blue Nile basin. Moreover, The expected annual electricity generation from the GERD is about 15,000 GW, which is considered to double Ethiopia's previous electricity output (Xinyi et al. 2022). The study focused on the benefits of the GERD to Ethiopia. Some authorities in Sudan have expressed optimism about the potential benefits of the GERD, stating

that it would bring social, ecological, economic, and development co-benefits. This vision was based on the statements made by the Sudanese and Ethiopian officials to the media during the early stages of the GERD project. However, these statements were not based on convention or shared formal information with the Ethiopian side. This optimistic vision also aligns with the findings of a quantitative study conducted by Habteyes et al. (2015). The study explored the possibility of mutually beneficial and sustainable benefit-sharing measures resulting from the development and operation of the GERD. The study produced encouraging results (Habteyes et al. 2015), which include water flow regulation, reduction of silt removal costs, affordable clean electricity generation, and the growth of industries in the river Nile basin.

3. Materials and Methods

3.1 Qualitative Data Generation

Real-world research examines personal experience, social life, social systems, and related policies and initiatives. It endeavours to understand the lived-in reality of people in society and its consequences (Robson & McCartan 2011).

The main research question of this research inquires how different actors perceive climate change effects on agriculture and what aspects are unproblematized within the policy. Additionally, what is the effect of this problematization? Creswell and Creswell (2018) pointed out that qualitative research is an approach to exploring and understanding the meaning individuals or groups ascribe to a social or human problem. It is also a type of inquiry that uses inductive reasoning to uncover and understand the factors that influence particular outcomes. Thus, the qualitative technique was chosen to answer my three research questions. In good qualitative research, the researchers draw on multiple qualitative data sources to interpret a research problem (Creswell and Creswell, 2018). As such, the methodology of this thesis is based on qualitative empirical study. The primary data was generated from interviews with key stakeholders (Farmers and officers). The secondary sources of the qualitative data I used are journals and relevant government documents.

3.2 Policy documents

This section offers a concise overview of the National Adaptation Plan (NAP) and the supporting documents utilized to elucidate the analysis of the NAP.

These documents encompass the third adaptation communication of the Nationally Determined Contribution (NDC) under the Paris Agreement, as well as the annual mid-season assessment report prepared by the Food and Agriculture Organization of the United Nations (FAO) in collaboration with the Ministry of Agriculture and various governmental authorities.

The NAP

The NAP project aims to build capacities in all 17 states of Sudan to prepare and execute climate change mitigation programs and establish and strengthen environmental institutions (Alhuseen and Kozová 2014). The NAP focuses on three sectors: Water, Agriculture, and Public health. The scope of this thesis focuses on climate change adaptation measures in Agriculture.

The NAP was prepared as a detailed long-term strategic plan by the Sudan Higher Council for Environment and Natural Resources (HCENR) in 2016, collaborating with the Ministry of Environment, Natural Resources & Physical Development and several local and international organisations. The NAP was introduced, in response to the 2010 Cancun Agreement under the United Nations Framework Convention on Climate Change (HCENR 2016). National vulnerability assessments have identified agriculture as one of the most vulnerable sectors, and it has consistently prioritised building climate resilience into these sectors and mainstreaming adaptation actions within development plans and strategies. This thesis is concerned with agriculture policies made to tackle climate change risks. However, according to the NAP, it is supposed to be supported by the Green Climate Fund (GCF). Which supports developing countries in achieving climate change resilience, alongside support from the local government after being integrated into the country's development plansThe NDCs

The second document analysed is the NDC. Sudan updated its NDC in 2021 to comply with the Paris Agreement, which requires periodic updates to strengthen institutional arrangements and transform NDCs into a strategic action planning framework (HCENR 2021).

The latest NDC indicates that various constraints hinder the implementation of the NAP. One such constraint is political instability, which challenges institutional coordination between different levels of authority due to conflicts in power-sharing arrangements. That leads to a significant lack of suitable policies, regulations, and legislation. Additionally, there is a lack of awareness of adaptation strategies and environmental management plans. According to the NDC, the NAP is based on data from climate change studies conducted in 2003 and 2004. The NDC reported that federal and state institutions face constraints due to their limited capacity, which hinders the implementation of the National Adaptation Plan (NAP). For instance, the Meteorological Authority cannot track climatic changes in Sudan due to the gap in knowledge and research related to climate change in Sudan (HCENR 2021).

The annual mid-season assessment report

The report is an assessment to identify the main factors affecting the agricultural situation in the production areas across 14 States in Sudan for the season between September 2021 and– September 2022.

The report thoroughly assessed the policies implemented to combat agricultural challenges and the measures taken to address climate change throughout the various agricultural seasons.

The mid-season report indicated recurrent problems in every season in all factors affecting agricultural products, such as rainfall, irrigation (water harvesting), agricultural Inputs, agricultural Finance, agricultural input cost, fertiliser and herbicides, agricultural Machinery, fuel, labour, seeds, fertiliser and herbicides, and pest and disease. The report's results showed that the rainy season was moderate in the first cycle and helped in two to three irrigations, but the heavy rainfall in some areas in August 2022 was much heavier than in the previous rainy seasons, which caused flash floods and destroyed crops in some states. With the rise in inflation, the cost of agricultural inputs is set to increase. To assist farmers in managing this, increasing the capital of agricultural banks and other financing institutions is essential. In addition, there is a need to develop long-term maintenance plans for irrigation infrastructure and drainage systems, while also enhancing the capabilities and efficiency of early warning devices for climate-related risks.

3.3 The Interviews

I prepared ten semi-structured interviews with farmers and other key stakeholders. As described in Creswell & Creswell (2018), researchers pose broad, general questions in semi-structured interviews to allow the participants to explain their ideas (2018).

Three interviews were conducted via Zoom, and the rest were emailed to an assistant who conducted the interviews face-to-face. Written consent form was signed before the interviews took place to record the interviews and use the information for educational purposes. For ethical and security reasons, the names of the participants have been kept anonymous and referred to as Participants 1,2,3, etc.

Sampling

I selected five smallholder farmers from different agriculture regions with similar agriculture conditions.

These regions are Kasala State and Al Gezira State. According to the NAP, Kasala State spans a semi-desert zone as well as a low rainfall savannah zone in the south (HCENR 2016). Al Gezira State belongs to an arid climatic zone where rainfall and evapotranspiration yield a negative annual water balance (ibid).

Interviewed smallholder farmers produce cash crops, such as sesame, sugar cane, cotton, and wheat, in addition to serials and horticulture.

The other four participants were engineers working for various agriculture development and management authorities. The last participant was with an officer who works for the Agricultural Bank.

Expert interviewees were selected from the engineering groups linked with the Sudanese Engineering Council Syndicate, of which I am a member. I have attended several seminars discussing agriculture, irrigation, flooding, rainfall, and the role of dams in Sudan's agriculture, as well as a workshop about the GERD. These seminars and discussions inspired me to research the experiences of smallholder farmers, which helped me to build a network that connected me with engineers and farmers. Recommendations from one of the engineers I interviewed facilitated the selection of interviewee farmers.

Table 1. The interviews

Interviewee	Role	Description
Participan 1	Smallholder farmer	Almanagel (Al Gezira State)
Participan 2	Smallholder farmer	Almanagel (Al Gezira State)
Participan 3	Smallholder farmer	Almanagel (Al Gezira State)
Participan 4	Smallholder farmer	Khashm Algerba (Kasala state)
Participan 5	Smallholder farmer	Khashm Algerba (Kasala stae)
Participan 6	Agriculture engineer	Ministry of Agriculture
Participan 7	Risk and safety engineer	Ministry of irrigation and water resources
Participan 8	Hydropower engineer	Ministry of irrigation and water resources
Participan 9	Mechanical engineer	Private agriculture servive company
Participan 10	An officer	Expert in agriculture technology/agricultural bank

3.4 Analytical Framework

The theoretical framework for this thesis is "What is the problem represented to be?" (WPR) approach is a critical framework developed by Carol Bacchi that encourages thinking outside of the conventional policy that challenges the belief that policy is being taken for granted. It involves assessing policy assumptions and unmaking and re-making policy (Bacchi 2012).

Bacchi's WPR assumes a specific policy or policy proposal contains an implicit representation of the "problem," referred to as a problem representation (Bacchi 2009). The WPR influenced by Foucault's poststructuralism encourages critical engagement with what information, knowledge, and assumptions have led to the «representation» of a policy «problem» in a particular way (O'Hagan 2020). The WPR analysis, drawing on Foucault's concept, which extends beyond language analysis, states that things are not as good as they are (Bacchi 2016).

Bacchi & Godwin suggested a poststructuralist approach that enables policy workers to reflect critically on governing practices, theorize their location within

those practices, and resist practices deemed to have deleterious consequences for specific people and groups (2016).

Bacchi & Godwin present WPR as an analytic strategy to facilitate policy work practices (2016). The emphasis on various practices highlights that "things", including both objects and people, are not static but are always in flux.

This perspective views individuals as temporary and constantly evolving. It encourages researchers to maintain an ongoing dialogue with themselves, questioning their own beliefs and perspectives while interpreting policies that why progressive changes are not being achieved by policies? (Bacchi 2000). It's about the ongoing journey of self-discovery that enhances the depth and authenticity of their analysis, challenging the taken-for-granted policies' status as a mode of governing (Bacchi & Godwin 2016). The insights and methodologies of experts, researchers, and professionals across diverse disciplines play a crucial role in shaping this process. As a result, these knowledgeable individuals often become the focal point of extensive critical analysis (Bacchi 2016), allowing for a deeper understanding of their contributions and the implications of their work.

Governing involves the constitution of policies. According to Bacchi (2016), we are governed through problematizations rather than through policies. Consequently, the practices and theories of practitioners and experts play crucial roles in this process. As a result, these experts become subjects of critical analysis (ibid).

In this thesis, I selected, in addition to farmers, experts from different authorities for interviews, and served as the researcher. As self-problematization ('reflexivity') forms a crucial part of the analysis (Bacchi & Godwin 2016). I situated myself as a researcher in this policy assessment process I consider my perspective also influences the direction of this work.

The poststructuralist perspective used in the analysis of interviews' narrative, the analysis considers discourse as a form of power that impacts people's actions by shaping how they frame the world. It analyzes language, concepts, and assumptions embedded in policy documents to uncover implicit power relations and ideological underpinnings. The poststructural perspective influenced by Foucault views policy work, like all types of knowledge work, as something that can be articulated through discursive practices. Objects of a discourse are quite capable of being contradictory (Bacchi & Godwin 2016).The WPR approach suggests six analaytical questions that can be utilised in policy analysis research, and researchers must tailor them to their specific research problem. Below are the questions formulated by WPR, as outlined in Bacchi (2009):

1) What's the 'problem' represented to be in a specific policy or policy proposal?
2) What presuppositions or assumptions underpin this representation of the 'problem'?
3) How has this representation of the "problem" come about?

4) What is left unproblematic in this problem representation? Where are the silences? Can the ‘problem’ be thought about differently?
5) What effects (discursive, subjectification, and lived) are produced by this representation of the “problem”?
6) How/where has this representation of the ‘problem’ been produced, disseminated and defended? How has it been (or could it be) questioned, disrupted and replaced?

3.5 Data analysis

The process of data analysis made in this thesis includes several stages that will be illustrated below.

This study adopted qualitative data; the stage of data collection generated massive data from the literature regarding agriculture in Sudan, to focus on data that respond to my research questions, guided by Bacchi's WRP framework, I thoroughly examined the policy documents to identify and organize key themes and patterns. I went through the material several times to identify descriptive coding for policy documents. For a deeper understanding, I performed a systematic colour-coding exercise, which allowed me to visually identify and highlight the key themes that emerged within the text. For instance, the main goals of the policies, the targeted segments, and the proposed solutions I summarised them in bullet points. I grouped similar codes into themes and organized these themes in an Excel sheet.

I followed a similar process was done with the interviews. I utilized the Otter Assistant software to transcribe the recorded interviews. After transcribing, I revised and screened the interviews to exclude unnecessary information that would not support my research questions. This initial step for the narrative analysis was followed by an inductive revision of the data, through which I aimed to create a comprehensive and organized set of themes. I also colour-coded the main themes and carefully selected quotes to support my interpretations.

To identify several codes guided by the research questions, I used an Excel sheet and color-coded the selected codes each cod given the same colour as the quote. For example, one code was related to destroyed infrastructure, illustrated by the participant's quote:

"The irrigation canals have not been cleaned or maintained for several years."

The results section is based on the WPR approach, which is used to interpret the findings and the constructed meanings surrounding the problem identified in the documents. Additionally, the findings provide insights into the participants’ views, allowing for the examination of any gaps or contradictions, especially regarding whether the voices of key actors were sufficiently included in the policies.

The research questions were explored in conjunction with the inquiries of Bacchi's (WRP) approach.The research questions were explored in conjunction with the inquiries of Bacchi's (WRP) approach.

I reviewed related topics, determining their objectives, and results to draw insights from these studies and highlight the primary areas of disagreement and uncertainty (Robson & Mc Cartan 2011). Discussing the results led to an understanding of the differences between the objectives outlined in the policy document, the treatment methods employed, and the perspectives of other stakeholders. The interviews revealed varying perspectives of the problem and proposed different solutions, exploring the silenced represented voices. This opens the room to critical thinking about the problem representation and solution differently.

This research contributes to the literature on environmental communication and management in investigating Sudan's struggle with climate change by utilizing WRP.

3.6 Research Limitations

Throughout the process of completing my thesis, I encountered several challenges. One significant obstacle was the collection and generation of empirical data on climate change., primarily due to a lack of reliable information and data sources.

I struggled to locate updated government policies, guidelines, and statistical databases pertinent to agricultural policies on official websites, such as the Ministry of Agriculture and Forestry. This difficulty stemmed from the frequent changes in policies over the past five years, influenced by the instability of the economic and political landscape since 2018. Consequently, I had to rely on outdated news articles available on the internet for information.

Another challenge I faced was engaging with key stakeholders. The ten interviews I conducted did not encompass all the stakeholders I had intended to reach, as agriculture policy decisions are influenced by a diverse array of contradictory sectors. Additionally, poor internet connectivity hampered communication with stakeholders in rural areas. Farmers were often reluctant to speak with me due to their strained relationships with authorities and educational institutions. To address this issue, I sought out individuals whom the farmers trusted to facilitate the interviews.

Other research areas required further exploration, such as the policies regarding foreign companies acquiring agricultural land in Sudan, which involve conflicting interests across various sectors. In addition to land tenure regulations due to the inheritance laws, many people are unable to utilise their lands as assets to get mortgages. Furthermore, the impact of gender roles in agriculture requires a more detailed examination, given that each state in Sudan adheres to different criteria and

contexts shaped by diverse norms and cultural backgrounds The data collection period aligned with a few weeks before the start of the ongoing conflict between military factions in the country. I plan to explore this genre in greater depth in future research.

When I started my research, I initially assumed that the (GERD) was responsible for the floods of the past five years, as it had been a frequent topic among activists and journalists. However, I found that there are not enough studies on the GERD, and it was not addressed in the National Adaptation Plan (NAP), which forms the basis of this research. While I did not want to exclude the GERD from my study, I acknowledged that further investigation is needed.

Despite the limitations, Bacci's WPR framework still perfectly fits the investigation of policy effectiveness on climate change adaptation measures in agriculture. The six questions encompass the essential information needed to conduct a critical analysis of policy documents and perespectives of all stakeholders.

4. Results and Discussion

The analysis results revealed in sections 4.1, 4.2, and 4.3 present diverse perspectives among key stakeholders about the climate change adaptation challenges facing the agricultural sector.

Furthermore, it highlights the underlying assumptions that shape the representation of these issues the policy proposals. These sections respond to the first question of the thesis on problem representations and presumptions, as well as WPR Questions 1 and 2. The third research question, along with the remaining WPR questions, will be answered in section 4.4, titled "The Discussion."

The subsections unveal the agricultural policies outlined in the National Adaptation Plan (NAP), as evaluated in the National Climate Document for 2021-2022 and the mid-season report of 2022. They also examine how key stakeholders frame the problems and identify gaps in various representations of climate change challenges.The subsections review the agricultural policies outlined in the National Adaptation Plan (NAP), as evaluated in the National Climate Document for 2021-2022 and the mid-season report of 2022. They examine how key stakeholders frame the problems and identify gaps in various representations of climate change adaptation measures.

4.1 The Problem As Described In The Policies

This section addresses the first and second WPR analytical questions and it will elaborates more on the conflict in conceptualising climate change.risks on agriculture.

WPR Q1, What's the 'problem' represented to be in a specific policy or policy proposal the (NAP)?

WPR Q2, What presuppositions or assumptions underpin this representation of the 'problem'?

The first question assists in clarifying the implicit problem representation within a specific policy or policy proposal (Bletsas & Beasley 2012).

The second question describes the necessary meanings that are antecedent to an argument and the assumptions (ontological, epistemological) that underlie this representation of the "problem"(ibid).

According to the NAP, the primary objective of developing Sudan's National Adaptation Plan is to promote sustainable development and alleviate poverty by mitigating the long-term effects of climate change (HCENR 2016). The NAP suggested three main aspects of reforms that aim to be incorporated into daily planning and operations.

From the recommended solutions in the NAP, the implication is that the problem is the governments currently lack the necessary tools and coordination mechanisms to create effective strategic plans for managing agricultural policies in the context of climate change. To address this issue, it is crucial to equip them with the resources needed to develop these strategic plans and to facilitate collaboration among the various authorities involved in agricultural policies. These policies aimed to increase agriculture producers' revenue by raising the prices of their products. This idea is based on the assumption that most farmers are commercially orientated and can gain from increased agricultural output prices despite the rise in inputs. Farmers purchasing inputs but mainly producing for subsistence will lose out. However, this should be mentioned in policies. Such policies might lead to a negative impact on smallholder farmers. For instance, it may cause a reduction in the cultivated areas because farmers who plant mainly for subsistence do not benefit from raised output prices but are hard hit by the rising cost of agricultural inputs. As a result, smallholder farmers tend to lease their land to farmers with better financial capacity. Foreign and Sudanese investors have taken advantage of the agricultural investment policies. Neoliberalism the ideology that advocates the dominance of a competition-driven market model (Leys 2008), in which the government has less interference in individual life, maing smallholder farmers lose the competition in the farming field against local and foreign investors.

4.2 The Problem As Described By Experts

This section will elaborate on expert’s views on climate change adaptation challenges.

While the proposed policies included in the NAP focused on building the capacity of institutes and individual farmers besides risk management, experts narratives from relevant authorities have identified different factors that have a significant impact on the process of the policy-making of climate change adaptation policy-making are not treated in the NAP.

Lack of information

Experts suggest that one of the main challenges faced in Sudan stem from a lack of scientific research on environmental issues and climate change.

The policy proposed the solution to this problem by building the capacity of research and educational institutes, which are primarily addressed within the HCENR framework. Additionally, professionals in both government departments and the private sector are not effectively integrating sustainable development goals into their practices.

However, Sudan's lack of political and security stability led to the suspension of universities and research institutes over the past five years, there are no empirical studies on climatic changes hence, led to a lack of reliable information regarding climate change projections and their effects. And a failure to capitalize on potential opportunities, such as GERD.

> There is a pressing need for more information and research. The first challenge we face is the lack of data. Because many experts have migrated, mainly to Gulf countries, in search of better job opportunities (Participant 8).

Absence of The Agricultural Research Corporation and Agricultural Extension

The ARC develops and implements applied research to produce sustainable crops and high yields. and research on technologies and systems for sustainable agriculture, The agricultural extension service communicates this knowledge and trains farmers to apply new systems.

the Agricultural Extension is a department within the Ministry of Agriculture responsible for organizing training and supervision programs for farmers on utilizing technology.

> Agricultural guides are government officials who act as a bridge between farmers and the government. They communicate the issues faced by farmers to the relevant authorities and agricultural research centres (Participant 6).

In addition to providing support for integrating their previous experiences with modern knowledge, agricultural extension helps farmers mitigate the impact of rainfall variability. Interviews with participants revealed that they practice traditional agriculture, cultivating crops such as cereals, sesame, peanuts, hibiscus, sugar cane, cotton, and various horticultural products.

> The ARC and agricultural extension services used to help guide farmers in selecting the type of crops and switching types according to the proposed policies but their visits stopped in 2019 (Participant 6).

Farmers typically select their crops based on the policies announced by the Ministry of Agriculture, which also determines the pricing for these crops. The Ministry buys surplus produce from farmers and either sells it in local markets or exports it.

> However, agricultural extension visits have been discontinued for the past five years due to a lack of funding, although some agricultural companies finance visits and training programs to promote their products (Participant 10).

Lack of funds for risk managemen

Lack of fund has three occurred in three areas of the Nap.

Engineers highlighted that inadequate funding hinders the implementation of risk management and early warning plans.

> We typically receive less than 50% of our requested budget, which results in plans that remain inactive until disasters occur (Participant 7)

Engineers from the Ministry of Irrigation and Water Management noted that while annual risk management and early warning plans are developed, they lack sufficient budgets. These plans include maintaining water infrastructure and raising community awareness about conservation. A critical issue is the exclusion of smallholder farmers from policy decisions and the failure to equip them with the education and training needed for sustainable agricultural practices.

> The Ministry often only provides subsidies to farmers post-flood instead of proactive measures. Additionally, funds meant for irrigation maintenance may be diverted to urgent issues like dam safety, disrupting ongoing projects (Participant 7)

The power imbalance

The balance of political power affects the authority of various ministries involved in agricultural policy-making.

The level of collaboration or conflict among these entities can greatly impact the effectiveness and direction of agricultural policies. These dynamics have significant implications for farmers and the agricultural industry as a whole, particularly due to the interactions between the Ministry of Trade and Finance and the Ministry of Agriculture. Policy-making is influenced by a country's economic and political landscape. As a result, the Ministry of Trade and Finance has been able to play a more significant role in shaping agricultural policies than the Ministry of Agriculture and HCENR.

Expert's views on the GERD

Experts are optimistic about the gerd, especially after the failure of several Sudanese dams to achieve electricity self-sufficiency

Participant 7 pointed out a critical aspect regarding the GERD. The NAP, issued in 2016, called for research on climate change's effects on agriculture, but it did not address the impact of GERD, which began construction in 2011. The participant expressed optimism about the potential outcomes of GERD if negotiated and studied collaboratively with the Ethiopian government.

Participant 7 noted that discussions surrounding GERD are often overshadowed by political negotiations rather than scientific inquiry into its benefits by political negotiations rather than scientific inquiry into its benefits. Given Sudan's strategic location in the Nile Basin, the country holds a strong position to negotiate water issues, reevaluate the inequitable Nile Water Agreement, and promote cooperation among Nile Basin countries.

> However, widespread mistrust and political conflicts in these nations hinder progress. Additionally, the potential benefits of GERD in providing hydropower have not been formally studied (Participant 7).

Participant 8 has an optimistic view about the GERD.

> Fatal floods could be controlled, and destructive floods could be transformed into constructive opportunities, If an agreement is reached regarding the opening of the lake's gates. Additionally, the flow of silt can be regulated which enhances the fertility of the soil. The generation of hydroelectric power greatly improves agriculture (participant 8).

4.3 The Problem As Described By Smallholder Farmers

Interviews with smallholder farmers indicated that they face numerous challenges that hinder the success of their traditional rain-fed agricultural season.
This section presents the analysis of the interviews.

Farmers encounter chchallenges such as access to the farming land, regular irrigation, the availability of improved seeds, fertilisers, and pesticides, in addition to storage and transportation of the product to the market. Concerning irrigation, farmers believe that the task of the government and the Ministry of Irrigation is to provide irrigation infrastructures, dig canals and clean them periodically.

> We do our work but we need the Authorities such as the Ministry of Irrigation and the other concerned sectors to do their job, too, all the agricultural projects such as the Al-Gazira project, have deteriorated dramatically because of the lack of irrigation and inadequate maintenance for the irrigation canals (Participant2).

Additionally, the issue of products marketing is one of the challenges highlighted by farmers a that have no long-term solution in the policies. It depends upon the country's economic situation, and the ongoing inflation affects the prices. The government buys agricultural products from farmers in the local currency, and prices are set before harvesting. However, after harvesting, farmers are surprised yearly by the low cost of the local currency due to daily increasing inflation.

> Crop markets are far from the production areas the transport of the crops is maintained but the roads are not maintained and not secure (Participant2).

Marketing and transporting their production to central crop markets in the capital or any other market is a big challenge due to a lack of dry or refrigerated storage facilities, poor infrastructure, inadequate roads, and an unsafe environment due to conflicts with herders. As a result, farmers are unwilling to take the risk of increasing production because they cannot sell their products before they expire. Therefore, smallholder farmers indicated that cultivate just enough food to meet their needs for the year ahead.

> Selling our products with the local currency is a big risk because of its instability (Participant3).

They believe the issue lies in the lack of infrastructure and processing of crops until they reach the marketing stage, be it local or export markets. In summary, farmers who have shared their experiences have a unique perspective on agriculture issues. They believe the problem lies in the inadequate infrastructure and processing of crops before they are marketed locally or for export

Socio-economic problems

Smallholder farmers do not encourage their children to pursue careers in agriculture. Instead, they prioritize sending them to school for a modern education. Although they struggle to afford school expenses, they hope their children will secure better-paying jobs outside of agriculture.

> Young people from this village and the surrounding villages often migrate to the capital in search of employment. They tend to prefer jobs in the army or police intelligence services due to the stability of monthly salaries (Participant 4).

Many young individuals favour the guaranteed income from these minor roles in security and law enforcement. Individuals who struggle to cover the costs of education often find themselves cutting down trees, transforming the wood into charcoal that they sell for a modest income. Meanwhile, some pursue their livelihoods in traditional gold mining.

> They do not have the patience for agriculture, especially since its results are not guaranteed (Participant 4).

In contrast, the older generation of farmers had access to agricultural schools, which produced skilled agricultural workers. Unfortunately, these schools have now closed.

> I face the problem of labour scarcity. I have to hire casual labourers without experience in farming (Participant 3).

Inadequate Infrastructure

Concerning irrigated agriculture, farmers believe that the government and the Ministry of Irrigation are responsible for providing irrigation infrastructure, digging canals, maintaining them, and cleaning them periodically.

> We do our work, but we need the Authorities, such as the Ministry of Irrigation and the other concerned sectors, to do their job, too. All the agricultural projects, such as the Al-Gezira project, have deteriorated dramatically because of the lack of irrigation and inadequate maintenance for the irrigation canals (Participant 2).

Concerning irrigated agriculture, farmers believe that the government and the Ministry of Irrigation are responsible for providing irrigation infrastructure, digging canals, maintaining the lack of reliable information, and cleaning them periodically.

Land tenure

The cost of agricultural land has become unaffordable for local farmers because the government sells land primarily to investors.

Farmers typically cultivate family-owned land that cannot be mortgaged due to issues related to ownership and inheritance. Additionally, many farmers are hesitant to take out loans because they are uncertain about their production outcomes. The absence of a loan insurance system further discourages them from taking these financial risks.

> As a farmer, I face this exact issue. The land I cultivate was inherited from my mother, but I am not the sole owner. My brothers and father also own parts of it and are unwilling to mortgage it to the bank. We do not need to take anything from the bank, as we select the seeds from our yield and use livestock manure as fertiliser (Participant 1).

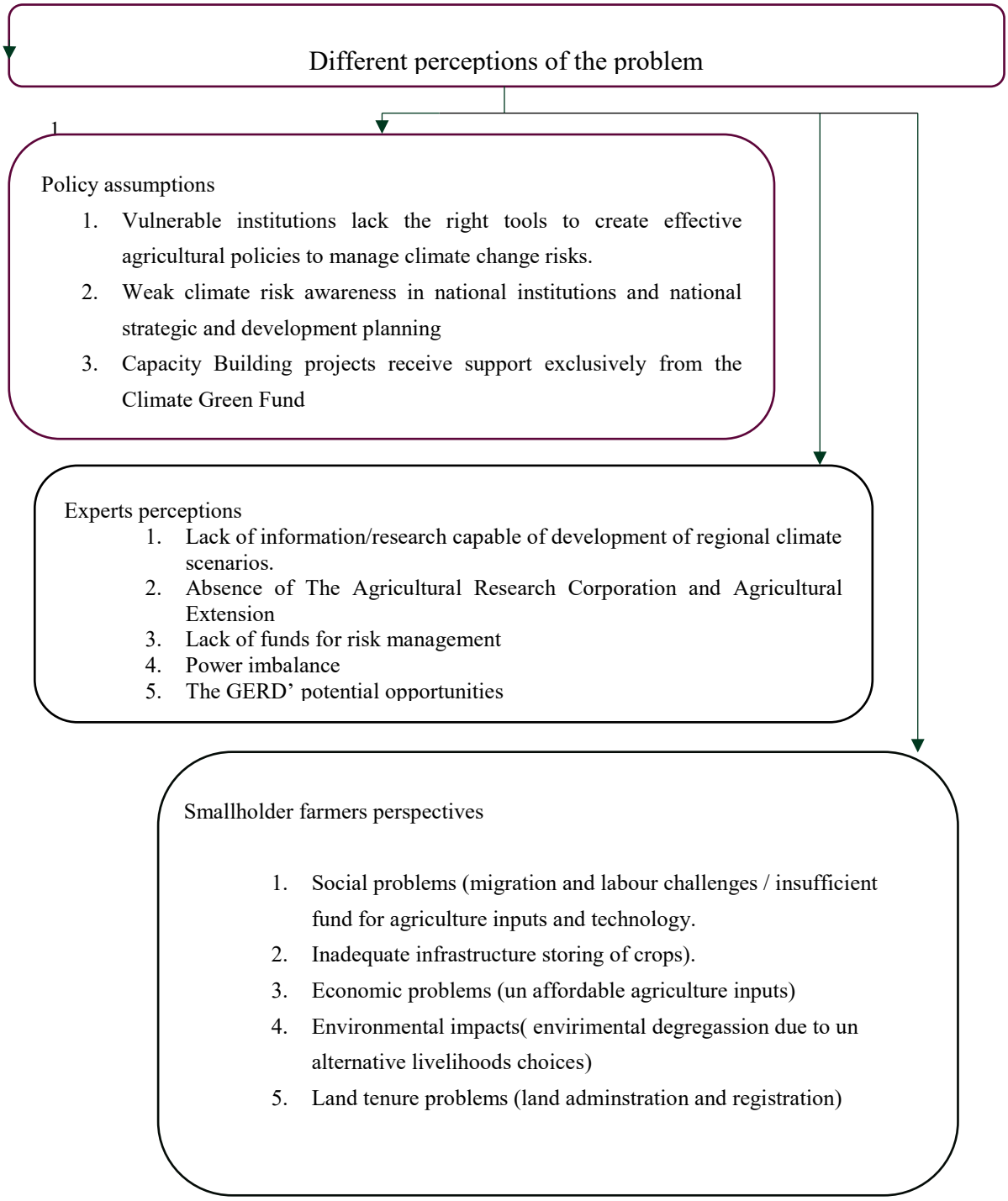
> I cultivate on my land, which I inherited from my father. I also farm on the land of my sisters because they are not interested in agriculture and live with their husbands in the city. After every season, I send them the rent; it is not a fixed amount; it depends on the yield (Participant 3).

4.4 Discussion

The analysis in this thesis is grounded on Foucault's poststructural approach analysis "discursive practice(s), not discourse, as a form of critical analysis that allows a refreshing skepticism toward the full range of things commonly associated with policy (Bacchi & Godwin 2016).

I analyzed the policies regarding climate change adaptation measures. The results of policy analysis when compared with expert's and farmer's narratives revealed differences in the problematization. The figure below summarizes the presumptions of policy definition of the problem and the interview narrative's produced climate change issues adaptation in agriculture.

Figure 1: Different perceptions of the problem from the NAP and the interviews



I start my discussion with a brief overview of the aims and findings of these articles. I will refer to these three studies in the sections below when I discuss my findings, organized under Bacchi's analytical questions 3-6.

These academic articles applied different theories to analyze the development of smallholder farming and climate change adaptation measures in Sudan and South Africa. There are similarities and some contradictions between what these three studies findings and those of my own research.

Alhuseen & Kozová (2014) present a SWOT analysis for climate change adaptation measures in Sudan. They utilized a qualitative approach with interviews and focus groups governmental officers, local NGOs and UN agencies. Findings of the study indicated that, despite initiatives like the National Adaptation Plan of Action (NAPA) and the NAP in Sudan, efforts to address adaptation needs are inadequate. Challenges include limited capacity, insufficient financial and technical support from developed countries, and weak regional cooperation. Climate change strategies and policy implementation in planning processes and institutional frameworks can be greatly enhanced by considering various factors, including political, social, economic, environmental, and cultural elements, which in extension can lead to better outcomes. The results indicate that despite that Sudan has suitable environmental laws and policies in place, there is no active comprehensive national policy or strategy on climate change and disaster risk management. The study stressed the importance of stakeholder's involvement for effective implementation.

Mahgoub's (2014) book, "The Current Status of Agriculture and Future Challenges in Sudan," presents several key findings. Research shows that agricultural output levels in Sudan remain suboptimal, particularly in the wake of oil production beginning in the early 2000s. This situation can be attributed to various factors, including climate change, insufficient infrastructure, and inconsistent agricultural policies.

Jacobson's (2013) study focuses on the ideas behind the Massive Food Production Programme (MFPP) Agricultural Development Program, which aims to alleviate poverty by enhancing agricultural production in South Africa. Utilizing critical discourse analysis (CDA) and a livelihoods perspective, this initiative specifically examines its local impacts when implemented in smallholder communities. Jacobson stressed the importance of the role of smallholder farmers. To reduce poverty, the revitalisation of African agriculture must essentially be smallholder-based (Jacobson 2013). The MFPP in South Africa as described by Jacobson (2013) applied similar aproach as the NAP in Sudan in improving the capacity of smallholder farmers in South Africa. The program primarily introduced Bt maize, which has been genetically modified to resist certain potentially harmful insects common in the region. A livelihood analysis of smallholders revealed that farmers rely on their traditional knowledge to manage such risks. However, the MFPP's efforts to shift smallholder practices toward risky entrepreneurial activities involved introducing agricultural seeds that needed a lot of fertilizer and watering to produce well, and that did not last in local storage facilities, without introducing the needed infrastructure or suipport to make appropriate use of these seeds possible. This approach reduced agricultural diversity and increased reliance on homogeneous seeds. Additionally, strict guidelines limited farmers' adaptation capacity. As a result the MFPP raised risks in smallholder agriculture.

I relied on the study by (Meram et al. 2020) to discuss this issue about the GERD. The study concludes that utilizing the Nile waters is necessary, especially in circumstances where rainfall patterns in the Nile River Basin are subject to climate change, they are variable and unpredictable.

There are similarities between what these three studies have found and what I have found in my study and I will refer to these three studies in the sections below when I discuss my findings, organized under Bacchi's analytical questions 3-6.

WPR Q3, How has this representation of the "problem" come about?

This question calls for an examination of the contingent practices and processes through which this understanding of the 'problem' has developed (Bletsas & Beasley, 2012).

Addressing this question requires a broad range of data that would expand the research's scope to include relevant institutions. However, it has been briefly addressed in the background section concerning factors that influence policy-making. These factors, which affect policy development, will be elaborated more here discussion.

Sudan collaborates with national and international partners to promote sustainable development, aiming to respond to the global call to action to eradicate poverty, protect the environment and climate, and ensure peace and prosperity for all.

The National Adaptation Plan (NAP) was developed in response to Sudan's commitment to environmental conventions and was introduced following the 2010 Cancun Agreement under the United Nations Framework Convention on Climate Change. In 2016, Sudan established the Higher Council for the Environment and Natural Resources (HCENR) to address environmental issues. The HCENR serves as the main figure responsible for climate change activities and operates independently, reporting directly to the President of the Republic. Its mission is to coordinate cooperation among various ministries to create a long-term national plan, which includes implementing essential urgent and immediate adaptation initiatives (Alhuseen & Kozová 2014).

The NDCs have consistently prioritized building climate resilience across various sectors and incorporating adaptation actions into development plans and strategies. Despite these efforts, the latest NDC indicates that several constraints hinder the implementation of the NAP. One significant challenge is political instability, which disrupts institutional coordination between different levels of authority due to conflicts over power-sharing arrangements (HCENR 2021). This political situation has led to a notable lack of appropriate policies, regulations, and legislation, as well as difficulties in securing support from donor countries.

WPR Q4 What is left unproblematic in this problem representation? Where are the silences? Can the ‘problem’ be thought about differently?

This question allows researchers to examine potential gaps or limitations in the representation of the 'problem' while fostering creative ideas for possible alternatives (Bletsas & Beasley 2012).

It encourages alternative perspectives on issues that empower marginalized groups and challenge dominant power structures. Response to this question addresses the second question of my research, including subquestions that arose during the interviews. The policy documents provide insight into the policymaking process and implementation methods. Alternative perspectives were proposed based on the narratives gathered from interviews with both experts and farmers. They highlighted aspects that may be overlooked or insufficiently addressed in policy discussions.

Political issues

Foucault’s insights remind us of the deeply political nature of our understanding of the “real.” It emphasizes that what we say and do are practices shaped by context, rather than fixed truths.

In Sudan, the impacts of climate change are further complicated by ongoing political and security challenges. This reality makes it incredibly difficult to create a viable long-term strategy for managing natural resources and addressing environmental issues. It's essential to acknowledge the struggles faced by those affected by these overlapping crises, as they seek sustainable solutions in such a complex landscape.

Interview narratives have pointed out issues that were not addressed in the policy document about power dynamics. This confirms Alhuseen & Kozová's views that political instability and power imbalances lead to overlapping interference from different authorities (2014). They emphasize that these can significantly affect resource allocation; for example, a minister aligned with a dominant group may favour certain projects during risk management phases.

Political instability exacerbated in the last five years. The country has experienced a persistent cycle of various governance forms, including democracy, military coups, and public uprisings aimed at reinstating democratic rule (HCENR 2021), leading to ongoing conflicts. Since the collapse of the Islamic military dictatorship in 2019, the Sudanese government has confronted constitutional uncertainty, further escalating tensions and contributing to the proliferation of conflicts.

Sudan's susceptibility to climate change is intensified by political and security instability, making it challenging to establish a sustainable long-term strategic plan for managing natural resources and tackling environmental issues.

Opportunities associated with the GERD

Merem et al. highlighted the importance of the researchers to elicit immediate answers to several queries that are pertinent to hydrological security in turbulent environments in the Nile basin.

According to Merem et al., Intervention to refocus the policy priorities on access to transboundary water in the Nile River Basin requires answers to inquiries such as how will environmental change affect transboundary water flow across the region and what are the essential ingredients for ending the transboundary water crisis in the study area (2020).

Narratives from experts have highlighted the necessity of regulating floodwaters, water harvesting and hydropower supply, a process that could involve negotiations with Ethiopian and Egyptian authorities regarding the management of the GERD.

This would entail coordinating the filling of the dam's reservoir and adjusting the gates to release water during periods of heavy rainfall. Additionally, the dam has the potential to provide electricity to agricultural regions, thereby enhancing farmers' access to technology. However, this matter remains unsolved within political discussions, which means the agricultural benefits of the dam have not been incorporated into scientific research or risk management topics. My findings confirm the results of (Merem et al. 2024) on the necessity of research in solving the conflict around the Nile Discussions surrounding the GERD are largely absent, as the issue is relegated to political negotiations among the Nile Basin countries.

WPR Q5, What effects are produced by this representation of the ‘problem’?

This question considered an assessment of how identified problem representations limit what can be talked about as relevant, shape people’s understandings of themselves and the issues, and impact materially on people’s lives (Bletsas & Beasley 2012). This also responds to the third question of this thesis.

According to Bacchi’s WPR approach, which challenges the common view that policies address problems (Bacchi 2016), the interviews revealed an unsustainable situation resulting from this representation of the problems. Governance is a critical variable in climate vulnerability, as it can create or accentuate inequalities that worsen the effects of climate change on specific groups (Tarif 2022). Interview narratives revealed unsustainability concerning the three capital assets in sustainable livelihoods for smallholder farmers: human, social, and financial, as well as coping and adaptive capacities to climate change impacts.

Socio-economic Impacts

Findings from smallholder farmers narratives revealed significant social and economic issues occurred due to the representation of climate change adaptation problems in the NAP.

Socially, the ongoing outflow of young people, skilled labour and researchers to urban areas or neighbouring countries, where job opportunities are better, negatively impacts the effective preparation and implementation of development projects (Mahgoub 2014). This approach has led to a decrease in social capital and a reduction in social protection in rural agricultural communities (Alhuseen & Kozová 2014).

Economically, the NAP emphasizes a commitment to using technology in agriculture to increase yields (Alhuseen & Kozová 2014). Still, it also acknowledges that the current state of agriculture needs to be able to effectively use technology. This could mean that there is significant room for improvement in the use of technology or that technology is not being effectively used in agriculture. The policies suggest that using technology in agriculture is desirable and that steps must be taken to achieve this goal.

Although the policy identifies smallholder farmers as the most vulnerable segment, the proposed solutions adopted the neo-liberalism approach, which focuses on macroeconomic indicators and ignores the individual challenges these farmers face such as inflation and increases in taxes. However, this approach aligns with the MFPP, which is applied in South African economic development thinking which is governed by a neoliberal discourse where the economy is seen as having no absolute limits and development equals growth (Jacobson 2013). According to Jacobson (2013), new regulations to ensure the biosafety of GM crops were largely incompatible with smallholders' practices and further undermined strategies for dealing with resource shortages.

My study similarly shows that the economic solutions proposed in the NAP are not affordable to smallholder farmers, and they cannot benefit from these adaptation measures because they require specific conditions that do not apply to them. Vulnerable farmers are inadequately prepared to address the impacts of climate change due to limited awareness and understanding of climate change risks. Furthermore, accessing financing can be unaffordable for smallholder farmers nar, as it often requires guarantees such as assets and bank credits. The smallholder farmers indicated that mostly they cultivate on family-owned land, which cannot be mortgaged due to ownership and inheritance issues. Additionally, many farmers avoid taking loans because they are uncertain about their production outcomes. The lack of a loan insurance system further discourages them from undertaking such financial risks.

Environmental Impacts

The interviews revealed that farmers often find themselves unprepared for risks such as floods, droughts, and diseases. Their internal migration places significant strain on natural resources and contributes to land and environmental degradation (Mahgoub 2019).

However this situation forces them to seek alternative, often unsustainable livelihoods, including traditional gold mining for fast revenue, or cutting down forest trees to burn and sell firewood. This is especially prevalent in rural areas with limited access to electricity, where coal selling is profitable. Experts estimate that only 40% of Sudan's inhabited areas have electricity. Traditional gatherers of firewood and producers of charcoal the main sources of fuel for homes (Omer 2011). This situation leads to haphazard resource exploitation and environmental degradation (Mahgoub 2019).

WPR Q6, Where has this representation of the 'problem' been produced, disseminated and defended? How has it been (or could it be) questioned, disrupted and replaced?

The goal of these questions is to develop a sharpened awareness of the contestation surrounding the representation of the 'problem' (Bletsas & Beasley 2012).

The Environmental Protection Act of 2001 granted the Higher Council for Environment and Natural Resources (HCENR) the authority to coordinate the efforts of State Councils, establish long-term policies, and promote research and awareness at both national and state levels (Alhuseen & Kozová 2014). The HCENR is designed to play a vital role in coordinating key institutions to enhance policymaking, planning, and legal reform while strengthening functional capacities at state, local, and community levels (FAO 2023).

The NDC communicates the National Action Plan (NAPA) annually and evaluates its implementation (HCENR 2021).

Additionally, the annual mid-season assessment report serves the same purpose for the end of reform or replacement in the next agricultural season.

For instance, the latest NDC 2022 report highlights several constraints that hinder the implementation of the NAP. One major issue is political instability, which disrupts institutional coordination among different levels of authority due to conflicts in power-sharing arrangements (HCENR 2022). This results in a significant lack of appropriate policies, regulations, and legislation. Additionally, there is insufficient awareness of adaptation strategies and environmental management plans. The NDC indicates that the NAP is based on data from climate change studies conducted in 2003 and 2004. Furthermore, the NDC reveals that both federal and state institutions face challenges due to their limited capacity, which obstructs the execution of the NAP. For example:

The Meteorological Authority is unable to track climatic changes in Sudan due to gaps in knowledge and research related to climate change in the country (HCENR 2021).

National vulnerability assessments have identified agriculture as one of the most vulnerable sectors (Mahgoub 2014). However, several factors have hindered the implementation of the national plan and the establishment of a mechanism to integrate it into Sudan's development programs and strategic plans. The decisions made by the HCENR are not binding on the ministries, allowing for political intervention in the agricultural sector. Additionally, the HCENR does not have a dedicated budget and relies on international support for its initiatives.

The annual mid-season assessment report aims to identify the key factors affecting the agricultural situation in production areas across 14 states in Sudan for the 2021/2022 season, covering the period from September 1 to September 16. The report thoroughly evaluates the policies implemented to address agricultural challenges and the measures taken to tackle climate change throughout the various agricultural seasons.

The mid-season report highlighted recurring issues that impact agricultural production factors, such as rainfall, irrigation (water harvesting), agricultural inputs, finance, input costs, fertilizers, herbicides, machinery, fuel, labour, and seeds. Their findings indicated that the rainfall season was moderate during the first cycle, allowing for two to three irrigations. However, heavy rainfall in some areas in August 2022 was significantly greater than in previous rainy seasons, causing flash floods that destroyed crops in several states. However, with the rise in inflation, the cost of agricultural inputs is expected to increase. To help farmers tackle these challenges, the report recommended enhancing the capital of Agricultural banks and other financing institutions. Furthermore, there is a need to create long-term maintenance plans for irrigation infrastructure and drainage systems, as well as to enhance the capabilities and efficiency of early warning systems for climate-related risks.

5. Conclusions

According to Bletsas, & Beasleypolicies, the ‘public’, of which we are members, is governed not through policies, per se, but through problematization—how ‘problems’ are constituted (2012).

This thesis begins with a detailed examination of the policies proposed to address climate change challenges in agriculture in Sudan to determine if a policy has been efficient. Grounded in a post-structuralist perspective and utilizing Bacchi’s WPR (What’s the Problem Represented to Be?), questioning whether proposed policies are the government’s best effort to solve ‘problems. I investigated the root causes of how these issues are represented in the policies, identifying unrepresented stakeholders and marginalized voices.

To analyze the data collected from policy documents and interviews with key stakeholders, I employed an inductive qualitative research methodology. In the discussion, I examined the constructed realities within the climate change debate by scrutinizing the policies and analyzing the narratives of key actors' perceptions.

The results revealed a gap between the way issues are framed in policy and the perspectives of key actors. Previous studies have indicated that the climate change adaptation measures suggested in policy documents have not been effectively integrated into Sudan's development and strategic planning due to several factors, including a lack of funding and political instability in recent years. Additionally, it is important to note that Sudan's agricultural policies are significantly influenced by its international relationships.

The findings of this thesis, using the WPR (What’s the Problem Represented to Be?) approach, confirmed results from earlier studies. It highlighted that some issues not discussed in policy and unresolved problems could lead to missed opportunities, such as the potential role of the Grand Ethiopian Renaissance Dam (GERD) in enhancing agricultural resilience. This aspect is often neglected by policymakers and tends to become a point of political trade-offs among countries sharing the Nile River Basin.

However According to the poststructuralist approach, the political and social landscape is always changing. Sustainable agricultural practices facing climate

change challenges require ongoing policy revisions to adapt to these changes.. This thesis recommends the continuous critical revision of the National Adaptation Program (NAP) and the incorporation of the updated perspectives of key stakeholders in policymaking.

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Popular science summary

Sudan is one of the most vulnerable countries in Africa regarding climate change. This resource-rich country faces challenges such as famine, drought, and floods, largely due to poor environmental management by political leaders.

The United Nations defines climate change as a change in climate that is directly or indirectly attributed to human activities, which alter the composition of the global atmosphere, in addition to natural climate variability observed over comparable periods. Although Sudan has one of the lowest greenhouse gas emissions globally, it is significantly affected by the impacts of climate change.

To address climate change crisis, Sudan ratified the United Nations Framework Convention on Climate Change (UNFCCC) and established its first Governmental Environmental Committee in 1977, assigning it the responsibility of assessing and developing environmental projects. In 2016, the Higher Council for Environment and Natural Resources (HCENR) issued the National Adaptation Plan (NAP), which Sudan submitted to the UNFCCC.

The NAP has identified the climate change crisis in agriculture as one of the most urgent sectors that needs to be addressed. This is because Sudan's economy relies heavily on rain-fed agriculture, which makes agricultural communities particularly vulnerable to the impacts of climate change, such as flash floods and unpredictable rainfall. These conditions have significantly harmed smallholder farmers.

This study explores the adaptation measures detailed in the National Adaptation Plan. It critically evaluates governmental strategies for climate change adaptation and the initiatives aimed at enhancing resilience within government institutions and among smallholder farmers.

As an Environmental Communication and Management student, my study focused on critically discussing the policies regarding the adaptation of smallholder farmers to one of the major environmental crises, incorporating the perspectives of key stakeholders and actively engaging them in the decision-making process, particularly in the context of ongoing political instability and economic challenges.

To this end, I adopted Bacchi's approach, "What is the problem represented to be?" which involves assessing proposed policy assumptions. Furthermore, it

challenges the notion that proposed policies are the sole solutions to environmental challenges.

Acknowledgements

I would like to extend my deepest gratitude to the dedicated teaching staff of the Environmental Communication and Management program. Their commitment to excellence and passion for the subject have greatly enriched my learning experience.

I am especially grateful to my supervisor, Klara Fischer, whose unwavering support, expert guidance, and invaluable feedback have been crucial throughout the entire process of completing this thesis. Klara's insightful suggestions and encouragement not only helped refine my research ideas but also inspired me to explore new perspectives. Her mentorship has played a vital role in shaping the direction and depth of my research.

I am also profoundly grateful to my family for their unending support, understanding, and patience during this academic journey.

Lastly, I dedicate this thesis to the cherished memory of my mother. Her wisdom, love, and unwavering spirit continue to inspire me every day, and I am profoundly grateful for the values she instilled in me.

Appendix 1

The interview questions (smallholders)

1. Tell us about yourself (age (no need to ask), education, place of living)

2. Can you tell us about the members of your household?

3. What do you do for a living rather than agriculture?

4. Can you please tell about your agricultural activities? What kind of crops do you grow? Irrigation type?

5. Can you tell us if there are any funds or subsidies you receive (banks, agriculture companies. etc.)?

6. How do you sell your products?

7. Can you talk about the challenge in agriculture this year compared to last five years?

8. How do you and your family members cope with these risks?

9. What is your perception aout climate change?

10. What you know about the NAP?

11. What is your perception of the GERD (advantages, disadvantages, expected risks)?

12. Can you tell us what you expect from the authorities to help in the face of climate change risk?

Appendix 2

The interview questions (Experts)

1. Can you Tell us about yourself (job or duties)?

2. Can you tell us about your perception about the climate change in Sudan?

3. What challenges do experts face in practice regarding climate risk

4. management in agriculture?

5. Can you tell us about your perception oabout the GERD?

6. What you know about the NAP?

7. Did the authorities record any change in agriculture this year when you compare it with previous years?

8. Can you tell us if the authorities make adaptation measures or risk management plans to overcome the consequences of risks on smallholders farmers.

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