

Utilisation of ICT for improved livestock traceability: a case for Botswana, a developing country perspective.

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Abstract:

The paper aims to look at how the use of animal identification and traceability systems have been deployed in the country for improvement of animal production contributing to the country's economy and food security for the people. The study's concentration is on Botswana cattle traceability systems in the country. Livestock production is heavily relied upon for sustainability by people of Botswana. It is the most source of income followed by subsistence farming. The agricultural sector on the other hand faces a number of challenges such as population growth, shortage of water, climatic changes and urbanisation that hamper food production. According to Gosalamang et al.2012, Botswana has a livestock population of 3.36 million ruminants (cattle, sheep and goats) out of which 15 per cent falls under a well-developed commercial farming system, comprising cattle ranching and feedlots coexists with a large number (85 per cent) of ruminants under the traditional or communal grazing system (unfenced ranges) comprising small farms. The country's traditional livestock farming system is subdivided into two: (a) the traditional livestock farming system based on small herds or so-called cattle posts; and (b) the traditional livestock farming system, under the Tribal Grazing Land Policy (TGLP) of 1975 based on relatively large cattle herds being managed under the communal grazing system, but operating on a commercial basis (Gosalamang et al. 2012). On the other hand commercial cattle production system, comprising fenced ranches and feedlots, is highly specialized, employing modern animal husbandry practices and strategic feeding to produce high-value beef animals. Agriculture in Botswana is the main source of livelihood contributing 2.3% of the GDP, out of which about 70 to 80% was attributable to cattle production (BEDIA, 2007). Cattle in Botswana are kept under two production systems, that is, the traditional (communal) and commercial systems. Currently, the traditional system accounts for approximately 80% of the national cattle population, while the commercial system accounts for only 20% (BEDIA, 2007).

Information communication technologies (ICTs) have benefits of changing people's lives by improving access to information and sharing of knowledge. In agriculture it can enhance access to agricultural markets; improved agricultural practices and information. But in most cases in developing countries

farmers who are unable to meet traceability requirements run the risk of being marginalized. The study will also see if it is the case in Botswana.

The European Union defines traceability as "the ability to trace and follow a food, feed, food-producing animal or substance intended to be incorporated into a food or feed, through all stages of production, processing and distribution" The animal identification and traceability systems have been used for different purposes such as tracking animal movement, monitoring health, controlling disease, and managing nutrition and yield.

The target population of this study is cattle owners, the related stakeholders being the Ministry of Agriculture staff, livestock officers, livestock extension agents, the Police. The study will be limited to zone II which include among others South East District, Kweneng District and Southern District. Then within this district random sampling was done because it is difficult to identify an appropriate sampling frame for the study. The objectives of the study are: to determine the level of deployment of ICTs in Botswana animal traceability; to identify the types of systems used, to determine the role of the government in the systems deployment ; to identify the role of the farmer in the systems deployment, to determine the usefulness/benefits of animal traceability systems in animal production, food security and marketing of Botswana beef to the international markets ; to determine the challenges and limitations on the use of animal identification systems and recommend the possible solutions to the challenges. The findings will be presented in the form of tables, pie charts. This study is expected to inform policy makers in making decisions on the deployment and improvement of ICTs to transform Botswana Agricultural sector more especially the cattle industry.

Keywords: *Information communications technology, animal identification, traceability system, livestock production.*

1 INTRODUCTION

The livestock industry is the only sub-sector of the agriculture sector that has constantly remained a significant contributor to the national Gross Domestic Product (GDP). This sub-sector is operated through two systems, commercial farming system and the traditional livestock farming system. Through these two systems, Botswana cattle herd significantly produces mainly beef and some milk for sale. Most Botswana, predominantly residents in rural areas derive their livelihoods directly from agricultural production activities. Beef

production is by far the most significant sub-sector of the Botswana agricultural economy,

accounting for about 80% of its output by value, (Department of Agribusiness Promotions, 2011). The cattle population of around 3million exceeds human population of 2million nurtured in an arid climate that favours livestock farming more than crop farming. Botswana beef is primarily produced for export with 70-75% going to the EU countries and 15% and 10% going to South Africa and Norway respectively.

The ever increasing cattle population, quality of beef and international beef market are a source of pride for the country, hence the need to embrace and adapt to the new technologies to enhance production and retain the lucrative markets. The use of Information communication technologies (ICTs) have benefits of changing people's lives by improving access to information and sharing of knowledge.

2 OBJECTIVES OF THE STUDY

The objectives of the study were to determine the level of deployment of ICTs in Botswana animal traceability; to identify the types of systems used, to determine the role of the government in the systems deployment ; to identify the role of the farmer in the systems deployment, to determine the usefulness/benefits of animal traceability systems in animal production, food security and marketing of Botswana beef to the international markets ; to determine the challenges and limitations on the use of animal identification systems and recommend the possible solutions to the challenges

3 UTILIZATION OF ICTS FOR IMPROVED LIVESTOCK MANAGEMENT

The importance of ICTs in development process was long recognized and access to ICTs was even made one of the targets of the Millennium Development Goal No. 8 (MDG 8), which emphasizes the benefits of new technologies, especially ICTs in the fight against poverty. At a national level Botswana's long term vision 2016, commits to a Botswana with people who will be able to use and apply the potential use of computer equipment in many aspects of everyday life. Government plays a leading role in by coming up with initiatives that embrace the use of technology. In 2000, the Government took an initiative to adopt the use of technology in livestock management by introducing Livestock Traceability System (LITS). The paper seeks to investigate the systems used in Botswana, their benefits to the stakeholders involved and problems encountered.

4 TRACEABILITY

The European Union defines traceability as "*the ability to trace and follow a food, feed, food-producing animal or substance intended to be incorporated into a food or feed, through all stages of production, processing and distribution*"

[Moe \(1998\)](#) says "*Traceability is the ability to track a product batch and its history through the whole, or part, of a production chain from harvest through transport, storage, processing, distribution and sales*".

5 HISTORY OF LIVESTOCK TRACEABILITY IN BOTSWANA

According to Moreki *et al.* (2012) four methods of cattle identification exist in Botswana and these are ear notching, hot iron branding, conventional ear tags (usually plastic ones) and rumen bolus. Recently the country upgraded the methods by introducing another ear tag with a microchip device known as Botswana Animal Information Traceability System (BAITS). *See figure 1 below for the evolution of Botswana animal traceability.*

5.1

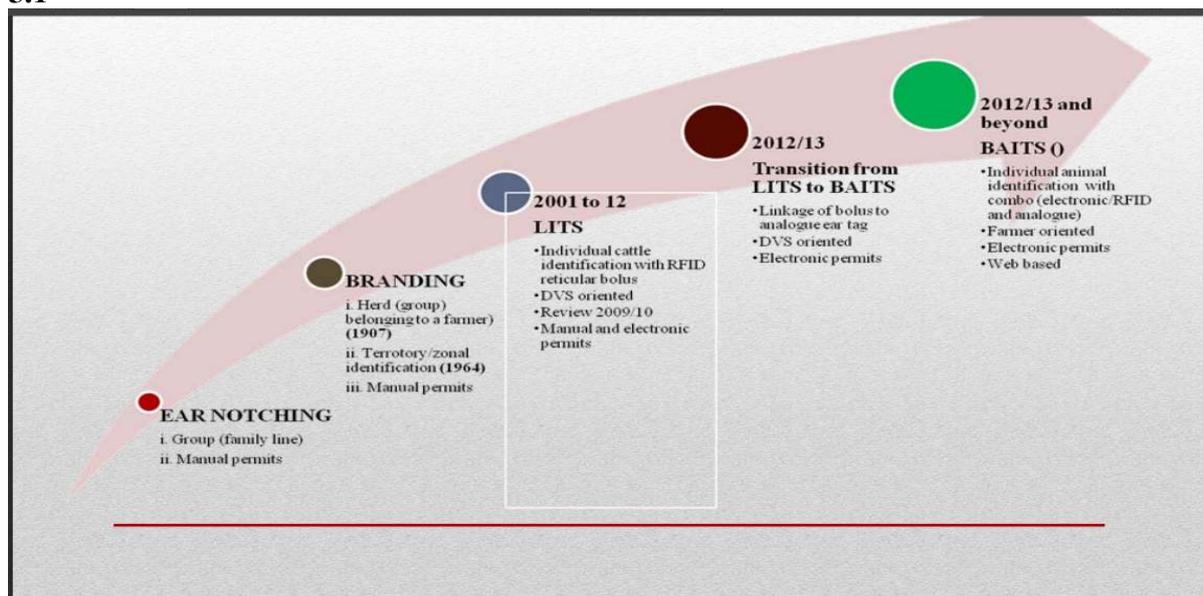


Figure 1 Evolution of Botswana Animal Traceability. Modisa (2015)

The four identification and traceability methods depicted in the figure above are mandatory and farmers use them simultaneously.

6 METHODOLOGY

The target population of this study is cattle owners, the related stakeholders being the Ministry of Agriculture staff, livestock officers, livestock extension agents, the Police. The study was limited to zone 11 which include South East District, Kweneng District and Southern District. Within these districts random sampling was done because it is difficult to identify an appropriate sampling frame for the study. Data was collected through the use of questionnaires which were administered during face to face interviews due to the diverse population consisting of educated and illiterate farmers. Questionnaires were personally distributed by researchers to the farmers. Researchers assisted farmers in cases where they could not read or write. To other stakeholders, i.e. Botswana Meat Commission, Ministry of Agriculture and the Police the questionnaires were administered to the head of the department or units.

7 FINDINGS

Seventy questionnaires were distributed through random sampling and two departments were interviewed, BAITs office and Police Office and one emailed to another department (BMC) which made the population of the study to be 73. Fifty eight questionnaires were returned plus two interviews are sixty responses making it 82% response rate.

Responses of farmers by age

Figure 2 below shows that majority of farmers with 43% are between ages of 46-55 and 16% are youth which ranges between ages of 18-35. This shows that majority of cattle farmers' falls in the middle age group while cattle farming is not popular among the youth.

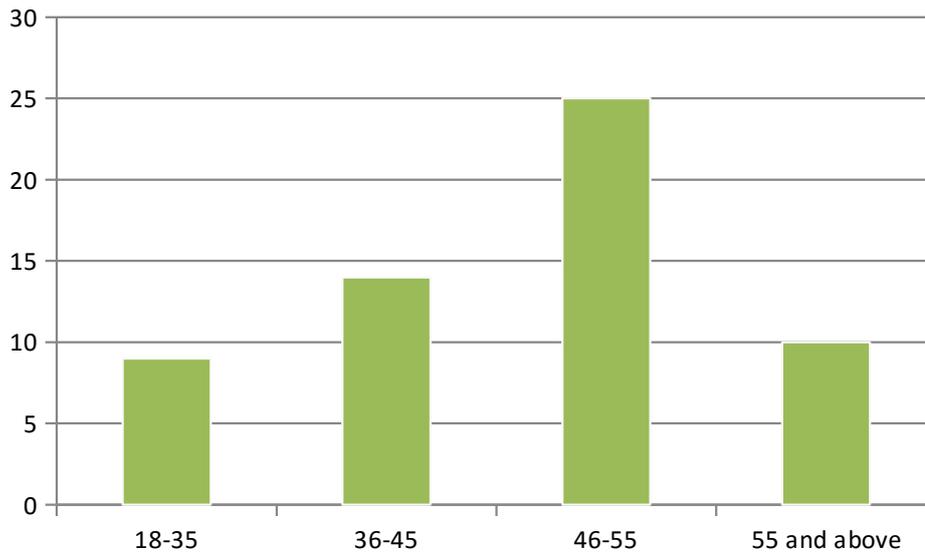


Figure 2 Responses by age

Responses of farmers by Education

The figure 3 below shows that 66% of farmers are illiterate while 34% are literate. Within the 34%, 22% do not have ICT skills, while 12% have ICT skills. Although there are 34% of farmers who are literate, there is high ICT illiteracy found among this group. Considering the 66% of illiterate farmers and 22% of ICT illiterate farmers, it shows that there is a high need of assistance in administering the system.

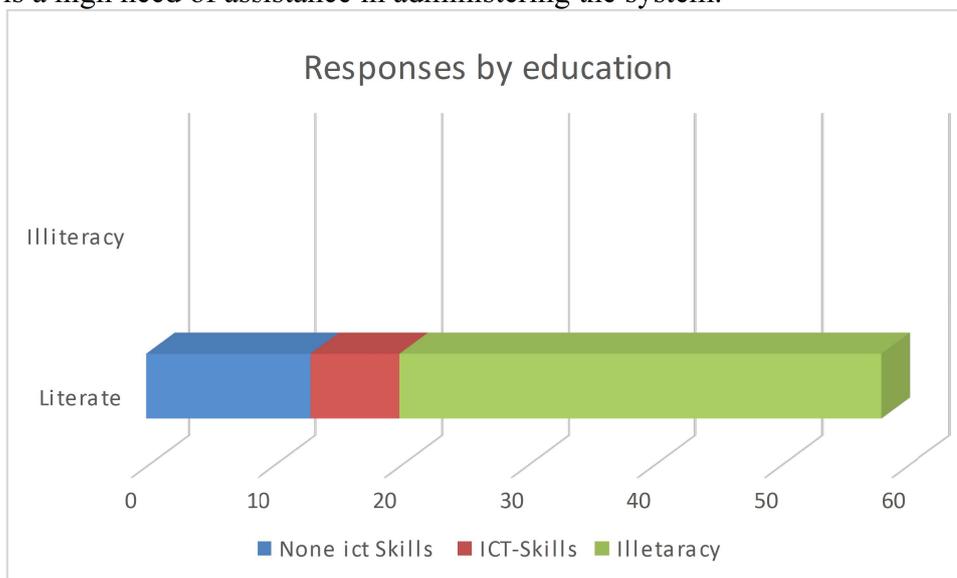


Figure 3 Responses by level of Education

Responses by type

Figure 4 below shows that a larger percentage of farmers- 93% practice cattle farming for subsistence purposes while 7% use it for commercial benefits.

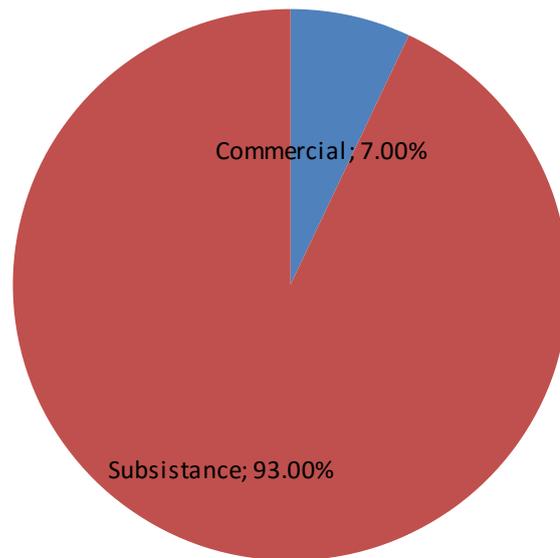


Figure 4. Responses by type of farming

7.1 To identify the types of systems used

Although there are a number of systems identified in the country, farmers are only aware of the Government mandated systems. Respondents were asked the systems that they are familiar with, all 58 respondents pointed to the LITS and BAITs facilitated by government. To determine at what level is BAITs deployed in Botswana. The country after the review of the then primary identifier known as bolus (Omang wa dikgomo) adopted Botswana Animal Information and Traceability System (BAITS) to address the gaps identified through the previous identification system. In actual fact this is an upgrading of the previous system. (Phokoje, 2016). The previous system was officer centered or government centered. The new system (BAITS) is farmer centric. It allows the farmer to tag their own cattle, effect ownership transfers, submit application for movement permit, report mortality, process replacement of lost ear tags, transfer ear tags and record arrivals and departures of all cattle. (Phokoje, 2016). This is indeed a cattle management tool for the farmer's livestock.

The system was rolled out in 2015. The country has about 200,000 farming community, about 2000 are registered users and 900 of these are active users of the systems. So far 615 480 tags were sold from which 419 061 cattle are tagged. BAITs office markets the system through print media, television programmes, agriculture radio programmes and workshops and seminars.

7.2 To find out the role the government and the role of the farmer in BAITs deployment

Table 1 Distinctive role of the government and the farmer

Role of Government	Role of the Farmer
Ensuring compliance with OIE standards	Purchases the keeper card and the also the combo which consists of the ear tag and applicator.
Capturing of animal and public health data	The farmer tags the animal and captures cattle data
Imposition of animal and public health controls	Buy Combo ear tag
Use BAITs data to inform decision making on animal and public health programmes, strategies and policies	Application of combo ear tags
Auditing on BAITs and holdings	On-line registration of ear-tagged cattle or manual submission to DVS or certified tagging and data entry agents
Build capacity on BAITs (certification of tagging and data input agents, staff, keepers and others)	Undertake transactions either on-line or manual submission to DVS or certified tagging and data entry agents
Develop, review and enforce legislation	Updating keeper ID information details on line or manual mission
Procure and resell ear tags	Query and retrieve reports on-line
Law enforcement by Police	Animal movement request and approval subject to animal and public health restrictions
	Notification of cattle deaths

The table above shows the distinctive roles of the two role player being government and farmer. The role of the government is regulatory while the farmer is the active participant in the management of cattle.

7.3 To determine the usefulness/benefits of animal traceability systems in animal production, food security and marketing of Botswana beef to the markets.

Table 2 Benefits of BAITS

Benefits of BAITS	
To Government	To Cattle Owners
Security for the Beef Export Market	Computerized Brand Certificates and Herd Cards available fast from District Offices
A Marketing edge for Botswana beef	Computerized Movement Permits and new Change of Ownership documents printed on the spot at crushes
Accurate Cattle Census Information	Reduced likelihood of Cattle Theft because of secure identification of stolen cattle
Accurate Disease Management Information	Easy identification of stray cattle
A simple, tamper-proof ID system which both the Public and government can use	1. Cattle management made easy
Linkage between cattle ownership records and the national registration system	Economic empowerment
More stakeholders	Cattle management tool

Table 2 above, classifies the benefits for both the regulator and the farmer. It is evident that the system has improved management of livestock by the farmer. The farmer is economically and socially empowered to control and manage cattle movement while the government regulates and facilitates and monitors animal public health controls.

7.4 To find out the challenges and limitations of BAITS

The respondents outlined the following challenges;

- Affordability
- Illiteracy
- Lack of computer skills
- Time factor
- Easily removed
- Access to ICT resources

8 RECOMMENDATIONS

The recommendations from this study which are mostly to the Botswana government are:

- Farmers should be trained on cost benefits of animal traceability systems
- Government should provide regular workshops
- Empower farmers with computer skills
- Government should engage more BAITS agents and farmers should train their herd boys
- Government should provide more centers of excellence

9 CONCLUSION

It is concluded that even though BAITs is still in the inception stages, it would go a long way in improving livestock traceability in Botswana. Already the benefits of the new system are appreciated through meeting international standards set by EU and World Organizations for Animal Health (OIE). BAITs help retain the country's competitive edge in the beef industry. The system has also empowered the farmers to be actively involved in the management of cattle through the use of ICT hence improving production and animal health.

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