

Exploring the use of conventional identification methods and Deoxyribonucleic Acid technology [And related technologies] in combating stock theft: The selected Southern African Development Community initiatives

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Abstract

Statistically, developing countries account for more than 2/3 of the world's livestock population. This sector contribute about 40% of the global value of agricultural outputs and support rural livelihoods, food and nutrition security of almost 1.3 billion people globally. Numerous tangible and intangible benefits are also provided. Negatively, within the context of developing economies, the Southern African Development Community (SADC) region is also prone to stock theft and inadequate value placed on livestock practices. The objectives of this study were Two (02) folded, namely: **1)** Determining the conventional identification methods and DNA technology [And other related technological] methods and techniques used to combat stock theft; and **2)** Identify factors that hinder effectiveness in curbing stock theft in the SADC region respectively.

From a qualitative standpoint, the empirical evidence was obtained through documentary studies, semi-structured Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs), aided with telephonic interviews. About 60 participants were targeted. This study presents selected findings from studies and publications on policing of stock theft in the SADC region to affirm the following findings: Despite the notion that international and local literature studies were found on the conventional identification methods, DNA technology [And related technologies] and stock theft, limited previous research on this topic in this region, often leave researchers with limited guidelines to work with in terms of establishing relevant contents on these subjects. It is also acknowledged that rapid growth and technological innovation have led to profound structural changes in this sector, calling for dire needs of using of the collated conventional identification methods and DNA technology, together with related technologies to combat stock theft in the selected SADC region effectively. Importantly, developing this sector can end extreme poverty, boost shared prosperity and feed a projected 9.7 billion people by 2050. It can also raise incomes among the poorest compared to other sectors.

For recommendations; this sector should be protected at all costs, all relevant stakeholders in the SADC region should collaborate to ease the current burden presented by this crime, as it is still touted as the strongest pillar of global food systems and a contributor to poverty reduction, food security and agricultural development. Therefore, effective cooperation between structures and/or other relevant stakeholders in the policing of stock theft in the SADC region is highly sought and should be incorporated into Anti-stock theft operations, by means of developing set of good practices guidelines, to efficiently assist in solving existing problems relating to this form of rural crime.

Keywords: Combating, Conventional identification methods/techniques, Deoxyribonucleic Acid technology [And other related technologies], Southern African Development community initiatives, Stock theft.

Introduction and problem contextualisation

According to Banda and Tanganyika (2021), livestock serve as a form of savings, which can easily be liquidated into cash and provide many other benefits both directly and indirectly. Livestock are key to poverty alleviation and are an important development tool where benefits derived vary with the gender of beneficiaries. Thus, there is a need for more research to quantify and value various aspects through which livestock benefit communities in the developing world for efficient resource allocation. Livestock play multiple and significant roles in the rural livelihoods of most developing countries where they provide both direct and indirect benefits to communities. Herrero *et al.* (2012) (in Banda & Tanganyika, 2021) reported that livestock roles in the economies of developing countries are significant to millions of both producers and consumers that are often vulnerable and economically constrained. Livestock serve as a source of food, income, manure, traction, and transport as well as serve as financial aids and enhance social status among others. The various benefits of keeping livestock confirm that livestock form an integral and indispensable part of social life and sustenance of poor communities (Meissner *et al.* 2013) (in Banda & Tanganyika, 2021).

However, the incidences of stock theft has been high in Botswana, as it is elsewhere in the SADC, due to the escalating number of stock thefts and the inefficiencies of the methods used to combat this problem (Dambe & Fombad, 2020). Stock theft is evidently becoming a worldwide growing problem, with more complexity to combat. From a South African perspective, this scourge is nothing new to the livestock farmers. The available research contends that stock theft is as old as agriculture itself. The initially recorded cases in South Africa can be traced to 1806. This crime affects the livestock industries within the SADC region, which causes long-term pain and suffering to the rural livestock farmers. Importantly, available studies on stock theft have focused only on the prevention of stock theft, using the conventional identification methods. However, no study has been done on the combined use of conventional identification and DNA technology [And other related technologies] in combating stock theft in the SADC region. Researchers in the field of humanities and related research areas are cited to be neglecting the importance of livestock farming industry and stock theft, while comparing it to other property-related crimes across this region.

Furthermore, stock theft may seem to be a minor crime to the public; owing to this view, research on this topic has been largely ignored by researchers. The existing literature proposes a variety of methods of combating stock theft across the selected SADC region, other parts of Africa and across the globe. Essentially, the DNA technology was designed to revolutionise modern science. As it evolves, more discovered applications to help in understanding all living organisms, including livestock/animals. For the purpose of this study, DNA technology makes it possible to provide a means of irrefutable identification of livestock. All livestock have a unique DNA profile. In the event that livestock are stolen, illegally relocated or even slaughtered, biological samples of such livestock can simply be taken and their DNA profile compared to those of the reference samples in order to verify their identity, effectively linking criminals to crime scenes. The advantage of this practice lies in

identification of criminals with incredible accuracy when biological evidence exists, and it can also clear suspects and exonerate persons who have mistakenly been accused or convicted of crime, making it increasingly vital to ensure accuracy and fairness within the Criminal Justice System (CJS).

As initial stated, the purpose of this study was determine the use of conventional identification methods and DNA technology [And other related technologies] in combating stock theft and identify factors that hinder effectiveness in curbing stock theft in the SADC region holistically. The selected SADC countries were chosen as learning grounds, from which shortfalls and outcomes of previous methods employed to combat stock theft were used to inform current work, and to improve future work in the use of the conventional identification methods and DNA technology to combat stock theft in the region and elsewhere. The DNA technology is easily accessible by means of the establishment of effective partnerships between the CJS and the relevant stakeholders, and using communal intervention systems to break the culture of isolation and move into a collaborative approach towards stock theft-combating strategies. It is important to simultaneously establish mechanisms to transfer Knowledge Management (KM), share strategies, including the integration of conventional methods with available DNA technologies, sharing the results of preliminary investigations, and establishing how this technology can be used to inform stakeholders about court procedures. This study contends that challenges associated with the 02 phenomenon guiding this study exists. These challenges include, but are not limited to the following:

- Chain of custody in terms of handling of the exhibits from the crime scene to the Forensic Laboratory (FL).
- Lack of general knowledge about the use of the conventional identification methods and DNA technology [And other technologies] combined by the Stock Theft Units (STUs) officials/investigating officers and other relevant stakeholders contributes to sample degradation and contamination, which negatively influence prosecution rates.
- A lack of awareness of, and interest in these 02 methods, the use of this application far exceeding its use in practice.

The value of using DNA technology in combating stock theft remain unclear to most study participants, thus instead of using this application they reverted to using conventional methods, such as brand-marking and tattooing, with more emphasis placed on the current legislative frameworks, such as the Stock Theft Act (No. 57 of 1959) and Animal Identification Act (No. 6 of 2002) respectively [In South Africa], as well as Stock Theft Act (No. 21 of 1996) in Botswana, the Enforcement of Stock Theft Act (No. 4 of 2000), Criminal Procedure and Evidence Act (No. 26 of 1981) in Lesotho, Stock Brands Act (No. 24 of 1995) in Namibia, Swaziland Livestock Identification Act (No. 13 of 2001), while invalidating the use of the new the Criminal Law (Forensic Procedures) Amendment Act (No. 37 of 2013) (the 'DNA Act') of South Africa for example and other related international Acts (World Organisation for Animal Health standards – OIE standards). This study further found that the effective use of DNA technology in combating stock theft could provide a positive and significant contribution to ensuring the safety and protection of livestock, as well as the

economies of South Africa communities. Therefore, Three (03) challenges and themes were identified in this study, namely: **1) Common usage of conventional methods to combat stock theft, 2) Insufficient methods and techniques to combat stock theft and 3) Limited prioritisation of the stock theft scourge.**

Consequently, Mapholi (2015:1) asserts that stock theft and poaching are major challenges to livestock farming and game production in South Africa. The author is of the opinion that this practice has an impact on the economy, affecting all sectors of the farming community, from the large commercial organisations to the stud breeders, and extending to the rural farmers who may own One (01) or 02 animals. As a result, economic losses due to stock theft are estimated to be R750 million per annum. Mapholi (2015:1) also mentions that the South African National Government through the SAPS has identified stock theft as one of the priority areas, and a partnership has been established between SAPS and the Animal Genetics Laboratory (AGL) of the Animal Research Council (ARC), Animal Production Institute (API) at Irene, Pretoria, to address the challenge of stock theft through the use of DNA technology. The agreement between the 02 organisations was established in the year 1996. According to the SAPS, approximately 45 000 cases of stock theft are reported for court purposes per year, and only about 8 000 cases go to court. More than 500 of the court cases, involving more than 3 000 exhibits, use evidence obtained from DNA analysis. About 95% of these cases are resolved and suspects are prosecuted. What a revelation to the potential livestock farmers.

The researcher is of the view that the findings of this study will prompt readers of this study to think of other contexts, settings or situations facing similar problem across the SADC region and elsewhere, and to recognise the existing similarities. This study will not involve broad claims, but invites study readers to make connections between elements associated with the study participants in line with their own experiences and available literature studies on these subjects. Thus, the researcher will explore and give a rich description of the related subjects of this study for the study findings to be possibly applied to other settings in order to contribute to the building of a new and technological pool of knowledge in respect of combating stock theft.

The collected data was contextualised in a rich and descriptive manner, focusing on the use of conventional identification methods and DNA technology, as combating strategies through establishment of themes and challenges in this regard. It is envisaged that these themes will be disseminated to the relevant stakeholders and other parties interested in the combating of stock theft and its impact on policy-making in the SADC region. The other purpose of this study is to broadly transfer the findings on the use of these 02 phenomenon to combat stock theft in the SADC region and elsewhere. Kempen (2015:10) is of the view that DNA can be used to link criminals to crime scenes. The advantage of this practice lies in achieving the identification of criminals with incredible accuracy when there is biological evidence, and it can clear suspects and exonerate persons who have mistakenly been accused or convicted of crime. Thus, DNA technology is increasingly vital to ensure accuracy and fairness in the CJS.

This study explores the use of conventional identification methods and DNA technology [And other related technologies] as a tool to combat stock theft in the

in the SADC region. The traditional methods of physical matching of animal hides, bones and ivory with animal identification tools, such as brand marking, were integrated with the use of DNA technology to combat stock theft across this region. The researcher also looked at the possibility of introducing DNA technology into the current legislative frameworks and other relevant conventional methods of combating this crime. This study aims to provide a positive and significant contribution to creating safety and protection for livestock, the economies of SADC communities, and the rural livestock farmers. This can be addressed by offering empirical foundations for the use of DNA technology by rural livestock farmers, with the cooperation and integration of conventional methods within this region, furthermore, the evaluation of the current stock theft combating strategies by means of the available literature and operational combating practices, with the view that not much has been written about the nexus between the use of DNA technology and stock theft to effectively combat the latter.

Clack (2013:77) argues that agriculture is one of the cornerstones in any country's economy. Therefore, the various crimes committed within the rural agricultural communities have to be researched, as they affect the economy and food security of the country. As stated earlier; researchers in the field of humanities and related research areas neglect the importance of crimes committed in the rural areas of SADC region. Thus, the conceptual and empirical research and identification of gaps in existing literature were deemed pivotal and analysed by the researcher. The research relating to stock theft prevention in conjunction with the use of DNA technology to combat stock theft in the SADC region was also considered to find possible solutions against this scourge, with a hope of broadening and expanding the body of knowledge in the field of policing, forensic science and investigation.

The discussion in this study revolved around the roles and competencies in respect of combating stock theft with the conventional identification methods and DNA technology [And other related technologies], as well as the successes and challenges experienced by countering stock theft without the benefit of the application of these 02 avenues. Based on the findings of this study, the researcher will make conclusions and recommendations for future improvements and intervention systems by offering recommendations to better prevent this crime within the SADC region. It is hoped that the findings of this nature will also be used to better understand diverse experiences in conducting research for specific needs and values aligned to the use nor application of these 02 methods of combating stock theft in this region, to create educational materials, or design interventions, to assist relevant stakeholders by providing services, and to further inform further policies related to the livestock sector.

Methodology

Maluleke (2016) shares that this qualitative study was carried out with questions that were tailored along the descriptive and exploratory paths and complemented with the use of inductive Textual Content Analysis (TCA) of both the FGDs and KIIs, some conducted telephonically, supported by documentary studies. The participants

were drawn from South Africa and other selected SADC countries. A purposive and snowball sampling techniques were utilised. The sample size of 60 participants formed part of this study, consisting of individuals attached to the 'Department of Agriculture, STUs coordinators and members, prominent livestock farmers, leaders and members of Community Police Forums (CPFs), as well as the Anti-Stock Theft Association managers. During the record-taking process, the researcher took notes, with a view to writing a more detailed and complete reports afterwards. A voice recorder was also used for these interviews, with a view of transcribing the information gathered at a later stage. The researcher then organised the obtained data by categorising it based on themes, concepts or similar features. Therefore, the researcher read the data several times to grasp the selected participants' perceptions on this subject. This was done by making cryptic written notes of what the participants were saying during the FGDs and KIIs to elicit the identified Three (03) study themes. The researcher further ensured that the elicited data answered the 02 objectives of this study, Matlala (2012), Maluleke (2014) and Manganyi, Maluleke, Shandu (2018).

Literature review and discussions: selected Southern African development community and african countries initiatives

Reference in this study is made on the use of the conventional identification methods and DNA technology/technologies [As an aid to the traditional methods of combating stock theft in the SADC region. The utilising of DNA technology assists 'Anti-stock theft' efforts by providing considerable evidence resulting from physical matching, soil analyses and manure samples. DNA technology, therefore, enables commercial and emerging subsistence livestock farmers, as well as other interested stakeholders, to more effectively combat this crime by obtaining successful prosecutions in court.

Identification methods: international and local standards

Ear-notching: This practice is widely used in the swine industry as a system of animal identification. There are variations in systems, but all of them identify a pig by litter number and individual pig number. Ear-notching can also be used in other animal species, but it is not used as widely as it is in the swine industry. This method involves removing V-shaped portions of the pig's ear that correspond to a specific litter number and an individual pig number from that litter. Not all operations find it necessary to notch ears at processing, and some may notch only a litter number, or the week of birth. It is necessary to notch a pig's ears for litter and individual numbers, when the pig has to be recognised separately from other pigs. Pigs being kept as replacement breeding stock and for exhibition purposes have to be ear-notched. Ear-tags are often used in conjunction with ear notches in a breeding herd (Neary & Yager, 2002:2).

There are many systems of Ear-notching, but when using the system of ear-notching required by the purebred swine associations of the United States (US), the litter number is notched in the pig's right ear, and the individual pig number is notched in the pig's left ear. The notches from the right and left ear should combine to give each

pig a unique identification number. The researcher holds the view that other small stock such as goats and sheep cannot be excluded from this type of identification system. The notches are numbered from the bottom of the ear, with the number one being next to the head. Multiplying this number by three will give the next notch number, for example: 3, 9 and 27, which is adjacent to the area where the previous notch was located. Start at the bottom of the ear next to the head and continue to the top of the ear, then work back towards the head. The exception to this is the tip of the right ear, which is the position for the 81-notch. Each Ear-notch, with the exception of the 81-notch can have only 02 notches for any single number (Neary & Yager, 2002:3).

Ear-tags: Are the another common form of identification used in all species/livestock. A number of companies make and sell ear-tags and corresponding applicators. The flexible plastic tags can be bought pre-numbered, or they can be purchased as blank tags. The producer can use ear-tag ink to number them accordingly. The tags come in a variety of colours and sizes. Selection depends on the age of the animal and the environment where the animal lives. The tags are pierced through the animal's ear, and allow for animals to be identified from the front and the back, if the tag is numbered on both sides. The tags should be installed between the second and third cartilage rib. Ear-tags are easy to use, flexible in all types of weather, inexpensive, and usually easy to read. There can also be limitations in respect of ear-tags. They can be ripped from the ear, or become lost if not applied properly. Permanent marking ink is used to number blank ear-tags. However, the ink can fade over time. It is recommended that another method of identification be used along with ear-tags (Neary & Yager, 2002:3).

Freeze-branding: This is another method of animal identification that allows for animals to be identified from a greater distance than with ear-tags. Brands can be read at any time of the year. This method is similar to hot branding, involves the use of branding irons, with letters and numbers being chilled in liquid nitrogen or dry ice and alcohol. Upon application to the animal's hide, the chilled branding iron kills the cells that produce colour pigment in the hair follicles, but does not kill the growth follicles. After freeze-branding, white or colourless follicles are produced in the branded region, which results in a permanent brand. Freeze-branding irons come in various sizes and are usually made of copper, copper alloy such as brass, or bronze, because of their temperature-holding capacity (Neary & Yager, 2002:4).

Table 1: Hair colours and identification application times

Hair colours	Application times at weaning (Add 15 seconds for yearlings)
Black	45 seconds
Dark Red	1 minute
Yellow	1 minute, 15 seconds
White	2 minutes, 15 seconds

Source: Neary and Yager (2002:4)

Neck chains: According to Neary and Yager (2002:6), the 'neck chains/ropes' are commonly used as a method of identification in dairy cattle. The neck chains have

a numbered tag attached that corresponds to that animal's identification number. The chain or rope should be positioned around the animal's neck, tight enough not to slip over its head, but loose enough to allow easy breathing and growth for young animals. The chains/ropes are easy to apply, painless to the animal, and can be seen fairly well. However, if growing animals are not inspected frequently, the chain can become too tight. The chains can also become caught on protrusions that choke the animal. Furthermore, the chains are not permanent, and can be hard to see when animals are grouped together.

Nose-printing/printing: This is similar to finger-printing, in that the lines and dotted pattern from a nose print are specific for each animal, and can be recorded by making an ink print. When 02 prints of the same animal are compared, there must be six identifiable matching lines or dots common to both prints. The nose-printing is used as a form of permanent identification, and is most commonly used for the sale and exhibition of sheep and cattle. Nose printing is useful, because it cannot be modified in any way, unlike many other forms of identification. Subsequently, the printing is performed by restraining the animal's head, either in a head gate or with a halter, and placing a minimal amount of ink on the animal's dried nose. The ink is then transferred to an index card, supported by a wooden block or stiff backing, by pressing the card against the animal's nose. If the prints are readable, they should be allowed to dry, and clearly identified with the owner's name and the animal's identification number. Problems associated with nose printing include the use of too much ink, a build-up of moisture on the animal's nose, and not holding the animal still, which can result in a smeared, unreadable prints, Neary and Yager (2002:7).

Paint-branding: Neary and Yager (2002:7) mention that paint-branding is a temporary form of identification. It is sometimes used along with a form of permanent identification. Irons similar to those used in freeze-branding or hot branding can be used to print a number on the animal's back, using paint. This method of identification may be useful in situations where animals are assigned to specific pens or crates and have to be returned to the same pen or crate after they are turned out. Examples are a farrowing or gestation barn, a lambing pen, or livestock shows. Paint-branding can also be useful when offspring have to be identified with their parents. For exhibition or sales, paint-branding is useful as a form of temporary identification because it is easily visible, and it is used to identify the animal in the sale directory. Prospective buyers can evaluate their selections before purchasing. During most livestock sales or shows, animals are paint-branded as they are weighed in. The paint numbers are usually applied on the left side of the animal for consistency, reading the number from the animal's head to its tail. Special paint is poured into a shallow pan, lined with burlap or a similar material to soak up the paint, Neary and Yager (2002:8).

Tattooing: Neary and Yager (2002:8) highlights that tattooing is another form of permanent identification that is commonly used for all species, and involves imprinting an identification number/letter combination into the skin of the animal, using indelible ink. The tattooing instrument uses number/letter dies made of sharp, needle-like projections that are secured on the application pliers. The ink is usually applied to the tattoo site after it has been disinfected with alcohol. Using the pliers, the identification number is pierced into the skin, and additional ink is rubbed into

the punctures. After healing, the permanent tattoo will be visible. For cattle, goats, sheep and swine, the tattoo is placed above the first rib of the ear so that it does not interfere with the use of ear-tags. Horses are often tattooed on the inside surface of their lips. Moreover, sheep can be tattooed on the inside of their flank, and swine can be tattooed on the shoulder for carcass identification during slaughter. Most purebred animals are required to be registered and permanently identified by their breed associations.

The tattooing is the best permanent method of identification for registered animals because it does not harm the animal's appearance or reduce its value in any way. The best time to tattoo depends on the species of animal. Cattle are easiest to tattoo when they are young calves. Goats and sheep should be tattooed at about 6 months, when the ear tissue has finished growing, and there is more space to apply the tattoo. Horses should be tattooed as late as possible because as the animal grows, the tattoo will fade and become spread out. Swine can easily be tattooed at a young age, but as the animal's ear or carcass grows, so will the identification number (Neary & Yager, 2002:8).

Table 2: Methods of animal identification, efficiency rating, and animal welfare ratings

Animal identification methods:	Efficiency ratings:	Animal welfare ratings:
Branding	20	10
Ear-tagging	70	75
Ear-notching	50	45
Tattooing	15	65
Noise printing	10	85
Biometrics	75	85
RFID Technologies	90	95

Keys: Ratings range from 0 to 100, as follows: 0-25 = Poor, 26-50 = Acceptable, 51-75 = Good, 76-100 = Excellent.

Source: Silveira (2013:22)

Apart from the identification systems discussed in the past section, some of the well-known traditional methods for combating stock theft include the 'animal bells, lamps, Livestock Guard Dog (LGD), livestock insurance, and livestock wealth' in South Africa, as indicated below:

Animal bells: In some cases, goat bells are used to scare off pot-slaughterers, and other animals such as cattle and sheep are no exception. These bells serve as an early warning system when the animals become restless or are chased (Oosthuizen, 2012:1). In other instances, they act as a form of detection of the location of an animal while grazing.

Lamps: Paraffin lamps can be lit at night and placed in paddocks, together with solar lamps. The lamps can also be used to illuminate kraals, which will serve as a deterrent. It is important that the lamps are managed by the farmer himself to maintain the element of deterrence. If the word spreads among employees that the lamps are

unattended, and the information reaches prospective stock thieves, these lamps will be useless (Oosthuizen, 2012:1). However, it should be mentioned that they act as a deterrent factor in this regard, more especially for the rural livestock farmers where technological equipment to police this crime is beyond their reach at times.

Livestock Guardian Dogs: Urbigkit (2016:1) highlights that some of the key factors in raising successful livestock guard dogs include acquiring dogs from working lineages, bonding of pups to the species to be protected at an early age, and managing the dogs in a working partnership with the shepherd. In definition, the Rural Living Today (2016:1) website indicates that the LGD refers to the dogs that spend their days and nights watching, roaming and patrolling, deliberately marking the perimeter of their territory, and barking out warnings to potential intruders, are large, strong and powerful, and are willing to fight to the death if necessary to protect their charges.

The Rural Living Today (2016:1) went on to reveal that the LGD are typically gentle and peaceful, unless provoked by intruders. They systematically respond to potential threats and perceived danger, beginning with deterrents and attacking only as a last resort. First, they seek to prevent the approach and entry of intruders by means of territorial marking. Secondly, they will deter approaching intruders with deep barking. Thirdly, they will repeatedly run towards an approaching predator to frighten it off. Finally, if the predator enters the dogs' territory and will not leave, the dogs will attack and fight as hard as necessary. On South African soil, because of the success of the Cheetah Conservation Fund's (CCF) livestock guard dog programme in Namibia, De Wildt's Wild Cheetah Management Project (WCMP) and Cheetah Outreach launched a trial programme in 2005 to introduce the Anatolian shepherd to serve farmers in South Africa. To give this trial the best possible chance of success, farmers were carefully selected and given an information booklet outlining the introduction and management strategies for their dogs that were collated from CCF literature and experiences, as well as veterinary protocols to ensure health. For optimal results, dogs have to be fit (Cheetah Outreach, 2005:1).

This was done to promote a good working diet and veterinary care; costs are sponsored by the programme for the first year. The rest is in the hands of the farmer, who must invest his personal interest during the initial critical period. This was regarded as the deciding factor that ensures success in the rearing of a productive guard dog. Since the programme was implemented, Anatolian guard dogs have been placed on farms in the cheetah range in Limpopo and North West Provinces, where livestock losses have been reduced 95 to 100%. Though mostly used to guard sheep and goats, for the first time in southern Africa, some dogs have been used to successfully guard cattle, and some are now guarding wild game such as Springbok and *Nyala* (Cheetah Outreach, 2005:1). In 2013, the Livestock Guarding Dog Project was expanded and split into 02 territories, namely: West and East. Deon Cilliers, a very experienced in 'Human-Predator Conflict Mitigation,' was hired as a second Anatolian field coordinator. Deon places and monitors Anatolians in Territory East (Limpopo Province), while Cyril Stannard continues to place and monitor Anatolians in Territory West (North West Province). In 2014, the LGD Project started placing Lesotho *Maluti* dogs outside the cheetah range to guard sheep and goats against smaller predators such as caracal and black-backed jackal. *Maluti* dogs were placed in the Western Cape, Free State,

Mpumalange and KwaZulu-Natal (Cheetah Outreach, 2015:1).

Livestock insurance in South Africa: South Africa is one of the few countries in Sub-Saharan Africa that offers agricultural insurance products. In developing countries, the demand for agricultural insurance is low. One reason for this is the limited understanding of insurance benefits. Insurance is seen as a non-practicable investment that is paid monthly, and claims are frequently not paid out. Farmers tend to be extremely aware of their production risks. At the same time, they may seem to exhibit “cognitive failure” because they can underestimate the likelihood or severity of catastrophic events (Mahul & Stutley, 2010). When it comes to livestock insurance, the value of animals covered increased dramatically between 2004 and 2012, Lombard (2015:21) citing (Bester, 2013). Cover for death of livestock includes pedigreed animals, such as cattle, sheep, and goats, but excludes bloodstock (horses), poultry, pigs, ostriches and game). All pedigreed animals must be insured. Livestock insurance includes products such as theft, extreme weather conditions, fertility, accidental death, mortality and epidemic disease cover. Mortality is influenced by management to a considerable extent. Mortality cover suffers when it is used by the highest-risk farmers (Mahul & Stutley, 2010; and Mutual and Federal Agriplus Product Summary, 2013).

Livestock Wealth: As founded in 2014 by Ntuthuko Shezi, a former Accenture strategy consultant and serial entrepreneur. In the process of acquiring farmland for the pilot of the idea, Shezi met Bill van Lelyveld, a Brahman-stud farmer and owner of Clanwill Farming in Vryheid, KwaZulu-Natal of South Africa. This is an innovative concept of creating a culture of savings and wealth building by Africans, using livestock as an asset class, thereby connecting investment as understood today to the way investment was done by the forefathers/ancestors. Livestock Wealth is an agency of the Gauteng Province Department of Economic Development Environment and Tourism (LEDET). It is emphasised that cows are a source of pride and wealth; however, the stock market is complicated and cows are easy. The agency exists as an answer to the way Africans invest. Their headquarters are at The Innovation Hub in Pretoria and the pilot farm is in Blood River, Zululand, South Africa. The company was launched to a global audience in July 2015 at the Global Entrepreneurship Summit in Kenya (Livestock Wealth, 2015a; and Livestock Wealth, 2015b).

Selected Southern African development community countries on the use of deoxyribonucleic acid and related technologies to combat stock theft

Botswana: Since 1999, Botswana’s Ministry of Agriculture has been implementing a large Radio Frequency Identification (RFID) and information system for cattle. The system is intended to ensure that all cattle in Botswana are identified individually and traceable throughout their lives, in compliance with new regulatory procedures required by the European Union (EU). This Livestock Identification Trace-back System (LITS) is intended to eventually monitor the entire national cattle population. Implementation is composed of 02 phases, namely: *Firstly*, the development of a central database and the identification of all the cattle in 02 pilot districts, and *secondly*, the countrywide implementation of the system. According to Stewart Sanders (Personal

communication, September 2003), full LITS implementation with the total national cattle identification is scheduled for the end of March 2004 (Germain, 2003:57) and (Botswana Police Service, 2011:6).

Against this background, Stock Farm (2015:7) reports that the principal Magistrate of Francistown in Botswana, Thabeetsile Molalu, has implored farmers in the North East district to cooperate with Zimbabwean authorities in strengthening anti-stock theft measures along the border between Botswana and Zimbabwe. Speaking during a one-day, anti-stock theft workshop in Matsiloje, Molalu further said livestock was of paramount importance to each community, both at subsistence and commercial levels. He called upon all role-players to strengthen their resolve to ensure that the situation is brought under control, if not eliminated completely. The government legislature has taken steps in a bid to address stock theft. A closer reading of the provisions of the Stock Theft Act (No. 21 of 1996) reveals that Botswana emphasises the need for farmers to take good care of their livestock.

For the purpose of this study, the researcher interpreted the LITS. The literature consulted at the time of conducting this study indicated that Botswana was enjoying three digital tagging systems, namely: Injected microchip; Digital ear-tag; and Reticular Bolus (Department of Veterinary Services [DVS] (2008:1). Based on their scientific evaluation, DVS decided to introduce a system based on the reticular bolus. This decision is in line with several other EU beef-supplying nations where the device is seeing increasingly widespread commercial usage. The characteristics of reticular bolus include the following:

- Made of very hard ceramic, the same as that used in humans for artificial joints.
- High specific gravity and quite heavy.
- About the size and shape of a small carrot.
- Contains an RFID microchip in the middle.
- No moving parts and no battery.
- Inert and safe, does not react with stomach acids and enzymes.
- Completely safe to human beings (DVS, 2008:1).

The technological advancement in Botswana confirm that the LITS, Forensic and Allied Services (FAS) has launched a livestock DNA test technology in Botswana in a bid to curb high levels of stock theft in the country. Stock theft is a major challenge for Botswana, as 4 004 cattle were reported to have been stolen in 2011. As a result, FAS has embarked on demonstrating different kinds of technology to farmers across Botswana, and introducing the DNA technology. They conduct tests to ascertain whether certain livestock actually originates from the herd, a key factor in determining whether it has been stolen or not. The then Botswana's director of Public Prosecutions, applauded the new development, by stating that the "DNA technology could assist investigators, it will help the courts in dealing with cases expeditiously as DNA findings are considered conclusive. The country's national veterinary laboratory had been sending samples to laboratories in South Africa, before FAS initiated the service (Botswana Daily News, 2012:1).

Table 3: The benefits of Livestock Identification Trace-back System to the Botswana nation

Area of interests	Descriptions
Nation	Long-term security for our established beef export market; and An additional marketing edge for Botswana beef in new export markets.
Cattle owners	Computerised brands certificates and herd cards available on demand from district offices; Computerised movement permits printed on the spot at kraals and cattle posts; Easy, on-the-spot access to detailed management information about your cattle from DVS staff; Reduced likelihood of cattle theft because of easy and tamper-free identification of stolen cattle; and Easy identification of stray (<i>Matimela</i>) cattle.
Government	Accurate information on the demographics of the national cattle herd; Accurate disease information to assist DVS in livestock disease management; A simple, tamper-proof Identification system available to the police, DVS and other Government organs with an interest in cattle ownership; and A linkage between cattle ownership records and the <i>Omanq</i> national registration system.
Number of cattle inserted so far?	2,4 million cattle out of 2,5 million.
Number of boluses recycled so far?	Over 600 000 boluses recycled over the last 2 years.

Source: DVS (2008:1).

Lesotho: Stock theft has been an existing phenomenon in Lesotho over the years, and it is nationally rampant and a transnational crime. Matlanyane, molahlehi, Ramachaea, Selimo, Moyeye and Mare (2011:1) point out that the economy of Lesotho is based on the factors mentioned below, among other things:

- Subsistence farming and animal husbandry.
- Export of wool and mohair.
- Small-scale industries that include clothing, footwear, textiles, food processing and construction.

✓ **Descriptions:** Livestock are stolen from the owner at the cattle posts, homes and Republic of South Africa farmers closer to the borders. Stock offences involve many animals - sheep, horses, cattle, goats, donkeys, and many others

and it is motivated by greed, perpetuated by illegal self-enrichment, and they are stolen for commercial purposes. The syndicates are active throughout the country, up to the Republic of South Africa.

- ✓ **Location:** Villages, mountain areas, foothills, and the Republic of South Africa. Stock theft cases are rare in urban areas.
- ✓ **Time of crime:** Winter seasons, festive seasons and night time.
- ✓ **Perpetrators' profile:** Young men, 21-40 years old, illiterate and unemployed; individuals, syndicates and livestock farmers are the masterminds.
- ✓ **Victim profile:** Stock owners remain victims of this crime, for example old people, single females, orphans and the disabled.
- ✓ **Techniques and methods used against stock theft:** Horse and mobile patrols; Intelligence-led raids and drives; Informants; Satellite police stations in identified areas; Joint operations with the Army, Lesotho Defence Force (LDF); Joint operations with SAPS; Simultaneous operations with SAPS; and Joint CPFs with *Setsoto* Municipality.
- ✓ **Other methods used:** Community policing initiatives such as communal kraals, communal cattle posts, neighbourhood watch, crime-prevention committees, public educational awareness campaigns, and social programmes.
- ✓ **Reporting mechanisms:** Physical reporting at police stations; Collaboration with media (Local radio stations); Suggestions boxes; Toll-free telephone numbers; Portable communication radios for the community in identified areas; and Use of cell phones by herd boys.
- ✓ **Successful techniques: 48% decrease in crime in past five years was probably caused by:** Close cooperation with almost all the spheres of the community; Communal kraals and cattle posts; Satellite police stations that intercepted the routes; and Joint operations with LDF and SAPS.
- ✓ **Future techniques:** Enforcement of Stock Theft Act (No. 4 of 2000); Implementation of anti-stock theft strategy; and Enhancement of cooperation with other stakeholders.

According to Kariri and Mistry (2005:1), the stock theft prevention strategies includes the following among others; one of the primary tasks of the available strategies are to search for stolen animals, to investigate issues related to stock theft, and hand over thieves to the police. They also hold regular meetings to discuss strategies for reducing stock theft and patrol villages at night to guard against theft. Membership fees are used to defray expenses incurred in their operations. The study conducted by Kariri and Mistry in the year 2005 in Lesotho shows that collaboration among Anti-stock theft associations from neighbouring villages increases the recovery of stolen animals. However, thieves who join these associations sometimes render them ineffective. In some instances, the Stock Theft Associations (STAs) cease to operate because of clashes with police and the murder of members by armed thieves. Moreover, the main intention of this sort of association is to promote community policing in general. Community policing, with the induction of CPFs are some of initiatives recommended by the police services and involves guarding the community against attack or theft or crime, thereby promoting public order and protecting the community against any threat. This kind of policing is carried out by community

members and coordinated by a chief, who consults with police officers. Furthermore, the police authorities initiated this project to encourage communities to establish community kraals closer to grazing posts. This is intended to gather group members of the community together so that an army officer or police official can be deployed at each grazing post or community kraal to protect them. The process of implementing these approaches to crime prevention is under way. The primary role of these committees is to report to the authorities where they suspect offences are imminent. As provided in the Criminal Procedure and Evidence Act (No. 26 of 1981), members of these committees, like all other citizens, are empowered to arrest and apprehend suspects, with immediate follow-up action to be taken by the police authorities.

They (Kariri & Mistry, 2005:1) further shares that the stock theft interventions in Lesotho are as follows:

- The roles of the different stakeholders are not clear with regard to stock theft issues, for instance the roles of the police and the chiefs are not adequately defined. For example, the chief writes a letter of introduction to the police on behalf of a victim of stock theft, who then goes to the police with the letter, only to be given a letter from the police to the chief that says the stockowner is given permission to search for his or her own animals.
- This letter serves as an introduction in villages that the stockowner visits to search for his or her stolen stock. The officer then investigates, after which he questions the victim. The chief then believes his role is only to write letters, and the police are of the view that their role is to take down statements and, where possible, help search for stolen stock, since a lack of resources hinders the ability of the police to engage in prolonged searches for stolen animals;
- The mandate applicable to the various stakeholders dealing with stock theft issues are not clear, therefore, their roles are not defined either. For instance, the STAs think that their mandate is to search for stolen stock, catch the perpetrators, and hand them over to the police. The police think their mandate is to take statements, fill in dockets and act as witnesses in court. Prosecutors view their role as going to court with a docket that has been completed by the police. These stakeholders have carved niches for themselves and do not try to address the problem in its entirety;
- The lack of resources hinders implementation of the strategies, the STAs and police patrols do not have the money to conduct extended operational searches for stolen animals. They lack essential equipment such as flashlights, bullet-proof vests, dry rations and shortwave radios;
- The STAs are rendered ineffective by violence: STAs are ceasing to exist, as members fail to patrol at night because they are afraid of stock thieves. Also, the inability of members to defend themselves against armed stock thieves means that even when they patrol, they can do nothing to prevent thieves from taking stock;
- Lack of a means of communicating with police makes it impossible to report stock theft in time for the police to respond: For communities that are far from police stations, it is impossible to report crime in time for an effective response

from the police. Reporting crime is at an all-time low as villagers feel it is futile; and

- Community policing is failing because of a lack of organisation: Due to the lack of formalised structures and remuneration, communities cannot agree on responsibilities.

Malawi: Germain (2003:58) notes that in 1999, the SADC Council of Ministers decided to urge Malawi to embark on an identification system. Therefore, through assistance from Food and Agriculture Organisations (FAO's) Technical Cooperation Program, an animal identification and trace-back system should be designed, and appropriate legislation should be drafted in order to support the adoption of the system and its endorsement into practice. The trace-back system would include:

- Registration of holdings, herds, flocks, animals, owners and keepers.
- Records of births, deaths, slaughters and movements of animals.
- Records of animal markings / ear-tags in livestock units.
- Records of the health status of individual animals, herds and holdings.
- Records of certified animal movements.
- Tracking and tracing of animal movements in case of disease outbreak.
- Data for meat labelling to reveal its origin, among others.

The law will provide a basis for legal obligations and rights of stakeholders and government in participating and supplying the necessary information. The proposal is actually intended to stimulate further investments and measures in order to achieve full implementation of the system.

Namibia: The Director of the Veterinary Services recommended the following post a visit of the 'Representatives of the Meat Board and the Directorate of Veterinary Services' in May 2002 to the offices of 'Director General of Health Directorate,' the implementation of an Ear-tag-based identification system. Currently, there is no compulsory individual animal identification but during a Farm Assured Namibian Meat Executive Committee (FAN MEC) meeting held on 13 August 2002, it was agreed to implement the Ear-tagging for use in export markets, in order to improve traceability. Concurrently, the meat board was initiating a project to improve the Veterinary Services permit system by creating a computerised issuance system with livestock movements recorded on a central server (Meat Board of Namibia, 2003) (in Germain, 2003:56). This system is still voluntary at the time of writing but the tags are officially recognised as a means of cattle branding for traceability purposes and will continue in order to fulfil the requirements of the Stock Brands Act (No. 24 of 1995) and the issues related to stock theft. The computerised issuance system is separate from Ear-tagging, which has to do with instant identification, traceability and market-related processes (Germain, 2003:56), citing (Meat Board of Namibia, 2003). With regard to Ear-tagging, some issues still need addressing in Namibia:

- Which animals should be tagged?
- Are all animals tagged from birth at farms, or only or when leaving the farms to the EU-agreed slaughterhouses/Abattoirs?
- How animals should be tagged, on which ear?
- What would happen during changes of ownership?
- What exact information would the tag contains, group identification or

individual identifications?

On the negative side, Germain (2003:59) quoting (Meat Board of Namibia, 2003), highlights that in Namibia, tail tags were dropped because of poor durability, and the visual ear-tag was chosen as the optimal device due to the medium low-cost, medium durability and medium readability for bovine identification. Each tag bears the farmer's animal brand code, for example, that is unique to the farmer and identifying the owner and the district, and contains a further special serial number. Although the system is intended for individual identification, at this stage it is used only to identify the farm of origin and the group of livestock. However, the presence of this serial number allows for a possible future individual identification. To this end, Namibia remains one of the countries for which no improved identification system is being implemented. Germain (2003:60) states that in most of the programmes described above, the expected output is individual identification for the animals intended for export. However, for some countries, it has not yet been determined whether to implement this individual identification or not. Most improved identification systems in fact begin with improved group or herd identification. As a result, although the Namibian system is intended in the longer term to be used for individual identification, it is currently used only to identify the farm of origin, like group identification.

Swaziland: The 1995 Livestock Development Policy highlights the necessity for a suitable Livestock Identification System that would strengthen livestock disease control and enhance livestock anti-theft measures in the country. In 2001, the Livestock Identification Act (No. 13 of 2001) was enacted to guide, support and enforces compliance with this policy objective. The implementation of the identification programme under the Livestock Identification Act, 2001 has been divided into 02 stages. Implementation of the first stage that involves branding of cattle with the country identification mark (shield) and herd mark (Diptank of origin number) started in 2006 and is ongoing. The second stage, referred to as the Swaziland Livestock Information and Traceability System (SLITS) is the computeriaation of the identification system and is implemented in a form of a Three (03) year project funded by the Government of Swaziland and supported by the FAO. The ultimate aim of the project is to develop a computerised livestock Identification and Traceability System that will effectively control and monitor animal diseases, inhibit local and cross-border stock theft as well as track livestock movements (The Government of the Kingdom of Eswatini, 2021).

According to Daborn, Ekodere and Van Aardt (s.a:1), livestock identification using branding marks, paint marks and ear-tags have long been practised as a means by which an individual animal or a group of animals can be uniquely, repeatedly and, ideally, reliably identified. Identification provides, among others, for proof of ownership, measurement of performance, disease monitoring, and surveillance and animal health certification. Increasing concerns for the safety of animal-source foods have added an important purpose of providing provenance and quality assurance by enabling tracing of an animal and its products along the production-market chain, for example from point of production through to point of consumption.

Daborn, Ekodere and Van Aardt (s.a:1) states that the LITs that rely on branding paint marks or ear-tags are subject to a number of reliability challenges and may require

time and effort to read. Brands can be altered/become illegible, paint marks wear off, and ear-tags can become illegible, lost or intentionally removed/altered. Reading and recording a given identification number are subject to human error, and much time is spent on manually transferring recorded identity marks to a computerised database. In recognition of these challenges, attention has been increasingly directed towards an electronic means of identification, such as the Electronic Identification (EID), inclusive of the RFID bolus, ear button and microchip. These provide acceptable solutions to the reliability and time challenges of conventional methods utilising the Visual Identification (VID) such as the VID, but come with their own challenges, such as expense/acceptability/application time for the bolus, expense/loss/removal of the ear button, and migration / food chain concerns regarding the microchip.

The use of EID provides for a much more secure, reliable and time-efficient method of tracing the provenance and history of a given animal, and any products derived from that animal. Using purpose-designed electronic readers, the EID can be 'read' and automatically recorded in a database along with any other desired information to provide a comprehensive history of the animal and its products. This database can be subsequently queried to provide Electronic proof (E-proof) of a quality-controlled production system and enhanced standard of animal health certification. The database can also be made readily accessible to high-end market customers, providing assurance of the origin and quality of the product, and justifying the levying of premium product prices, Daborn, Ekodere and Van Aardt (s.a:1).

The Department of Veterinary and Livestock Services [DVLS] (2004:44) reports that the University of Swaziland (UNISWA) has a university farm that keeps various livestock species for educational purposes. It has 02 main biotechnology-related laboratories, namely; the 'Tissue Culture Laboratory,' which has some capacity for tissue culture but at present has no facilities for heat treatment of cultures for disease elimination, and the 'Molecular Marker Laboratory,' which is fully equipped for Polymerase Chain Reaction (PCR)-based molecular marker analysis. It can also be used for DNA testing but has no capacity for DNA sequencing.

The Data Processing Unit of the DVLS uses a computerised system to assemble, validate, analyse and store cattle performance data from the National Cattle Breeding Programme. It maintains databases that could be used and developed further into an Animal Genetic Resources (AnGR) National Data Bank. Technical and financial assistance would be needed to upgrade the computing facilities of this unit and for the development of a national AnGR Information System capable of handling data from the proposed National Performance Recording Schemes. Human capacity to handle a system of such magnitude is, however, currently lacking and will have to be developed (DVLS, 2004:47).

The unit responsible for the AnGR information system will have to be incorporated into the Animal Genetic Resource Centre (AGRC). The purpose of the pilot programme is to provide evidence-based argument in favour of the performance and cost of microchip implants as a method of choice for EID and as a complementary Identification system to other forms of VID for branding in the case of the Northern Rangeland Trust [NRT] cattle (DVLS, 2004:44-47). Therefore, there is an urgent need for an animal breeding policy to address the various breeding practices, including

AnGR identification, maintenance of herd books, performance recording, evaluation of breeding values, and breeding programmes (DVLS, 2004:47). Against this background, Dlamini, Dlamini, Madlopha, Mthembu, Dube and Hlatshwayo (2011:1) presented the following:

- Stock theft is considered a major crime in Swaziland, and this conclusion is based on the following:
 - The Swazi nation considers livestock as their wealth and treasure, therefore their investment is in their livestock.
 - The Swazi people pay dowry, using their livestock, and it plays a major role in strengthening the relationship between the in-laws; and
 - Stock is a source of income for the Swazi Nation.
- ✓ **Focus:** The focus of the Swazi Nation is on cattle and goats, due to the fact that these are the stock most targeted by rustlers. Another reason is that most of the Swazi people concentrate on cattle and goats for their living.
 - ✓ **Perpetrators' profile:** Indians are mostly suspected in this crime; Local butchery owners; People from neighbouring countries such as South Africa and Mozambique, colluding with locals; Local people, some to pay dowry / *Lobola* to their in-laws; and Local farmers.
 - ✓ **Victim profile:** Commercial farmers and domestic farmers.
 - ✓ **Swaziland livestock:** Cattle and goats.
 - ✓ **Location:** Stock theft is committed all over Swaziland but is more prevalent in the *Lubombo* and *Shiselweni* Regions; the Shiselweni Region shares borders with South Africa and most of the stock stolen in this region is taken across the borders to the Republic of South Africa; and the *Lubombo* Region, on the other hand, shares its borders with Mozambique.

In support of the above-mentioned statement (referring to the information provided by Dlamini, *et al.* 2011:1), Hubschle (2010:82) states that in Swaziland, stock theft exists predominantly in rural communities bordering Mozambique.

- ✓ **Time committed:** Most of the stock is stolen during the night; some are stolen during the day from the grazing land, during the rainy seasons and *Marula* season.
- ✓ **Methods and techniques:** The methods and techniques to combat stock theft in Swaziland include the following, among others:
 - The STUs have been established in the four regions to detect and monitor the movements of stock.
 - Qualified veterinary officers have been recruited into the Royal Swaziland Police Service.
 - Laws regulating butcheries have been enacted.
 - The registers for local butcheries are checked frequently to determine whether they comply with the regulations
 - The Umbatfo Swaziland Defence Force (USDF) patrol the borderlines between South Africa and Mozambique, where the stolen livestock is often taken too.

- Tripartite meeting between Swaziland, Mozambique and South Africa.
- Specialised criminal intelligence is used to monitor well-known cattle rustlers.
- Awareness campaigns.
- Patrols involving the community and the police.
- Bilateral meetings and joint operations between Swaziland and South Africa.

As highlighted prior, the SLITS is a system of Livestock identification and traceability integrated within an Animal health Information System. The centre focus of the system is to make sure that each individual animal in Swaziland is traceable for life (Lifetime traceability). The system has 02 main parts. The first part involves animal identification and in this part, the priority species is cattle. The second part involves computerization of veterinary activities. This involves hardware installation and networking of veterinary offices and development of a registration, movement, animal health and brands database.

Animal Identification: An animal will be identified using 02 types of identifiers. The first identifier will be brand marks. This will identify the animal to the country and a group. The second identifier will be Ear-tags. From its design, this is meant for individual animal identification. Each individual animal will be double tagged.

Computerisation of Veterinary Services: A computer system will be developed to track all movements and health information of cattle from birth to death. The system is designed to follow the paper trail of the currently used permit system with some improvements. The system will have three parts. The first part is registration of Diptanks, kraal owners, and individual animals as well as animal movements. The second part is the animal health information system (Diseases, treatments, vaccination, and meat hygiene, among others) and the third part is the brands register.

The expected benefits of SLITS:

- Improve access to markets of livestock and livestock products.
- Assist in the recovery and identification of stolen and strayed animals.
- Assist in the reduction of stock theft and cross border cattle rustling.
- Assist in disputes over animal ownership among farmers.
- Assist in rapid containment of animal diseases in the case of outbreaks.
- Assist in production management.
- Improve efficiency of Government controlled movement permits (The Government of the Kingdom of Eswatini, 2021).

South Africa and other African and immediate SADC countries: Furthermore, Hubschle (2010:82) highlights that syndicates reportedly raid Swazi communities at night and make off with livestock. Occurrences have also been reported on the South-Eastern border with KwaZulu-Natal Province in South Africa. With respect to the Mozambican stretch of the border with Swaziland, a key issue influencing stock theft is the presence of 02 'Meat Wholesalers' in *Nomahasha*, whose major source of business is the informal traders who smuggle the meat to Mozambique. The reason for smuggling is that beef is almost 50% more expensive in Mozambique than it is in Swaziland. While both of these wholesalers get their supplies from Mbabane, one

imports its meat wholly from South Africa, while the other has a slaughterhouse in Mbabane. The latter is known to sustain its business by means of a significant number of cattle stolen across the whole of Swaziland. The price difference for beef between Mozambique and Swaziland also fuels cattle rustling and the theft of other livestock for smuggling to Mozambique. It is believed that smuggling takes place predominantly across the *Lubombo* Plateau, Swaziland's longest mountain range, between the 02 border posts of *Lomahasha / Namaacha*, and *Goba / Seshelweni*. Stock theft is a significant problem in Lesotho because of the large number of people who rely on stock for subsistence.

Thieves steal cattle from both local and South African communities and sell them to butcheries, use or sell them for ceremonies, or re-brand them for rearing. It is a market-based criminal activity and shows remarkable organisation at that level. The operational problem for law enforcement is in terms of establishing the frequency of offences by individual entities. This is because even after arrest, only the activities for which criminals are arrested are the ones that are taken into consideration. The retrospective activities of livestock criminals are difficult to establish, leaving in doubt the element of continuity. For example, stock criminals do not leave fingerprints or paper trails that can be referred to by law enforcement in future investigations. To the contrary, several stock theft cases over the last few years have exhibited sophisticated organisation. Criminals either steal stock from the veld while the animals are grazing, or raid kraals during the night. In both instances, weapons may be used. It is understood that the incidence of this crime is significantly lower following the fatal shooting by the police of a notorious kingpin and key members of his syndicate. The following is a generic outline of the *Modus Operandi (MO)* of stock theft syndicates, Hubschle (2010:83).

Nkabinde (2015:1) reveals that the Royal Swaziland Police Service (RSPS) managed to recover stolen livestock worth Euros [E]3.5 million [About R60 774 665,00, by the time of conducting this study] out of the E7.5 million (Approximately R130 255 275,00) that was reported stolen in 2014. The total number of stolen livestock of 1 886 consisted of cattle, goats and sheep. The annual performance report of 2014 shows a 2,8% decline in stock theft cases, compared to 2013. Despite the decline, this crime continues to be a menace, as over E7.5 million worth of livestock were stolen during the period of 1 January 2014 to 31 December 2014. To illustrate the seriousness of the police to bring this problem under control, collaborative arrangements with counterparts in Mozambique have been strengthened. A similar arrangement with the SAPS is in the pipeline. In addition, joint operations to investigate and recover stolen stock are held regularly. It was also reported that an operation code-named '*Sondeza*' was recently conducted in the Mpumalanga Province in South Africa, covering *Donga*, *Vlackfontein*, *Belfast*, *Badplaas*, *Sandleni*, *Lukwatini*, *Oshoek*, *Waverly* and *Nerston*. This operation was also attended by Swazi cattle owners to help the police in identifying their livestock.

The combination of all these efforts aimed at combating stock theft has resulted in the recovery of 888 head of cattle valued at over E3.5 million. The arrests of 65 suspects give a similar glimmer of hope that this problem will ultimately be overcome. In 2014, a 2,8% decline was reported, compared to 2013. The report further states that

“Despite the fact that the number of stock theft cases recorded during the year under review shows a 2,8% decline in comparison with the previous year, this crime continues to be a menace as over E7.5 million worth of livestock has been stolen during this period (1 January 2014-31 December 2014). In a bid to curb the cases of stock theft, the National Commissioner of Police, reportedly held a series of meetings with traditional leaders, livestock farmers and communities from the *Mhlambanyatsi* Constituency, where strategies of dealing with the problem were discussed. Other meetings have been held routinely in all parts of the country by police, to sensitise the public about preventing stock theft, Nkabinde (2015:1).

Apart from the SADC countries, Myburgh (2007:33) states that during the period from the 6th-8th August 2003, a workshop on cattle rustling and illicit firearms crimes was held in Kampala, Uganda by the Eastern Africa Police Chief Cooperation Organisation Conference (EAPCCO). Delegates from Tanzania, Kenya, the Republic of South Africa, Sudan, Seychelles, Djibouti, Rwanda Uganda and the representative from Interpol were all present during the workshop. The aim of the workshop was to address the issues of cattle rustling in Africa and therefore determine the solutions that can be implemented. The main objective of the event was to pursue a sub-regional program of action to tackle and prevent cattle rustling. Myburgh (2007:33-34) further explains that in the plan of action to prevent cattle rustling in the Eastern Africa the following were decided upon improving the regular measures by implementing regional, international instrument and agreements. This includes the use of the International police (Interpol) agreement on the Mutual Cooperation on Combating Crime for countries within the Eastern Africa region with the United Nations Convention on Trans-national Organised Crime. Thus, a new legislation and regulation was developed after reviewing all existing legislation and identify all the necessary amendments, where appropriate relating to cattle rustling, stock theft, branding and registration, movement of livestock, sentencing as well as small arms and light weapons controls.

However, another workshop on the prevention of stock theft was held in *Bagamoyo*, Tanzania, only this group had more members from other states such as the representative of Kenya, the Republic of South Africa, Sudan, Seychelles, Djibouti, Rwanda, Uganda, Burundi, Ethiopia as well as Tanzania attended the workshop. All the countries represented presented their current encounter on stock theft, for instance Burundi indicated that they did not encounter any problems relating to cattle rustling whilst Djibouti had the unique problem of camel rustling. All other issues that were discussed during the first workshop (The 1st The Southern African Regional Police Chiefs Co-operation Organisation (SARPCCO) conference from the 7th until the 10th of May 2002 in Arcadia Hotel Pretoria were once again discussed, addressed and feedback on the progress was given (Myburgh, 2007:34). In Kenya stock theft or livestock raiding was traditionally done to replenish the herd that was lost because of drought or disease. Lately in Kenya, cattle rustling had been commercialised and prosperous businessmen, politicians, traders or local people were mixed up in stock theft for financial gain (Kaimba, Njehia & Guliye, 2011:5). The main reason for stock theft in Swaziland was that the meat prices in Mozambique were almost 50 percent more expensive. It was known that a slaughterhouse in Mbabane sustained

its business with stolen cattle from Swaziland. The high meat prices in Mozambique also stimulated stock theft in Swaziland (Hubschle, 2010:121).

Networks are formed by thieves who committed cross-border crimes, this problem was aggravated by the thieves from QwaQwa who were collaborating with their counterparts from neighboring Lesotho with whom they exchanged stolen livestock (khoabane & Black 2012:122). Furthermore, Lesotho poverty causes people to steal cattle. Khoabane and Black (2012: 134)'s study in Lesotho establish that stock theft contributed to livestock reduction. The main causes of theft were increasing poverty among the unemployed workers and drought stricken crop farmers. However, stock theft also had a serious socio-economic effect on the households as it impoverished the people from whom the cattle were stolen (Malekano, 2000:56).

The increase in stock theft was clearly connected to increasing poverty in the area. Mine workers were retrenched and sent home, and the young are unemployed and cannot get work in Lesotho or South Africa. This rise in unemployment aggravated household and community poverty and supplied willing workers for the stock thieves. Stock theft raiding created added impoverishment, uncertainty and distrust and stimulates the growing cycle of theft and counter-theft (Kynoch & Ulicki, 2001:125). Crime like stock theft, house robberies and muggings were caused by unemployment and poverty. The life of the community members at risk were made difficult by hooligans who resorted to gangsterism (Malekano, 2000:52). At one stage or another, many countries were involved in border conflict with their neighbours. The conflict between South Africa and Lesotho was not unique. A border issue such as boundaries that are not clearly defined is the most common cause of conflict. Border conflict could take on different forms such as war, cattle rustling and poaching. This happened because the people claim that they have the right to be there as it was theirs previously (Malekano, 2000:58). This clearly indicates that stock theft had become a well organised crime where big amounts of money were invested.

The farmers who are farming near the Lesotho border from where the stock thieves are operating are vulnerable because they often found themselves 'at a wrong place, at a wrong time' (Philips, 2012:45). The animals might not be in sight of the farmer for 24 hours a day and there are no border controls or any military patrols to protect the borders between South Africa and Lesotho. The farmers stay in rural areas with a mountainous landscape (Phillips, 2012:46) and could easily fall prey to stock theft, with no police close by to prevent it. People, who are helping commercial and communal livestock owners tracking stolen animals into the Drakensberg Mountains and even into Lesotho, are shot at by the *Basothos*. The South Africans are not allowed to be armed when entering Lesotho to track animals and therefore have to rely on SAPS to provide armed cover (Phillips, 2012:48).

The root causes of stock theft are limited to a well established and widespread economic, demographic and political processes within a community that cause communities, or part thereof, to be unsafe and vulnerable. One of these root causes is the expansion of the Lesotho population. This population needs to provide for its livelihood. Currently they have an unemployment rate of 25%. Their livelihood is affected by availability of land and resources for farming. Further, the lack of education causes unemployment and prohibits a decent wage. This could result

in people resorting to stock theft as a means of livelihood (Collins, 2011:46). The South African farmers in Kwa Sani do not have access to the political support of the decision-makers to help them curb stock theft, to deploy more military personnel for border control and police to patrol the area in the communities next to the border (Collins, 2011:52). According to Wisner (Philips, 2012:59), it is an image that resembles a nutcracker, with increasing pressure on the farmer arising from either side, from their vulnerabilities and associated effects. The 'release' concept is incorporated to conceptualise the reduction of disaster, which in this case is stock theft, to relieve the pressure. Nevertheless, to achieve this, vulnerability has to be reduced (Collins, 2011:67). Positively, the year 2021, South Africa has seen a decline in stock theft across all provinces for the first time, which has resulted in a cumulative 'saving' of about R100 million for the period. This was according to National Stock Theft Prevention Forum (NSTPF) Chairperson, Mr Willie Clack (2021) (in Marais, 2021), speaking at the Red Meat Producers' Organisation's (RPOs) virtual annual general meeting held on the 6th August. He hinted on the following in verbatim:

"We are still unsure exactly what led to the national decline in stock theft, though we have seen a slight increase in sheep theft, the big change was brought about by the fact that 10 000 [Fewer] head of cattle were stolen in the past reporting year. "Goat theft is, however, still a source for concern. It looks as though 7 000 goats are stolen every year. This figure [remains] stable, and that is of concern, because we need to make a plan to decrease this."

It is also reported that in 2020/20 the total value of cattle stolen was just over R779 million (2019/2020: R862 million). Authorities were able to recover stolen cattle valued at more than R210,6 million (2019/2020: R251,2 million). The value of stolen sheep amounted to almost R212 million for 2020/2021 (2019/2020: R206 million). The losses suffered due to the theft of goats were just over R116,8 million in 2020/2021, while the losses amounted to almost R111,4 million in 2019/2020. Clack (2021) (in Marais, 2021) went on to share this verbatim expression on this subject:

"South Africa is unique in the sense that we are the only country in the world that officially keeps track of stock theft, from the data we've been able to establish that thefts rise and decline in five- to seven-year cycles."

Clack (2021) (In Marais, 2021) also identifies South Africa's former homeland regions and densely populated areas as the main areas of concern when it came to stock theft, by providing the following verbatim notes:

"There is a clear route stretching [from] Umtata [across] the Transkei, the KwaZulu-Natal Drakensberg and Harrismith [areas] to Gauteng, where stock theft is very prevalent. The Taung [area] of North West is another area of concern." There were still many challenges that needed to be overcome if the farming community was going to win the war against stock theft, we need to change the current culture where we as farmers are constantly asking why we should do something, such as registering and marking animals, to a culture where we should ask 'why not?' Farmers should stop looking for excuses not to do something."

Clack (2021) (In Marais, 2021) also explains that to obtain a realistic picture of stock theft it was crucial for farmers to report incidences of theft to the SAPS. This is what pans out in verbatim:

"Often farmers will report thefts on WhatsApp groups, [to] traditional authorities, or security companies. However, this is not enough. You have to go to the [SAPS], no matter

how trivial it might seem."

Clack (2021) (In Marais, 2021) also expresses concern that the country's criminal justice system did not regard stock theft in a serious enough light by sharing the following in verbatim:

"Stock theft are often viewed as a petty offense, and the perpetrators are let go too easily. These individuals simply go back to stealing again."

In addition, Clack (2021) (In Marais, 2021) further calls on insurance companies to start sharing the information they have access too, as this could also aid the prevention of stock theft. Moreover, Sergeant Thabo Shedrick Moletsane [During 2019/2020, Moletsane investigated 58 cases that led to 66 arrests. Of these, 45 went to court and resulted in 34 convictions] of the SAPS's Beaufort West STU, Western Cape (2021) (in Kriel, 2021) states that stock theft has increased greatly since he joined the unit, primarily because of the country's rising levels of unemployment and the fact that stock theft is seen as an easy crime. Most cases he investigates are of thieves taking a small portion of the livestock for their own consumption and selling the rest of the meat. Nevertheless, the past few years have seen a steady increase in organised theft, where syndicates steal large numbers of animals.

These crimes are far more sophisticated than when people steal for the pot, and often involve the use of specialised vehicles. According to Moletsane (2021) (in Kriel, 2021), most farmers do a good job of stock theft prevention and management. Appearing in court to testify against suspects is time-consuming. Fortunately, most farmers understand that failure to do so can result in a perpetrator going free. Local livestock farmers generally appreciate the importance of marking livestock properly, which is actually a legal requirement. The problem with unmarked or incorrectly marked animals is that it is difficult to build a case without being able to positively identify them. There is no proof that the animals/livestock were stolen.

When stock thieves strikes, Moletsane (2021) (in Kriel, 2021) advises farmers to count their animals regularly, otherwise they will not know whether any are missing, or if so, when the crime took place. Stock theft should be reported as soon as possible after it occurs. The longer you wait, the harder it is to solve a case. The livestock posts, too, should be visited regularly to check on the animals. Equally, care should be taken not to follow set routines, as this could make it easier for criminals to determine when the farm is more vulnerable. Moreover, technology is becoming an increasingly valuable tool in the fight against stock theft, and encourages farmers to invest in cameras to monitor hot spots such as camps near public roads.

Identified themes and challenges

There are issues that emerged during the fieldwork period and that the researcher thought were important for this study. The use of conventional and DNA technology [And other related technologies] for combating stock theft in the selected SADC region seems to be a new concept to the livestock farmers. This can be also stated that the CPFs leaders, Departments of Agriculture officials and other relevant stakeholders. Another development is that the STUs officials and Anti-stock theft associations are knowledgeable about the practice under investigation. However, the interviewed

participants noted that they faced various difficulties associated with stock theft. The data was collected around the presented themes. However, there was an indication that an improvement had to be made with regard to the current stock theft combating strategies within the selected SADC countries. This study acknowledges some areas where the stakeholders in these regions did fairly well in combating stock theft. It was also noted that the primary analysis of study data shows that there is still more to be done to combat this crime effectively. Therefore, the following 03 study themes and challenges were identified in this study:

Common usage of conventional methods to combat stock theft

It remains of importance to understand the operation of stock thieves. The participants indicated that there are various types of stock thieves. For instance, they work individually or in groups, and some of the local native residents are receivers and couriers in stock theft operations. We also have national buyers, facilitators and exporters, making this type of operation very lucrative. The study found that the livestock farmers in the SADC region heavily rely on the conventional methods to combat stock theft, for example branding, ear marking and gum marking deserve special mention. The Division of Crime Intelligence (DCI) operations should therefore be established at all costs, working under the Chairmanship of the National Intelligence Coordinating Committee (NICOC), and consisting of all relevant stakeholders, in order to understand the enabling factors in stock theft in this region.

Insufficient methods and techniques to combat stock theft

The STUs in the SADC region vigorously use DNA technology and other related technologies in the investigation of stock theft. However, the majority of the livestock owners are unfamiliar with the concept under investigation, with the exception of a few. They partly rely on DNA technology nor technologies to combat stock theft, yet it seems that their problems are far beyond this intervention system, as it was noted that they are negligent in protecting and being accountable for their livestock. Some of the participants indicated that the livestock farmers do not look after their livestock, they do not brand-mark them, and they do not count them either.

Limited prioritisation of stock theft scourge

The participants showed clearly that stock theft is not identified as a priority crime in general. They further view stock theft as one of the National Priority Offences (NPO), by remarking to the researcher that this crime requires national prevention or investigation. They said that combating and investigating stock theft require specialised skills, as guided by the legislative frameworks. The STU members specifically indicated that stock theft should be declared a priority crime, and that the message should be spread more widely than what is currently happening. They also called for the intervention of the Ministers of Police and for the matter in question to be elevated to the National Joint Operational and Intelligence Structures (NATJOINTS) in the SADC region for the staging of anti-stock theft operations within the provincial boundaries. They feel that the SAPS, South African National Defence Force [SANDF], LDF and USDF (Focusing on border security in the SADC region),

National Intelligence Agency (NIA), intelligence-led operations, Departments of Agriculture and all other relevant, co-opted stakeholders should be involved in order to address syndicates by means of major combating and investigative procedures.

Conclusion and recommendations

This study concludes that the conducted empirical fieldworks and consulted literature studies indicates that livestock plays a significant role in the livelihoods of the rural poor in developing African countries. Thus, stock theft, which has now reached an alarming level in the SADC region, has exacerbated the challenge of poverty, especially among rural households. The effects of stock theft on households include an enforced cut back in their consumption and/or sales of animal products as parts of the household wealth returns. It also removes their ability to sell livestock and use the proceeds to acquire other food and non-food products or expand and diversify their farming activities. Critically, stock theft often prevents household heads from investing in the human capital development of their children, and may result in a deterioration of the household's nutritional status adding to health expenses. The loss of livestock limits the coping strategies available for poor rural households in this region.

This study recommends that much-needed support should be directed at the livestock farmers by the government, SAPS management and other relevant stakeholders. Stock thefts have the potential to cause serious negative impacts, and there are indications of the crime diversifying and extending into new realms. This crime is not only affecting rural emerging livestock farmers, but also the established individuals in the commercial farming sector as well. It is a fact that if it is not successfully controlled, it will not only threaten the sustainability of the South Africa livestock sector but also the competitiveness of the sector to a high degree. Support is required for the development and adaptation of the conventional identification methods and DNA technology [And other related technologies] to combat stock theft in the SADC region. The SAPS, together with the relevant stakeholders as identified by this study and others, should develop and facilitate the integration of conventional methods of combating stock theft with DNA technology. This should be underpinned by policies and targeted programmes aligning with international standards, and aimed at enhancing the current strategies for combating stock theft in the SADC region and elsewhere.

The introduction of educational and training programmes and the provision of Knowledge Management, the relevant Acts, technological advancements and the promotion of corporate imperatives should be improved to manage the risks associated with stock theft, and to establish reliable strategies and rearing techniques to address this crime holistically. The relevant stakeholders in combating stock theft should maintain the flexibility to act on viable practices, the emerging rural livestock farmers should form part of the practices, and past research on stock theft should inform the present strategies for combating stock theft. It is recommended that cooperation between the relevant stakeholders, by using technological developments and adhering to more efficient regulations, should direct current stock theft strategies

towards the best combative, management and sustainable practices. In addition to other equipment, it is highly advised that all-terrain vehicles be supplied to the SADC region. This should further inform the state of other equipment for combating stock theft, as the lack of essential equipment seems to be a province-wide problem.

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