RESEARCH ARTICLE:

Goat Rearing for a Resilient Future: Enhancing Climate Adaptation among Smallholder Farmers in Umguza District, Zimbabwe

Douglas Nyathi[1], Cynthia Ndlovu[2], France Maphosa[3], Munyaradzi Dzvimbo[4], Joram Ndlovu[5] and Manase Chiweshe[6]

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Abstract

The agriculture sector is pivotal for the income and livelihoods of rural populations in the Global South, particularly in arid regions where small-scale livestock farming has emerged as a viable source of sustenance and economic stability. This study explores the potential of subsistence goat farming to enhance climate resilience among smallholder farmers in Umguza District, Zimbabwe. Data were gathered through 15 face-to-face interviews, eight key informant discussions, and two focus group sessions, with participants selected with the assistance of local leadership. The findings reveal that climate change vulnerability stems from erratic rainfall patterns, the failure of rain-fed agriculture, pervasive poverty, social inequality, limited access to extension services, and the impact of HIV/AIDS. Consequently, smallholder farmers face acute challenges including food insecurity, water scarcity, and livestock loss. Goat farming has been identified as a crucial strategy for building resilience, particularly because goats demonstrate higher survival rates than cattle during drought conditions. However, farmers face significant barriers, including lack of start-up capital, access to high-quality breeds, and insufficient information regarding disease management. The study emphasizes the need for further investigation into the effectiveness of subsistence goat farming as a climate adaptation strategy, advocating for community-led initiatives that integrate traditional knowledge, local resources, and social structures. By prioritizing community-based resilience efforts, smallholder farmers can develop tailored strategies to effectively combat the challenges posed by climate change in Zimbabwe.

Keywords*: climate change; resilience; subsistence goat farming; smallholder farmers; Umguza District*

Introduction

Climate change remains a concern for countries around the world and even constitutes a threat to peace and economic growth (Nyathi and Mlambo, 2024). Smallholder farmers in sub-Saharan Africa are particularly vulnerable to numerous difficulties, including climate change (Lipper and Zilberman, 2018; Murray *et al*., 2016). According to the Intergovernmental Panel on Climate Change, the level of global average temperatures at the surface of the land is expected to increase in the near future (IPCC, 2022), and rainfall patterns have become more unpredictable than usual (Lobell and Asseng, 2017). Agricultural activities are prone to risks and uncertainties of various nature: biophysical, abiotic, climatic, environmental, biotic (pests, diseases) and economic (Adger, 2006). Many of these risks have a climatic component and most of them will be affected by climate change, either in intensity, scope or frequency (Fellmann, 2012). Specifically, the agricultural sector is the most affected by the adverse effects of climate change (Dube *et al*., 2018; Ndlovu, 2020) as climate change puts rain-fed agriculture, free-range pasture-fed cattle, ecosystems, forestry-based livelihoods, and all other things vulnerable to the harsh

[1]University of Johannesburg, dnyathi@uj.ac.za | https://orcid.org/0000-0003-1310-627X
[2]Lupane State University, cynthianozie13@gmail.com | https://orcid.org/0009-0007-3097-6740
[3]University of Botswana and University of Johannesburg, maphosaf@ub.ac.bw | https://orcid.org/0000-0002-7180-1775
[4]University of the Free State, munyadzimbo@gmail.com | https://orcid.org/0000-000-6390-1541
[5]University of KwaZulu-Natal, ndlovuj1@ukzn.ac.za | https://orcid.org/0000-0003-4021-8322
[6]University of Zimbabwe, manasekudzai@gmail.com | https://orcid.org/0000-0002-9781-6633

DURBAN UNIVERSITY OF TECHNOLOGY
INYUVESI YASETHEKWINI YEZOBUCHWEPHESHE
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consequences of climate change, at risk (Chaudhury, 2017; Dube *et al*., 2016). Communal farmers' livelihoods have suffered due to rising temperatures, decreased annual precipitation marked by mid-season dry spells, and an increase in the frequency and severity of climatic catastrophes, including floods and droughts (Herrero *et al*., 2009; Zhang *et al*., 2021).

The situation of smallholder farmers is worsened by lax agrarian policy and little institutional or financial support from the government (Lipper *et al*., 2014; Dube *et al*., 2018). High input costs of improved seed varieties and implements, limited access to knowledge and agricultural techniques for water and soil conservation and limited long-term planning practices are some of the notable predicaments facing smallholder farmers in Zimbabwe (Phiri *et al*., 2021). A growing body of research shows that goats are generally better adapted to the harsh conditions caused by climate change, such as frequent droughts, than larger livestock, because they require smaller grazing ranges, less water, and are less vulnerable to pasture depletion (Silanikove and Koluman, 2015; Phiri *et al*., 2020). Small-animal agriculture is encouraged as a potential climate-resilient solution because it has greater survival rates than cattle (Nandhini and Suganthi, 2018). In addition, goats tend to eat less grass from meadows in a given area, based on their smaller size compared to cattle, which require more feed because of their larger size (Assan, 2014; Abraham, 2015; Chisango *et al*., 2015). Sheep and goats drink significantly less water than cattle. In this regard, owning fewer cattle has a comparative advantage in risk aversion (Hegde, 2020; Lu, 2023). These qualities provide the basis for the appropriateness of subsistence goat farming and its suitability in bolstering climate change resilience. The economies of Zimbabwe and other southern African countries mostly depend on the rearing of subsistence goats (Phiri *et al*., 2020). They are essential for the formation of organic fertilizers (manure), food security, and nutrition (Herrero *et al*., 2009).

Therefore, goat farming, especially in dry nations like Zimbabwe, can be used to sustain rural livelihoods in the face of continuously shifting conditions that impede crop production (Assan and Sibanda, 2014; Phiri *et al*., 2020). Consequently, the study examines the potential of subsistence goat farming to build smallholder farmers' resilience to climate change in the Umguza District, Zimbabwe. In particular, this study focused on the following research questions: What factors explain livelihood vulnerability in the study area? How viable is goat farming as a climate-change-resilient strategy compared to other livelihood options? How do goats adapt to the changing climate in the area? What are the possible climate change policies that could enhance smallholder farmers' resilience to climate change?

Theoretical Underpinnings of the Study

The Africa Climate Change Resilience Alliance (ACCRA) has formulated the Local Adaptive Capacity Framework (LACF), which serves as a robust theoretical basis for enhancing our understanding of climate resilience in smallholder farming systems (ACCRA, 2010). Chishakwe *et al*. (2012) argue that LACF is an indispensable tool for devising, implementing, and evaluating community-focused resilience strategies. This research meticulously evaluates the utility of subsistence goat farming in bolstering community resilience to climate change in the Umguza District by employing the five indicators of adaptive capacity defined by the LACF (ACCRA, 2010). The LACF encompasses a suite of indicators that serve as a critical tool for evaluating the potential and performance of subsistence goat farming. Collectively, these indicators provide a comprehensive framework for scrutinizing the contribution of such farming practices to the broader spectrum of resilience (Cornell *et al*., 2013). Specifically, the framework facilitates the examination of adaptive strategies in response to climatic shocks, the diversification of livelihoods to reduce risk, the strengthening of community infrastructure and services to support adaptation, and the enhancement of information flow to enable informed decision-making (Jones *et al*., 2010).

The present study extends beyond a mere assessment of the supposed benefits of subsistence goat farming practices by aligning them with the standards established by the LACF. Instead, it meticulously outlines how these methods can be integrated into a robust and sustainable agricultural model (Levine, 2014). This alignment illuminates the direct impact of goat farming on individual farmers' resilience, while also shedding light on the broader implications for community resilience and adaptation to climate change. Moreover, the study acknowledges the distinct sociocultural, economic, and environmental factors that influence local resilience by applying the LACF to the specific context of the Umguza District. This localised approach is critical in ensuring that climate resilience interventions are relevant to the context and rooted in the experiences of the communities they aim to serve (Tompkins and Adger, 2004; Levine, 2014).

Understanding and enhancing climate resilience through subsistence goat farming necessitates a comprehensive understanding of the Local Adaptive Capacity Framework (Jones *et al*., 2010). To ensure that interventions are practical, sustainable, and tailored to the specific needs and abilities of the community, this framework provides an organized approach for evaluating resilience on both a macro and micro scale (Levine, 2014). The table below, as outlined by the ACCRA and explicated by Jones *et al*. (2017: 6), delineates the five characteristics of the Local Adaptive Capacity Framework.

Table 1: A summary of the five characteristics of the local adaptive capacity framework

Characteristic	Summary
Asset base	The availability of a diverse range of key livelihood assets that allow households or communities to respond to evolving circumstances
Institutions and entitlements	The existence of an appropriate and evolving institutional environment that allows for access and entitlement to key assets and capitals
Knowledge and information	The ability households and communities have to generate, receive, assess and disseminate knowledge and information in support of appropriate adaptation options
Innovation	The presence of an enabling environment to foster innovation, experimentation and learning to take advantage of new opportunities
Flexible Forward-looking Decision Making	The ability to anticipate, incorporate and respond to changes concerning governance, structure and future planning

Source: Jones *et al*. (2017: 5)

Study Setting and Methodology

The study was conducted in wards 15 and 21 of the Nyamandlovu area, a part of the Umguza District of Zimbabwe (*See Fig 1*). These wards were selected because of the significant number of farm households that rear goats and other small livestock. The district is part of the Matabeleland North province and borders Bulawayo and Tsholotsho to the west and Lupane to the east. Like other districts in the province, the Umguza District has low crop-growing potential due to poor soil fertility, erratic rainfall regimes, and related water unavailability challenges (Worby, 2001). The district receives between 450 mm and 600 mm of rainfall annually; precipitation that cannot sustain rain-fed agricultural activities. Farmers on the three farms had mixed livelihood paths. Thebe (2011) argues that most farmers in the district grow maize and small grains on a small scale. Cattle, sheep, and goats also form a part of their livelihoods. People in the Umguza District are predominantly Ndebele-speaking (Thebe, 2011), although those who speak other languages are also found.

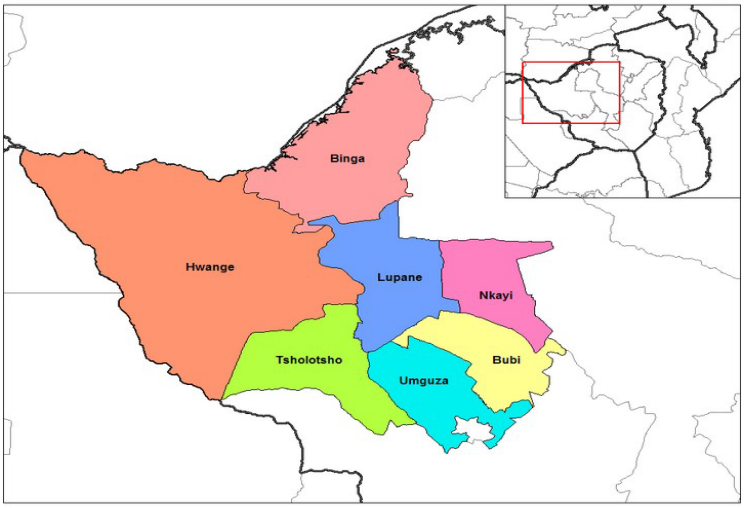

Figure 1: Showing Umguza District

The study utilized a qualitative case-study approach, anchored on an interpretive research philosophy (Punch, 2013; Bhandari, 2020). In interpretive research, there are no predefined dependent and independent variables but a focus on the complexities of human sense-making as the situation emerges (Kaplan and Maxwell, 2005). A case study design was also adopted because of the qualitative nature of the study (Streubert, and Carpenter, 2011). This enabled researchers to conduct an in-depth investigation of the topic and therefore, generate a

comprehensive understanding of issues surrounding goat rearing and climate change in Umguza (Trahar, 2009). Data were collected using 15 face-to-face interviews and two focus group discussions purposively selected with the assistance of local leadership and other key informants who were either goat farmers or people with knowledge about goat farming. Each focus group discussion comprised of 12 individuals (women, men, and youths). The purpose of including the youth was to ensure that their perspective on goat rearing for climate change adaptation and resilience was solicited. Focus group discussions took an average of one and a half hours, and they were all recorded with the consent of the participants.

Interviews were conducted in a face-to-face format until a point of saturation was reached to enhance the validity and reliability of the data collected (Punch, 2013). The participants were key informants who met the inclusion criteria for the study and were selected through snowball sampling. These individuals were chosen based on their relevant characteristics related to the study and were initially engaged through interviews (Creswell, 2012). The researchers ensured that the participants understood the purpose of the research and their role in it, using Ndebele, the dominant language spoken in the area. The use of the local language enabled the participants to comprehend the demands of the study questions and express their perspectives to the best of their abilities. Key informants included local NGO staff, Agriculture, Technical and Extension officers (AGRITEX), local traditional leadership, and council representatives. Each group of participants provided referrals that led to the next batch, creating a snowball effect. The objective of involving key informants was to obtain official information on adopting subsistence goat farming to enhance resilience against the consequences of climate change in the two study wards (Creswell, 2012; Bhandari, 2020). Analysis of data was conducted thematically, a process that involved transcribing recorded interviews into written format and assigning codes to specific data segments. The group codes were then combined and grouped into broader themes, which were identified as significant patterns that emerged from the data (Creswell, 2012).

Findings

The findings reveal that climate change vulnerability stems from erratic rainfall patterns, the failure of rain-fed agriculture, pervasive poverty, social inequality, limited access to extension services, and the impact of HIV/AIDS. Consequently, smallholder farmers face acute challenges including food insecurity, water scarcity, and livestock loss. Goat farming has been identified as a crucial strategy for building resilience, particularly because goats demonstrate higher survival rates than cattle during drought conditions.

Climate vulnerability in Umguza District

The vulnerability factors of families and communities must be considered when implementing climate change resilience solutions for them to be effective (FAO, 2010; Jones *et al*., 2017). Poor communities are already at risk from the effects of both natural and man-made stressors including poverty, HIV/AIDS, and other diseases. The two pillars for effective climate change resilience are a response to community vulnerability and a strengthening of resilience capacity (IPCC, 2007). Our study revealed that a significant number of households are headed by women due to the gendered migration of men to neighbouring towns and South Africa. Factors such as limited access, control and ownership of productive resources such as land, among others, influence women's ability to adapt to climate change. Assessing the resilience of communities in the face of climate change necessitates evaluating both their agricultural knowledge and formal education (van Rooyen and Tui, 2009). Factors such as education level, knowledge, and skills contribute to their capacity for resilience (Munhande *et al*., 2013). Anecdotes indicated that individuals with higher levels of education were more likely to exhibit climate resilience (FAO, 2024). Effective technology and information transfer from government, academia, and civil society organisations on climate change mitigation to communities is influenced by the educational attainment of both individuals and the community (Gukurume, 2013; Jamshidi, *et al*, 2020). The negative consequences of climate change on rural regions have become almost clichéd. We found that smallholder farmers in the area grapple with the impacts of climate change, particularly concerning water.

One participant indicated the following:

> *The main issue that our community deals with is the lack of water. Of late rainfall has been irregular, arriving as late as November and lasting barely a few months before ceasing resulting in the depletion of our water reserves. The region's poor water-gathering practices and water scarcity exacerbate this problem* (Female participant).

This was confirmed by a key informant who stated that:

> *Umguza District, which falls under agro-ecological region 5, is one of the country's driest regions. The lack of water-harvesting infrastructure, like dams, further complicates the situation. It is believed that the completion of the Gwayi-Shangani Dam will alleviate water problems in the district as it falls within the belt to Bulawayo* (Key informant).

The findings disclosed that the majority of livelihood prospects available on farms were not practical due to unreliable precipitation. Participants asserted that their animals' well-being was subpar. Animals often perish from starvation and dehydration when the pastures cannot maintain sufficient grass due to insufficient rainfall. During planting seasons, extended dry spells pose a challenge for crops, and farmers face difficulties in addressing this issue.

The adaptability of goats to the changing climate in Umguza District

Climate change poses significant challenges to agriculture, making it a critical topic of discussion (IPCC, 2022). Goats demonstrate remarkable resilience to these changes, effectively adapting to climate variability (Tirivangasi, 2019). UNDP (2023) emphasizes the importance of small livestock production (including goats and sheep) as a key asset among smallholder farmers that helps them cope and adapt. Participants of the study revealed that raising goats is vital for ensuring food security when crop yields are low, as they can be sold to supplement household income. Additionally, discussions revealed that there is a high demand for goats in the area. Goat meat is seen as a good alternative to traditional meats. It is leaner, nutritious meat and has been a staple red meat in the diet of many families. One key informant posited:

> *During drought, goat herds grow simply because they reproduce at two to three times the rate of cattle. A goat may produce one to four kids per year, compared to one birth every year or two years for cattle. The farmers in Umguza attest to this. In these circumstances, goats make better economic sense, and in the context of climate change, their resilience cannot be over-emphasised* (Agritex extension informant).

Another key informant echoed the same sentiments, arguing that:

> *Goats play an important role in the context of climate change. Goats offer many options for smallholder farmers: they are sold for cash, slaughtered for food, and used during traditional ceremonies (marriages and religious ceremonies).* (Key informant, local NGO).

Additionally, smallholder farmers concurred with responses from key informants. Two of the participants from different wards stated the following:

> *Due to poor rains, crops usually fail, and goats act as a rebound. We sell them, buy maize and slaughter them for meat and the skins we use as carpets at home and covers for drums that we sell. Goats also have good milk* (Male participant).

> *Goats are profitable, and how they have multiplied for me is the envy of the community. I had three goats in 2019, but now I have 20, and I do not need to feed them during drought. I just keep crop residues for them, and they can sustain them for the duration of the drought. I can also use my scorch cart to fetch water for them* (Female participant).

As indicated by the anecdotes, goats exhibit a more competitive nature than cattle, which has led to an increase in their popularity among smallholder farmers. The field of study related to goat breeding has produced numerous superior gene breeds. These include breeds advocated by local non-governmental organisations, such as the Boer goat and Kalahari red (*see Table 2*). Despite this, the majority of the participants reported that the most commonly found goat in the Umguza District is the native Matabele goat.

Table 2: Common goat breeds in Umguza

Goat Breed	Characteristics
Matabele Goat	i. This breed is found mainly in the southern part of the country ii. It is a large, framed animal iii. Mature weight can reach up to 50 kg plus for males and between 35- 40kg for females iv. It is a dual-purpose breed (meat and milk production) v. It has multiple colours including white, brown, black and mixed vi. They are adapted to local conditions
Kalahari Goat	i. Originated from South Africa or Namibia ii. Mature doe 75 kg; mature buck 115 kg; kids at six months average 30 kg iii. They are fertile and prolific, typically bearing twins of equal weight
Boer Goat	i. It originates from South Africa and is well adapted to the southern parts of the country ii. This is a large, framed breed with a white body and a brown neck and head iii. It is valuable for meat, milk and skin

Source: Government of Zimbabwe (2020)

The viability of goats as a climate change-resilient strategy in Umguza District

Experts and smallholder farmers alike agreed that the primary cause of their diminishing standards of life and food insecurity was climate change. Consequently, they realised the importance of confronting the effects of climate change using small livestock. Participants asserted that they have improved their food security and increased their asset base by utilising subsistence goat farming as a climate-resilient technique. It emanated from the focus group discussions that some households had managed to pay fees for their children and settled medical bills through goat rearing. Probes indicated that, in some households, the adoption of goats improved the dietary diversity and well-being of children. One female participant (heading a household) noted that:

> *I am very grateful for having started goat rearing. As a widow, I have managed to send my children to school, buy food, and pay debts. Goats have the advantage that their meat is in demand, especially during holidays. And of late we have also realised that most people who perform rituals now use goats instead of cattle. This has created a high demand for goats, which is a large market for us.*

Goats provide 'latent' financial power to smallholder farmers who raise them for a living since they can sell the goats when needed. Participants reported that goats in Matabeleland can cost anywhere from US $30 to US $100, depending on factors including size, sex, condition, and whether they are castrated or pregnant. Goats that are pregnant or castrated are highly valued. Raising goats has allowed many smallholder farmers to afford to send their children to school. Despite the benefits of goat farming, the Umguza District community indicated that it faced challenges in its adoption. Many smallholder farmers indicated that wild animals, particularly jackals, hyenas, and birds like hawks, were a significant constraint, followed by incessant diseases. One farmer stated the following:

> *Usually, our goats give birth in the bush and hawks prey on them; and when you do not pen them, you will notice that they come home with others missing, and we will see the carcass later. The most dangerous is the hyena, as it can eat all the goats in one night.* (Smallholder Farmer 8, Nyamandlovu).

On a related note, one participant opined:

> *Smallholder farmers face challenges, including increased input costs, such as veterinary chemicals, which leave their animals vulnerable to diseases. Under these conditions, government agricultural agencies and non-governmental organisations support smallholder farmers by providing chemicals and expertise. Unfortunately, the support is erratic and uncoordinated*.

Climate change policy for enhancing smallholder farmers' resilience

To promote the use of sustainable goat farming as a climate-resilient strategy, it is essential that the government eliminates any obstacles and capitalises on the benefits it provides (Agrawal, 2010). For agriculture and food systems to adapt to climate change, smallholder farmers must have access to a diverse range of genetic resources, farming inputs, and knowledge (Monau *et al*., 2020). This can only be accomplished if climate change policies

acknowledge the significance of goats and other small livestock in addressing the challenges faced by households in the face of the crisis (Zhang *et al*., 2021).

According to participants, Non-Governmental Organizations and Agriculture Extension Services are empowering them by providing essential training for Community Supported Agriculture (CSA) implementation and goat farming in the area. It emanated from the probes that smallholders are trained in goat keeping, record keeping and nutritional needs for such small livestock. However, the study's findings also revealed that smallholder farmers in the region face difficulties in obtaining funding for their farming activities due to Zimbabwe's land tenure system. This system prevents smallholder farmers from using their land as collateral to secure bank loans since the land is held by the state, and they do not possess title deeds or own any land. Therefore, it is crucial to address this issue when devising strategies that promote climate resilience (Agrawal, 2010). This was captured by one participant who noted:

> *Goat farming is one adaptation strategy that needs some support from funding institutions as most of us lack start-up capital, non-availability of high-quality breeds, lack of adequate information/extension services and disease outbreaks. We also need title deeds so that we can access credit to address most of the challenges we face as smallholders doing goat production. Without titles, our growth will remain a pipe dream.*

Zimbabwe can learn from China, South Korea, and other Southeast Asian economies' well-established agrarian policies (Manikarakiza *et al*., 2020). China, South Korea, and various Southeast Asian economies have implemented several key strategies to enhance farmers' climate resilience (Diana *et al*., 2022). China has invested heavily in precision agriculture by utilising drones to monitor soil moisture and crop health. This helps to optimize water usage and reduce waste. The government is promoting genetically modified crops that are more tolerant to droughts and flooding. For example, flood-resistant rice varieties have been developed to withstand extreme weather conditions. The South Korean government provides subsidies to farmers who adopt eco-friendly practices and technologies, encouraging a shift towards sustainable farming (Zhou *et al*., 2023). Many Southeast Asian countries emphasize community resilience through local co-operatives that share resources and knowledge, for example, Indonesia, where farmers collaborate on water management systems (Mamun *et al*., 2024). These strategies reflect a combination of technological innovation, research investment, community engagement, and policy support, helping farmers to adapt to the challenges posed by climate change (Monau *et al*., 2020). One key informant pointed out the following:

> *The most significant burden faced by smallholder farmers in the Umguza district, which is also detrimental to their climate resilience strategies, is that they do not own the land. They only have offer letters, which is not enough to secure finance to develop their land or buy the necessary equipment to climate-proof themselves. You can see that commercial farmers do not have problems obtaining loans and drilling boreholes because of their land tenure stability*.

Since reduced crop yields, increased agricultural risks, declining soil fertility, and environmental degradation seem to be the main barriers to society's improved food, income, and nutrition security, especially in smallholder master farming, the use of subsistence goat farming has the potential to increase smallholder farmers' resilience to climate change, effectively aiding communities in multiple ways (FAO, 2017).

Discussion and Implications of Findings

Using the Local Adaptive Capacity Framework, the study explored the potential of subsistence goat farming to enhance climate resilience among smallholder farmers in Umguza District, Zimbabwe. Findings indicate that subsistence goat farming can aid smallholder farmers in becoming more resilient to climate change. First, the asset base indicator comprises various financial, physical, natural, social, and human capital resources necessary to prepare a system for a community to respond to climate change. Specifically, findings insinuate that goats are relevant to food and nutrition sustainability, economic sustainability, and environmental sustainability (Mentoiro et al, 2018). Goats can play an important role in supporting the four pillars of food security and enhance global food supply and human nutrition, and therefore, improve food and nutrition sustainability (Lipper *et al*., 2014; Lu and Miller, 2019). Second, the study revealed that the Government of Zimbabwe, in collaboration with local NGOs and Agritex, has trained smallholder farmers in goat rearing. By doing so, technology and skills (including social, natural, and human capital) are transferred to these communities. The ability of a climate change programme to

ensure equitable access and entitlement to essential resources that provide equal opportunities for all groups, regardless of gender, age, ethnicity, or class, to participate and be represented, is measured by the institutions and entitlements indicator. Particular attention should be given to this metric for marginalized or vulnerable groups. The Agritex selection criteria have specifically targeted vulnerable groups, including women, the elderly, those with chronic diseases, individuals with impairments, and households headed by a child. These groups now have access to necessary information that promotes climate change resilience.

Third, the knowledge and information indicator highlight the importance of disseminating information for effective resilience to climate change. Communities require an understanding of future change, knowledge of potential adaptation options, access to those options, and the ability to implement them (Tompkins and Adger, 2004). The primary challenges associated with goat production involve enhancing the productive potential of indigenous breeds and conserving indigenous germplasm. The phenotypic traits of coat colour, respiration rate, rectal temperature, skin temperature, thyroid hormones, and genotypic markers, such as heat shock proteins and thyroid hormone receptors are considered reliable indicators of metabolic adaptation in goats during heat stress (Sejian *et al*., 2021). The Agritex early warning systems provide information on risk assessment, hazard identification, and community mitigation plans. As a result, the organisation has assisted the community in addressing issues related to keeping their animals healthy all-year-round, particularly during dry seasons and droughts when diseases are more prevalent. Fourth, the innovation indicator promotes neighbourhood-level initiatives that assist local communities in adapting to climate change. In addition, the goat industry could undergo a transformation by incorporating features that govern production, adaptation, and low methane emission into current breeding programs to create eco-intensified breeding strategies that minimise their impact on the ecosystem (Joy *et al*., 2020; Sejian *et al*., 2021).

Lastly, the governance and decision-making indicator suggests that CSA policies should ensure that local communities have the ability to determine how or what appropriate actions to take to plan for the future and make informed decisions regarding future climate impacts. Across the district, village-level community-based disaster risk-reduction committees have been established to enhance governance and decision-making (Jones *et al*., 2019). Such community-based adaptation approaches are about empowering vulnerable communities and their local governments and service providers to understand and analyse how the climate is and will continue to impact on their lives, make informed and anticipatory decisions on priority adaptation actions, and constantly adjust their livelihood and risk management strategies in response to new and uncertain circumstances. This is the starting point for effective adaptation, bringing decisions under the control of those affected by them and avoiding predetermined solutions.

Conclusion

This paper explored the possibility of smallholder farmers becoming more resilient to climate change through the practice of subsistence goat husbandry. The findings of the study suggest that subsistence goat husbandry has the potential to significantly enhance resilience among smallholder farmers. Goat production plays a vital role in the livelihoods of rural communities in dryland agro ecosystems, offering a crucial source of income and food security in an area where crop production is inconsistent due to unpredictable rainfall and frequent droughts. It emanates from the analysis that at the heart of any local-level adaptation intervention is the need to increase the individual or community's adaptive capacity. A key component of this is ensuring that individuals, communities and societies are actively involved in processes of change. Importantly, this relates to changes in behaviour, as well as in resources and technologies. The government should consider issuing title deeds to newly resettled smallholders. This would enable them to use their land as collateral to secure credit and enhance their financial stability. Scaled up goat programmes require engagement with government agencies to facilitate policies and activities during implementation and beyond. Successful development programmes focus on people, and the goats and other activities are the means to improve their livelihoods and welfare. Goats make an excellent entry point into poor communities, and their relatively low cost means that more people can participate in goat-based activities. There is also a need to work closely with the Department of Parks so as to address the challenges emanating from problem animals such as hyenas.

Declarations

Interdisciplinary scope: The article demonstrates an interdisciplinary approach by integrating insights from business management, economics, and policy studies to analyse the COVID-19 pandemic impact on small and medium enterprises' performance in the tourism sector South Africa.

Author Contributions: Conceptualisation (Nyathi and Ndlovu); literature review (Nyathi and Ndlovu); methodology (Maphosa, Dzvimbo, Ndlovu); data cleaning (Ndlovu); (data analysis (Ndlovu Nyathi and Ndlovu); drafting and preparation (Nyathi, Ndlovu and Ndlovu); review and editing (Maphosa and Chiweshe). All authors have read and approved the published version of the article.

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Data availability: The data utilised in this study with additional details are available upon reasonable request from the corresponding author.

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