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Opportunities and Challenges of Up-scaling and Diversifying Sisal Production in Eswatini: a case of Ekupheleni Chiefdom

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ABSTRACT: This study assesses the opportunities and challenges of up-scalling and diversifying sisal production in the Kingdom of Eswatini, using the Ekupheleni chiefdom as a case study. A cross-sectional research design was employed. Data were collected through in-depth interviews administered to 200 conveniently selected heads of households and 32 participants in the sisal industry, identified via a list provided by the Home Economics Department within the Ministry of Agriculture. Additional data were gathered through key informant interviews with four extension officers from the same ministry and department, as well as through direct community observations. Data were entered into a Microsoft Excel spreadsheet and analyzed using frequency tables and graphs. The findings indicate that opportunities for up-scalling and diversifying sisal production in Eswatini include an improved standard of living and a steady flow of income. Key challenges include a lack of knowledge regarding sisal cultivation and processing, as well as insufficient finances for purchasing seedlings. To ensure community needs and concerns are addressed, the study recommends involving communities in all planning stages. Furthermore, conducting market research to analyze existing and potential markets for

sisal fibre and diversified products is essential to understand consumer preferences and price points.

Keywords: *sisal production, opportunities and challenges, Ekupheleni chiefdom, Eswatini.*

Introduction

Sisal is a xerophytic, monocarpic, semi-perennial plant that produces leaf fibre and is resistant to drought (Sarkar and Jha, 2017; Beleko and Urassa, 2022; Motsa *et al*., 2025; Figure 1). It grows in semi-arid to arid climates and has the potential to thrive on marginal lands unsuitable for other crops. As a renewable resource, sisal contributes significantly to climate change mitigation and sustainable agricultural practices (Lok Sanjh Foundation, 2016; Mwaniki *et al*., 2017), largely because it absorbs more carbon dioxide than it produces over its lifespan (Food and Agriculture Organization, 2025). Sisal can withstand maximum temperatures of up to 50°C and grows well with evenly distributed rainfall of 60-125 cm. However, excessive rain causes water stagnation, and very low temperatures can induce frost damage in plantations (Davis and Long, 2015; Sarkar *et al*., 2010).

Figure 1: Sisal plantation

Source: McDonald (2016)

Sisal is cultivated primarily for its fibres, which are extracted from its leaves (Figure 2). The fibre is used in a wide range of applications, including twine, rope, cordage, and mats. The plant is typically grown without irrigation or fertilization, producing large, sword-shaped, thick, fleshy leaves that emerge from the roots. These leaves have a sharp point and generally a spiny margin, growing from a short but stout stem (Figure 1). Each rosette grows slowly over an average lifespan of 6–9 years and flowers only once (Anandjiwala and John, 2010; Kanogu *et al*., 2011).

Figure 2: Sisal fibre
Source: Simals (2024)

Sisal production holds significant economic and environmental promise. As noted by [Mwaniki (2013), sisal cultivation can offer substantial opportunities for economic development, leading to improved living standards. It is an environmentally friendly and sustainable fibre, requiring less water and fewer pesticides than synthetic alternatives. This makes it attractive to farmers, as it can withstand various agro-ecological conditions while reducing net carbon dioxide emissions through sequestration (Lok Sanjh Foundation, 2016; Kasyamakula, 2022).

Moreover, sisal cultivation can contribute to soil conservation by reducing erosion through its extensive root system and positively impact watershed management. Sisal

plants are often planted as hedges, acting as effective vegetative barriers that protect crops and forests from predatory animals and intruders (Srinivasakumar *et al*., 2013; Lok Sanjh Foundation, 2016). The industry has tremendous potential, as global demand for sisal currently outweighs supply. Sisal fibre production and associated enterprises, such as harvesting and processing, could generate employment and income in impoverished areas of developing countries (Kanogu *et al*., 2011; Srinivasakumar *et al*., 2013). For example, sisal exports contributed over a quarter of Tanzania's foreign income in the early 1960s and employed more than 100,000 individuals (Beleko and Urassa, 2022). Currently, sisal cultivation is concentrated mainly in Brazil, Tanzania, Kenya, and China (Drieling *et al*., 2010).

Countries like Brazil and Tanzania have advanced sisal industries that utilize sisal waste for mushroom cultivation, animal feed, and biogas production, with Tanzania having demonstrated relevant pilot projects (Bisanda and Enock, 2003). The sisal plant is highly versatile. For instance, sisal extract exhibits antibacterial properties against *Escherichia coli* and *Bacillus stearothermophilus*. Women in rural Eswatini, particularly in Siteki, use it as an ingredient in petroleum jelly. They boil pieces of the plant in hydraulic oil to extract the juice, strain it, and add it to pure white petroleum (Zwane *et al*., 2010). This activity provides an extra source of income, underscoring the need to assess the opportunities and challenges of up-scalling and diversifying sisal production in the Kingdom of Eswatini.

However, the use and cultivation of natural fibres like sisal have declined, primarily due to competition from synthetic fibres (Dellaert, 2014). Sisal production faces numerous problems, including the transportation of leaves from fields to decortication plants and a limited number of decortication facilities in both large and small-scale growing areas (Bisanda and Enock, 2003). Where decortication is done manually, the work is laborious, hazardous, and low in productivity, yielding lower-quality fibre (Kanogu *et al*., 2011). In the sisal craft industry, artisans often receive little to no innovative government support and face limited market access, leading many to abandon the trade (Mkhonta *et al*., 2014). Workers in the sisal industry also contend with low wages, poor working conditions, long hours, exposure to hazardous

chemicals, and a lack of safety equipment (Balemesa *et al*., 2022), making it difficult to support their families.

The sisal industry has failed to meet local labour market challenges while simultaneously losing its international commodity market share to alternatives. A key factor has been the industry's failure to adopt innovative technologies and utilize parts of the plant beyond the leaf's hard fibres. The industry also continues to pollute the environment by discharging liquid and solid waste from the decortication process and burning post-harvest waste before replanting (Muthangya *et al*., 2013). For example, Kenya generated an estimated 611,875 tonnes of solid sisal waste in 2013, which was discarded, leading to environmental pollution (Muthangya *et al.*, 2013). There is a lack of specific information on the challenges of up-scalling and diversifying sisal production in Eswatini, justifying the need for this study.

Undertaking sisal cultivation in low- to middle-income countries has significant potential to contribute to economic development and improved living standards (Mwaniki *et al*., 2017). The sisal industry offers countries like Eswatini a pathway to achieve Sustainable Development Goals (SDGs). For example, SDG 9 focuses on building resilient infrastructure, promoting inclusive and sustainable industrialization, and fostering innovation, which calls for more efficient resource use to sustain the planet (Denoncourt, 2020). Therefore, this study assesses the opportunities and challenges of up-scalling and diversifying sisal production in the Kingdom of Eswatini.

Conceptual Framework

According to Tamene (2016), a conceptual framework is a set of ideas, beliefs, and theories that support and guide a study, explaining the key factors, concepts, or variables and their presumed relationships. Figure 3a illustrates that any change in independent variables is directly linked to the dependent variable, with outcomes being positive or negative depending on the study's objectives. Mwaniki (2013), noted that factors such as knowledge of sisal production, education level, land availability, and perceived opportunities and challenges all influence sisal cultivation and adoption.

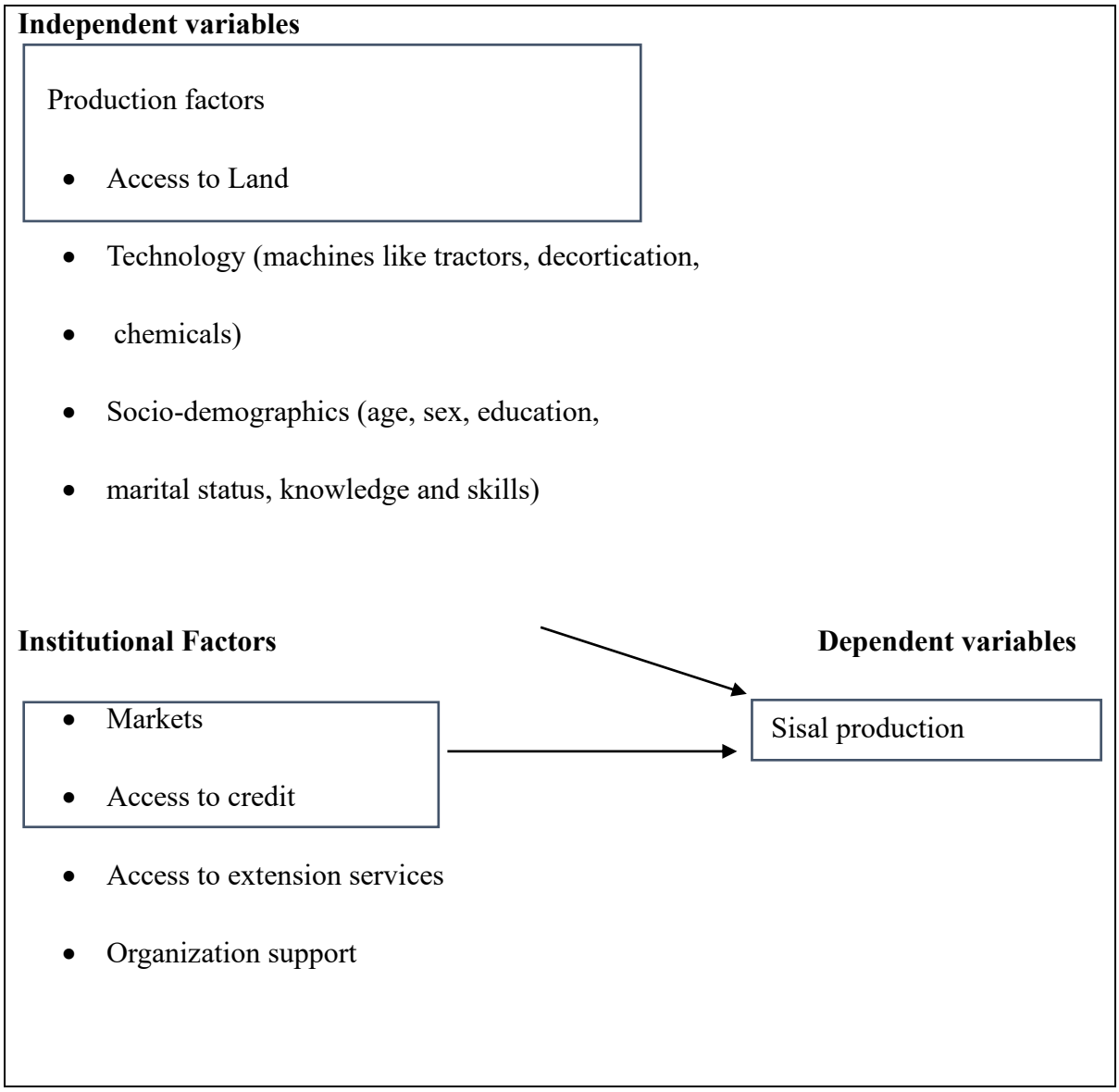

Figure 3a: Conceptual Framework

(*Adapted from* Kasyamakula (2022)

Based on this study's objectives, Figure 3b shows that perceived opportunities (*e.g.*, job creation, poverty reduction) and challenges (*e.g.*, environmental impacts, market fluctuations) are independent variables expected to influence the dependent variable: up-scalling and diversifying sisal production. An individual's perception of opportunities may encourage them to undertake sisal production. Organizational and government support, such as providing seedlings, educational workshops, and market access, can also impact community adoption. Conversely, perceived challenges like land-use changes, water consumption, and lack of technology may reduce viability.

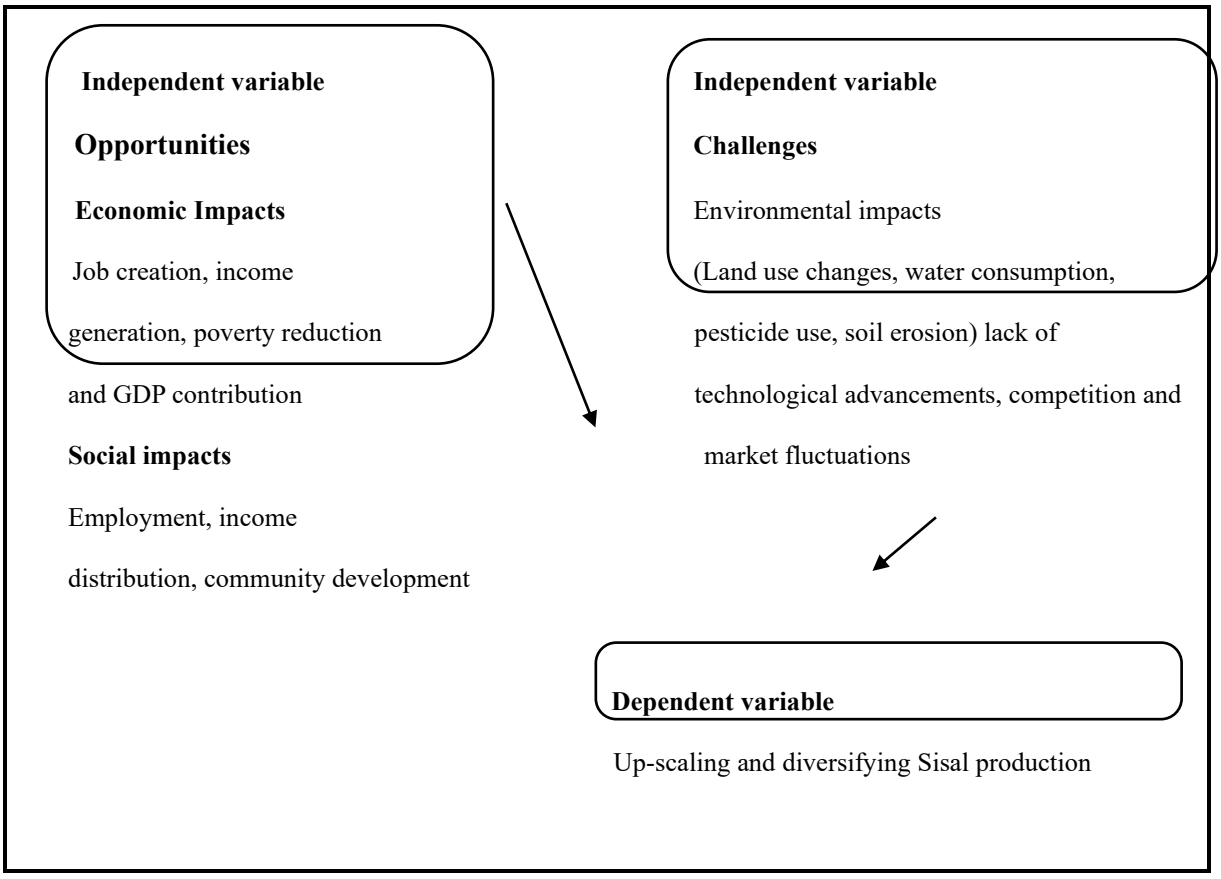

Figure 3b: Conceptual framework of assessing the opportunities and challenges

Problem Statement

The need to assess the opportunities and challenges of up-scalling and diversifying sisal production arises from the industry's recent decline. This decline is due to factors including a lack of markets, insufficient government attention and innovation, and limited product diversification. It has significantly impacted rural communities, leading to increased poverty, unemployment, and out-migration. To address these challenges and harness sisal's potential, an assessment of the opportunities and challenges of up-scalling and diversifying production is necessary.

Main Objective

To assess the opportunities and challenges of up-scalling and diversifying sisal production in the Kingdom of Eswatini, using the Ekupheleni chiefdom as a case study.

Specific Objectives

1. To assess the opportunities of up-scalling and diversifying sisal production in Eswatini.
2. To assess the challenges of up-scalling and diversifying sisal production in Eswatini.

Study Area

The study was conducted in Ekupheleni chiefdom, which falls under Motshane *Inkhundla* in Eswatini's Hhohho Region. Ekupheleni was selected because a majority of sisal users are located in this region. Ekupheleni chiefdom is situated between latitudes 26°18′22″ S and 26°19′22″ S and longitudes 31°1′3″ E and 31°2′3″ E (Figure 4). It is located in the Highveld physiographic region, characterized by Mapako (2011:2) as "the upper part of an overall escarpment, consisting of a complex of steep slopes between low and high levels, dissected plateaux, plateau remnants, and associated hills, valleys and basins." The steep slopes found in Ekupheleni are suitable for sisal cultivation, as sisal is known to grow in poor, acidic soils (Srinivasakumar *et al*., 2013). The chiefdom is located 34 km from the capital city, Mbabane.

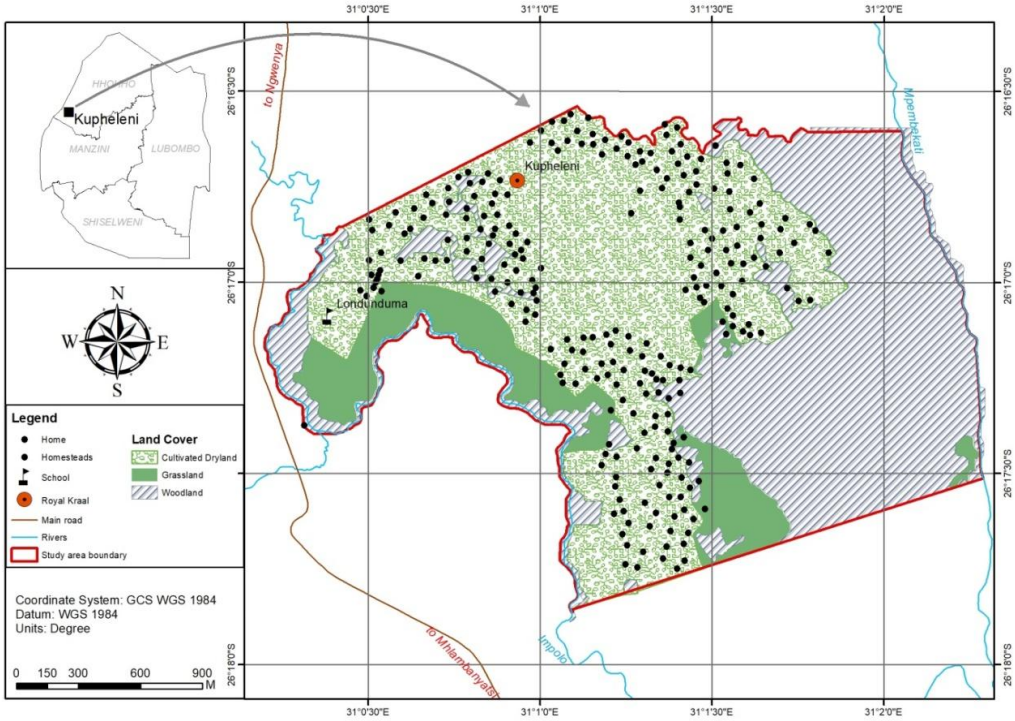

Figure 4: Ekupheleni chiefdom

Materials and Methods

This study employed a cross-sectional research design. According to Omair (2015), this design uses a representative sample from a population to generalize findings. The population of interest included heads of households in Ekupheleni chiefdom, participants in the sisal industry, Home Economics extension officers, and Ministry of Agriculture officials.

Ekupheleni chiefdom had approximately 1 192 homesteads (CSO, 2017). To determine the sample size, the study applied Yamane's (1967:886) simplified formula, which produces a 95% confidence level and p= 0.5, using tables.

$$n = \frac{N}{1 + N(e)^2}$$

Where n is the sample size, *N* is the population size and *e* is the level of precision (Israel, 1992).

$$n = \frac{1192}{1+2\,614(0.05)^2}$$

$$= \frac{1192}{6.5375}$$

$$= 182$$

The study employed convenience sampling, where participants were selected based on availability and willingness to participate (Farrokhi and Mahmoudi-Hamidabad, 2012). From the sampled homesteads, in-depth interviews guided by a semi-structured questionnaire were administered to 200 heads of households. The Ministry of Agriculture also provided a list of 32 participants who work closely with the ministry in sisal-based activities (crafting, manufacturing petroleum jelly), who were also interviewed. Furthermore, four key informants from the Home Economics Department and two government officials from the Ministry of Agriculture were interviewed.

Participatory observation was conducted during the harvesting, processing, and marketing of sisal products to gain first-hand insights into current practices, challenges, and potential improvements. A brief market survey was also conducted to

gather data on demand, supply dynamics, price trends, and market opportunities for diversified sisal products.

Data were input into a Microsoft Excel spreadsheet for cross-tabulation and to produce frequency tables and graphs. The findings are presented using tables, graphs, and narrative descriptions.

Findings and Discussion

This section presents findings from heads of households, sisal industry participants, extension officers, and direct observations.

Demographic Characteristics of Respondents

Findings from heads of households indicate that 38% of respondents were aged 60–69, while 1% were 80+. Notably, 2% of respondents were below 20 years, indicating the presence of child-headed families (Table 1). Among heads of households, 69.5% were male and 30.5% were female. In contrast, among sisal industry participants, 78% were female and 22% were male. Furthermore, 47% of these participants (who manufacture petroleum jelly and brooms) were women aged 50–59, followed by those aged 40–49 (22%). The smallest proportions were participants aged 20–29 and 60–69 (9% each) (Table 1).

Table 1: Age of heads of households and participants in the sisal industry

Age	Heads of households		Participants in the sisal industry	
	Frequency	Percentage (%)	Frequency	Percentage (%)
below 20	3	2	0	0
20-29	4	2	3	9
30-39	3	2	4	13
40-49	46	23	7	22
50-59	40	20	15	47
60-69	75	38	3	9
70-79	27	14	0	0
80+	2	1	0	0
Total	200	100	32	100

The study also included four key informants (three females, one male) aged 35–49. Three held tertiary education qualifications, while one had a high school education.

Among heads of households, 67% of respondents aged 70–79 had received no formal education (Figure 5). Respondents with tertiary education were primarily in the 60–69 (40%) and 50–59 (37%) age groups (Figure 5). Cross-tabulation with education levels showed that heads of households generally had low educational attainment. Younger heads of households were typically unemployed due to academic commitments or a lack of opportunities (Figure 6a). Among sisal industry participants; 31% were employed, 47% unemployed, and 22% self-employed (Figure 6b).

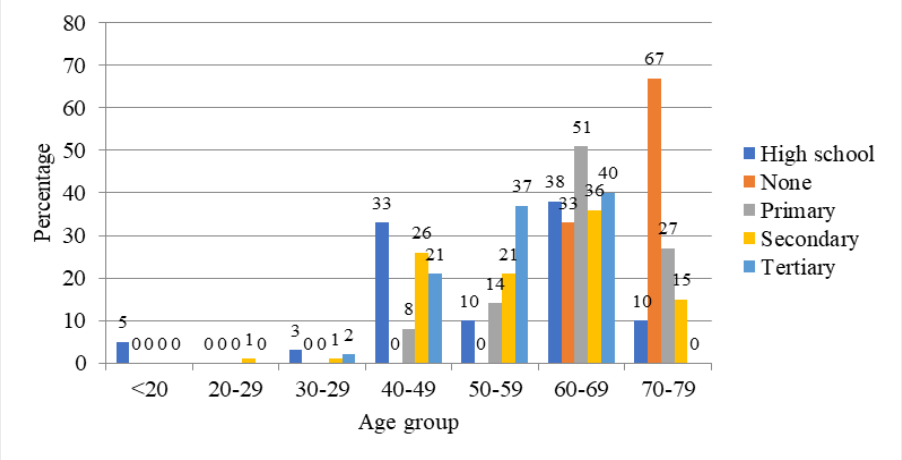

Figure 5: Age and level of education of heads of households

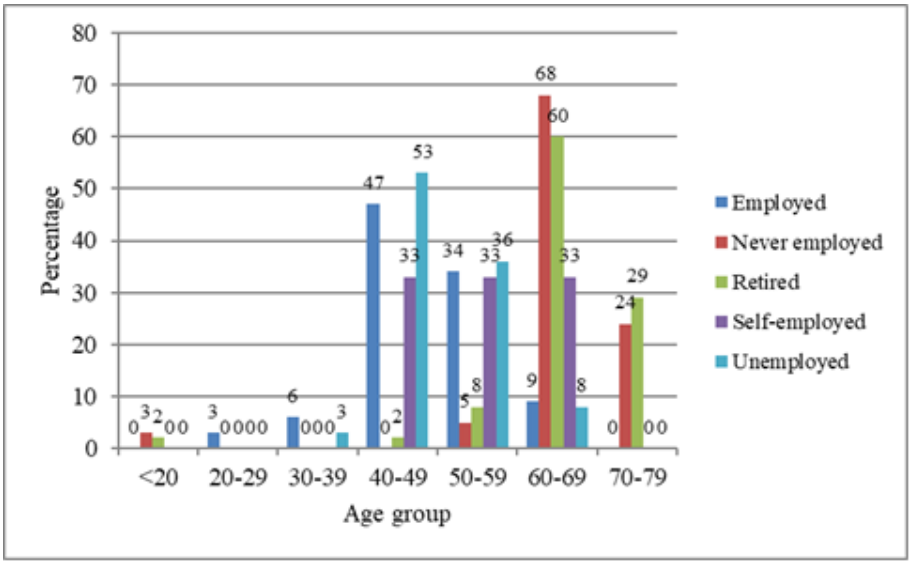

Figure 6a: Age and employment status of heads of households

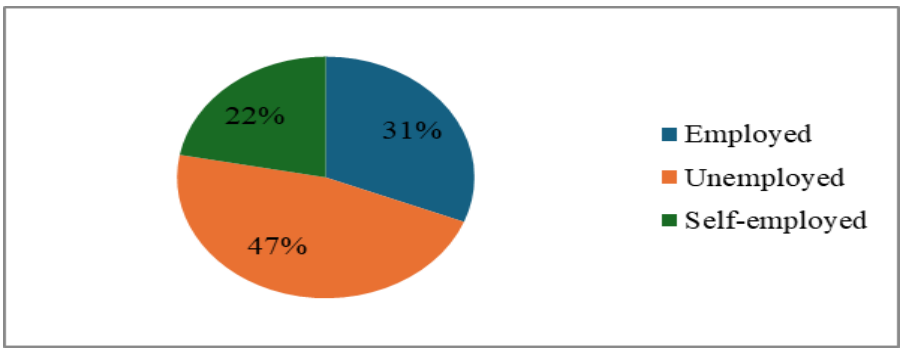

Figure 6b: Employment status of sisal industry participants

Perceived Opportunities of Up-scalling and Diversifying Sisal Production

When asked about perceived opportunities, 47% of heads of households cited an improved standard of living, 38% cited increased income flow, and 15% foresaw improved employment opportunities in the community (Figure 7a). Among sisal industry participants, 75% foresaw an improved standard of living, 19% perceived increased income flow, and only 6% saw opportunities for employment creation (Figure 7b).

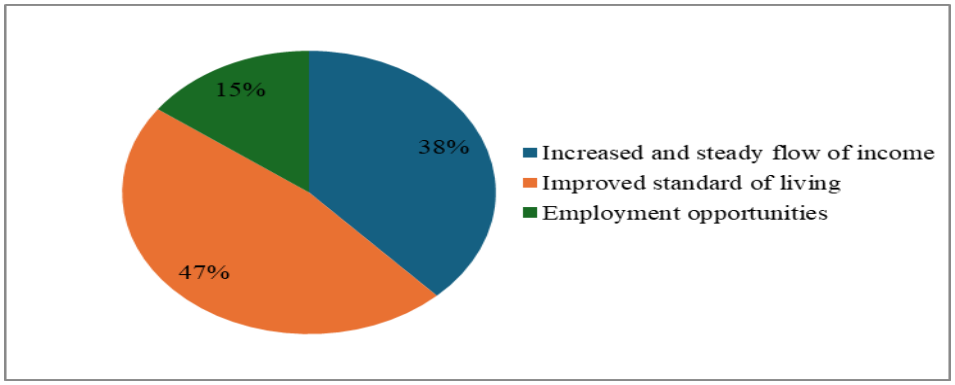

Figure 7a: Perceived opportunities cited by heads of households

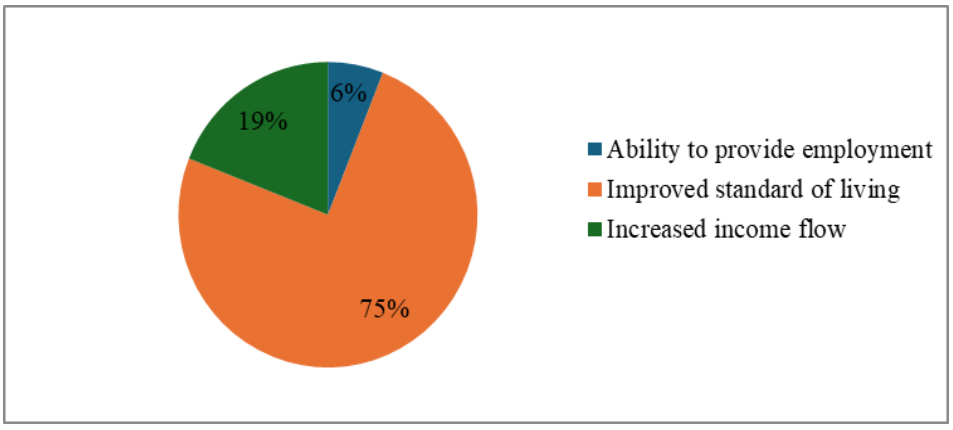

Figure 7b: Perceived opportunities cited by sisal industry participants

Experts from the Ministry of Agriculture's Home Economics Department recognized the significant potential of up-scalling and diversifying sisal production to revitalize rural communities. They cited key opportunities, including: economic growth where up-scalling and diversification could significantly boost farmers' revenues, improving livelihoods and reducing poverty. Moreover, the experts cited job creation whereby expansion would generate new employment opportunities in cultivation, processing, and marketing. Furthermore, experts cited enhanced market access where diversification could open new markets for value-added products, increasing resilience. In addition, experts cited local economic development: Increased production would stimulate local businesses and services, fostering overall economic growth.

Challenges of Up-scalling and Diversifying Sisal Production

When asked about challenges, 75% of sisal industry participants stated they lacked knowledge of how to grow and process sisal (Figure 8a). They reported that an extension worker had visited their community only once to demonstrate making petroleum jelly from sisal. Furthermore, 13% cited a lack of finances for seedlings, and 13% stated they had no land for cultivation (though 74% of those with land still lacked cultivation knowledge) (Figure 8a).

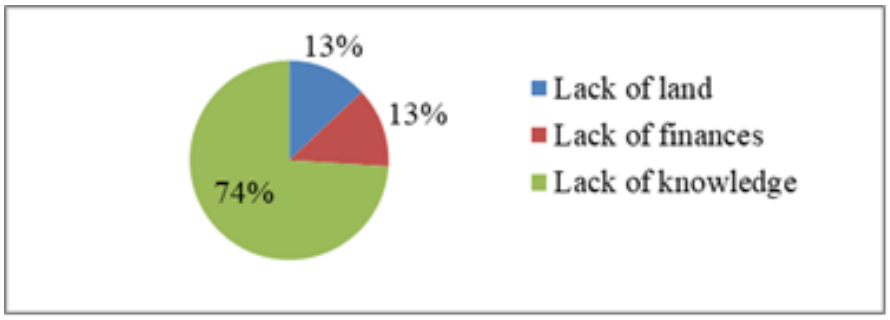

Figure 8a: Challenges cited by sisal industry participants

Among heads of households, 42% cited a lack of finances as the main challenge (Figure 8b). Other challenges included lack of market access (26%), lack of land (16%), soil degradation concerns (11%), and restrictive social norms (5%)—the latter referring to the community's unfamiliarity with large-scale sisal cultivation, as most only cultivate maize (Figure 8b).

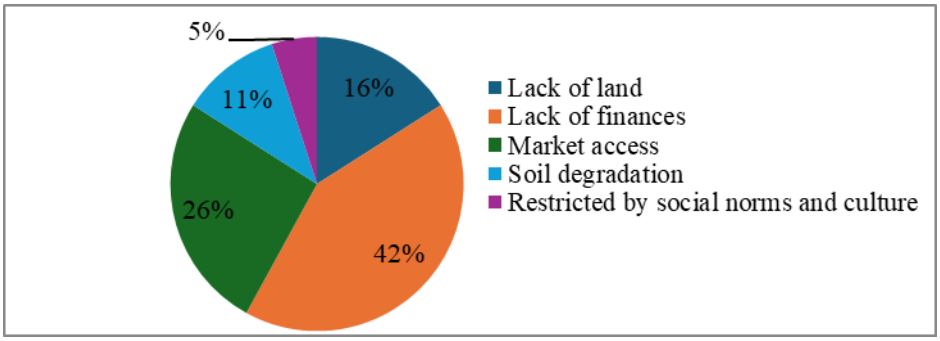

Figure 8b: Challenges cited by heads of households

Extension workers concurred that while up-scalling and diversification offer great potential, significant challenges exist. These include market saturation, dependence on external actors, financial burdens on smallholders, potential land conflicts, high labour requirements, skill gaps, and possible cultural or community identity disruptions.

Discussion and Conclusions

Opportunities of Up-scalling and Diversifying Sisal Production

Community members envisioned several opportunities, including enhanced well-being through boosted incomes, job creation across the value chain, and improved local economic activity. These findings align with Srinivasakumar *et al.* (2013), who observed that up-scalling and diversifying sisal production can create economic opportunities in rural India. Similarly, Mkhonta *et al*. (2014) noted that women in rural Eswatini use sisal fibres to make various products as a livelihood source. This justifies the need to upscale and diversify production to tap into these opportunities fully.

Challenges of Up-scalling and Diversifying Sisal Production

Community members in Ekupheleni mentioned significant challenges: a lack of knowledge regarding sisal cultivation and processing, financial constraints for purchasing seedlings, limited land access, and restrictive social norms. These findings are corroborated by Beleko and Urassa (2022), who identified challenges such as a lack of knowledge, limited access to resources and technology, and market inexperience among smallholder farmers. Mwaniki (2013) also highlights that poor

market system mobilization discourages smallholders in Kenya from up-scalling sisal production.

Conclusion

The perceived benefits of up-scalling and diversifying sisal production include an improved standard of living, employment provision, and increased income opportunities. Perceived challenges include a lack of capital, knowledge, adequate land access, and restrictive social norms. Key informants emphasized the significant potential for improving local livelihoods but also highlighted considerable challenges, such as market saturation and financial constraints.

Recommendations

The study aimed to assess the opportunities and challenges that could be brought by up-scaling and diversifying sisal production. These perceived challenges are most likely to deter the up-scaling and diversification of sisal production. Therefore, the study recommends that communities be involved in all stages of planning to ensure that the needs and concerns of communities are addressed. Moreover, there is a need to conduct market research and analyse existing and potential markets for sisal fibre and diversified products in order to understand consumer preferences and price points. Furthermore, there is a need to explore opportunities for producing woven goods, handicrafts, bio composites, or other niche products with higher profit margins to move beyond raw fibre and create value-added products. In addition, in an effort to promote sisal products, it is imperative to develop a distinct brand identity that highlights their sustainable and ethical credentials and invest in branding and marketing.

Recommendations for further studies

There is a need to conduct a comprehensive social impact assessment of up-scaling and diversifying sisal production. This could be done by evaluating how expanding sisal production could affect job creation, income distribution, gender equality, and community livelihoods. Conversely, an assessment of environmental impacts could

be conducted, where the environmental footprint of sisal production could be assessed.

This could be carried out by analysing the impact that increased sisal production could have on the environment, including water usage, waste generation and potential land-use changes. Finally, strategies for mitigating negative impacts of increased sisal production could be developed. This could be done by investigating practical measures to minimize any negative social and environmental consequences and promote sustainable production practices.

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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