

Leveraging indigenous knowledge and natural resources for sustainable socio-economic development in Mfwambo chiefdom of Mbala, Northern Province, Zambia

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Abstract

This study explores the contribution of indigenous knowledge systems and natural resource utilisation to sustainable socio-economic development in Mfwambo Chiefdom, Mbala District, Northern Province, Zambia. Employing a pragmatist philosophical orientation, the research adopted a mixed-methods design that combined quantitative surveys with qualitative interviews, focus group discussions, and field observations. A stratified random sample of 200 respondents was drawn from an eligible population of 400 adults, ensuring representativeness across farmers, fishermen, artisans, households, traditional leaders, government officials, NGO representatives, and private sector actors. Quantitative analysis employed descriptive statistics, correlation, regression, chi-square, and ANOVA, while qualitative data were analysed thematically using NVivo. The findings demonstrate that agricultural land is the most intensively utilised resource, with 96.5 per cent of respondents rating its impact on socio-economic development as high or very high. Forestry resources provide supplementary livelihoods but face ecological degradation, while water resources remain underutilised despite their potential. Indigenous knowledge, particularly traditional agricultural practices such as crop rotation, intercropping, and organic manure use, plays a critical role in sustaining livelihoods and resource management. Regression analysis confirmed that natural capital, indigenous knowledge, and resource utilisation each exert statistically significant positive effects on socio-economic development, jointly explaining 91.2 per cent of the variation in livelihood outcomes. The study concludes that sustainable development in rural chiefdoms depends on effective management of natural capital, equitable access to resources, and the integration of indigenous knowledge into formal systems. Policy interventions should prioritise diversification beyond agriculture, ecological conservation, and intergenerational knowledge transfer to enhance resilience and long-term development.

Keywords: Indigenous knowledge; Natural resource utilisation; Sustainable socio-economic development; Rural livelihoods; Mfwambo Chiefdom; Zambia

1. Introduction

Rural communities across Sub-Saharan Africa continue to rely heavily on natural capital and indigenous knowledge systems to sustain livelihoods, yet their transformative potential is often undermined by ecological degradation, informality, and weak institutional support. Scholars such as Scoones (1998) and Ellis (2000) have long emphasised the centrality of natural resources and local knowledge in shaping rural livelihood strategies, while more recent studies highlight the risks posed by deforestation, soil erosion, and declining intergenerational transmission of indigenous practices (FAO, 2018; Rockström et al., 2010). Within Zambia, rural chiefdoms represent critical sites where natural capital and indigenous knowledge intersect, providing both subsistence and income opportunities, but also facing challenges of sustainability and modernisation pressures.

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This study investigated the role of indigenous knowledge and natural resource utilisation in promoting sustainable socio-economic development in Mfwambo Chiefdom, Mbala District, Northern Province. The chiefdom is endowed with fertile land, forests, and water bodies, yet its economy remains dominated by smallholder agriculture, supplemented by forestry and fishing. Indigenous practices such as crop rotation, soil conservation, and traditional food preservation underpin household resilience, but their transmission to younger generations is weakening, while forestry and fisheries remain underutilised.

By adopting a mixed-methods design underpinned by pragmatism, this research provided empirical evidence on how natural capital, indigenous knowledge, and resource utilisation interact to shape socio-economic outcomes. It situates the findings within broader debates on sustainable rural development, resilience, and ecological economics, thereby contributing to both academic discourse and policy formulation. The study addresses three core hypotheses: that natural resource utilisation, available natural capital, and indigenous knowledge each exert significant positive influences on sustainable socio-economic development. In doing so, it responds to calls for more context-specific, evidence-based approaches to rural transformation in Africa (Chambers, 1997; World Bank, 2020; UNDP, 2019).

2. Methods

The methodological framework was anchored in pragmatism, privileging practical solutions and methodological flexibility in addressing complex social phenomena (Creswell, 2014). A mixed-methods design was adopted, integrating quantitative surveys with qualitative interviews, focus group discussions, and field observations.

2.1. Sample Distribution

Table 1 Sample Distribution by Category

Category/Stratum	Sample Size	Sampling Technique
Farmers	60	Stratified Random Sampling
Fishermen	20	Stratified Random Sampling
Artisans	10	Stratified Random Sampling
Households	70	Stratified Random Sampling
Traditional leaders	10	Purposive Sampling
Government officials	10	Purposive Sampling
NGO representatives	10	Purposive Sampling
Traders/Private sector	10	Purposive Sampling
Total	200	

Sampling was carefully structured to ensure representativeness. The total population of Mfwambo Chiefdom was 12,352, but eligibility criteria reduced this to approximately 400 adults permanently residing in the chiefdom and actively engaged in natural resource utilisation or indigenous practices. Slovin's formula was applied to determine the sample size at a 5 per cent margin of error, yielding 200 respondents (Kothari, 2004). Stratified random sampling captured diversity across farmers, fishermen, artisans, and households, while purposive sampling selected key informants such as traditional leaders, government officials, NGO representatives, and traders, justified by the need to obtain information-rich perspectives (Patton, 2002).

Validity and reliability were ensured through pilot testing, content and construct validation, and multiple consistency checks. Internal consistency was assessed using Cronbach's alpha, inter-rater reliability was tested using Cohen's Kappa, and test-retest reliability was applied during the pilot phase. Ethical approval was secured from the University of Lusaka's Ethics Committee, and clearance was obtained from traditional leadership in Mfwambo Chiefdom. Cultural sensitivity was observed throughout data collection, with community leaders consulted to ensure respect for local customs and traditions.

3. Results

3.1. Demographic Characteristics

Table 2 Demographic Characteristics of Respondents

Age Group	Male	Female	Total	Percentage (%)
18–30	25	29	54	27.0
31–45	30	21	51	25.5
46–60	46	16	62	31.0
61+	13	16	29	14.5
Total	115	85	200	100.0

The findings in Table 2 revealed a nuanced picture of socio-economic development in Mfwambo Chiefdom. Demographically, refer to table 2, respondents were predominantly male (57.5 per cent) and concentrated in the 46 – 60 age group (31 per cent), reflecting the economically active population with accumulated indigenous knowledge. Farming emerged as the dominant occupation, accounting for 46 per cent of respondents, most of whom possessed primary or secondary education. This confirmed agriculture as the backbone of the local economy, consistent with rural livelihood structures across Sub-Saharan Africa (Mulenga et al., 2020). Trading was the second most common occupation, associated with higher educational attainment, while artisans and craftspeople relied largely on indigenous skills and informal training (Phiri et al., 2018).

Table 3 Perceptions of Natural Resource Utilisation

Perception Level	Frequency	Percentage (%)
Very High	62	31.0
High	69	34.5
Moderate	46	23.0
Low	7	3.5
Total	200	100.0

Table 3 demonstrates overwhelming recognition of natural resources as central to socio-economic development, with 96.5% of respondents rating their impact as high or very high. These perceptions provide the foundation for the subsequent figures, which illustrate the specific resources utilised, employment opportunities created, and household income contributions.

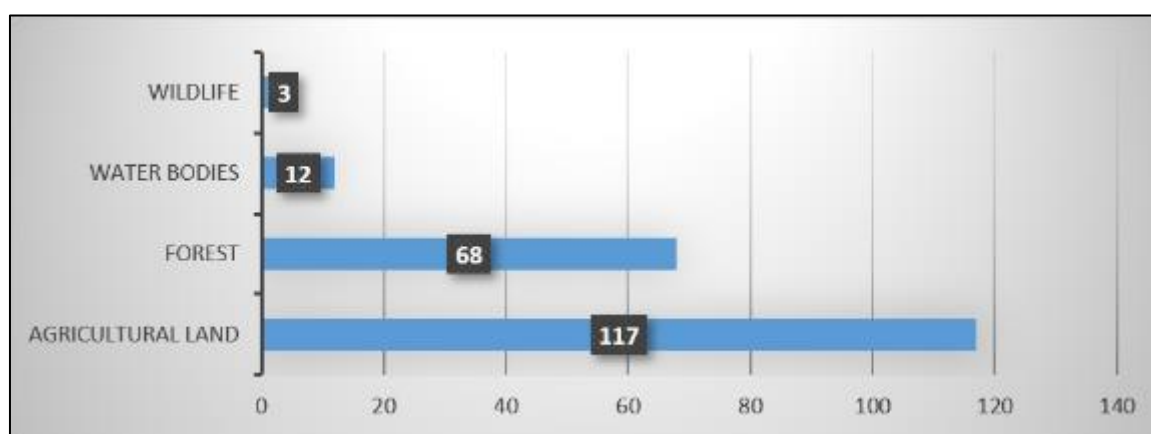


Figure 1 Most Utilised Natural Resources

Figure 1, showed agricultural land as the most utilised resource (117 responses), followed by forests (68), water bodies (12), and animals (3). The figure demonstrates the overwhelming reliance on agricultural land as the foundation of livelihoods in Mfwambo Chiefdom. While forests and water bodies provide supplementary resources, their comparatively lower utilisation suggests untapped potential for diversification. This pattern is consistent with rural livelihood structures in Sub-Saharan Africa, where agriculture dominates household economies (Mulenga et al., 2020).

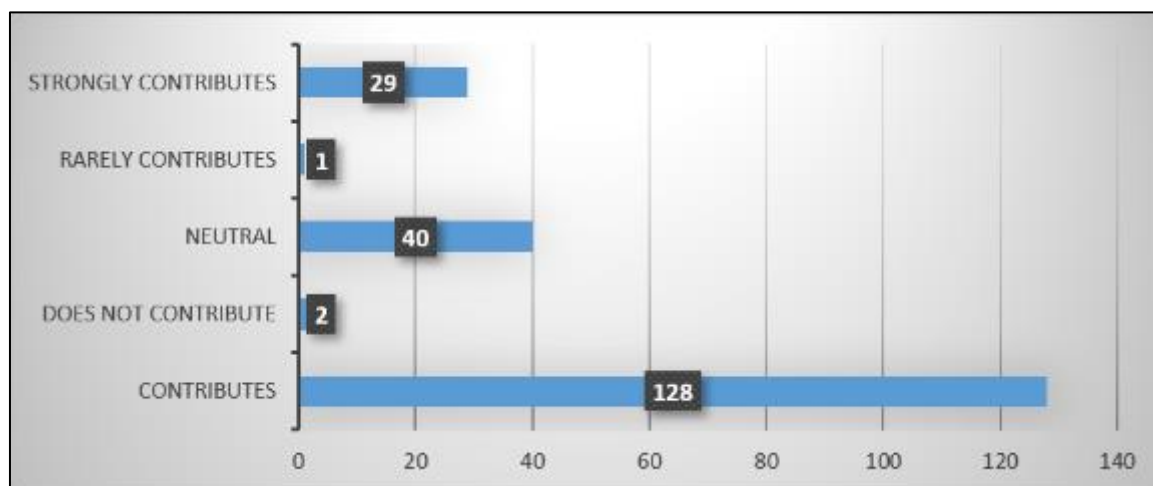


Figure 2 Employment Opportunities from Resource Utilisation

Figure 2 illustrated that 64% of respondents confirmed natural resources contribute to employment creation, with qualitative evidence highlighting crop farming, fisheries, forestry, and agro-processing. The findings highlight the strong link between natural resource utilisation and employment creation. The majority of respondents identified agriculture as the primary source of jobs, while qualitative evidence revealed additional opportunities in fisheries, forestry, and small-scale enterprises. However, many of these jobs are informal and seasonal, limiting their contribution to long-term economic stability (Phiri et al., 2018).

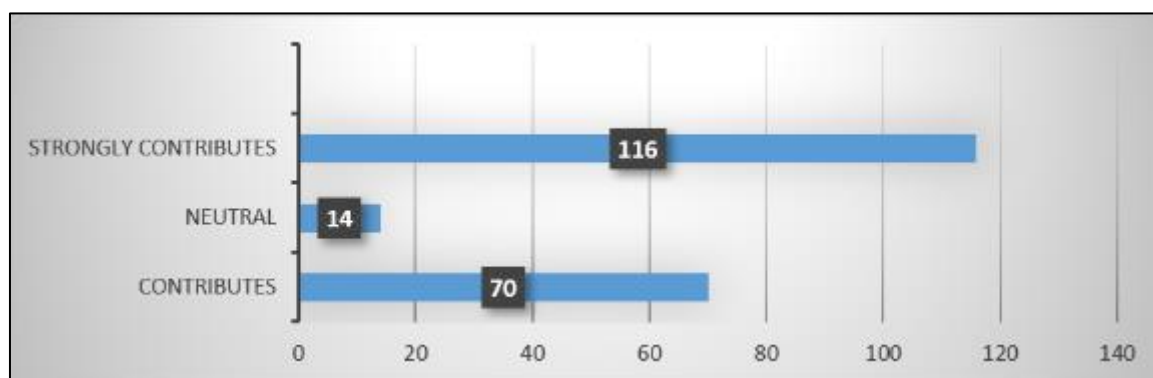


Figure 3 Household Income Contribution

Figure 3 showed the proportion of households reporting significant income derived from natural resources (93%). The findings demonstrate the direct link between resource utilisation and improved living standards. Respondents reported that income from crop sales, timber, fish farming, and honey production supported household needs and improved housing conditions. Yet, dependence on primary resource extraction also suggests vulnerability to environmental shocks and market fluctuations, echoing findings from rural Malawi and Uganda (Phiri et al., 2018; Kato & Kiwanuka, 2019).

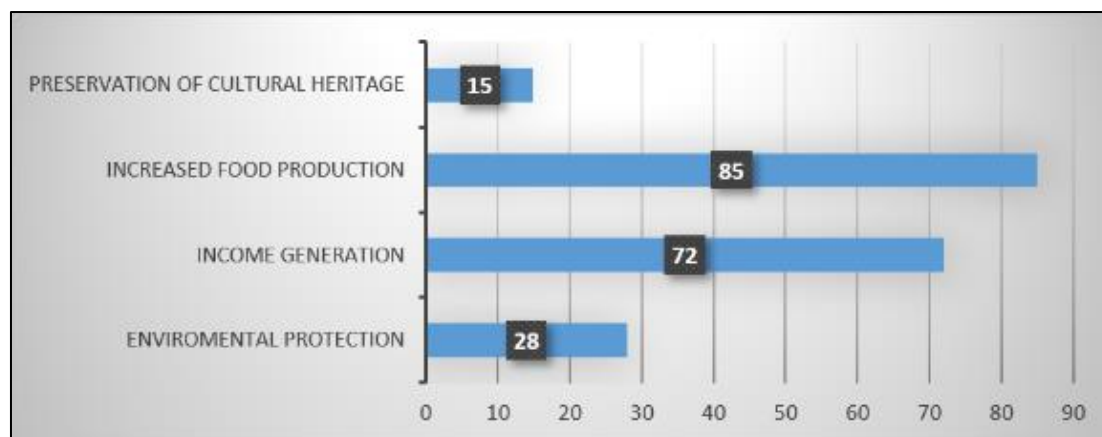


Figure 4 Indigenous Practices and Their Benefits

Figure 4 maps indigenous practices (soil conservation, organic manure, seed preservation) to benefits (food security, income generation, environmental sustainability). The findings illustrates the resilience-enhancing role of indigenous knowledge. Soil conservation and organic manure use were widely adopted, directly improving crop yields and reducing input costs. Respondents identified increased food production (42.5%) and income generation (36%) as the most significant benefits. However, declining transmission of these practices to younger generations raises concerns about sustainability, underscoring the need for deliberate intergenerational knowledge transfer.

4. Discussion

The findings confirm the centrality of agriculture in rural livelihoods, consistent with the sustainable livelihoods framework articulated by Scoones (1998) and Ellis (2000). Natural capital, particularly land, remains the foundation of socio-economic development, but over-reliance on agriculture exposes households to environmental and market vulnerabilities. Forestry functions as a livelihood safety net, yet unsustainable harvesting threatens long-term resilience, echoing FAO's (2018) warnings on deforestation. Water resources remain underutilised, reflecting management inefficiencies rather than absolute scarcity, a pattern observed across Sub-Saharan Africa (Rockström et al., 2010).

Indigenous knowledge strengthens resilience by embedding sustainability within everyday practices. Soil conservation, crop rotation, and organic farming reduce input costs and enhance productivity, aligning with ecological economics perspectives that emphasise the value of traditional ecological knowledge. However, weak institutional integration and declining transmission among younger generations undermine its potential. This reflects broader debates on resilience theory, which stress the importance of adaptive capacity and knowledge transfer in sustaining livelihoods.

Constraints such as deforestation, underutilisation of fisheries, and declining indigenous knowledge transmission highlight systemic challenges. These findings underscored the need for integrated policies that bridge traditional and modern systems, promote diversification beyond agriculture, and strengthen ecological conservation. Scholarly debate increasingly emphasises the importance of combining indigenous practices with scientific approaches to achieve sustainable development outcomes (World Bank, 2020; UNDP, 2019).

5. Conclusion and Recommendations

This study concludes that sustainable socio-economic development in Mfwambo Chiefdom is shaped by the combined effects of natural capital, indigenous knowledge, and resource utilisation. Regression analysis confirmed that these variables jointly explain 91.2 per cent of the variation in livelihood outcomes, underscoring their importance. Yet, imbalances in resource use — with agriculture dominating while forestry and fisheries remain underutilised — and the weakening transmission of indigenous knowledge threaten long-term sustainability.

At the community level, deliberate efforts are needed to preserve and transfer indigenous practices to younger generations through cooperative learning and intergenerational engagement. Government should invest in rural infrastructure such as irrigation and aquaculture, while integrating indigenous knowledge into extension services. NGOs and development practitioners can strengthen capacity-building and afforestation initiatives, targeting women and

youth. Academia should document indigenous knowledge systems and explore ways to integrate them with modern science. Policy interventions must therefore be holistic and culturally grounded, aligning strategies with the realities of rural chiefdoms. By conserving natural capital, diversifying livelihoods beyond agriculture, and institutionalising indigenous knowledge, Mfwambo Chiefdom can achieve inclusive and resilient socioeconomic development.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare no conflict of interest.

Statement of ethical approval

Ethical approval was obtained from the University of Lusaka Ethics Committee, and clearance was granted by traditional leadership in Mfwambo Chiefdom.

Author Contributions

Robbie Julius Fwambo designed and conducted the study; Professor Margaret Oloko supervised and reviewed the manuscript.

Data Availability

Data supporting the findings of this study are available from the corresponding author upon reasonable request.

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