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Piloting livestock identification and traceability systems in pastoral production systems in eastern Africa

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Preliminary report
December 2015



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Citation

Bett, B., Mutua, F., Kihara, A., Rogena, J., Ngwili, N., Muunda, E. and Wabacha, J. 2015. *Piloting livestock identification and traceability systems in pastoral production systems in eastern Africa*. Preliminary report. Nairobi, Kenya: ILRI.

1 Background

Two pilot studies on livestock identification and traceability systems (LITS) are being carried out in selected beef value chains in Uganda and Kenya to determine ways of implementing the systems in the region for improved livestock production and trade. LITS are increasingly becoming a key requirement for livestock trade as livestock markets become globalized and food safety concerns influence consumer behaviour. A number of countries in the region – notably Ethiopia, Sudan and Somalia – have had successful trade in cattle, sheep and goats with the Middle East and an effective LITS would help them maintain, and possibly expand, the existing markets. For the other production systems that are not export-oriented, LITS could be used to support animal health and food safety surveillance and deter livestock theft.

Questions have, however, been raised on whether the local livestock industry and the existing veterinary infrastructure can sustain LITS interventions once introduced. There are also valid concerns that these systems could increase costs and technical complexity of production and hence erode any profits that most producers and traders currently enjoy. No evidence has ever been generated to approve or disapprove these propositions and the references that are often used in stakeholder consultations are based on studies or experiences from southern Africa or other countries with advanced LITS and organized marketing systems.

This work represents an initial attempt to pilot LITS in pastoral production systems in eastern Africa. These systems were prioritized for this work because they produce the bulk of live animals and beef consumed locally and internationally. In Uganda, the study is being implemented in beef value chains that start in the primary markets in Karamoja (Amudat, Amudat district; Naitakwe, Moroto district and Kanawat, Kotido district) and terminate in slaughterhouses in Soroti, Mbale and Busia. The secondary markets being studied are Katakwi, Arapai and Bukedea. This area has had perennial insecurity associated with cattle theft and LITS is being proposed as an intervention to support the ongoing security interventions. In Kenya, the selected chains start in the primary markets in Ngorongoro, Tanzania and Narok and terminate in slaughterhouses in Ewaso Nyiro, Narok and Dagoretti (Nairobi). This is an area with a thriving livestock industry and LITS is being proposed as an intervention to support animal health surveillance.

This report documents preliminary findings and proposes some recommendations that are relevant for LITS policymakers. It is also intended to elicit responses from LITS experts which will inform the preparation of the final report.

2 Methodology

2.1 Designing a LITS framework to pilot

The Terrestrial Animal Health Code (Chapter 4.1) describes the general principles on LITS but no standards that can be used to typify best practices have been defined. Multiple LITS designs have, therefore, been used in various parts of the world with varying objectives. In this pilot, multiple local and regional stakeholder meetings were used to define the precision, breadth and depth of a desired system to pilot. Precision meant assigning unique identifiers to individual animals rather than to groups, breadth defined the range of data that the system could collect and depth defined

the primary market as the ultimate point to which animals captured higher up in the value chain could be traced back. Ear tags were chosen as the key identification device to use but other livestock identification methods such as painting, back tags and reticular boluses were allowed.

2.2 Activities

Table 1: Activities implemented at various points along the selected value chains

Value chain node	Point	Activity
Primary market	Entry	Animals are randomly selected and ear-tagged, their identification numbers (IDs), name and contacts of their owners, name of the source village or market, age, sex and colour are recorded by enumerators using electronic forms in smart phones.
	Exit	IDs of tagged animals, name and contacts of their new owners, destination market/village and the registration number of the transport permit issued by the market officials are recorded.
Secondary market	Entry and exit	IDs of tagged animals, name and contacts of their owners, origin/destination market or village and the registration number of the transport permit issued by the market officials are recorded.
Check/security points	-	Transport permits and the number of animals transported by each truck are verified (specifically in Uganda).
Slaughterhouse	Ante mortem	IDs, the last market the animal passed through and results of ante mortem inspection are recorded. Blood samples are collected from tagged animals and used for serological testing for <i>Brucella</i> spp., <i>Coxiella burnetii</i> and Rift Valley fever virus.
	Post mortem	Results of post mortem inspection are recorded. Lesions selected for reporting include tapeworm cysts (<i>Cysticercus bovis</i> and <i>Echinococcus granulosus</i>), post mortem lesions for contagious bovine pleuropneumonia and liver flukes. Muscle, liver, spleen and sometimes kidneys were sampled for drug residue screening.
		Summary diagnosis, based on the lesions observed as provided by the meat inspectors, was also captured

2.3 Data collection and management system

The Open Data Kit (ODK) (<https://opendatakit.org>) is being used to collect the data at each node in the value chain (Table 1). The data collection forms were designed and uploaded into the ODK aggregate server (<http://azizi.ilri.org/repository>) of the International Livestock Research Institute (ILRI) and then downloaded to mobile devices. Using these devices, data are being collected in the field and uploaded to the aggregate server at the end of each day. Figure 1 summarizes the flow of the data from the markets to the server and finally to a laboratory where statistical analyses are carried out. There are interactions between these points and additional data monitoring stations—for instance, the country or district offices—can be added if required.

2.4 Questionnaire surveys

Questionnaire surveys are being implemented to collect data that define levels of understanding and implementation of LITS as well as experiences and perceptions by the various market actors including producers, traders and transporters. These surveys include questions on livestock marketing and perceptions on the different identification methods used. The ethical approval for this work was obtained from ILRI's Institutional Research Ethics Committee. All respondents are required to provide informed consent before being recruited to participate in the study.

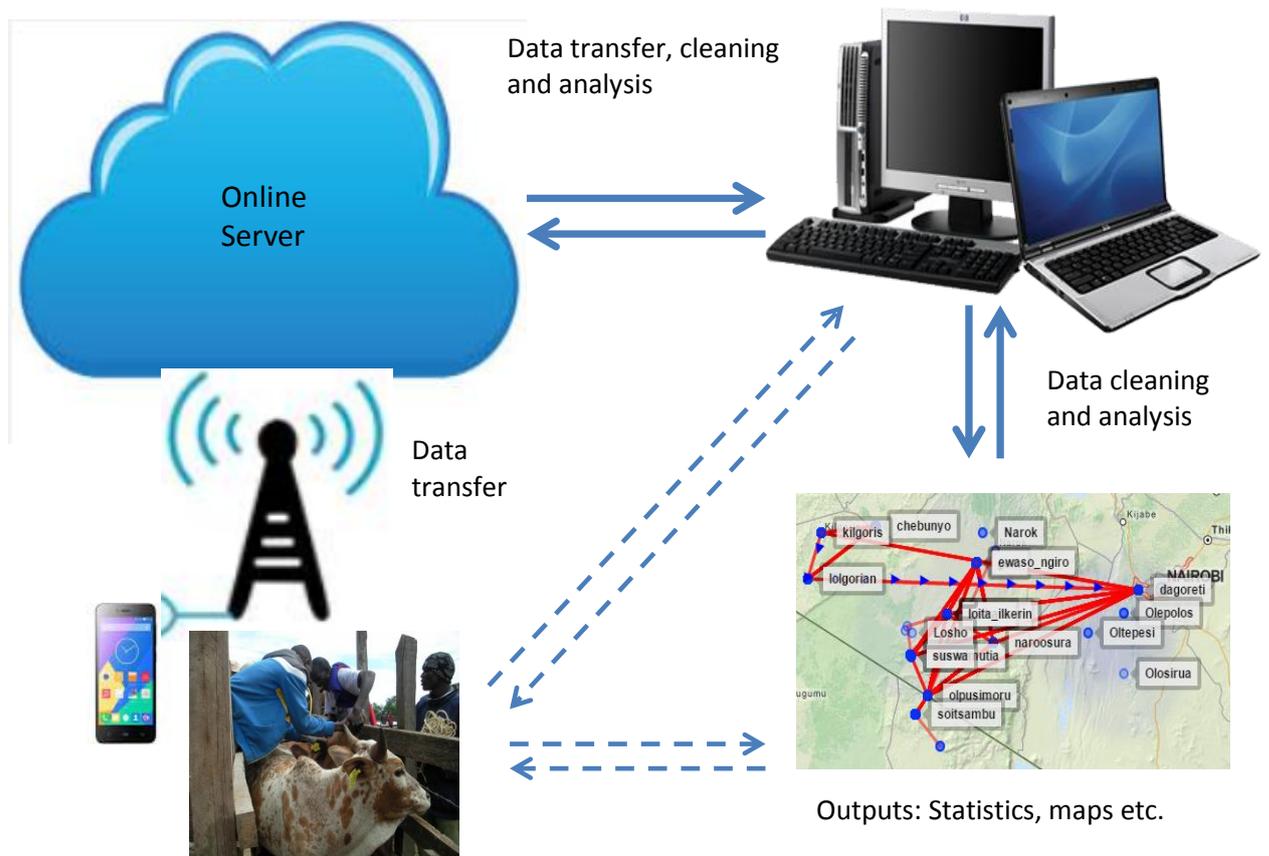


Figure 1: Data collection and management system.

3 Preliminary observations

Below is a summary of the preliminary observations.

- A total of 1256 records from 607 cattle in Uganda and 3114 records from 1186 cattle in Kenya have been entered into the traceability database. The movement patterns of these animals along the respective market chains are shown in Figures 2 and 3.

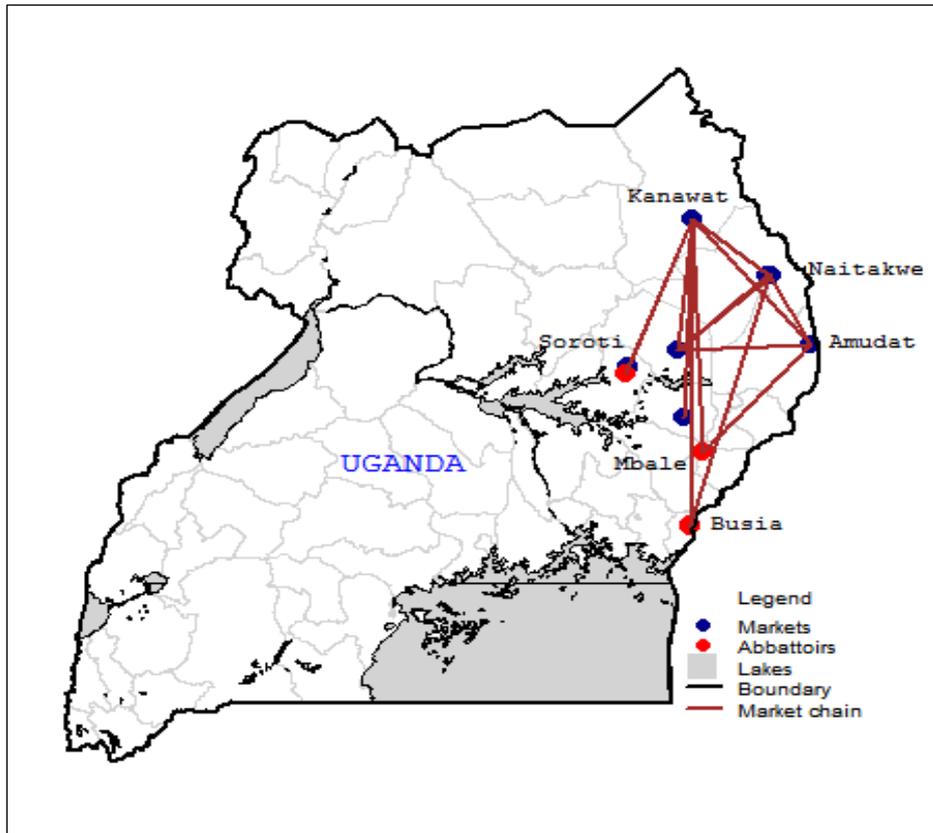


Figure 2: Map showing the livestock markets selected for the LITS pilot study and the identified market chains in Uganda.

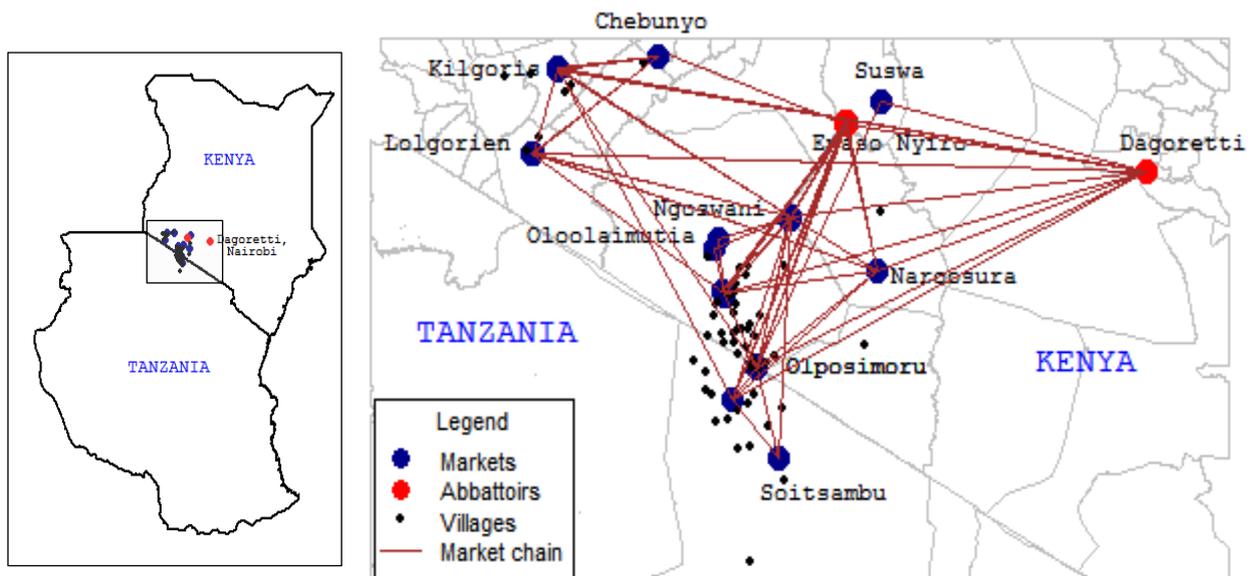


Figure 3: Map showing markets selected for the LITS pilot study in Tanzania-Kenya and the identified market chains.

- Up to 32% of the animals tagged can be traced back to their villages of origin, 39% can be traced to other markets not included in the pilots and the remaining 29% can be traced back to the primary markets covered in the study. These results suggest that there is a huge potential to extend the depth of the traceability system to the village level by expanding the number, or the spatial coverage, of the market chains in the study. The accuracy of information on animal source, as determined at the primary market, depends on the type of actor encountered or interviewed at these points. Livestock producers give accurate information on their village of origin but intermediaries do not always remember and at times are not willing to divulge this information.
- The proportion of tagged animals recaptured at subsequent nodes of the value chain declined exponentially (Figure 4). This trend could be attributed to:
 - tagged animals joining other value chains not being considered in the study
 - animals being taken back to the farms for fattening to be sold later
 - removal of ear tags (discussed below)

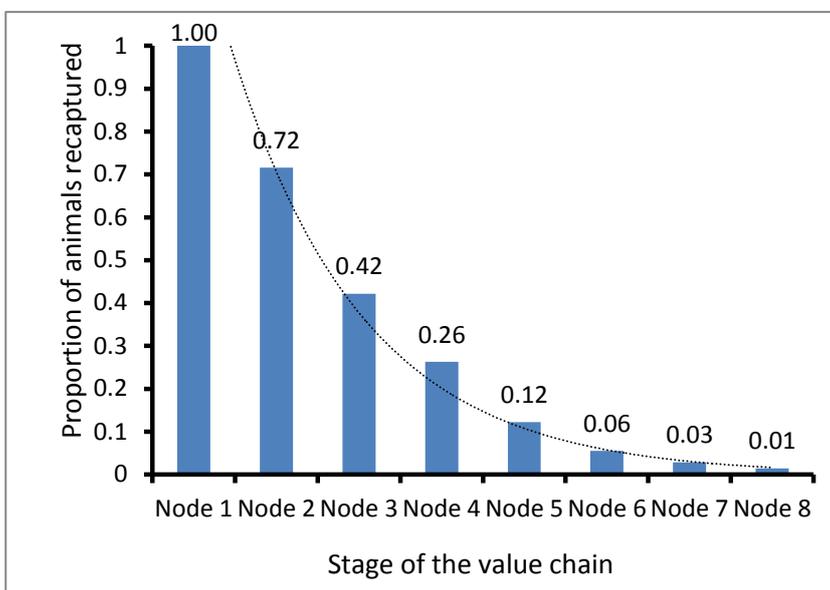


Figure 4: Proportion of tagged animals recaptured at various points in the value chain. Node 1 represents the primary market. Nodes 2 to 8 are secondary markets.

- Markets enrolled for the pilot have very poor animal holding facilities yet these are required for the implementation of LITS. Facilities such as crushes, perimeter fences and shades have deteriorated and most of these had to be refurbished before the work could begin.
- Ear tags are the most preferred method of animal identification. Other identification methods in use but with limited acceptance from market actors include painting and back tags. Painting was less preferred because traders thought this would interfere with their own method of marking animals purchased (since they use paints) and back tags were thought to be alien.
- There is adequate cellular phone network from the local mobile phone companies in these areas which made it possible to use electronic systems for data collection and storage. The main challenge encountered, however, was on the accuracy of recording animal

characteristics like colour, breed and age. These challenges are being addressed through frequent training of enumerators and provision of reference materials, for instance, pictures of animal breeds, colours and common lesions encountered at the slaughterhouses.

- The forms used for data collection captured much more information than required for traceability. However, some of the data collected (for example, those on animal characteristics and the period over which animals were in the chain) will be used for other purposes, for instance, estimating risk of transmission of infectious diseases along market chains.
- The questionnaire surveys indicate that market actors consider LITS as a tool that would protect their animals against theft and improve disease control, market access and food safety. The commonly used identification methods, in decreasing order of frequency, were colour of the animal, ear notching, hot-iron branding, mud, paints, ear tags and names. However, some of these identification methods are not amenable for use for traceability purposes.
- A few traders acknowledged removing tags that had been applied on their animals. The tampering was done at different levels of the market chain. The traders said they feared that buyers would avoid purchasing a tagged animal based on a false impression that such animals had been stolen or purchased for a specific purpose. Methods used to remove tags included cutting with knives, scratching, tearing or covering with mud.
- Up to 33% of animals from Tanzania–Narok whose tissues were collected at slaughterhouses for drug residue analysis had high levels of diminazene aceturate, a curative drug for animal trypanosomosis. The traceability system piloted enabled the identification of villages and markets where these cases came from. Such villages and markets could be targeted for education campaigns on drug withdrawal periods to improve the safety of meat from these supply chains.

4 Initial recommendations

- Awareness campaigns involving all market actors (producers, traders, intermediaries, butchers and market officials) should be initiated to improve knowledge of LITS and associated opportunities and challenges. This should include defining the roles of each actor in the market chain. For example, intermediary traders who collect animals from the production units (and hence prevent producers from travelling to the markets) should be encouraged to record the sources of animals they purchase so as to enhance the accuracy of information they provide at the primary markets.
- Results from the questionnaire surveys show that ear tags are highly preferred by most actors while hot-iron branding and ear notching are frequently used. We recommend the use of ear tags for individual identification and hot-iron branding and ear notching for group identification.
- There have been several discussions on the implications of tagging animals at the farm or production units versus primary markets on the depth of the traceability system to be realized. Our data show that tagging animals at the primary market can still allow the identification of villages where animals come from (that is, it can still provide a robust system. Measures that can be put in place to improve the accuracy of information obtained from such a system include defining epidemiological units that producers, intermediaries

and traders can identify easily when asked and collecting additional information at the time of tagging to be used for cross-validation.

- In some areas in the region, animal identification is being done at the production units to support animal management (for example, in disease control, ear tags are used to identify animals that have been vaccinated against East Coast fever) or deter insecurity associated with cattle theft (for example, in parts of northwestern Kenya, northeastern Uganda and South Sudan). These activities should be integrated with LITS interventions and veterinary departments should strengthen collaboration between institutions that are implementing similar projects.
- LITS projects should make use of the available cellular phone networks for data collection and storage. This will enhance the efficiency of the system and enable a faster turnaround when a trace back or forwards needs to be made.
- Misuse of veterinary drugs and lack of adherence to the recommended withdrawal periods are major challenges that require an urgent response in the region. Many reports have shown that levels of veterinary drug residues in meat and other livestock products are quite high and frequently exceed the minimum tolerable levels. This pilot study has enabled the identification of areas and value chains where animals whose tissues had high levels of diminazene aceturate came from. As consumers become enlightened and demand safer and wholesome products, decision-makers should develop LITS and utilize them in managing most of the foodborne hazards.
- The existing livestock marketing infrastructure is, however, not conducive for the implementation of effective LITS in the region. Key interventions that are urgently needed are:
 - Development of policies on LITS so that all market actors—producers, intermediaries, traders and market officials—understand their responsibilities.
 - Development of a LITS governance plan with details of the institutions and processes needed to implement the system. There has been a lot of focus on defining livestock identification measures but LITS governance (which requires institutionalizing LITS in private and public sectors) is a more urgent issue to resolve.
 - Renovation of physical facilities in the markets—for example, crushes and fences—since these are required to restrain animals for tagging or move them along specific channels where their identification numbers and other characteristics can be determined.

These pilot studies will be completed by the end of 2015 and the final conclusions and recommendations developed and shared with regional partners such as the African Union-Interafrican Bureau for Animal Resources and the Intergovernmental Authority on Development Centre for Pastoral Areas and Livestock Development for implementation.

Acknowledgements

We thank all the market actors and officials, government officers and non-governmental organizations that participated in this work. The specific people who supported the work include Benon Kyokwijuka in Uganda, Stanslaus Kagaruki and Isihaka Haji in Tanzania and Thomas Manga, Gabriel Turasha and Isaac Naiboni in Kenya.