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Role of water governance systems and institutions in smallholder farming systems in the Western Cape, South Africa

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Abstract: In light of the growing impacts of climate-related shocks on water availability, such as drought, it is increasingly important to manage water resources efficiently, particularly for smallholder farming systems. The 2015-2018 drought in South Africa highlighted the necessity for effective water management in agriculture. This study assessed the role of water governance systems and institutions in smallholder farming systems in the Western Cape in response to climate-related challenges. Data were gathered from individual interviews with key informants working in water institutions. Additionally, focus group discussions and one-on-one interviews were conducted with smallholder farmers in historical towns within the Overberg and West Coast Districts. The study evaluates the applicability of the Organisation for Economic Co-operation and Development Multi-level Governance Framework in diagnosing the challenges of water governance in the smallholder farming sector at the local level. Results indicated inadequate funding, a lack of water management training for smallholder farmers, and insufficient human resource capacity within institutions. Uniquely, the study's findings also highlight the strong link between water governance and land tenure in ensuring water security for smallholder farmers. There is a disconnect between the objectives of water policy and its implementation at the local level. The results will help policymakers understand the challenges faced by water institutions and smallholder farmers. This is expected to assist water institutions in strengthening their roles and responsibilities in water management and to enhance water security for smallholder farmers.

Keywords: Climate change, drought, land ownership, smallholder farmers, water governance, water management.

1. Introduction

Worldwide, the impacts of climate change continue to complicate the management of water for smallholder agriculture. Climate change threatens the availability of water and the capacity of the agricultural sector in Southern Africa to satisfy the growing demand for food resulting from an expanding population (Nhemachena et al., 2020). The inadequate adaptive capacity and heavy reliance on agriculture by smallholder farmers expose them to the risks of climate change (Naderi et al., 2024). Globally, smallholder farming is important for enhancing the livelihoods of many people in rural communities (Zenda, 2024). South African smallholder farmers play a crucial role in driving economic growth, enhancing food security, and reducing poverty (Machethe et al., 2024). The smallholder farming sector significantly contributes to the gross domestic product (GDP), with approximately 20–30% of agricultural produce generated by smallholder farmers in South Africa (Mkuna & Wale, 2023).

Climate change continues to exacerbate water security challenges, particularly in countries experiencing water scarcity. South Africa is characterised as a water-scarce and semi-arid country, ranking as the 30th driest globally, with an average annual rainfall of 400-650mm. This amount is less than the global annual average rainfall of 860mm (Zwane, 2019). Only a limited area (10%) of

South Africa receives rainfall exceeding 750mm, and approximately 50% of this rainfall is utilised in the agricultural sector. Given the uneven distribution of rainfall across South Africa, water availability is a major factor constraining agricultural production (Zwane, 2019). The considerable variability in rainfall further complicates water management (Fallon et al., 2019). In South Africa, more than 30% of water resources are under stress, and approximately 20% of the annual water supply is being lost due to ineffective management (Matimolane & Mathivha, 2025). Although climate change significantly contributes to physical water scarcity, water insecurity also arises, in part, from governance failures in managing these resources (Naderi et al., 2024). Effective governance of water is crucial for addressing water challenges, particularly in the context of climate change-related events such as droughts and floods.

In South Africa, the risks associated with climate change are significant (Botai et al., 2017). The escalation in the occurrence and severity of water scarcity due to climate change is expected to continue reducing agricultural production (Davis-Reddy & Vincent, 2017). In the Western Cape Province, projections indicate that the region is likely to experience more frequent droughts due to a changing climate (Theron et al., 2022). From 2015 to 2018, the province endured a severe and extreme drought, surpassing even the conditions experienced in 1904 (Botai et al., 2017; Otto et al., 2018; Wolski, 2018). This drought resulted in the imposition of water restrictions, which seriously affected smallholder farming (Fanadzo et al., 2021). As a consequence of the drought's impact on water availability, South Africa was ranked among the countries most vulnerable to climate change risks (Otto et al., 2018).

Various studies focused on the drought that occurred during the 2015–2018 period in the Western Cape Province of South Africa, particularly concerning smallholder farming systems (e.g., Raaijmakers & Swanepoel, 2019; Fanadzo et al., 2021; Pili & Ncube, 2022). Raaijmakers & Swanepoel (2019) evaluated the strategies implemented in the commercial and smallholder farming sectors during the drought. The study demonstrated that South Africa's historical legacy remains a significant challenge affecting smallholder farmers. Additionally, the researchers found that smallholder farmers were predominantly impacted by the drought due to insufficient access to natural capital, particularly water. Fanadzo et al. (2021) revealed that the 2015–2018 drought was the primary environmental issue affecting smallholder farmers, mainly due to water shortages. To manage water resources efficiently, Fanadzo et al. (2021) emphasised the importance of water-saving technologies as essential strategies for the smallholder farming sector. In their investigation, Pili & Ncube (2022) identified that rainwater and borehole water were among the strategies employed by smallholder farmers. Although issues related to water access were highlighted as fundamental adaptation strategies, the effectiveness of water governance systems— including institutional and water users' governance capacities in smallholder farming systems in the Western Cape Province, particularly in the context of climate change—remains inadequately understood. While some previous studies have investigated water governance issues in the Western Cape, the focus areas limited the generalisability of findings across the province.

For instance, Mugejo et al. (2022) found that inadequate coordination among institutions, lack of funding, insufficient human resources, political interference, and a failure in participation and commitment, along with the disintegration of roles and responsibilities, contributed to the dysfunctionality of water governance systems for smallholder farmers in Genadendal, Western Cape. Focusing on institutions supporting smallholder farmers in selected areas in the Western Cape, Sadiki & Ncube (2020) highlighted that inadequate financial and human resources and insufficient coordination among institutions were contributing factors to the limited water access for smallholder farmers. Thus, the primary objective of this study was to evaluate the functioning of water governance systems and institutions in smallholder farming systems within the Western Cape Province, South Africa. The findings will help strengthen water security for smallholder farmers in the face of drought and climate change.

2. Theoretical Background

Water governance is defined as a set of administrative, political, and institutional processes, practices, and policies that enable decision-making through stakeholder consultation and hold decision-makers accountable (Organisation for Economic Co-operation and Development (OECD), 2018). Principles that promote good water governance are essential for enhancing water security. Although various water governance principles exist, the twelve OECD principles of good water governance are considered comprehensive in this study (Figure 1). The OECD principles aim to provide a framework that facilitates the understanding of water governance systems at all levels (Havekes et al., 2013). Water governance frameworks can help identify and address water governance challenges, contributing to the development of effective operational water governance systems. This study adopted the OECD Multi-level Governance Framework (Figure 2) because it is comprehensive (Akhmouch & Correia, 2016). The framework categorises water governance challenges into seven categories and aims to enhance water management by identifying and addressing them. In the South African smallholder farming sector, the framework has been utilised in only a few studies (Mugejo et al., 2022; Ncube et al., 2025). In Genadendal, Western Cape Province, Mugejo et al. (2022) applied the framework to assess water governance for smallholder farming. In another study, Ncube et al. (2025) in the Western Cape also utilised it to evaluate water governance and institutional arrangements in smallholder farming systems. Although the framework has been applied in other countries, water governance is dynamic and primarily localised (Mirzaei et al., 2017; Keller & Hartmann, 2019; Linh et al., 2025). Therefore, operationalising the framework at the local level is crucial, as this is where the implementation of water governance occurs.

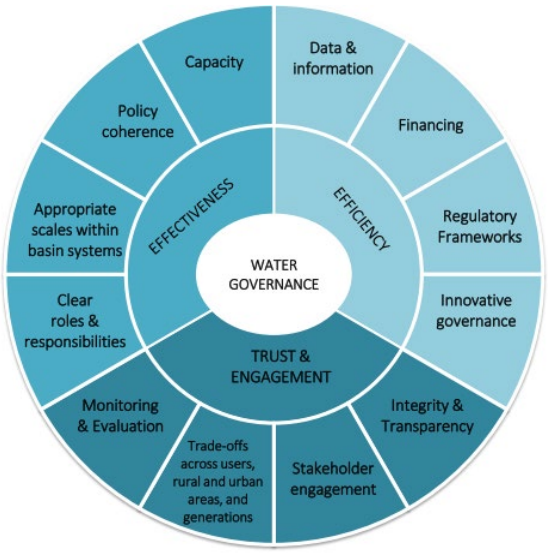

Figure 1: *OECD Water Governance Principles* (OECD, 2015)

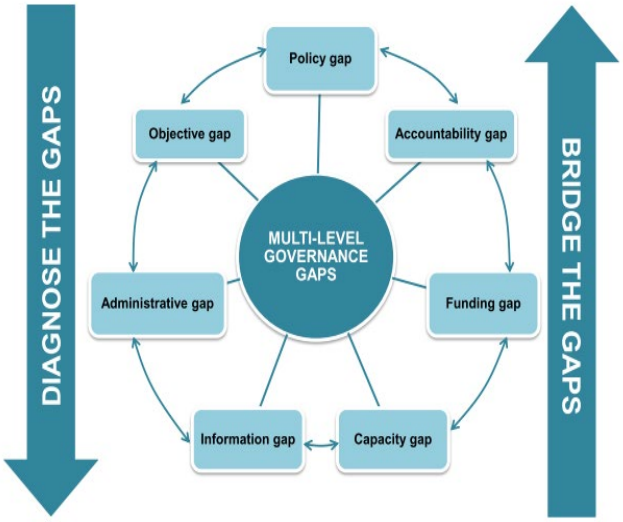

Figure 2: *OECD Multi-level Governance Challenges* (OECD, 2011)

The OECD Multi-Level Governance Framework (Figure 2), developed based on the comprehensive OECD water governance principles (Figure 1), was utilised to identify the challenges of water governance in smallholder farming systems in South Africa's Western Cape Province. The framework was employed to focus solely on the water governance gaps identified in participants' narratives. The seven water governance gap categories of the framework are anchored in OECD water governance principles, which are centred on the dimensions of effectiveness, efficiency, and trust and engagement. The framework provides an effective means to trace the challenges faced by smallholder farmers and institutions stemming from systemic failures in South Africa's water governance system.

3. Study Area

The study was conducted in the Western Cape Province, South Africa, specifically in the Overberg and West Coast District Municipalities (Figure 3). The province primarily has a Mediterranean climate, characterised by cold, wet winters and hot, dry summers. The Overberg and West Coast Districts account for 46% and 43% of the agricultural produce in the province, respectively, and together they contribute approximately 37% of the gross farm income. Agricultural activities in these districts include livestock, wheat, canola, fish, barley, and rooibos tea.

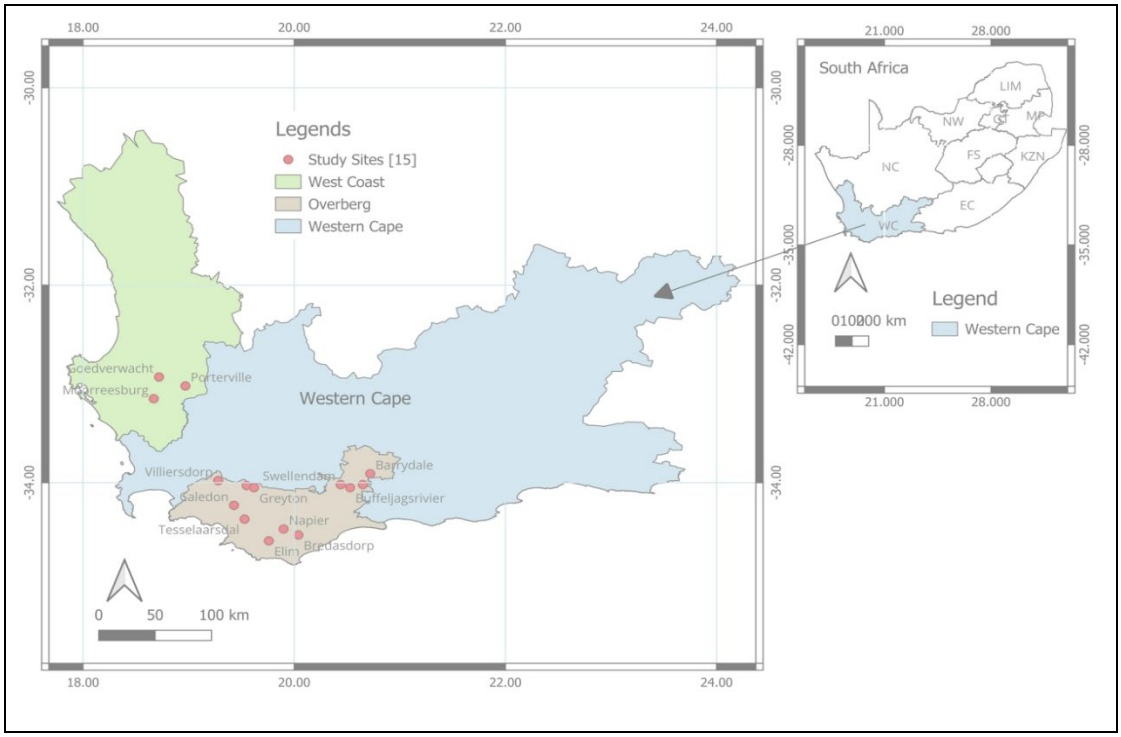

Figure 3: *Study sites map in South Africa's Western Cape Province (Author, 2025)*

Fifteen towns with farmers practising smallholder agriculture were selected for this study. Twelve of these towns—Genadendal, Caledon, Napier, Bredasdorp, Elim, Tesselaarsdal, Greyton, Suurbraak, Barrydale, Villiersdorp, Swellendam, and Buffeljagsrivier—are located in the Overberg District. The other three towns, Moorreesburg, Goedverwacht, and Porterville, are situated in the West Coast District.

4. Methodology

Using the concurrent triangulation design, quantitative and qualitative data were collected simultaneously and compared to identify any combinations, convergences, or differences. This design was selected because the quantitative and qualitative data compensate for each other's weaknesses while combining their strengths. The initial seventy-two participants were selected using a purposive sampling technique, with the support of officials from the Western Cape Department of Agriculture (WCDoA), who are knowledgeable about the study sites and work closely with smallholder farmers. After the initial selection process was completed, the snowball sampling method was used to identify an additional forty-seven suitable participants. A survey questionnaire with both closed and open-ended questions was administered to 119 smallholder farmers. Officials from the WCDoA helped review the questions to ensure the validity and reliability of the data collected from smallholder farmers via questionnaires. To gain deeper insights from the survey, eight

focus group discussions (FGDs) were conducted. Additionally, twenty key informant interviews were held with officials from institutions including the WCDoA, the Breede-Olifants Catchment Management Agency (BOCMA), Farmers' Cooperatives (FC), the World Wide Fund (WWF) South Africa, and the Greyton Conservation Society (GCS). Both FGDs and key informant interviews were conducted to obtain farmers' shared experiences and expert-informed perspectives, respectively. This ensured the trustworthiness of qualitative data through data triangulation.

Before data collection commenced, the Cape Peninsula University of Technology Ethics Committee issued the ethical compliance certificate. The Western Cape Department also granted permission to access smallholder farmers in the selected study sites. The participants were asked to sign informed consent forms and were assured that their responses would remain anonymous. A mixed-methods research design was used, as it enables an in-depth understanding of the research issue by integrating quantitative and qualitative methods. To protect the anonymity of the participants, pseudocodes were developed.

The Statistical Package for Social Sciences (SPSS) version 35 and ATLAS.ti 25 software were used to analyse quantitative and qualitative data, respectively. Quantitative data were presented using descriptive statistics in the form of tables to illustrate the percentages of responses from the participants, while qualitative data were presented through participant narratives and direct quotations. Based on the themes emerging from the narratives, the OECD Multi-level Governance Framework was applied to identify water governance challenges.

5. Results and Discussion

This section presents and discusses the study's results, describing the characteristics of the farmers, including their agricultural practices. Following this, the identified challenges in water governance within smallholder farming systems are presented and discussed.

5.1 Characteristics of farmers

Table 1 shows the characteristics of smallholder farmers, including their farming practices.

Table 1: *Profile of smallholder farmers and farming practices (N = 119)*

Category	Description	Percentage (%)	Category	Description	Percentage (%)
Gender	Male	74.8	**Farming Structure**	Group	69.7
	Female	25.2		Individual	30.3
Age Group	20 – 30	4.2	**Type of Farming**	Crops	34.5
	31 – 35	4.2		Livestock	40.3
	36 – 40	13.4		Mixed	25.2
	41 – 45	9.2	**Farming Purpose**	Selling	40.3
	46 – 50	7.6		Consumption	10.1
	51 – 55	12.6		Consumption & selling	49.6
	56 – 60	8.4	**Education Level**	Primary	22.7
	61 – 65	19.3		Secondary	63.0
	66 and above	21.0		Tertiary	11.8
Household Position	Father	63.0		No formal education	1.7
	Mother	21.8		Not Sure	0.8
	Child	3.4	**Farming Experience**	Less than a year	2.5
	Grandfather	10.1		1 – 10	51.3
	Grandmother	1.7		11 – 20	24.4
Household Size	1 – 3	41.2		21 – 30	9.2
	4 – 6	49.6		31 – 40	6.7
	7 – 9	7.6		41 and above	5.9
	10 and above	1.7			

The characteristics of farmers, including their agricultural practices, are shown in Table 1.Most of the farmers (74.8%) were male. Approximately 61.0% of the smallholder farmers were 50 years or older, indicating that they were relatively older. The results show that the youth were not actively involved in farming. Myeni et al. (2019) also highlighted the lack of involvement in agriculture among the majority of South African youths. Youth apathy towards farming has implications for the future development of the sector. Sixty-three per cent of the farmers indicated that they were fathers. Almost half of the farmers (49.6%) had household sizes of 4 to 6 people. Approximately 70.0% of the farmers practised farming in groups. Moreover, around 40.0% of the farmers were engaged in livestock farming. The purpose of farming for approximately 50.0% of the farmers was for both home consumption and selling. About 63.0% of the farmers had a secondary education level, while 11.8% had attained a tertiary education level. Approximately 51.3% of the farmers had farming experience ranging from 1 to 10 years.

5.2 Status of water governance systems for smallholder farmers

The OECD Multi-Level Governance Framework, illustrated in Figure 2, was employed to identify water governance challenges. Only four governance categories that emerged from participant narratives in the study area were selected. These categories include policy, accountability, funding, and capacity. Figure 4 summarises the selected OECD water governance categories and the associated governance challenges identified.

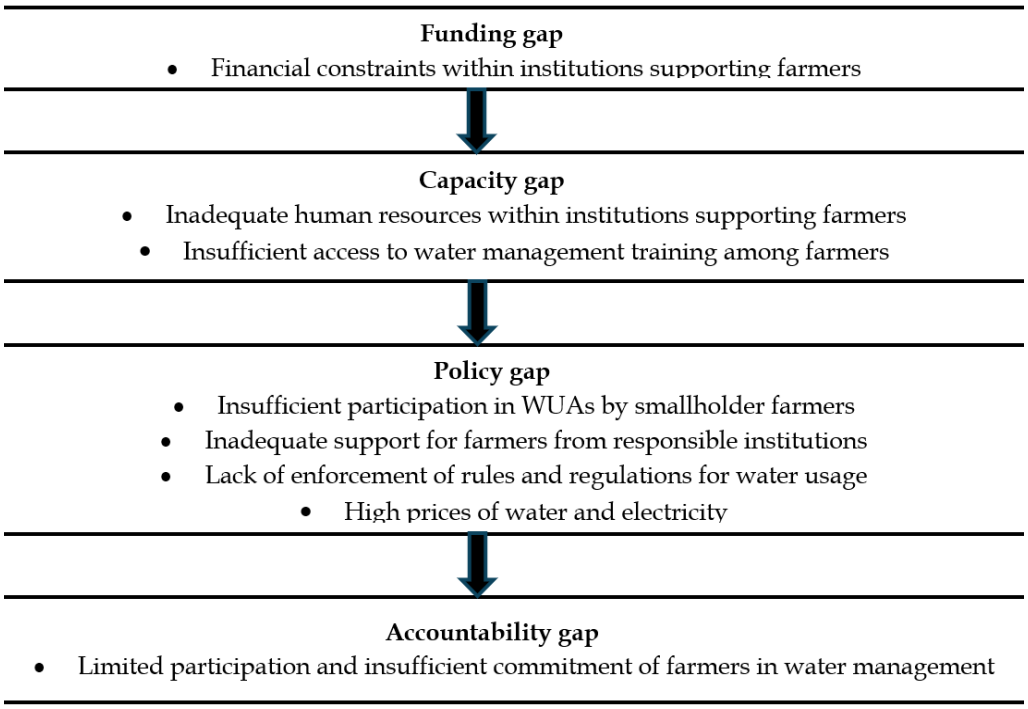

Figure 4: *Conceptual diagram illustrating interrelationships between identified water governance challenges*

The water governance challenges illustrated in Figure 4 were obtained from focus group discussions (FGDs) and key informant interviews. Figure 4 demonstrates how funding constraints impact human resources within institutions, farmers' skills, and policy implementation. Capacity and policy failures lead to a lack of participation and, ultimately, to insufficient accountability mechanisms. The survey results on water governance issues among smallholder farmers are presented in Table 2. The findings in Figure 4 and Table 2 are used to support the discussion of water governance issues in sub-sections 5.2.1 to 5.2.4.

Table 2: *Water governance issues identified by farmers during interviews (N=119)*

Issues	Key Questions	Percentage of Responses			
		Yes	No	Not Stated	N/A
License/Rights	Farmers with water use licenses or water use rights	45.4	53.8	0.8	-
Fees	Farmers who were paying water use fees	47.9	52.1	-	-
Capability	Farmers who were able to pay water use fees	38.7	6.7	3.4	51.3
Organisations	Farmers who knew water management institutions	60.5	37.8	1.7	-
Illegal water users	Farmers who experienced illegal water users	10.1	79.8	10.1	-
Water conflicts	Farmers who experienced water-sharing conflicts	23.5	69.7	6.7	-
Training	Farmers who received training in water-related issues	11.8	88.2	-	-
Decision making	Farmers who were involved in water-related decision-making making	68.9	24.4	6.7	-

5.2.1 Water management policy

The lack of Water User Associations (WUAs) close to farmers was among the policy challenges identified, highlighting the misalignment between national policy and local institutional realities. This is despite the provisions of the National Water Act (NWA) 36 of 1998, which promotes the establishment of WUAs as institutions of local water management in South Africa. Similarly, Peters and Woodhouse (2019) noted that devolving water governance through the development of WUAs to ensure representation of HDIs remains an ongoing challenge. Due to the absence of WUAs, farmers were forming their own local farmers' associations. Regrettably, some of these associations were not performing water management duties, resulting in improper water utilisation among farmers. Inadequate support was also cited as another policy-related challenge in smallholder farming. In some areas, smallholder farmers were deprived of direct assistance from responsible water institutions. For example, one of the farmers indicated that:

> "*Since we do not have direct municipal support, an overseas council is supposed to work with farmers. However, the Overseas Council has not been actively involved, leading the community to take matters into their own hands by seeking assistance from the municipality.*" (FGDGoedOD4)

The support for smallholder farmers was insufficient, as it was mainly directed towards other areas, such as potable water testing. This indicates that the support for improving productive water access for smallholder farmers was inadequate. Myeni et al. (2019) conducted a study in the Free State Province, South Africa, and documented that smallholder farmers experienced inadequate support from the responsible water institutions. Although some farmers reported issues related to water challenges, it was unfortunate that only limited measures were implemented for them. This suggests that there was insufficient dedication to water management issues among the institutions responsible for supporting farmers. For instance, one of the farmers mentioned that:

> "*Another concern is the presence of trees, which we believe extract a significant amount of water, contributing to quick drying even when irrigating. We have informed the extension officer and requested the removal of at least one large tree, as we believe it contributes to the*

> *water problem. Unfortunately, no action has been taken, and addressing this issue is one of the measures we have tried to implement to improve the water situation in this area.*" (FGDCaledOD)

Other farmers felt they did not receive support because they lived far from the offices of the officials responsible for the institutions. As a result, they were not prioritised. This suggests the importance of the geographical location of institutional offices in relation to farmer support. The narratives from the participants showed that the absence of enforcement of rules and regulations was also a policy-related challenge affecting the sustainable management of water resources. Interestingly, about 80.0% and 70.0% of the farmers indicated the absence of illegal water users and water conflicts, respectively (Table 3). However, a few farmers reported that water conflicts arose when upstream farmers extracted large amounts of water, thereby diminishing the amount available to downstream farmers. This ultimately led to downstream farmers not receiving water on time, resulting in negative implications for agricultural production. It was revealed that the responsible institutions were allowing commercial farmers to build gabions and dams on their land. This led to a decline in water availability for downstream smallholder farmers, highlighting the disconnect between land allocation practices and the lived realities of smallholder farmers, who have lost their sources of livelihood as water sources are now under private ownership. Other studies have found that water conflicts arise from unequal water distribution, inefficient water use, unfair water allocation, illegal water extraction, and undefined water rights (Phakathi et al., 2021; Ncube & Shoko, 2025). On the other hand, Dlangalala & Mudhara (2020) emphasised that water conflicts are worsened by ineffective water governance, such as limited rule enforcement. The absence of water meters, required to determine water use, was identified as a factor contributing to water-use conflicts among smallholder farmers. This finding underscores the importance of water meters in preventing water-use conflicts, especially when different farmers utilise water from the same source.

Water and electricity prices were among the key challenges in water management policy. Pricing water is considered a viable approach to enhancing water-use efficiency, as noted by Akinyemi et al. (2018). Chipfupa and Wale (2019) asserted that water pricing has been shown to influence the efficient use of water among smallholder farmers. Even though water was available, high electricity bills made it difficult for farmers to pump water. These high bills, resulting from the use of electric water pumps, were also identified as a setback affecting smallholder farmers in the Western Cape (Fanadzo et al., 2021). According to Table 3, more than half of the farmers (52.1%) reported not paying fees for using water, while 38.7% of the farmers were able to pay these fees. Interestingly, this suggests that affordability does not typically guarantee farmers' motivation to pay the required water use fees. In contrast, Tshona et al. (2025) demonstrated that the affordability of paying water fees remains a key challenge for most people in South Africa's rural communities. The study also confirmed that some farmers were not paying water fees because they viewed water as a free resource, while others argued that there was no need to pay for water on their property. Similarly, Viljoen (2017) noted that some farmers in South Africa do not pay water-use fees because they consider water to be their private property, located on their land. However, key informant KIBOCMA12 argues that the non-payment of water fees was also due to a clause in the General Authorisation (GA) governing water use. The GA described in Section 39 of the National Water Act [36 of 1998] permits a certain volume of water to be used freely in South Africa, provided that the user stays within the limits of the GA.

5.2.2 Accountability in smallholder farming systems

Several participants reported that limited participation and inadequate dedication by farmers to water management issues posed a significant accountability challenge. Active stakeholder engagement in water-related matters is essential for effective water resource management (Fan et al., 2019). Despite participants' narratives suggesting a lack of involvement, 68.9% of smallholder

farmers reported their participation in water-related decision-making. This indicates that involvement in decision-making processes does not always guarantee meaningful participation. In some instances, there was a lack of commitment among smallholder farmers regarding water management issues. A significant portion of the challenges in water management stemmed from the smallholder farmers themselves. For instance, one farmer highlighted that:

> "*Despite being vocal about the issues, we often do not actively participate in providing solutions or offering input when water systems are being constructed. The root of the problem lies in the lack of unity and in the absence of proactive initiatives among the people. My perspective is that if the community can come together, devise initiatives, and take responsibility for the maintenance and management of water and infrastructure, we can address these issues without solely relying on external assistance.*" (FGDGoedOD4)

This narrative suggests that smallholder farmers are underrepresented in water management activities, including infrastructure maintenance. A study by Maziya et al. (2017) in KwaZulu-Natal found that, despite government support for water infrastructure development, it is the responsibility of smallholder farmers to ensure that this infrastructure is well maintained. Insufficient participation in decision-making processes also affects the governance of water for smallholder farmers in South Africa (Dlangalala & Mudhara, 2020; Thabane et al., 2025). To address water management issues, some farmers had previously established a farming community forum; however, the forum was unfortunately disbanded, and the reasons for its discontinuation were not provided. In some areas, community groups were involved in water-related activities. Chipfupa & Wale (2019) argued that farmers should be part of farming groups, such as cooperatives, as this assists them with water management.

5.2.3 Funding for smallholder farmers

Insufficient financial resources were a significant challenge affecting smallholder farmers. Limited budgets within government institutions have been reported to restrict the financial support available to smallholder farmers in South Africa (Sadiki & Ncube, 2020). Approximately 92.0% of the farmers reported that farming was their primary source of income (Table 3).

Table 3: *Sources of income for smallholder farmers (N = 119)*

Sources of Income	**Percentage of Responses (%)**	
	Yes	**No**
Social grant	13.4	86.6
Pension	21.8	78.2
Off-farm activities	27.7	72.3
Farming	91.6	8.4

Almost 59% (Figure 5) of the farmers generated 20,000 South African rands (approximately USD 1,130) or less per annum from their farming activities. Consequently, the income generated from farming was deemed insufficient for smallholder farmers to undertake water management activities. These results align with those of Myeni et al. (2019) and Molotsi et al. (2019), who found that many South African smallholder farmers were not generating sufficient income from farming. Additionally, Tshona et al. (2025) identified inadequate funding for infrastructure investment as one of the primary factors hindering effective water resource management in South Africa.

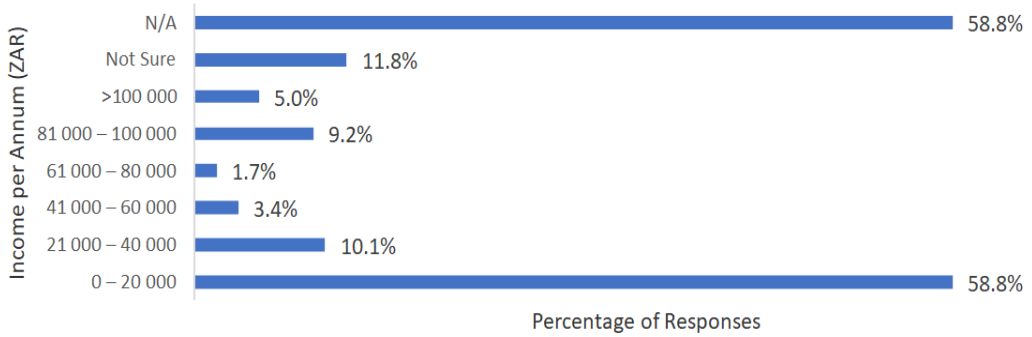

Figure 5: *Percentage distribution of smallholder farmers based on income generated from farming (n = 119)*

About 87% of smallholder farmers did not receive any financial support (Figure 6). These results align with those of Chikozho et al. (2020), who demonstrated that smallholder farmers in South Africa generally lack access to the financial resources necessary for water infrastructure development. Often, credit providers are willing to extend financial support to farmers within the economically active age range, enabling them to secure a reliable source of income (Baiyegunhi & Fraser, 2014). Unfortunately, approximately 61.0% of the farmers were over 50 years old.

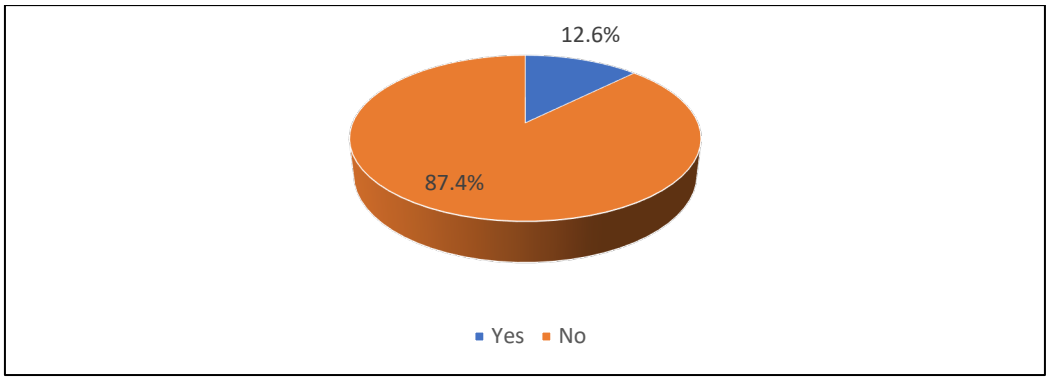

Figure 6: *Percentage distribution of smallholder farmers based on access to credit (N = 119)*

In the Western Cape, Fanadzo et al. (2021) found that smallholder farmers were reluctant to borrow money due to the high interest rates charged by credit providers. Land ownership also influenced access to funding for these farmers. As shown in Figure 7, only 9.2% of the farmers held land title deeds in their names.

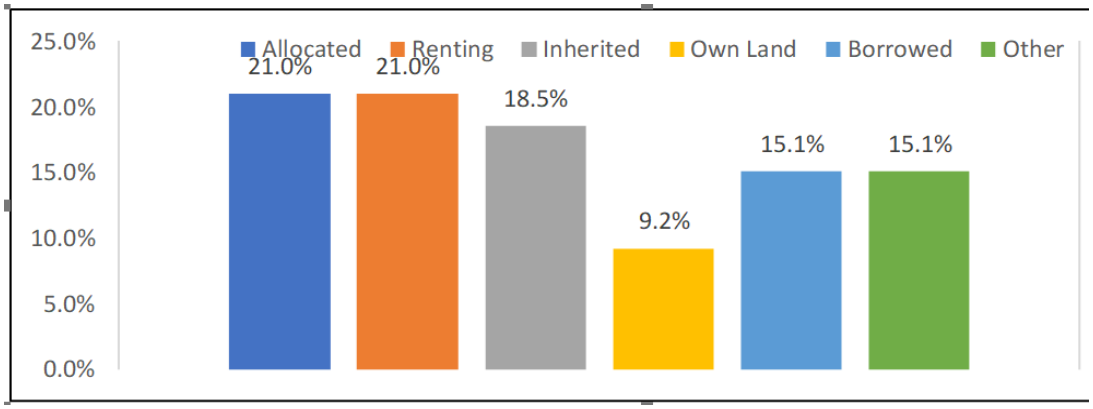

Figure 7: *Percentage distribution of smallholder farmers based on type of land ownership (N = 119)*

Land ownership serves as collateral when farmers need to secure funding from credit providers. This indicates that water governance is inextricably linked to land governance and asset ownership, underscoring the need to integrate land and water policies to ensure water security for smallholder farmers. The findings are consistent with those of Phali et al. (2022), who noted that a lack of land ownership and collateral contributed to the limited access to credit for smallholder farmers. Shahid et al. (2024) also emphasised that land ownership remains a persistent challenge facing HDIs due to the delayed implementation of land redistribution processes in South Africa. Although smallholder farmers were willing to secure land title deeds, they had minimal chances of acquiring land through the application process. This was primarily because they felt they lacked personal connections with the institutions responsible for issuing land access.

The responsible institution was also unable to assist some smallholder farmers with funding because the water rights were not in their names. This corresponds with the statistics from Table 3, which show that approximately 54.0% of smallholder farmers did not own a licence or rights to use water. To secure funding, either a licence or rights to use water are important because they provide assurances to credit providers that farmers have a sustainable water supply for successful agricultural production and, therefore, repayment. Another participant reported that their area received financial support when they were a councillor. This validates the assertion that political connections can influence access to financial support. Of the 12.6% of farmers who indicated access to credit, some were using the funds contrary to their intended objectives. This sometimes contributes to institutions' reluctance to fund smallholder farmers.

5.2.4 Capacitation of smallholder farmers

Most smallholder farmer participants noted that insufficient training was among the capacity-related challenges they experienced in their areas. In their study, Olley et al. (2024) and Sadiki and Ncube (2020) maintained that training in water management would likely improve the sustainability of water resource use. Approximately 88% of the farmers did not receive any training on water-related issues (Table 3). The results are surprising because around 61% of the farmers were aware of the institutions responsible for water management. This suggests that knowing about responsible institutions does not necessarily translate to receiving training.

The participants argued that it would be beneficial to farmers if the responsible institutions offered such educational training programmes (FGDCaledOD). Dirwai et al. (2019) stated that it is essential to provide farmers with training opportunities, as this helps improve water use efficiency and ultimately enhances water security. However, smallholder farmer SBaryOD75 felt that smallholder farmers were always excluded from training sessions. Key informant KBOCMA12 added that a few tech-savvy young farmers were able to use computers and access the system. This also seems to have contributed to the lack of awareness of training opportunities, which might be published on the system. The findings were expected because approximately 61% of the farmers were relatively old, with an average age of over 50 years (Table 1). Additionally, the education level of smallholder farmers appears to have limited their capacity to access information from the system. This was evident as about 12% of the farmers reported having a tertiary education (Table 1).

Inadequate human resources within water institutions were another challenge related to the capacity-building of smallholder farmers. Previous studies also found that the lack of support for South African smallholder farmers is often due to a shortage of staff within responsible institutions (van Koppen & Schreiner, 2019; Bosch & Gupta, 2020; Sadiki & Ncube, 2020). Other smallholder farmers acknowledged that officials from the responsible institutions had a significant workload in other areas; as a result, they found it particularly challenging to receive sufficient assistance. The limited human resources available in water institutions were unable to adequately cover the ground needed to train smallholder farmers in water management skills. Weaver et al. (2017) also confirm that the apartheid and post-apartheid governments have struggled to establish the adequate

technical capacity needed to enable effective water management at the municipal level. Pahl-Wostl (2019) highlighted that achieving the objectives of the NWA is continually impeded by insufficient government capacity, particularly in human resources.

6. Conclusions

The study concludes that water governance systems exhibit dysfunctionality due to inadequate capacity, funding, accountability, and a failure to implement water policy at the local level. The conclusions drawn from this study have several significant implications for water policy and institutional reform in smallholder agriculture in South Africa. The existing gap between the national water policy and its implementation underscores the necessity to adjust governance structures to align with the primary objectives of the policy. Consequently, there is a need for systems that facilitate the effective operationalisation of the national water policy at local levels. The inability of smallholder farmers to access water, attributable to the absence of Water User Associations (WUAs), inequitable water pricing, and insufficient institutional support, has adverse implications for agricultural productivity and the livelihoods of smallholder farmers. The level of education and age of farmers influence digital access and, ultimately, access to information and training opportunities, resulting in inadequate human resources within institutions and among farmers.

Thus, the study recommends that comprehensive water management training, financial resources, and digital resources be allocated within institutions that engage with smallholder farmers, including the Department of Agriculture, Catchment Management Agencies, Farmers' Cooperatives, and Non-Governmental Organisations. To ensure effective water governance, particularly in the context of climate change, smallholder farmers should be regarded as active stakeholders rather than passive partners. Integrated approaches that strengthen farmer participation and enhance the capacity of water institutions to address water governance issues are vital for improving water access for smallholder farmers. The active involvement of smallholder farmers in decision-making processes regarding water governance is crucial for enhancing accountability and trust. Therefore, support programmes that promote the establishment of functional WUAs, along with capacity-building initiatives within smallholder farming systems, are recommended to ensure meaningful farmer participation and representation in water management. To overcome the barriers created by distance between farmers and institutions, joint training programmes on water management and governance should be implemented, incorporating the promotion of mobile or community-based extension services. Additionally, support programmes linking water-use rights applications to land tenure are necessary to assist farmers in building collateral. Furthermore, the study proposes pilot projects for subsidised, equitable water pricing models for certified smallholder farmers, which have the potential to enhance the sustainability of agricultural production and improve the livelihoods of smallholder farmers. Future studies should focus on investigating the impact of the 2015–2018 drought on long-term institutional changes and smallholder farmer livelihoods, including an assessment of the factors influencing the establishment of WUAs for smallholder farmers.

7. Declarations

Author Contributions: Conceptualisation (B.N.); Literature review (K.M.); Methodology (K.M., B.N. & E.S.); Software (K.M.); Validation (B.N. & E.S.); Formal analysis (K.M.); Investigation (K.M., B.N. & E.S.); Data curation (K.M.); Drafting and preparation (K.M.); Review and editing (B.N. & E.S.); Supervision (B.N. & E.S.); Project administration (B.N.); Funding acquisition (B.N.). All authors have read and approved the published version of the article.

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Data Availability: The data are not publicly available yet because the data are part of a bigger project that still needs to be synthesised before all the data are made publicly available.

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