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RESEARCH REPORT

Exploring Opportunities and Challenges in Cultivating Traditional African Crops for Sustainable Urban Agriculture: Insights from the Melusi Underprivileged Community

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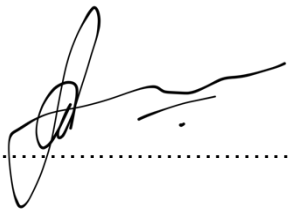
28 June 2024

DECLARATION OF ORIGINALITY

I declare that the mini-dissertation, "**Exploring Opportunities and Challenges in Cultivating Traditional African Crops for Sustainable Urban Agriculture: Insights from the Melusi Underprivileged Community"**, which has been submitted in fulfillment of part of the requirements for the module of DIT 802, at the University of Pretoria, is my work and has not previously been submitted by me for any degree at the University of Pretoria or any other tertiary institution.

I declare that I obtained the applicable research ethics approval to conduct the research described in this dissertation.

I declare that I have observed the ethical standards required by the University of Pretoria's ethics code for researchers and have followed the policy guidelines for responsible research.

Signature: 

Date: 5 July 2024

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ABSTRACT

Urban agriculture (UA) is increasingly recognised for its potential to enhance food security in cities, yet integrating Traditional African Crops (TACs) into Sustainable Urban agriculture (SUA) remains underexplored, particularly in underprivileged communities like Melusi in Tshwane, South Africa. This study explores the opportunities and challenges of TACs integration in Melusi's SUA to address severe food insecurity and improve environmental, social and economic spheres of sustainability exacerbated by financial constraints and limited access to nutritious food.

This research employs a qualitative approach grounded in the interpretive paradigm. It employs semi-structured interviews and focus group discussions with Melusi community members and stakeholders. Thematic analysis is conducted using ATLAS. Ti software to identify patterns and insights on SUA practices, community perceptions of TACs, and barriers to implementation.

Themes explored include SUA's socio-economic impacts, TACs' cultural significance, and environmental sustainability in urban agriculture. Recommendations include tailored strategies for enhancing local food production, fostering community engagement, and effectively integrating TACs into SUA initiatives to improve food security and resilience in Melusi.

Keywords: Traditional African Crops, Urban agriculture, Sustainable Urban agriculture, Underprivileged communities, Opportunities, Challenges

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ABBREVIATIONS

UA: Urban agriculture
SUA: Sustainable Urban Agriculture
TAC: Traditional African Crop
TACs: Traditional African Crops
ECD: Early Childhood Development
GI: Green Infrastructure
QU: Quotation

LIST OF ANNEXURES

Chapter 1: Introduction

Cities have been pivotal in food production since the earliest human settlements (Haysom et al., 2020; Steel, 2008). With rapid urbanisation accelerating globally, UA has emerged as a crucial strategy to tackle the challenge of food security and encourage sustainability in urban areas (Mabhaudhi et al., 2018; FAO, 2017). UA enhances food access and fosters resilience against environmental challenges and socio-economic disparities (Bisaga et al., 2019; Lovell, 2010).

Cultivating TACs within UA holds significant ecological, economic, and social potential, especially for underprivileged communities (Orsini et al., 2013; Shackleton et al., 2010; Akinola et al., 2020). These crops, with their nutritional richness, resilience to local conditions, and cultural significance, offer sustainable alternatives to exotic crops, instilling hope for a more sustainable future (Shackleton, 2010; Cloete & Idsardi, 2013; Mabhaudhi et al., 2018).

In South Africa, the legacy of apartheid-era urban policies continues to shape spatial inequalities, concentrating informal settlements on the fringes of cities and exacerbating food insecurity (Mabin, 2005; Rudolf & Muchesa, 2023). Over half of the population resides in underprivileged areas such as townships and informal settlements, facing persistent challenges in accessing essential services and adequate nutrition (Bisaga et al., 2019; Grangxabe, 2023).

Despite UA's potential to mitigate food insecurity, its integration into urban planning and agricultural policy still needs to be improved, particularly in underprivileged communities like Melusi in Tshwane (Rudolph & Muchesa, 2023). Melusi, characterised by socio-economic vulnerabilities and inadequate infrastructure, underscores the urgent need to explore innovative food production strategies. This emphasis on urgency highlights the importance of enhancing community resilience and well-being through sustainable food production (Kgoale, 2024).

1.1 Background

Melusi, often called Gomora Informal Settlement, represents the socio-economic difficulties widespread in urban areas of South Africa (Huchzermeyer, 2006). The ongoing problems of insufficient service delivery, corruption, and economic exclusion highlight the urgent need for sustainable development programs such as UA to address poverty and enhance food security (Kgoale, 2024).

Traditional African Crops (TACs) encompass many native plants that have been farmed in Africa for generations. Traditional African Crops (TACs) provide nutritional benefits and present an opportunity

to adapt to changing climatic conditions (Gruca et al., 2017; Akinola et al., 2020). These crops contribute to the nutritional needs of the local population and promote the diversity of animal species and plants and the benefits they provide to the urban environment (Monteiro et al., 2017).

1.2 Research Problem

Although UA can potentially improve food security in Melusi, more research is needed on the advantages and challenges of incorporating TACs into SUA activities. Comprehending these interactions is crucial for formulating solutions appropriate to the particular circumstances, which aim to tackle the problem of inadequate access to food and encourage long-term, environmentally-friendly progress in disadvantaged urban areas.

Our study draws on various disciplines, including UA, food security, and community development, to construct a robust and comprehensive theoretical framework. Theoretical frameworks, such as social-ecological systems and community resilience, are employed to analyse how integrating TAC could foster the development of sustainable food systems in Melusi (Akinola et al., 2020; Ernstson et al., 2010).

1.3 Research Questions and Objectives

This research investigates the potential opportunities and challenges of growing TACs for SUA in Melusi, South Africa.

Main Research Question:

What opportunities and challenges does the underprivileged Melusi community in Tshwane face when utilising TACs in SUA?

Sub-questions:

What SUA practices does Melusi currently employ?
How do Melusi's youth perceive TACs?
What opportunities and challenges does the Melusi community face in implementing SUA?

1.4 Limitations, Delineations, and Assumptions of the Study

This research focuses specifically on Melusi and may not fully generalise to other underprivileged communities with different socio-economic contexts or climatic conditions. Limitations include constraints in data collection time, financial resources, and potential biases in participant perspectives.

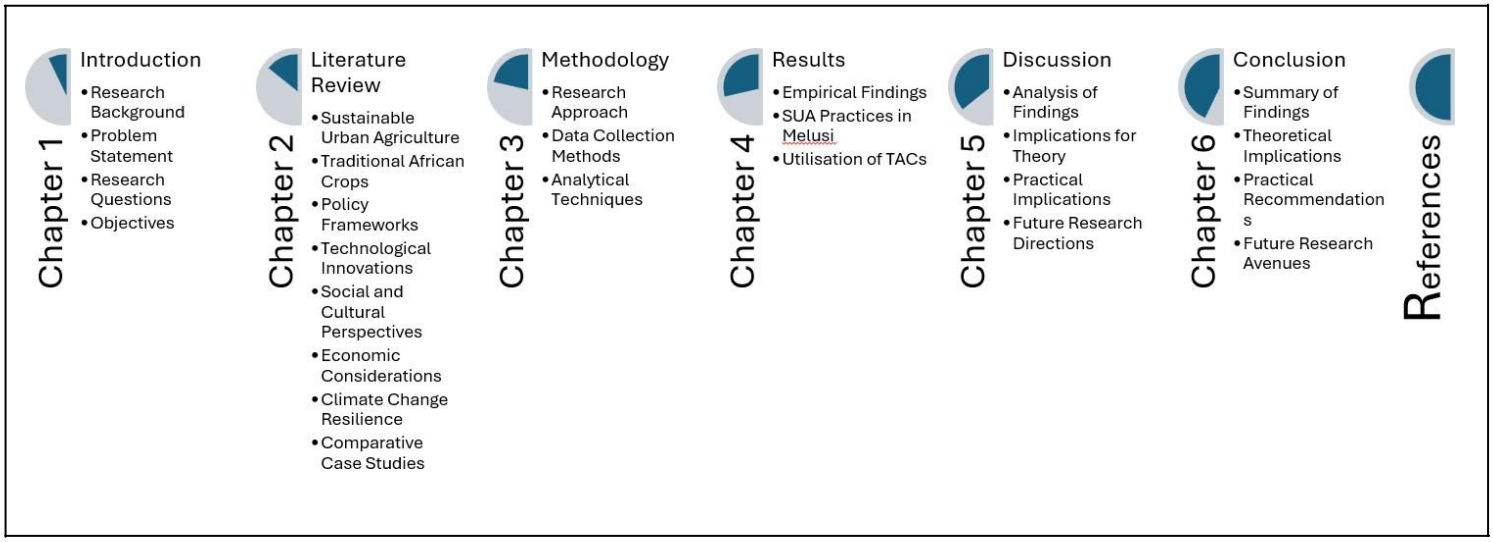
1.5 Significance of the Study

This research contributes to the discourse on UA and food security by exploring the potential of TACs to enhance local food production, nutrition, and community resilience in underprivileged urban settings. Findings will inform policy and practice to promote sustainable development and reduce socio-economic disparities in South Africa.

1.6 Structure of the Thesis

This research is structured as follows:

Graph 1: *Research structure* (Author, 2024).



Chapter 2. Literature Review

2.1 Introduction to SUA

Urban agriculture (UA) is crucial in enhancing food security, promoting local economic development, and fostering environmental sustainability, particularly in underprivileged communities (Rogerson, 2011, Kanosvamhira, 2023). In the City of Tshwane, the concept of UA is pivotal amid growing urbanisation and its associated challenges.

2.2 Importance of SUA in Underprivileged Communities

Urban agriculture (UA) in underprivileged communities aligns with several United Nations Sustainable Development Goals (SDGs), including poverty reduction (SDG 1), hunger alleviation (SDG 2), and sustainable urban development (SDG 11) (United Nations, 2024). Despite its potential benefits, UA faces substantial challenges in informal settlements such as Melusi, characterised by water scarcity, land tenure insecurity, and inadequate infrastructure (Bisaga et al., 2019; Kanosvamhira, 2023; Cilliers et al., 2020).

2.3 Opportunities and Challenges of SUA in Underprivileged Communities

2.3.1 Opportunities for SUA

Table 1: *Opportunities for SUA* (Author, 2024).

Opportunities	Source
Economic opportunities	
Income generation	(Hamilton et al., 2013; Cilliers et al., 2020)
Job creation	(Hamilton et al., 2013; Cilliers et al., 2020; Rudolph & Muchesa, 2023)
Cost savings	(Rudolph & Muchesa, 2023)
Encouraging business initiatives	(Rudolph & Muchesa, 2023)
Affordable local food	(Hamilton et al., 2013; Cilliers et al., 2020)
Economic resilience	(Cilliers et al., 2020; Rudolph & Muchesa, 2023)
Land use optimization	(Rudolph & Muchesa, 2023)
Market sales & skills	(Hamilton et al., 2013; Cilliers et al., 2020; Bisaga et al., 2019; Rudolph & Muchesa, 2023; Kanosvamhira, 2023)
Environmental opportunities	
Enhancing green spaces and biodiversity	(Rudolph & Muchesa, 2023; Hamilton et al., 2013; Kanosvamhira, 2023; Cilliers et al., 2020)
Ecological benefits	(Hamilton et al., 2013; Cilliers et al., 2020)
Carbon footprint reduction - minimized transportation	(Hamilton et al., 2013; Rudolph & Muchesa, 2023; Kanosvamhira, 2023)
Climate resilience	(Rudolph & Muchesa, 2023; Kanosvamhira, 2023)
Waste management	(Rudolph & Muchesa, 2023; Kanosvamhira, 2023)
Resource efficiency	(Rudolph & Muchesa, 2023; Kanosvamhira, 2023)

Social opportunities	
Food security	(Hamilton et al., 2013; Cilliers et al., 2020)
Social connection, community building and social cohesion	(Hamilton et al., 2013; Cilliers et al., 2020; Kanosvamhira, 2023)
Empowerment of underprivileged and marginalized groups	(Hamilton et al., 2013; Cilliers et al., 2020; Kanosvamhira, 2023)
Improving health and nutrition	(Hamilton et al., 2013)
Educational opportunities	(Rudolph & Muchesa, 2023; Kanosvamhira, 2023)
Empowerment and skill development	(Rudolph & Muchesa, 2023)
Activism & advocacy	(Kanosvamhira, 2023)

SUA presents various opportunities:

- Social Opportunity: UA enhances food security through locally produced fresh food, addressing nutritional deficiencies prevalent in underprivileged communities (Bisaga et al., 2019).
- **Economic Opportunities:** It generates income and employment opportunities, crucial for economic stability and poverty alleviation (Hamilton et al., 2013).
- **Environmental Sustainability:** UA contributes to improving air quality, reducing urban heat islands, and enhancing biodiversity, promoting ecological health (Kanosvamhira, 2023; Peroni et al., 2022).

2.3.2 Challenges of SUA

Despite its benefits, UA faces challenges such as water scarcity, land tenure insecurity, resource constraints, inadequate infrastructure, climate change impacts, and financial and knowledge gaps (Department of Water and Sanitation, 2023; Rudolph & Muchesa, 2023; Bisaga et al., 2019).

Table 2: *Challenges for SUA* (Author, 2024).

Challenge Source	
Environmental Challenges	
Water scarcity	(Department of Water and Sanitation, South Africa, 2023; Cofie et al., 2005; Bisaga et al., 2019)
Climate change	(Dorr et al., 2021; Sowerwine & Acey, 2018)
Soil and air contamination	(Bennedetti et al., 2023; Bisaga et al., 2019)
Pollution of nearby rivers	(Bisaga et al., 2019)
Social Challenges	
Land tenure insecurity	(Rudolph & Muchesa, 2023; Cisse et al., 2005; Bisaga et al., 2019)
Inadequate infrastructure	(Achi, 2021; Cruz & Medina, 2003; Bisaga et al., 2019)
Social acceptance and inclusion	(Wadumestrige Dona et al.,, 2021)
Food distribution issues	(Sowerwine & Acey, 2018; Bisaga et al., 2019)
Lack of community organization	(Bisaga et al., 2019)
Economic Challenges	
Resource constraints	(Chari & Nqcamu, 2022; De Bon et al., 2010; Bisaga et al., 2019)
Funding and knowledge gaps	(Bisaga et al., 2019; Ferreira & Oliveira, 2023)
Competition for urban land use	(Bisaga et al., 2019)

2.4 Traditional African Crops for SUA in Underprivileged Communities

Traditional African Crops (TACs) encompass various indigenous plants cultivated and consumed across Africa for generations. These crops offer numerous advantages in SUA due to their adaptability to local conditions, minimal need for soil amendments, and cultural relevance (Gruca et al., 2017; Orsini et al., 2013).

2.4.1 Opportunities for TACs in SUA

2.4.1.1 Social Benefits:

- **Community Cohesion and Empowerment:** TAC cultivation enhances community bonds and empowers residents through participation in UA initiatives (Hamilton et al., 2013; Cilliers et al., 2020).
- **Skills Development and Education:** UA provides opportunities for skill development in horticulture and business management, promoting awareness about food security and environmental stewardship (Kanosvamhira, 2023).

2.4.1.2 Environmental Benefits:

- **Biodiversity and Ecological Health:** Cultivating TACs promotes biodiversity conservation and enhances urban green spaces, contributing to environmental sustainability (Mabhaudhi et al., 2017).
- **Resource Efficiency and Climate Resilience:** TAC cultivation supports sustainable practices that optimise resource use, minimise the carbon footprint, and enhance climate resilience (Rudolph & Muchesa, 2023).

2.4.1.3 Economic Benefits:

- **Income Generation and Economic Stability:** TAC cultivation creates income opportunities through local produce sales, thereby improving economic stability in underprivileged communities (Hamilton et al., 2013).
- **Entrepreneurship and Market Access:** It fosters entrepreneurship in agriculture and related sectors, facilitating market access and economic sustainability (Rudolph & Muchesa, 2023).

2.4.2 Challenges to Widespread Adoption of TACs

Despite their benefits, the widespread adoption of TACs faces challenges such as water scarcity, land tenure insecurity, resource constraints, inadequate infrastructure, climate change vulnerabilities, and financial and knowledge gaps (Department of Water and Sanitation, South Africa, 2023; Dorr et al., 2021; Bisaga et al., 2019).

2.5 Incorporating Sustainable Practices

Not all UA approaches are inherently sustainable (Pearson et al., 2010). Sustainable viability depends on integrating environmental, social, and economic elements (Bisaga et al., 2019). Achieving sustainable viability in UA requires integrating environmental, social, and economic elements (Bisaga et al., 2019). It involves optimising resource efficiency, fostering social equality, and ensuring economic viability to sustain long-term SUA activities (de Zeeuw et al., 2011; Rudolph & Muchesa, 2023).

2.6 Deficiencies in Existing Research

Current literature emphasises the significance of UA and TACs in underprivileged communities but lacks detailed case studies addressing specific operational dynamics, adaptive strategies, and community impacts (Thornton, 2008; Rogerson, 2011; Bisaga et al., 2019). Future research should focus on evaluating policy frameworks, enhancing cultural acceptance of TACs, and conducting longitudinal studies to track UA's long-term impacts (Ramadevi et al., 2019; Akinola et al., 2020; Dawson et al., 2019).

2.7 Climate and Conditions for Cultivating TACs in Melusi

The Melusi, situated in the City of Tshwane, exhibits a moderate climate characterised by warm summers and mild winters. Summer temperatures average around 22°C, with winter temperatures averaging 12°C. The city receives approximately 670 mm of rainfall annually, mainly during the summer months from December to February, often accompanied by thunderstorms and hail (SAWS, 2024). Winter months can experience temperatures dropping below freezing, leading to frost in some areas (SAWS, 2024). Cyclical climate phenomena such as El Niño and La Niña influence extreme weather events like droughts and heatwaves (IPCC, 2021).

Temperature Trends and Projections

Future climate models predict a drying trend with more frequent extreme weather events, though the overall drying scale is expected to be limited (IPCC, 2021). By the end of the century, very hot days (temperatures exceeding 35°C) could increase significantly, posing risks to agriculture and public health (SAWS, 2024). Extreme weather events such as floods, droughts, heatwaves, and hailstorms already impact various sectors in Pretoria, including agriculture, biodiversity, water resources, and public health (IPCC, 2021).

Rainfall Patterns and Extreme Weather Events

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Adaptability of TACs

Traditional African Crops (TACs) are crucial in enhancing food security and resilience to climate change in Pretoria. These crops, such as African Cabbage (*Brassica carinata*), Cowpea (*Vigna unguiculata*), Millet (*Pennisetum glaucum*), Sorghum (*Sorghum bicolour*), Spider Plant (*Cleome gynandra*), Wild Garlic (*Tulbaghia spp.*), Wild Spinach (*Cleome gynandra*), and Wild Watermelon (*Citrullus lanatus*), exhibit traits such as drought tolerance, heat resilience, and suitability for various soil types (Mabhaudhi et al., 2017; Gruca et al., 2017; Orsini et al., 2013; SAWS, 2024). Leveraging these adaptive qualities can strengthen Urban agriculture initiatives, mitigating risks associated with climate variability and contributing to sustainable food production.

2.8 Synthesis and Integration

Urban agriculture (UA) is a pivotal strategy for addressing multifaceted challenges and harnessing opportunities within underprivileged communities, particularly in the City of Tshwane. This practice aligns closely with the United Nations Sustainable Development Goals (SDGs), specifically targeting poverty alleviation (SDG 1), hunger eradication (SDG 2), and sustainable urban development (SDG 11) (United Nations, 2024).

Opportunities and Challenges of SUA

Sustainable Urban Agriculture (SUA) offers numerous social, economic, and environmental benefits. Socially, it enhances food security by providing locally grown produce, thus addressing nutritional deficiencies prevalent in underprivileged communities (Bisaga et al., 2019). Economically, SUA generates income and employment opportunities crucial for economic stability and poverty alleviation (Hamilton et al., 2013). Environmentally, it improves air quality, reduces urban heat islands, and promotes biodiversity, fostering ecological health (Kanosvamhira, 2023; Peroni et al., 2022). However, the implementation of SUA faces substantial challenges. These include water scarcity, land tenure insecurity, resource constraints, inadequate infrastructure, climate change impacts, and financial and knowledge gaps (Department of Water and Sanitation, South Africa, 2023; Rudolph & Muchesa, 2023; Bisaga et al., 2019).

Role of Traditional TACs in SUA

Traditional African Crops (TACs) represent a valuable resource in SUA due to their adaptability to local conditions, minimal need for soil amendments, and cultural significance (Gruca et al., 2017; Orsini et al., 2013). These crops, including African Cabbage, Cowpea, Millet, Sorghum, Spider Plant, Wild Garlic, Wild Spinach, and Wild Watermelon, offer social, environmental, and economic benefits. Socially, TAC cultivation enhances community cohesion and empowerment, fostering participation in UA initiatives and providing opportunities for skills development in horticulture and business management (Hamilton et al., 2013; Cilliers et al., 2020). Environmentally, TACs promote biodiversity conservation, resource efficiency, and climate resilience through sustainable agricultural practices (Mabhaudhi et al., 2017; Rudolph & Muchesa, 2023). Economically, they support income generation, economic stability, and entrepreneurship within local communities (Hamilton et al., 2013; Rudolph & Muchesa, 2023).

Nevertheless, challenges to the widespread adoption of TACs persist, mirroring those faced by SUA more broadly, such as water scarcity, land tenure insecurity, inadequate infrastructure, and climate change vulnerabilities (Department of Water and Sanitation, South Africa, 2023; Dorr et al., 2021; Bisaga et al., 2019).

Climate and Conditions for Cultivating TACs

Pretoria's climate, characterised by warm summers and mild winters with an average annual rainfall of 670 mm, poses opportunities and challenges for TAC cultivation (SAWS, 2024; IPCC, 2021). While future projections indicate temperature increases and altered rainfall patterns, TACs' resilience to drought and heat positions them as viable options for enhancing food security and resilience against climate variability (SAWS, 2024; IPCC, 2021).

In conclusion, integrating TACs into SUA in Pretoria addresses local challenges and contributes to global sustainability agendas by promoting food security, economic empowerment, and environmental stewardship. Future research should aim to bridge existing knowledge gaps, evaluate policy frameworks, and enhance community engagement to ensure the sustainability and scalability of SUA initiatives (Ramadevi et al., 2019; Akinola et al., 2020; Hendre et al., 2019).

Chapter 3: Research Methodology

3.1 Study Area and Context

This research was conducted in the Melusi community, situated west of Tshwane City in Gauteng, South Africa. Melusi was chosen because it is a low-income community facing socio-economic challenges, including food insecurity, poverty, unemployment, and limited access to essential resources such as clean water. These conditions make it an ideal setting to investigate the community's readiness to adopt SUA for cultivating and consuming TACs. Melusi also serves as a representative case study for many similar disadvantaged communities grappling with comparable issues, such as inadequate access to essential services and encroachment on ecologically diverse areas.

Melusi has experienced rapid population growth, expanding by over 524% from 2011 to 2021, encompassing three regions: Melusi 1, Melusi 2, and Melusi 3 (Achi, 2021). These regions vary in population density, level of formalisation, and access to municipal services. Urban expansion has contributed to environmental degradation, including deforestation for residential development. Covering approximately 145 hectares, Melusi features three water bodies totalling about 15 hectares, formerly clay quarries converted into reservoirs. The settlement lies within the 100-year floodplain and adjacent to the Witwatersberg Ridge, which is prone to recurrent flooding. The entire area falls under the 'Gold Reef Mountain Bushveld' vegetation type, with the ridge classified as Critical Biodiversity and Environmentally Sensitive (Achi, 2021).

Figure 1: Flooding in Melusi, which will be exacerbated by climate change (Author 2021) Image by (Achi, 2021: 4).

The Melusi Youth Development Organisation (MYDO), a registered non-profit (registration number 152-983 NPO), plays a crucial role in this research. MYDO provides educational support and activities for holistic youth development in Melusi's informal settlements.

Research Context

This research proposal centres on Melusi for several compelling reasons. Melusi exemplifies the struggles encountered by numerous underprivileged communities in South Africa. The introduction of UA holds significant potential to improve food security within Melusi. Lastly, the community has expressed interest in exploring sustainable food production methods.

The reintroduction of cultivating TACs holds particular promise for Melusi. Traditional African Crops, such as sorghum and cowpea, are renowned for their drought tolerance and ability to thrive in challenging environments. These crops could serve as a dependable source of nutritious food for the community. Furthermore, TACs bear cultural significance for many South Africans, potentially fostering a sense of ownership and connection to the UA initiative.

This research examines the case of Melusi and endeavours to develop a model for integrating TACs into sustainable UA practices that can benefit underprivileged communities across South Africa.

Figure 2: Melusi Context - Axonometric visualisation (Author, 2024).

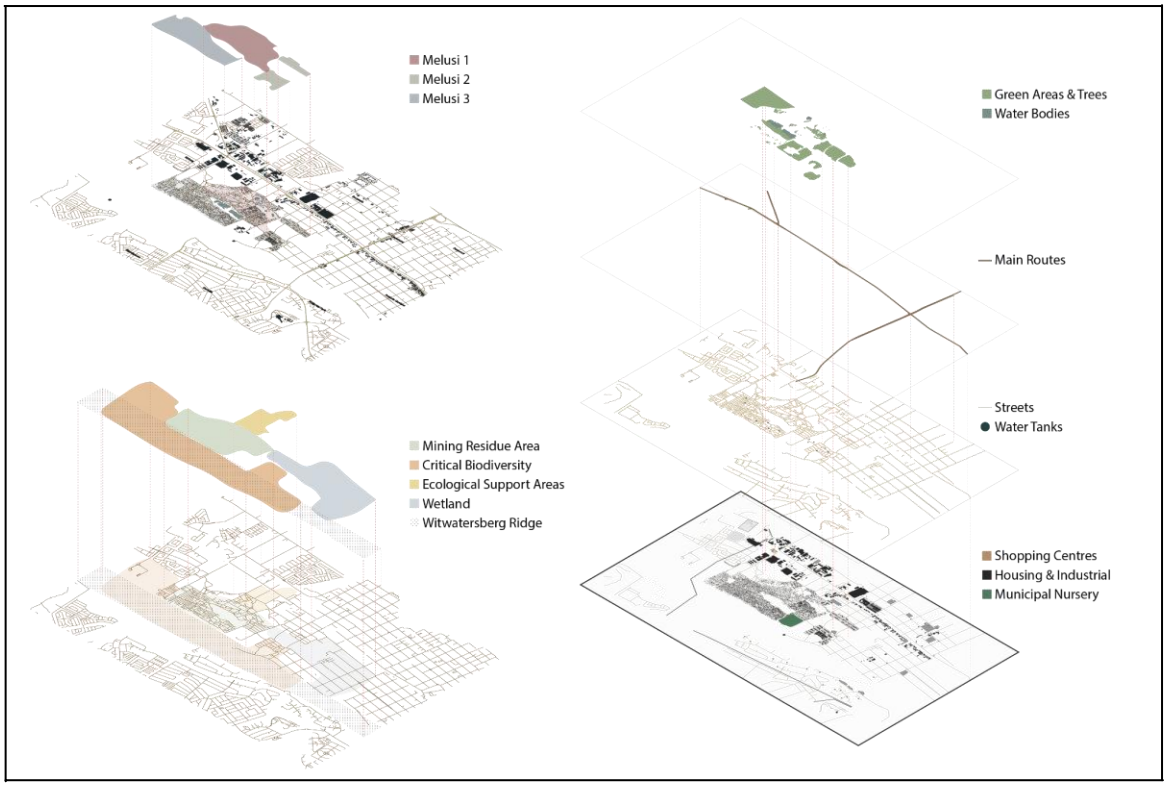


Figure 3: Melusi Map (Author, 2024).

3.2 Research Paradigm and Design

The research adopts an interdisciplinary approach integrating environmental, sociology, and landscape components (Smith, 2018; Pedroza-Arceo et al., 2022; Green & White, 2021). This approach enables the development of practical methods that blend different paradigms to effectively address complex issues and link research findings with practical experiences. Grounded in the interpretive paradigm, which posits that social processes shape reality, this study focuses on understanding the meanings individuals or groups attribute to their experiences (Mertens, 2019). The research aims to explore the subjective experiences, views, opinions, and attitudes of Melusi community members towards TACs and UA, aligning with research objectives outlined by Patton (2015), Tümen-Akyıldız and Ahmed (2021), and Gundumogula (2020).

This methodology is particularly suitable for examining intricate social phenomena within their natural contexts, such as understanding the potential and challenges of cultivating TACs for SUA in the economically disadvantaged Melusi community (Creswell, 2013). The exploratory nature of the approach allows for flexible and comprehensive exploration, which is essential for uncovering the nuanced perspectives and experiences of community members (Creswell, 2013). Emphasising interpretation underscores the importance of situating these perspectives within the community's cultural and social milieu, providing valuable qualitative insights (Mertens, 2019).

3.3 Data Collection

Participants: Participants include members of MYDO, community leaders, and Early Childhood Development (ECD) leaders within Melusi.

Methods:

- **Semi-Structured Interviews:** Conducted with key stakeholders to explore knowledge, experiences, attitudes, needs, goals, and barriers to SUA and TAC cultivation. Interviews were guided by a thematic interview guide (see Appendix A) to ensure depth and flexibility in probing emergent themes.
- **Focus Group Discussions:** These were held with a purposive sample of Melusi community members to examine collective experiences, views, and attitudes towards TACs and SUA. The discussions were guided by the same thematic interview guide used for semi-structured interviews and audio-recorded for subsequent analysis. Meetings took place in a neutral, accessible location within the community, namely MYDO, to promote comfort and open dialogue.
- **Data Collection Procedure:** Participants were recruited by community leaders who were acting as gatekeepers. Interviews and focus group sessions lasted approximately 40 to 60 minutes each. Verbal and written consent were obtained from all participants before commencement.

3.4 Data Analysis

Thematic Analysis: Qualitative data from interviews and focus groups were analysed using thematic analysis (Clarke & Braun, 2013; Braun & Clarke, 2006). This method involved:

- Familiarisation with the data,
- Generating initial codes,
- Identifying and reviewing themes,
- Defining and naming themes,
- Producing the final report (Braun & Clarke, 2006; Nowell et al., 2017).

This process entails methodically detecting, encoding, and classifying repetitive patterns within the data, facilitated by ATLAS.ti software for organising, encoding, and retrieval (Saldana, 2021).

3.5 Ethical Considerations

This study received ethical approval from the EBIT Research Ethics Committee at the University of Pretoria (EBIT/11/2024), as documented in Appendix A. The endorsement underscores the importance of adhering to stringent ethical standards to uphold integrity and ethical conduct throughout the research process. To maintain excellent and standard ethical practices, raw data is not included in this thesis document (National Health Research Ethics Council, 2024). The anonymised data is available on request.

Aligned with ethical guidelines, the University of Pretoria's Code of Ethics for Scholarly Activities governed this study's ethical framework, encompassing the following principles:
Informed Consent: Participants were provided with comprehensive information to make informed decisions about their involvement. They were informed about the study's objectives and the researcher's contact details for any queries or concerns. Verbal and written consent was obtained from each participant, supplemented by a participant information sheet (Annexure A) outlining the research and participation expectations.

- **Voluntary Participation**: Participants were treated as autonomous individuals and fully informed about the study's goals, objectives, and roles if they chose to participate. Emphasis was placed on voluntary participation, ensuring participants had the freedom to decide whether to participate.
- **Confidentiality and Anonymity**: Participants' confidentiality and anonymity were strictly maintained. Data was anonymised, and identifiable information was removed to protect participants' identities. Access to confidential data was restricted to the research team and only stored securely on password-protected devices.
- **Data Storage:** All confidential data collected during the study was securely stored. Data storage and handling adhered to institutional guidelines and ensured data security and privacy.
- **Ethical considerations were paramount throughout this research.** Participants were fully informed about the research objectives, and consent was sought from all focus group participants to ensure they understood their rights, including the right to withdraw from the study without consequences (Mertens, 2019). The University of Pretoria's ethics committee provided ethical guidelines that governed the research process, ensuring adherence to ethical norms and responsibilities.

The EBIT Research Ethics Committee outlined specific requirements to maintain ethical approval:

- **Permission Granting**: Data collection commenced only after receiving explicit permission from relevant organisations—each organisation's designated signatory authorised participation without disclosing organisation names to protect privacy and confidentiality.
- **Researcher Accountability**: The researcher upheld the Code of Ethics for Scholarly Activities and complied with the Policy and Procedures for Responsible Research at the University of Pretoria. The university's ethics committee provided guidelines that are accessible through the EBIT Ethics Committee website.

- **Extent of Research Activity:** The study adhered strictly to the approved research proposal. Any deviations beyond the approved scope would prompt immediate revocation of ethical approval to safeguard research integrity and participant well-being.
- **Reporting Issues and Changes:** Serious issues related to the study or research methodology were promptly reported to the EBIT research ethics office. Any modifications to the study plan were communicated promptly to ensure ongoing ethical oversight and approval.
- **Declaration of Finalisation**: Upon project completion, the final report was submitted to the ethics committee for comprehensive ethical review and evaluation.
- This comprehensive approach ensured that ethical standards were rigorously maintained throughout every phase of the research process.

3.6 Limitations

Limitations include potential participant bias, limited generalisability due to Melusi's specific context, and the inherent constraints of qualitative research methodologies. Efforts were made to mitigate these limitations through diverse participant representation and triangulation of data from multiple sources.

3.7 Role of the Researcher

The researcher's role in qualitative studies can influence data collection and interpretation. To manage potential biases and maintain research objectivity and transparency, reflexive practices, such as maintaining a reflective journal and regular discussions with peers and supervisors, were employed.

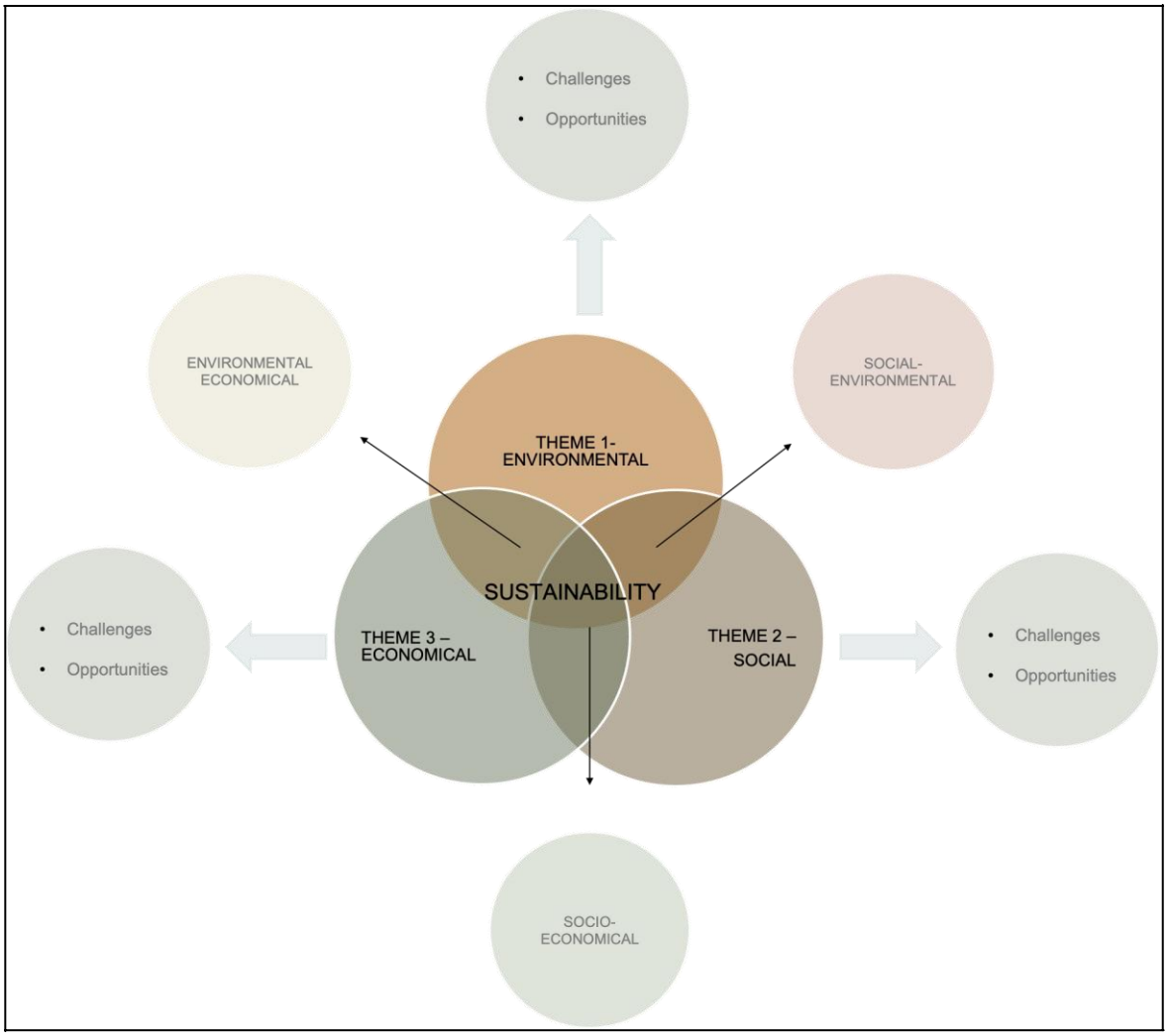
Chapter 4: Results[1]

4.1 Introduction

Melusi, a financially underprivileged community, faces numerous challenges, including resource scarcity, food insecurity, and limited access to expertise necessary for SUA (FITRI, 2024). The community has implemented some UA techniques to reduce poverty and food insecurity, serving multiple purposes, including environmental, social, cultural, and developmental functions (Caka, 2020). While eager to implement more UA techniques, the community requires additional skills and resources to translate aspirations into practical solutions (Salim et al., 2022).

This chapter explores research findings, focusing on environmental, social, and economic factors influencing opportunities and challenges in cultivating TACs within SUA.

Graph 2: Research themes: Multilateral facets that define Sustainability in UA (Author, 2024).



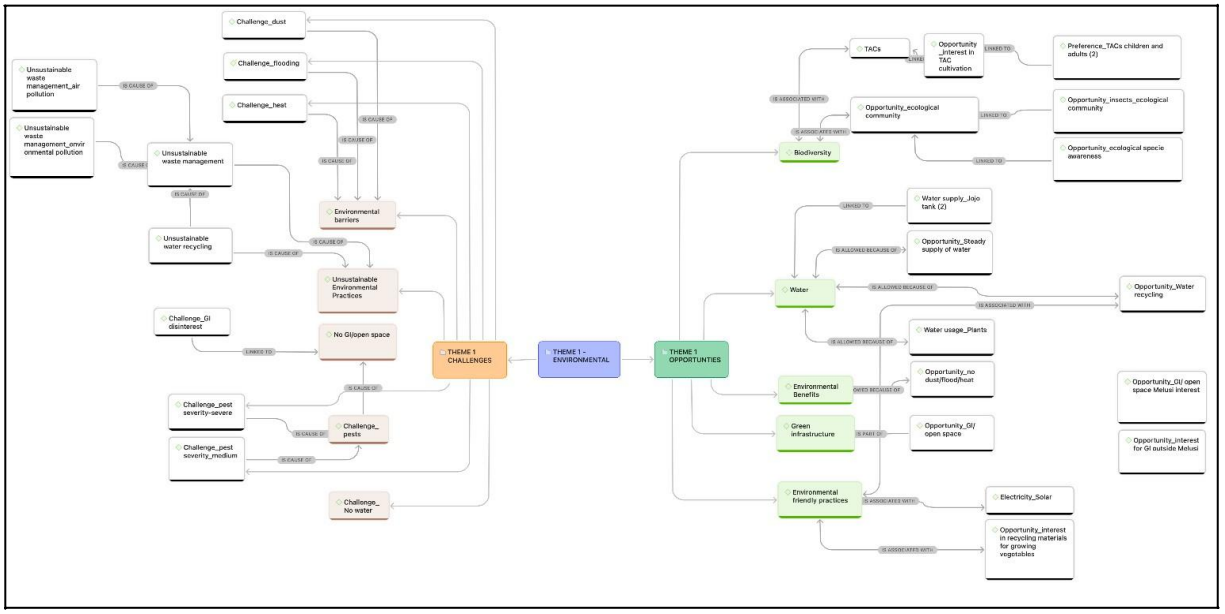
[1] To keep with good and standard ethical practice, the raw data is not included in this thesis document (National Health Research Ethics Council, 2024). The anonymised data is available on request.

Urban agriculture (UA) contributes to sustainable development through its diverse benefits, which align with the social, economic, and environmental facets of sustainable development. To assess sustainability, a framework based on environmental, economic, and social dimensions was utilised.

4.2 Empirical Findings

4.2.1 Theme 1: Environmental Drivers Influencing Opportunities and Challenges

Graph 3: Theme 1- Environmental Drivers Influencing Opportunities & Challenges (Author, 2024).



Environmental Challenges

- **Inadequate Waste Management Practices:** Melusi suffers from severe air pollution due to unsustainable waste management practices exacerbated by inadequate city services.
  Quotes:
  - "I burn it every day." (Melusi Interviewee A, 2024)
  - "I usually take it in the wheelbarrow to a small bush nearby." (Melusi Interviewee B, 2024).
- **Inadequate Water Resource Management:** Water scarcity in Melusi hampers agricultural and domestic use despite the non-functionality of municipal taps.
  Quotes:
  - "Despite having a tap provided by the municipality, there is no flowing water available." (Melusi Interviewee C, 2024)
  - "The tank located on the property." (Melusi Interviewee C, 2024)

- **Environmental Challenges (Flooding and Climate Change):** Flooding and rising temperatures from climate change affect infrastructure and agricultural output, while dust contamination harms air quality.
  Quotes:
  - "Are you faced with difficulties in managing dust, flooding, or heat?" (Melusi Interviewee D, 2024)
  - "There are numerous problems with dust, and yes, the water is originating from the mountain." (Melusi Interviewee E, 2024)

Environmental Opportunities

- **Biodiversity:** Increasing awareness of species and ecological groups in Melusi could enhance biodiversity and support afforestation efforts.
  Quotes:
  - "Yes, we have rats." (Melusi Interviewee G, 2024)
- **Water Resource Management:** Efficient water management systems could ensure a steady supply for household, industrial, and agricultural uses, reducing dependence on freshwater sources.
- **Green Infrastructure:** Integrating TACs into urban green infrastructure, such as parks and green roofs, can mitigate urban heat islands, improve air quality, and promote biodiversity.
  Quotes:
  - "If you have a piece of land to expand our gardens, we will expand." (Melusi Interviewee H, 2024)
  - "Maybe an hour a day." (Melusi Interviewee I, 2024)

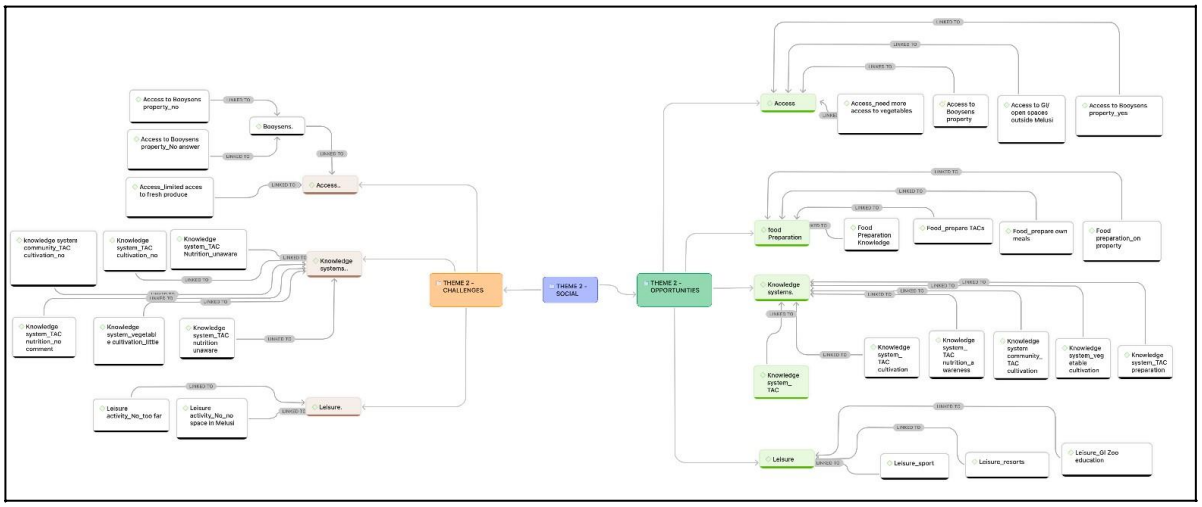
Environmentally Friendly Practices

- Promoting solar electricity and local food production can reduce greenhouse gas emissions and improve food security.
  Quotes:
  - "How much would it cost to create and maintain a garden like that? Maybe. I think a monthly payment of at least R500 is necessary." (Busy Bee ECD, 2024)

Summary: Melusi's environmental factors—such as rainfall patterns and soil quality—present opportunities and obstacles for SUA. Strategic planning and learning from successful community practices are crucial for improving agricultural output and environmental standards.

4.2.2 Theme 2: Social Drivers Influencing Opportunities and Challenges

Graph 4: Theme 2 - Social drivers influencing Opportunities and challenges (Author, 2024).



Social Challenges

- **Community Apathy:** Lack of community involvement hampers the adoption of sustainable practices.
- **Limited Open Spaces:** Urban biodiversity and green infrastructure suffer due to a lack of open spaces.

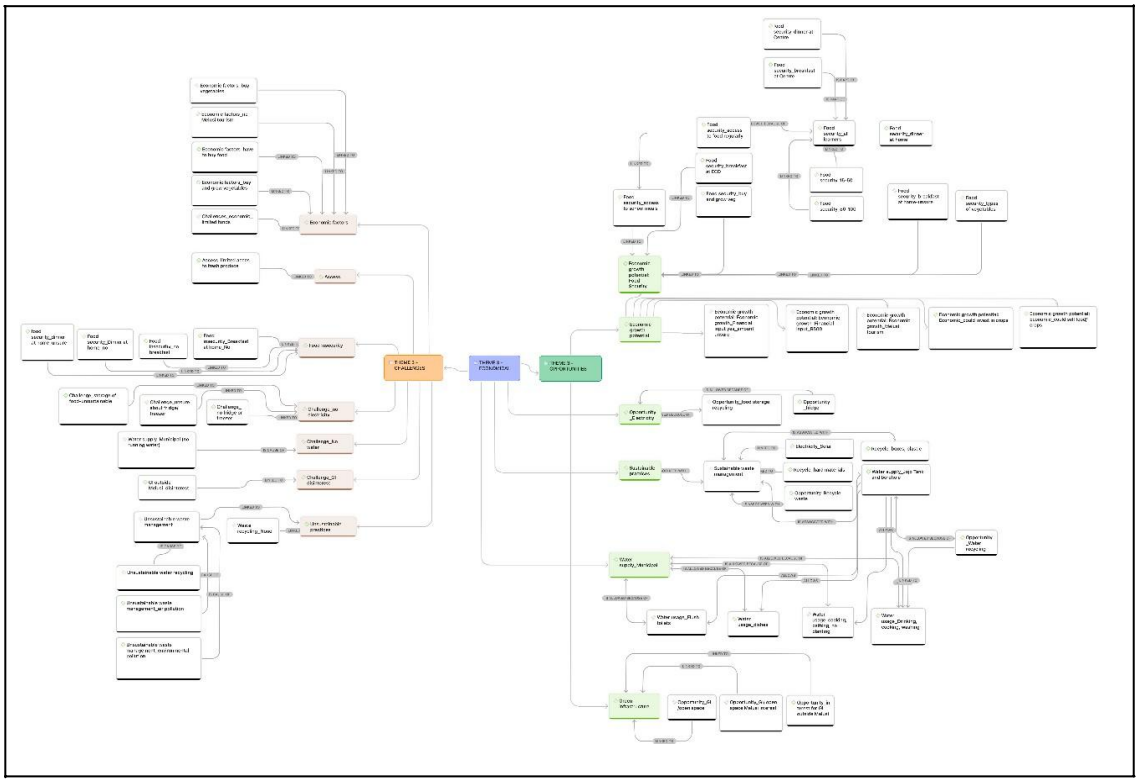
Social Opportunities

- **Ecological Community Opportunities:** Promoting ecological knowledge and community participation can enhance biodiversity and social cohesion.

Summary: Social factors like community engagement and open space availability challenge Urban agriculture in Melusi. Encouraging ecological awareness and participation can foster positive social and environmental outcomes.

4.2.3 Theme 3: Economic Drivers Influencing Opportunities and Challenges (Author, 2024).

Graph 5: Theme 3 - Economical drivers that influence Opportunities & Challenges (Author, 2024)



Economic Challenges

- **Economic Constraints:** Limited funding hinders sustainable waste and water management in Melusi.

Economic Opportunities

- **Management of Hydrological Resources:** Efficient water management systems can reduce water scarcity and enhance agricultural productivity.
- **Ecological Infrastructure:** Developing green infrastructure supports urban sustainability and community resilience.

Summary: Economic factors such as financial constraints present challenges for SUA in Melusi. Learning from microfinance and market access initiatives can promote economic stability and progress.

4.3 Summary

The study underscores how environmental, social, and economic factors shape SUA in Melusi. Addressing these factors holistically can lead to comprehensive strategies that improve food security and community well-being.

Implications for Practice: Policymakers and practitioners can use these findings to develop tailored initiatives for disadvantaged communities like Melusi, promoting SUA and community resilience.

Methodological Reflections: While snowball sampling was effective, future studies could benefit from broader sample diversity and the inclusion of quantitative data for a more comprehensive analysis.

4.4 Conclusion

The findings highlight the importance of addressing interrelated environmental, social, and economic factors in promoting SUA in Melusi. Resilient practices can enhance food security and community well-being by leveraging identified opportunities and mitigating challenges. The subsequent chapter discusses detailed implications and recommendations for further study.

Chapter 5. Discussion

In Melusi, an underprivileged community, integrating TACs into SUA presents opportunities and challenges crucial to sustainable development. The incorporation of Traditional African Crops (TACs) into Sustainable Urban Agriculture (SUA) in Melusi demonstrates the intricate interaction of environmental, social, and economic elements that impact sustainable development. This analysis combines real-world observations with wider theoretical viewpoints to outline the potential advantages and obstacles associated with this amalgamation. It places the findings in the current context and draws comparisons with related research.

5.1 Environmental, Social, and Economic Opportunities and Challenges

Water availability and land suitability are environmental factors critical for sustainable UA (Bisaga et al., 2019; Cilliers et al., 2020; Kanosvamhira, 2023). The success of agricultural efforts is influenced by social dynamics, encompassing community engagement and cultural notions of food security (Hurd, 1992). From an economic perspective, the cultivation of TAC provides opportunities for wealth generation and local economic development despite obstacles such as restricted market access and financial constraints (Priyadarshini, 2023).

Environmental Drivers:

The success of SUA initiatives heavily relies on environmental factors like water availability and land suitability. Melusi encounters major obstacles due to insufficient waste management and water resource administration. Research shows that the community grapples with air pollution caused by unsustainable waste practices and water scarcity despite having municipal infrastructure. This aligns with other studies that emphasize the environmental challenges of urban agriculture in disadvantaged areas (Bisaga et al., 2019; Kanosvamhira, 2023).

The environmental prospects are significant, with opportunities to boost biodiversity and enhance water resource management. By implementing efficient water management systems and integrating TACs into green infrastructure, urban heat islands can be mitigated and air quality improved, leading to a more sustainable urban environment. A participant expressed willingness to embrace environmentally friendly practices if given the resources, saying, "If you have a piece of land to expand our gardens, we will expand" (Melusi Interviewee H, 2024). Urban agriculture enhances air quality and reduces the urban heat island effect by creating more green spaces and increased biodiversity (Hamilton et al., 2013). The expansion of urban green areas through agriculture contributes to ecological well-being by providing habitats for pollinators, birds, and other wildlife (Rudolph & Muchesa, 2023). Additionally, urban agriculture encourages sustainable resource

management practices like composting and rainwater harvesting, which optimize resource use and minimize waste (Kanosvamhira, 2023).

Social Drivers:

The successful adoption of TACs is heavily influenced by social dynamics, such as community engagement and cultural perspectives on food security. The research indicated that limited community involvement and open spaces are significant obstacles. However, there are opportunities to promote community unity and empowerment through ecological knowledge and participation in SUA initiatives. By strengthening community engagement and raising ecological awareness, positive social and environmental outcomes can be achieved, ultimately benefiting the overall well-being of the Melusi community. Urban agriculture offers social benefits by improving food security, fostering community unity, and empowering marginalized groups (Hamilton et al., 2013; Cilliers et al., 2020). Joint gardening projects promote social interaction, nurturing a sense of community and inclusivity among participants (Kanosvamhira, 2023). One participant highlighted the potential for urban agriculture to strengthen social connections, stating, "Community gardens not only provide food but also create a space where we can come together and support each other" (Melusi Interviewee, 2024). Furthermore, urban agriculture serves as a platform for educational efforts, educating residents about sustainable farming methods, environmental stewardship, and food security (Rudolph & Muchesa, 2023). This is consistent with other research findings that emphasize the role of urban agriculture in developing social capital and fostering community resilience (Hamilton et al., 2013; Cilliers et al., 2020).

Economical Drivers:

The economic landscape plays a dual role for SUA in Melusi, offering both prospects and obstacles. Financial constraints hinder the community's capacity to implement sustainable practices effectively, although opportunities exist in managing hydrological resources and developing ecological infrastructure. Implementing efficient water management systems can boost agricultural productivity, with the growth of green infrastructure supporting urban sustainability and community resilience. Embracing lessons from microfinance and market access initiatives can foster economic stability and advancement within the community. In urban agriculture, revenue and employment are derived from small-scale agricultural activities, contributing to economic empowerment and alleviating poverty (Hamilton et al., 2013; Cilliers et al., 2020). Urban farmers have access to diverse income generation avenues and job opportunities, spanning agricultural work as well as managerial and marketing roles, which in turn bolster local economies (Rudolph & Muchesa, 2023). An interviewee from Melusi highlighted, "Selling our produce at the local market has helped us earn money and improve our living conditions" (Melusi Interviewee, 2024), demonstrating the economic advantages of urban agriculture. Local food production reduces expenses linked to long-distance supply chains, leading to more

affordable produce for consumers and higher profits for producers (Rudolph & Muchesa, 2023). Additionally, urban farming fosters entrepreneurship, enabling individuals to establish farming enterprises, food processing ventures, or agritourism businesses, fostering innovation and business expansion (Rudolph & Muchesa, 2023). By providing access to affordable, locally produced food, urban agriculture lowers household food costs and bolsters economic resilience (Hamilton et al., 2013; Cilliers et al., 2020). Maximizing the use of vacant or underused urban spaces for agriculture can augment property values and effectively utilize neglected areas, enhancing economic vitality (Rudolph & Muchesa, 2023).

Food Security as a Motivator

Participants in this study were primarily driven to participate in TAC cultivation to enhance local food production, foster dietary diversity, and address food insecurity within their community (Whittinghill & Sarr, 2021; Salleh et al., 2020).

5.2 Integration of Interdisciplinary Approaches

This research employed a multidisciplinary approach, integrating environmental, economic, and social knowledge to fully understand Melusi's capability and perspectives on SUA and TAC cultivation (Smith, 2018; Jones, 2016; Green & White, 2021).

5.3 Methodological Rigor and Data Collection

Robust methodologies, including semi-structured interviews and thematic analysis using ATLAS. Ti software ensured a thorough exploration of diverse viewpoints within Melusi (Braun & Clarke, 2006).

5.4 Ethical Considerations and Community Engagement

Ethical guidelines were strictly followed, focusing on informed consent, confidentiality, and community participation through partnerships with the Melusi Youth Development Organisation (MYDO).

5.5 Constraints and Prospects for the Future

While the study's interdisciplinary approach is robust, its findings may have limited applicability beyond communities similar to Melusi. Future research could benefit from longitudinal studies and quantitative assessments to gauge the long-term impacts of SUA and TAC cultivation, thereby enhancing scalability and sustainability.

Chapter 6: Conclusion

6.1 Research Results Summarised

This research examined the potential opportunities and challenges of integrating TACs into SUA in Melusi. It underscores the complex interplay of environmental, social, and economic factors influencing TAC cultivation projects' feasibility and long-term sustainability.

The incorporation of Traditional African Crops (TACs) into Sustainable Urban Agriculture (SUA) in the Melusi community offers a promising approach to tackling food insecurity, building community resilience, and enhancing environmental sustainability in disadvantaged urban areas. This study emphasized the intricate interactions among environmental, social, and economic factors that impact the successful adoption and implementation of SUA initiatives in Melusi. It took a comprehensive, multidisciplinary approach to understand the opportunities and challenges of integrating TACs into urban agriculture. Environmental Benefits and Challenges: The research identified significant environmental challenges such as inadequate waste management and water scarcity. However, it also emphasized the potential environmental advantages of urban agriculture, including promoting biodiversity, enhancing air quality, and encouraging sustainable resource management practices like composting and rainwater harvesting. These findings support existing literature highlighting the role of urban agriculture in addressing environmental issues and promoting ecological well-being (Hamilton et al., 2013; Rudolph & Muchesa, 2023). One participant mentioned, "The tank located on the property," underscoring the current water management system inadequacies that need attention (Melusi Interviewee C, 2024). Social Benefits and Challenges: The study found that social dynamics, such as community engagement and cultural perceptions of food security, are essential for the successful implementation of SUA. It revealed a lack of community involvement and limited open spaces as significant obstacles while also highlighting the potential social benefits of urban agriculture, such as improving food security, fostering community cohesion, and providing educational opportunities. These findings are consistent with studies that emphasize the social capital-building aspects of urban agriculture (Hamilton et al., 2013; Cilliers et al., 2020). As one participant expressed, "Community gardens not only provide food but also create a space where we can come together and support each other" (Melusi Interviewee, 2024). Economic Benefits and Challenges: The study identified financial constraints as a major challenge for SUA in Melusi. However, it also highlighted the economic opportunities presented by urban agriculture, including generating income, creating employment, and fostering entrepreneurship. Urban agriculture can significantly contribute to economic resilience in underprivileged communities by reducing household food expenses and promoting local economic development (Hamilton et al., 2013; Cilliers et al., 2020; Rudolph & Muchesa, 2023). One participant mentioned, "Selling our produce at the local market has helped us earn money and improve our living conditions" (Melusi Interviewee, 2024).

6.2 Recommendations

The recommendations derived from this research are grounded in addressing identified gaps and leveraging opportunities for sustainable development in Melusi:

Policy Support:

- Advocate policies that ensure stable ownership of agricultural land.
- Encourage environmentally responsible agricultural methods and, most importantly.
- Build equitable governance structures.

Implementing policy support will ensure fairness and transparency in decision-making processes (Munialo, 2024).

Community Empowerment: Engage the community and local organisations, exchange knowledge, develop abilities, and encourage cooperative decision-making in agricultural projects (Kimambo, 2018).

Invest in technological advancements in water management, soil conservation, and agricultural processing to improve production and optimise resource use (Benedict et al., 2023).

Nutritional Education: Introduce educational initiatives that emphasise the nutritional advantages and culinary adaptability of TACs to encourage consumption and improve the variety of local diets (Akinola et al., 2020; Mabhaudi et al., 2017; Mabhaudi et al., 2018; Lewu and Mavengahama, 2010).

Develop robust systems for monitoring and assessing the effects of TAC cultivation on food security, economic development, and environmental sustainability (Ochieng et al., 2017).

The recommendations, by referencing these studies and integrating stakeholder perspectives, provide a holistic approach to promoting SUA and enhancing food security in Melusi.

This comprehensive strategy acknowledges the importance of overcoming challenges while leveraging existing opportunities to foster a resilient and food-secure urban environment in Melusi.

This structured discussion and framework ensure that the research findings are situated within the current literature, offering an understanding of implications for policy, practice, and future research in SUAs and TACs in underprivileged communities.

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APPENDICES

Focus Meeting Questions

Melusi community's experienced opportunities and barriers of living walls with local vegetables for food security

SECTION A: BIOGRAPHICAL DETAILS

This section will assist the study in better understanding the background of the participants.

1. How many adults work at your organisation? What meals do they eat at the centre?
2. How many children/ learners/adults attend the centre daily?
3. What age range are these children/ learners?
4. What language/s do these children/ learners/ adults speak?
5. What times is the centre open daily?
6. Is the centre open over weekends, public holidays, and school holidays?

SECTION B: CURRENT INFRASTRUCTURE AND LIVING CONDITIONS

1. Do you have electricity and water on your property?
2. If this is the case, how and where do you get it?
3. Do you have a steady supply of water?
4. Where is the water supplied from? (Municipality tap/tap on property/tank/dam)
5. What do you do with the water you use?
6. Do any appliances store food? (Fridge/cool room/freezer)
7. How do you store the food currently?
8. Do you have any issues with rats, rodents or other pests?
9. If yes, how severe?
10. How do you dispose of waste?
11. Do you recycle any waste?
12. If yes, what waste do you recycle?

SECTION C: HEALTH AND WELLBEING

13. Does the community have access to the Booysens property/ Can the community (legally) utilise the Booysens property?
14. Do you struggle with dust/flooding/heat?
15. What detergents do you use to clean dishes and clothes?
16. What do children/ learners do for leisure?
17. Where do they partake in these activities?
18. Are there any open green spaces where you can go to relax?
19. Are there any open green spaces for the students to play after school?
20. Do you take the students on any outings to open green spaces? If yes, where and why the specific site? If not, what restricts you from doing so?
21. If there were any open green spaces in Melusi, would you visit them and why?

22. Do you visit any open green spaces outside of Melusi? (For example, parks, green corridors, sports fields, etc.)
23. What insect and bird species do you usually notice in Melusi?

SECTION D: FOOD SECURITY

24. Do the children receive meals at school? If so, which meals do children eat at school?
25. How many children receive meals at the school?
26. Do the meals include vegetables? If the case, which vegetables?
27. Would you use more vegetables in your meals if you had access to vegetables?
28. Do you prepare/ cook meals on your property?
29. Do (you know if) the children eat breakfast at home?
30. How many children eat breakfast at home?
31. Do (you know if) the children eat dinner at home?
32. How many children eat dinner at home?

SECTION E: ECONOMIC FACTORS

33. Where do you get/ buy vegetables that you use for meals?
34. Are there any markets in or around Melusi that sell fresh produce?
35. Do people not living in Melusi come to Melusi for shopping or leisure?
36. How much time are you willing to spend on growing vegetables?
37. How much money will you be able to spend on the installation and maintenance of the garden?

SECTION F: URBAN FOOD PRODUCTION WITH TAC

38. Are you interested in growing vegetables for your centre on your property? If yes or no, why?
39. What do you know about growing vegetables?
40. Which pesticides and fertilisers do you use to maintain vegetables?
41. Do you know how to harvest vegetables?
42. What do you know about African vegetables and their nutritional value?
43. What do you know about growing African vegetables?
44. Are you interested in growing African vegetables?
45. Do you know how to prepare African vegetables?
46. Do you know any elders/ other community members who have a good knowledge of African vegetables?
47. Would you/ the children/ learners eat African vegetables?
48. Will you build and use a living wall for growing vegetables? Why?
49. Would you be interested in growing and using vegetables from community gardens?

SECTION G: OPPORTUNITIES AND BARRIERS OF GROWING AV IN LWSs (only for MYDO staff following harvesting of AV in the LWS)

1. What reactions do learners and people using MYDO have to the living wall and African vegetables?
2. What worked well with the installation of the living wall? Why?
3. What did not work well with the installation of the living wall? Why?

What worked well with the maintenance of the living wall? Why?

4. What did not work well with the maintenance of the living wall? Why?
5. What worked well with the maintenance of the African vegetables? Why?
6. What did not work well with the maintenance of the African vegetables? Why?
7. Did you notice insects and birds near the living wall and African vegetables? If this is the case, what insects and birds did you see?
8. How did the staff and learners experience looking after the African vegetables on the living wall? What would improve the experience for them?
9. Was looking after the African vegetables in the living wall easier/ more difficult than commercial vegetables? Why?
10. Would you prefer to grow vegetables in a living wall or a standard soil-based garden? Why?
11. Could the kitchen staff use the harvest in their meal preparations? What would make living walls and AV more feasible for use in their meals?

[1] To keep with good and standard ethical practice, the raw data is not included in this thesis document (National Health Research Ethics Council, 2024). The anonymised data is available on request