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Entrepreneurial Livestock Consultancy for Cattle Theft Prevention and Recovery in South Africa's North-West Province

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Abstract:

The purpose of the study is to design an entrepreneurial framework for SMEs to effectively prevent cattle theft and recover stolen ones in South Africa's North-West Province, focusing on border areas. Its aim is to develop a sustainable livestock consultancy model incorporating technology, insurance, and cross-border collaboration to improve livestock security and reinforce farmer resilience. This study employs a design-oriented approach merging exploratory, descriptive, and developmental phases to examine cattle theft facilitators and economic impacts. It employs the Business Model Canvas and Technology Adoption Framework to develop a SME livestock consultancy model. Ethical factors and informed consent were upheld. The study contributes an innovative business model that combines technological, financial, and institutional systems to alleviate cross-border cattle theft (CT) while enhancing rural entrepreneurship. It combines profitability, social inclusion, and environmental sustainability by aligning with the Triple Bottom Line framework. The model adds dual pricing for insurance and recovery services, incentivizing technology adoption among farmers. It explains how Livestock Consulting Enterprises can create sustainable SMEs through IoT-enabled surveillance, blockchain traceability, and cross-border legal collaboration. The study ends by advancing practical pathways for rural economic empowerment,

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youth employment, and regional policy coordination in livestock security management across Southern Africa's border regions.

Keywords:

Cattle Theft, Cross-Border Collaboration, Digital Surveillance, Livestock Theft Prevention, Rural Entrepreneurship

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Introduction

Livestock farming is a basis of rural livelihoods in South Africa (Nontu et al., 2025). According to Wesley et al. (2025), this is factual particularly in the North-West Province where cattle production maintains both survival and commercial farming populations. Nevertheless, North-West continues to experience chronic challenges of cattle theft (CT). The CT problem is deepened by its massive and permeable borders with Botswana and Namibia. These borders comprise passage points such as Ramatlabama, Skilpadshek, and Matlhase (Peta et al., 2025). They extend across semi-arid rangelands and river systems such as the Marico and Molopo rivers. The inadequate fencing and sparse patrols in these areas offer opportunities for illegal cross-border movement of livestock. The phenomenon of cross-border CT weakens local economies. It also brings down farmer confidence. Moreover, it complicates efforts for enforcing law. Aiyzhy et al. (2021) explain that these occur because stolen cattle are often trafficked, masked within informal market sales, or combined into substantial herds to disguise ownership. The recovery rates of lost livestock are estimated at below 30% (Ndzungu et al., 2025). Neethirajan (2025) underlines that the lack of inexpensive livestock insurance, the high cost of technologies of surveillance, and the logistical obstacles of cross-border recovery intensify the CT situation. Existing mediations have essentially depended on police and community patrols (Apene et al., 2024). However, they could not manage to address the fundamental economic and technological factors of the problem. Subsequently, there is a mounting necessity for innovative, entrepreneurial approaches that position SMEs as essential players in livestock theft prevention and recovery. Therefore, this study conceptualizes the creation of SME-based livestock consultancy services that incorporate technological blends, insurance expedition, and cross-border cooperation. The ingenuity intents to provide value to farmers, fortify border security, and encourage agricultural resilience within the North-West Province and the broader southern African region through framing these SMEs as both economic ventures and social enterprises.

Research gap: Economic importance of livestock farming in South Africa's North-West Province and the tenacious challenge of cross-border CT have been acknowledged (Modise, 2025). However, there is a remarkable absence of structured entrepreneurial frameworks that integrate livestock consultancy, technology-based prevention, and recovery mechanisms. Peta et al. (2025) and interventions mainly concentrated on community policing, legislative controls, and strategies for law enforcement. However, these approaches have not adequately resolved the economic and operational liabilities of smallholder and commercial cattle farmers. Moreover, cross-border CT aspects are underexplored from perspectives of entrepreneurship and SME development. The concern applies especially along the Botswana and Namibian borders.

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Problem statement: CT in South Africa's North-West Province presents a relentless danger to rural livelihoods and regional stability. Asaala (2024) views the danger as being worsened by leaky borders with Botswana and Namibia that permit cross-border trafficking through inadequately monitored channels. There are rolling efforts of law enforcement, but recovery rates of stolen cattle are still below 30% (Ndzungu et al., 2025). Sandlana et al. (2025) add that most farmers lack access to reasonable insurance and modern surveillance technologies. Contemporary mediations are disjointed and exclude entrepreneurial and technological tactics. Subsequently, there is a vital necessity for a complete SME-motivated livestock consultancy model that mixes risk management, insurance facilitation, and cross-border partnership to prevent and recover stolen cattle effectively.

Purpose statement: The purpose of this study is to develop an entrepreneurial framework for SMEs that can effectively prevent and recover CT in South Africa's North-West Province. The study aims to design a sustainable livestock consultancy model that integrates technology, insurance, and cross-border collaboration to enhance livestock security and farmer resilience. Its specific objectives are to analyze the socioeconomic and border-related factors contributing to CT, propose innovative SME-led prevention and recovery mechanisms, and formulate practical pricing models for insured and uninsured cattle that account for border complexities and regional economic conditions.

Conceptual clarifications: For clarity's sake, the paper provides conceptual explanations of major terms and acronyms used in this paper, namely, CCTV systems, DNA sampling, GPS, IoT, RFID, SADC, SAPS, USD, and ZAR. CCTV, standing for Closed-Circuit Television, is a technological tool for upgrading security and operational efficiency in agribusiness (Rachamadugu & Thota, 2025). DNA, or Deoxyribonucleic Acid, is viewed by Thilakarathne et al. (2025) as a technological technique in contemporary agribusiness for management purposes. GPS, or Global Positioning System, is a satellite-based system utilized for navigation (Verma & Tracer, 2025). It is commonly used in agriculture to enable accurate positioning, routing, and tracking in real-time (Höyhtyä, 2025). IoT, standing for Internet of Things, is a technological ecosystem joining diverse physical devices and objects through the internet (Chai, 2025). RFID for Radio Frequency Identification, is a wireless technology that uses electromagnetic fields to automatically identify, and track tags attached to objects (Eteng et al., 2025). SADC, Southern African Development Community, is an inter-governmental organization for promoting regional integration, economic development, peace, and security among its southern African member states (Koboyatau, 2023). SAPS, for South African Police Service, the national police force of South Africa tasked to enforce laws across the country (Modise, 2025). USD stands for United States Dollar, and ZAR for South African Rand (Bertaut et al., 2025).

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Literature and Contextual Review

Geldenhuys (2025) describes livestock theft as a momentous agricultural crime that involves the stealing of animals such as cattle, sheep, and goats. Historically, livestock, and mostly cattle, was a currency for exchanging goods in African communities and markets. This explains why livestock theft negatively impacts farmers and rural communities economically and socially. Gwaka and Dubihlela (2020) explain that livestock theft remarkably affects smallholder farmers by expanding financial risks and threatening their livelihoods. Ndzungu et al. (2025) concur by considering livestock theft as both an economic crime and a developmental constraint. This means that when livestock is stolen, the economy on the victim's side is weakened, and their development is also stalled. Donnermeyer (2025) explains that livestock theft often involves criminals operating at night stealing livestock to sell illegally. According to Dike (2025), sometimes livestock theft transpires across borders, causing the victims major financial losses and safety risks. Prevention measures include security systems, proper marking of animals, community vigilance, and cooperation with law enforcement (Maxwell & Reyes, 2024). In South Africa, legislation like the Stock Theft Act and Animal Identification Act (Maluleke, 2021 regulate the issue and encourages the presence of police and prevention and recovery by using technology.

The issue of seasonality in stock theft has also been explored in which there are periods when the rates of theft are high and those which show lower rates. Schwartz et al. (2025) reveal that theft peaks during dry seasons when grazing competition increases. Understanding such patterns is a step closer to being able to manage and curb stock theft but is not the sole requirement as many factors compounding to complicate the problem.

The South African government police and security systems have failed dismally to solve stock theft in communities. This failure presents an opportunity for the private and individuals to find alternative ways such as entrepreneurial tactics to address stock theft. According to Ratten (2023), entrepreneurship refers to the process of establishing, introducing, and managing a new business venture, often including innovation and risk-taking to make a profit. This task is undertaken by entrepreneurs. Chen (2025) explains that entrepreneurs create economic value by identifying and exploiting business opportunities, managing resources, and navigating uncertainties to build successful enterprises. Benefits of entrepreneurship include employment creation, impact on society and community development, increase in standard of living, innovation, and research and development support (Majeed et al., 2025). Entrepreneurial literature by Singh et al. (2023) suggests that SMEs can thrive in rural economies when they leverage local knowledge, digital tools, and community partnerships. The current idea points to innovation in agricultural services for the concept of agri-entrepreneurship (Das & Darshan, 2025). Agri-entrepreneurship offers a foundation for SMEs to address structural challenges in the livestock value chain.

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Technology, as Singh and Sharma (2025) testify, plays a vital role in agribusiness to combat stock theft using several innovative solutions such as GPS agricultural CCTV systems, animal collars, biometric identification methods, and real-time monitoring apps. Technological developments such as RFID marking, GPS collars, drones, and blockchain livestock registries have been introduced in regions such as Kenya and Namibia (Letshabo, 2024). These developments produce positive results. According to Choudhary (2024), these technologies enable farmers to track livestock movements, send alerts in case of abnormal activity, and enhance recoverability of stolen animals. Additionally, DNA sampling and IoT innovations are used for forensic evidence and livestock health monitoring to reduce stock theft and improve livestock management. Rana et al. (2025) explain that cooperation between farmers, law enforcement, and technology providers is essential for effective implementation. However, cost barriers and lack of local technical capacity are the main challenges.

This research argues that locally embedded SMEs can serve as connecting establishments: linking farmers, insurers, security agencies, and technology suppliers: to create an integrated anti-theft and recovery system. Marienau (2017) explains that the entrepreneurial opportunity for SMEs lies in developing specialized Livestock Consulting Enterprises (LCEs) that offer three interconnected service domains: *livestock risk assessment and insurance facilitation* (LRAIF), *theft prevention technology integration* (TPTI), and *recovery and legal mediation* (RLM). On LRAIF, sentiments insinuate that SMEs can appraise profiles of herds, issue risks, and relate farmers with insurance underwriters who specialize in rural agricultural cover (Tapo et al., 2024). Regarding TPTI, SMEs can monitor livestock movement, issue alerts, and conduct patrol coordination with local security networks via installation and management of digital tracking devices such as GPS and RFID (Schatt, 2023). According to Pellegrini (2025), RLM allows LCEs to support recovery operations, recording evidence, and concession with cross-border authorities for restoration. Each enterprise operates within a clustered service network, anchored by regional hubs near border towns such as Mahikeng, Zeerust, and Vryburg.

Research Methodology

Research design: This study adopts a design-oriented approach mixing exploration, descriptive and developmental research phases. The exploratory phase identifies the drivers and patterns of CT and the existing gaps in prevention and recovery mechanisms (Peng et al., 2025). The descriptive phase quantifies the economic implications and operational challenges (Gao et al., 2025). The developmental phase synthesizes the findings to construct a business model framework and technological strategy customized for SMEs in livestock consultancy (Lidder et al., 2025).

Research paradigm and approach: The study follows a pragmatic paradigm, which emphasizes solutions that work in real-world contexts (Haristiani et al., 2025). According to Lima and Appio (2025), pragmatism allows the researcher to leverage many data sources and methods to generate actionable

outcomes. This case uses a *viable entrepreneurial framework* supported by financial data and technological applications.

Study area: The research focuses on the North-West Province of South Africa, especially areas along the Botswana and Namibia borders: Mahikeng, Zeerust, and Vryburg. These are cross-border CT hotspots (Rosen et al., 2024). These regions were selected because of their high incidence of livestock theft, leaky borders, and growing entrepreneurial capability in agriculture-related services.

Units of analysis: The unit of analysis is the *livestock enterprise system*, including its value chain role players and operational environment affecting cattle security and recovery.

Model development framework: Based on the Business Model Canvas (Tahir, 2025) and Technology Adoption Framework (Kruger & Steyn, 2025), the study synthesized findings into two key outputs: Business Model Framework and Technological Strategy Framework.

Output 1: Business Model Framework

The value proposition stems from farmers' needs and addressing theft prevention gaps. Revenue streams are shaped by attention on affordability, insurance premiums, and recovery expenses. Key partners include stakeholders identified during planning, such as insurance companies, SAPS, border agencies, and technology suppliers. The cost structure is developed via a financial analysis of service delivery, technology acquisition, and logistics.

Output 2: Technological Strategy Framework

The approach blends RFID labeling, GPS tracking, and digital reporting systems to enhance monitoring and security. It covers a feasibility analysis of adopting these technologies, considering infrastructure and farmers' capacity. This technological integration is linked to business viability through incentives such as premium discounts or subscription-based tracking services.

Ethical considerations: Ethical approval was obtained from institution's ethics committee. Participants were informed of the study's purpose, and their consent was sought. Confidentiality and anonymity were maintained, and data were used solely for academic and developmental purposes. Permissions were obtained from SAPS and local municipalities for field data collection.

Results

Business Model Framework

The proposed business model aligns with the Triple Bottom Line (TBL) framework: profitability, social equity, and environmental sustainability (Abraham, 2024).

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Value proposition: The value proposition includes the reduction of financial losses (Chukhray et al., 2025) caused by CT, offering accessible insurance and recovery support customized for both smallholder and commercial farmers. In addition, it promotes the integration of local herders and youth in digital surveillance operations to enhance monitoring and community engagement.

Revenue streams: The revenue streams consist of service fees charged for livestock risk audits, monthly subscriptions for theft prevention and tracking services, commissions earned from insurance partners, and performance-based recovery service charges.

Key partners: Key partners include farmers' associations and cooperatives, insurance firms, SAPS Stock Theft Units and border police, veterinary and branding authorities, as well as technology suppliers specializing in IoT and GPS solutions.

Cost structure: The cost structure comprises expenses for equipment procurement such as RFID tags and drones, personnel training and field logistics, communication and data management systems, as well as legal and recovery costs.

Technological and Operational Strategies

Technology forms the backbone of the consultancy model (Gitelman et al., 2020). It core components include RFID labelling to allocate exclusive identification to each animal for digital herd registration, GPS tracking collars to monitor real-time locations with geofencing alerts near border zones, and drone surveillance to assist in border patrols especially in difficult terrain near the Molopo River. Mobile applications provide farmers with theft alerts, insurance updates, and herd performance reports, while a blockchain traceability register upholds immutable ownership records for cross-border verification. Moreover, local youth trained as Livestock Digital Scouts would be employed by LCEs. This will promote rural employment and ensure cost-effective surveillance.

Border Complexity and Security Collaboration

Border issues for South Africa, Botswana, and Namibia pose unique challenges. These include legal complexity due to different property and evidence laws affecting recovery claims, geographic accessibility issues occurring from sparse border infrastructure that makes patrolling expensive, and cultural and linguistic diversity impacting communication between livestock owners across national lines (Maila & Czimre, 2024). Effective entrepreneurships operate within cooperative networks involving cross-border veterinary services, international police livestock databases, and bilateral agricultural agreements. SMEs could advocate for a Tripartite Livestock Security Protocol that ensures the recognition of livestock tags and recovery documentation across borders to address these challenges.

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Pricing Models

Livestock insurance pricing model (for available cattle): The insurance model provides protection against theft, injury, and death of cattle (Gogoi et al., 2025). The model components, according to Moro-Visconti (2025), are base premium (BP), border risk multiplier (BRM), technology discount factor (TDF) and administrative fee (AF). BP is determined as a percentage of the market value of the animal; BRM adjusts cost for cattle located within 50 km of international borders; TDF reduces premium for farmers using GPS or RFID, and AD covers inspection and audit services. The premium formula is: $\text{Premium} = (MV \times BP \times BRM) - (MV \times TDF) + AF,$ where: MV = Market Value of Cattle (average ZAR 12,000 / USD 640 per head); BP = Base Premium (3%); BRM = 1.25 (for border risk); TDF = 0.05 (for tech-enabled herds); and AF = ZAR 150 (USD 8)

Recovery pricing model (for uninsured stolen cattle): The recovery model applies on uninsured stolen cattle. It consists of components of service fee: Investigation Initiation Fee (IIF), Cross-Border Coordination Fee (CBCF), Success-Based Recovery Fee (SBRF), and Technology/Trace Cost (TTC) (Barbopoulos et al., 2025). IIF is the fixed fee to start case tracking, CBCF is charged per case involving Botswana or Namibia, SBRF is the percentage of market value upon successful recovery, and TTC is the optional fee if digital tracking devices are deployed.

a. Suggestive pricing

Component	Description	Cost (ZAR/USD)
IIF	Initial documentation, report filing, field survey	2,000 (USD 107)
CBCF	Border coordination, translation, liaison	1,500 (USD 80)
SBRF	15% of recovered cattle's market value	Variable
TTC	GPS/Drone tracking support	800 (USD 43) per case

Table 1: Suggestive pricing

b. Example Scenario: If two cattle worth **ZAR 24,000 (USD 1,280)** are recovered, $Service\ fee$

$= IIF + CBCF + (0.15 \times 24{,}000) = 2{,}000 + 1{,}500 + 3{,}600 = 7{,}100$ZAR (USD 380)

This fee is intended to ensure rational compensation for SME recovery efforts, especially under cross-border operational constraints. The CT victim needs to furnish the insurer with accurate and honest information. The insurer will provide the recovered cattle, or a report that justifies why the stolen cattle are not recoverable.

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Financial Feasibility and Sustainability

The profitability of Livestock Commercialization Enterprises depends on upholding moderate overheads while scaling operations (Shikuku et al., 2024). The enterprises' revenue sources include consultancy fees, premium commissions (15 to 20%), and technology rentals. A local SME engaging 200 active farmers (averaging 50 cattle each) can generate annual revenue exceeding ZAR 1.8 million (approximately USD 96,000) and achieve net margins of around 25%. Each enterprise has the potential to employ 10 to 15 individuals, including field agents, technology officers, and administrative personnel. The model encourages financial sustainability and growth without placing excessive financial strain on smallholder farmers by nurturing alliances with insurance firms and local municipalities.

Discussion

Policy, Legal, and Institutional Alignment

This initiative is consistent with some primary policy frameworks: South African Livestock Theft Act (No. 57 of 1959) that regulates labelling and ownership; the Agricultural Master Plan (2021–2030) that upgrades rural enterprise development; and the SADC Transfrontier Conservation and Development Protocol that inspires cooperative border management (Mtombeni & Shoba, 2025). Furthermore, SMEs can support the inclusion in the AgriBEE and Enterprise Supplier Development programmes to enhance their access to capital and legitimacy.

Expected Socioeconomic Impact

The effort of this paper is to assist in economic enhancement, prevent losses, and engagement on entrepreneurship as a community building contribution, using the route of agri-entrepreneurship. Implementing SME-based livestock consultancy may significantly impact socioeconomic conditions by reducing CT incidents by up to 40% by using digital deterrence and rapid reporting mechanisms (Nxumalo, 2025). This reduction improves farmer income stability, mainly as insurance coverage penetration increases, offering financial protection against losses. Furthermore, the consultancy model inspires youth employment by generating opportunities in technology-driven agricultural services. This will contribute to economic empowerment. It also promotes improved cross-border alliance in law enforcement and veterinary surveillance, improving institutional effectiveness.

Risk and Mitigation Analysis

Risk	Description	Mitigation Strategy
Data theft or misuse	Initial documentation, report filing, field survey	2,000 (USD 107)

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Cross-border legal disputes	Border coordination, translation, liaison	1,500 (USD 80)
Technology cost barriers	15% of recovered cattle's market value	Variable
Corruption in recovery	Possible local collusion	Independent audit trail and transparent case tracking

Table 2: Risk and Mitigation Strategy

Implementation Roadmap

Phase & Duration	**Activities**
Phase 1: Pilot (6 months)	Establish SMEs in Mahikeng and Zeerust; test RFID & insurance linkages
Phase 2: Scale (Year 1–2)	Expand to Vryburg, leverage local youth agents, integrate mobile apps
Phase 3: Cross-Border Integration (Year 3)	Formalize agreements with Botswana and Namibia agencies
Phase 4: Policy & Replication (Year 4–5)	Advocate national rollout through DAFF and SADC coordination

Table 3: Implementation Roadmap

Conclusion and Recommendation

CT in the North-West Province and its neighboring borders presents both a challenge and an opportunity for rural entrepreneurship. This manuscript displays how Livestock Consulting SMEs can offer integrated solutions mixing risk management, insurance expedition, and recovery operations. SMEs can continue financial viability while addressing border complexities by adopting the dual-pricing framework: insurance-based and recovery-based. The approach boosts security, supports local farmers, and strengthens regional economic linkages between South Africa, Botswana, and Namibia. The study recommends that future initiatives should integrate digital infrastructure investment, policy harmonization to ensure scalability and long-term sustainability, and public-private partnerships.

The theoretical contributions of the business model framework draw on interdisciplinary concepts. It supports the TBL framework by adding profitability, social equity, and ecological sustainability, granting a holistic lens for assessing livestock theft prevention strategies. The value proposition increases

theories related to risk reduction and community engagement, encircling financial loss mitigation and socio-economic presence of local herders and youth into digital surveillance roles. Technological adoption is rooted in innovation diffusion theory and operational strategy literature, stressing RFID, GPS, drones, and blockchain to enhance transparency and traceability. Cross-border collaboration mirrors institutional and network theories addressing legal, geographic, and cultural intricacies in security systems. Pricing models stem from actuarial and behavioural economics principles, with technology-enabled discounts and multi-partt service fees. Lastly, financial viability builds on sustainability theory by balancing scalable enterprise growth with affordability and stakeholder partnerships for resilient rural livelihoods and enterprise viability.

Implications of the results are:

- Technology-driven livestock management combined with cooperative security frameworks enhances profitability, social inclusion, and environmental sustainability withing TBL.
- The model promotes empowered community participation and rural employment by lowering financial losses through accessible, customized insurance and recovery services for diverse farmers.
- Addressing border complexities requires coordinated cross-border protocols and legal harmonization to improve livestock recovery outcomes.
- Proposed pricing balances affordability with cost recovery, promoting technology adoption among farmers.
- Financial analysis shows that SMEs can maintain scalable operations, generate revenues, and create local employment, while supporting smallholder farmers via strategic partnerships with insurance firms and authorities.

Some limitations of the study based on the results are:

- Context limitation: The model and technological solutions apply to the border regions of South Africa, Botswana, and Namibia, and may not generalize to other regions.
- Technology dependance: The model relies on RFID, GPS, drones, and blockchain technology, which could experience accessibility problems.
- Cross-border legal difficulty: Different property and evidence laws present challenges in livestock recovery and insurance claims, threatening model effectiveness and scalability.
- Cost and affordability: Some farmers may struggle to pay fees related to insurance premiums, recovery charges, and technology implementation.
- Operational encounters: The success of surveillance and recovery depends on coordinated cooperation among diverse stakeholders, which may be difficult to maintain consistently.

- Human resource reliance: Dependence on trained local youth as Livestock Digital Scouts could experience issues with turnover, training quality, or sustained motivation.
- Economic expectations: Financial feasibility assumes involvement and scaling that may be affected by external economic or political factors not anticipated.

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