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Abstract

Livestock Identification and Traceability Systems (LITS) contribute to reduction, control or eliminated safety scares that result from transboundary diseases outbreaks. Recent studies on LITS in Kenya have been focused on testing innovative technology, information and traceability system management, and examining the determinants for effective implementation. This paper analyzes the strengths and limitations of the operating a LITS institutional and organisational mechanisms in Kenya.

The result revealed that a disarticulated institutional and organisational environment was the main constraint to effective implementation of LITS. It proposes that for successful implementation, a regional approach covering multiple countries, substantial private sector involvement and intensive stakeholder education are essential.

Keywords: Institutional and organisational mechanisms, livestock identification, traceability

Introduction

Global concerns on the spread of animal diseases, protection of human health and consumer preference have necessitated the development of more robust livestock identification and traceability systems. Traceability has been described as the ‘ability to trace the origin of products throughout the supply chain.’ Its purpose is the assurance of food quality and safety in agri-food chains. A host of traceability requirements promulgated by international standard bodies are becoming mandatory in international beef trade (Office International des Epizooties (OIE 2009) . However, due to lack of appropriate livestock identification and traceability systems, the horn of Africa has the lowest share of world beef trade in spite of having high concentration of cattle.

The application of electronic LITS requires institutional, organisational and processes realignment that address the tensions and conflicts inherent in international negotiations as a precondition to widespread adoption. Such reorganisation integrates a technological sphere that incorporates both information and communication (Galliano and Orozco 2008). Indeed, whilst relevant law and regulations on traceability of food products have been issued from various economic/trading blocks such as United States, the European Union and China, violation of these regulations have led to the imposition of bans on products that originated from various countries (Zhang et al 2010).
The frameworks that influence governance, interactions and exchanges among parties/actors in the society are set based on both formal and informal elements. Formal elements comprise the legal provisions/ institutions i.e “rules of the game” that sanction a particular activity (constitutions, acts, laws, ordinances, among others) and the instruments that operationalize and regulate such provisions (rules, regulations, systems and procedures among others). Informal elements are defined to include traditions, customs, practices and taboos. Organizations on the other hand are “the players” who implement actions (North 1993). Institutions are usually effected and controlled by formal or informal organizations within a sector.

With the exponential development of information technology (IT)-based traceability systems, it is imperative that a strategic shift towards the institutional, competitive and operational environment be made in order to contribute to making the most appropriate choice of implementation framework. This should take cognisance of the specific circumstances of the agribusiness, address the allocation of resources, uncertainty, and decision rights throughout the supply chain as to assure accurate information flows and quality integrity whilst ensuring that IT-based traceability system is practical and cost effective for the agribusiness (Zhang et al 2010). This paper reports on the broader institutional, procedural and organisational requirements and proposed changes to upscale electronic identification of livestock possible at national and regional level within the short-term possible.

Materials and methods

The Kenyan meat marketing chain

The livestock and meat marketing chain comprises a network of enterprises/firms of varying sizes and activities. These includes the livestock producers either in Kenya or Somalia and export traders (finishers) of animals, marketing organizations (Kenya Livestock Marketing Council and Livetock Traders Marketing Society of Kenya), processors (slaughtering, meat cutting and packaging), secondary processors (butchers, value added and by product manufactures) and distributors (wholesalers, supermarkets, multiple retailers and exporters).

North-Eastern Kenya has an estimated 67% of the national beef herd either exported or slaughtered within the export standard abattoirs (AU-IBAR and NEPDP 2006). Figure 1 describes the marketing chain originating from Southern Somalia, Northeastern Kenya and the subsequent movement of beef cattle to either the slaughterhouse or export port (Wanyoike and Rich 2008).
Collection of data

A market value chain approach was effected through a snow ball design methodology with the investigators relying on referrals from initial subjects to generate additional subjects engaged within the livestock marketing chain.

In order to define the institutional and organisational arrangements, a series of in-depth semi-structured and structured interviews were held with policy makers/operators in the Ministry of Livestock Development (MoLD) including the Minister, Assistant Minister and Permanent Secretary. A second level of consultations were also held with technical officers and administrators in the MoLD. All the interviews consisted of two parts. In the first part, the participants were asked to describe their understanding of the institutional
and operational requirements for the traceability system currently implemented by the MoLD. In the second part, the participants were asked to make comments regarding the degree of interest shown by stakeholders (wholesalers, retailers, consumers) toward efficient livestock identification and traceability. Triangulation of data with experts and opinion leaders enabled the authors to construct the operations within the livestock marketing chain.

In addition, various considerations were made on the rules and procedures for revising or updating The Branding of Stock Act Cap 357 and other relevant documents as follows; i) The processes and challenges in amending Cap 357 and prescribing the best possible option for hinging electronic livestock identification in legislation; ii) emerging issues, international guidelines and benchmarking the operations of LITS in other countries; iii) desk study on related legislation such as Animal Diseases Act Cap 364 and the Prevention of Cruelty to Animals Act Cap 360; iv) desk study of Sessional paper No. 2 of 2008 on the National Livestock Policy and the Draft Strategic Plan 2008–212 of the MoLD; and v) desk study of the Attorney General’s circular on “Proposed Legislation” on Bills and Legal Notices.

Finally, a workshop was facilitated for a group of technical officers and legal experts in order to establish the best way to address the matter in the interim. Microsoft Visio Version 2003 was used to generate the flow charts of animals moving along the chain as well as the modules used.

Results and discussions

Institutional framework at implementation of LITS

For effective implementation of LITS, an inclusive legal framework was noted as a requirement. The livestock policy propounded in 2008 mentioned livestock identification in two portions. Section 3.9.2 of the livestock policy document states “The government will discourage livestock rustling and ease recovery of stolen animals, through instituting measures to identify all livestock and register identification marks”; and section 3.4.2 that states: “The existing legal and regulatory framework is inadequate to address the current and future challenges in disease, pest and quality control” (Government of Kenya 2008). At the time of the study, the Branding of Stock Act CAP 357 was the principle legal instrument concerned with effecting the identification of livestock never-the-less, its enforcement was wanting. This situation was similar to that in Botswana where LITS has been anchored in policy rather than law.

The review established that The Branding of Socks Act Cap 357 was the only legislation dealing with livestock identification in Kenya. The Act had a number of limitations 1) identification of animals was restricted to the level of the ‘location’ and at group level 2) the Act did not provide for mandatory identification of individual animals and therefore its enforcement, policing and implementation was inadequate. Penalties prescribed under
the Act were lenient and woefully inadequate as deterrents 3) The Act did not recognize other methods and technologies used in animal identification.

Whereas the most meaningful proposal by the Department of Veterinary Services (DVS) was to repeal Cap 357 and come up with a new “Livestock Identification and Traceability Act”, in the interim it was suggested that a anchor for the rules be established while a full review was being undertaken. DVS further felt that any new rules made under this section on identification would have been ultra vires and exceeding the mandate of the Minister to make law by Ministerial decree. This was after the realisation that the Act specifies only hot-iron branding and inclusion of alternative methods of livestock identification would have required a change in the objectives and name of the Act. In addition, Section 28 may have required legal interpretation whether to apply a restrictive interpretation or a wide interpretation that takes cognizance of the spirit of the Act. In the interim, recommendation was made to formulate rules under section 9(a) of the Animal Diseases Act (Cap 364) vide Ministerial decree, but only after industry-wide consultations with relevant stakeholders. The provision for licensing of animal producers under CAP 364 section 9(a) implied traceability, which could accommodate a device that generated a certificate of ownership. Section 9(e) that prohibited movement of animals was also pertinent to traceability and food safety.

The rules cited as the draft Animal Identification and Traceability Rules 2009 were developed during the workshop for gazettement by Ministerial decree.

**Organizational mapping for LITS in Kenya**

This aspect of the study was used to identify all the related stakeholders, examine their roles and functions and separate them into categories by their importance. This enabled the study to focus on actors crucial for the implementation of LITS. Identification of stakeholders were done through discussions with knowledgeable people, and by reading available documentation and records. In line with tradition and previous engagement in the implementation of projects, the DVS proposed a top down and resource heavy structure of management of LITS in Kenya. This typified the highly bureaucratic structure of veterinary service delivery with many layers of clear hierarchies, compartmentalized responsibilities/functions and tedious implementation procedures. Such an organisational arrangement, would be constrained by the slow speed of communication and feedback both vertically and horizontally. This was with the finding of (Grevesen and Damanpour 2007) that suggested that performance is enhanced by the horizontal and lateral (hierarchical) exchange of information, but is constrained by bureaucratic coordination and control mechanisms.

In many developing countries, organisational structures are not designed to be responsive to the end users and their needs, but rather to the demands of the political and bureaucratic authorities. Such organisation required urgent transformation into flatter (less layered bureaucratically), horizontally oriented (focused on the clients), responsive and flexible in operation (easy interdepartmental collaboration and sectoral collaboration across agencies). Issues such as decentralization (shifting of power from the centre to the
periphery), devolution (decentralization in regard to law-making and the creation or revitalization of local bodies with legislative powers) and deconcentration (shifting power within the bureaucracy from the centre to the local level) were also important.

Various players were identified and the proposed functions of each of the committees were provided thus:

1. Inter-Ministerial Advisory Committee comprising Ministers of (livestock, Internal Security, Trader, Information, Northern Kenya Development, Health Fisheries and Finance).
   i. Resource mobilization, coordination; and,
   ii. Policy direction.
2. LITS Steering Committee comprising Permanent Secretary (PS) (Ministry of Livestock, Finance and Internal Security) Provincial commissioners, Directors of Veterinary Services, Livestock Production (DLP) and Information (DI).
   i. Overall guidance in LITS implementation; and,
   ii. Resource mobilization.
3. Technical Co-ordinating Committee comprising the DVS, Chief of LITS, Chief Veterinary Fields Officer (CVFO), LITS registry, DLP, Deputy Police Commissioner (DPC) in charge of livestock movement and three alternate members.
   i. Implementation of the programme;
   ii. Monitoring and Evaluation; and,
   iii. Programme / Management review.
4. Chief of LITS (Chief implementer of the programme) (Registrar of Brands and other identification devices, Head database, Chief Inspector of LITS)
   i. Co-ordinating the Implementation of LITS;
   ii. Making budgets;
   iii. Preparation of reports; and,
   iv. Supervision, monitoring and evaluation

(NB - These functions of the Chief of LITS cascaded downwards to provincial, district and locational committees).

From a technical perspective, the traditional model was not easy to implement. Therefore an alternative triangular coordination hub of the steering, technical coordination committees with the Director of Veterinary Services was proposed in order to simultaneously address policy and technical advisory functions during implementation (Figure 2). Creation of the post of deputy director responsible for coordinating the implementation of LITS both country- and species-wide like in the case of Tanzania was also suggested. Concurrently, the CVFO was proposed to retain responsibility for ensuring livestock certification, disease surveillance and control procedure while the Chief Meat Hygiene Officer (CMHO) for recovery of the rumen boluses.
Figure 2. Alternative organizational structure proposed for implementing LITS

Functions of the Department of Veterinary Services in the implementation of LITS

The core functions of the DVS were recruitment and registration of traders as well as compliance with market related veterinary procedures related to export certification. Veterinary personnel were also responsible for application of RFID devices to cattle. In addition, they were responsible for collection, entry, validation and verification of market data, uploading of file and transferring of the information to the local database. Finally synchronisation of the information was done to the central database. DVS also provided for registration of brands, ensured overall adherence to procedures and sensitisation and awareness nationally. The Meat Hygiene Division undertook recovery and recycling of rumen boluses from Halinghum slaughterhouse.

The roles of key stakeholders pertaining to LITS was presented in Table 1.
<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Role in LITS</th>
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<tbody>
<tr>
<td><strong>Department of Veterinary Services</strong></td>
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<tr>
<td>Headquarters</td>
<td>- Control/custodian of the central database;</td>
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<td>- Validation and verification of market data;</td>
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<td>- Engineering policy change to the branding of Stock Act;</td>
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<td>- Provision of access to market infrastructure;</td>
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<td>- Provision of required human resource;</td>
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<td></td>
<td>- Explore opportunities to expand traceability to the rest of Kenya;</td>
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<td></td>
<td>- Ensuring compliance with veterinary procedures;</td>
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<td></td>
<td>- Sensitisation and awareness to the community;</td>
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<tr>
<td></td>
<td>- Recovery and recycling of rumen bolus from slaughterhouse.</td>
</tr>
<tr>
<td>District level</td>
<td>- Recruitment and registration of traders;</td>
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<td></td>
<td>- Compliance with market related veterinary procedures;</td>
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<td>§</td>
<td>§ Movement permit.</td>
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<td>§</td>
<td>§ Physical mouthing of animals for FMD.</td>
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<tr>
<td>§</td>
<td>§ Serological testing for CBPP (P-1).</td>
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<tr>
<td>§</td>
<td>§ Hot iron branding.</td>
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<tr>
<td></td>
<td>- Application of ear tags and RFID devices to consigned cattle; and</td>
</tr>
<tr>
<td></td>
<td>- Collection, entry, validation and verification of market data;</td>
</tr>
<tr>
<td></td>
<td>- Uploading of file and transferring of the information to the local database and subsequently to the central database.</td>
</tr>
<tr>
<td>Livestock Production Department</td>
<td>- Promote policy change</td>
</tr>
<tr>
<td></td>
<td>- Sensitisation and awareness</td>
</tr>
<tr>
<td>AU-IBAR</td>
<td>- Cross-border policy harmonisation, dialogue and information exchange</td>
</tr>
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<td></td>
<td>- Audit of the traceability system</td>
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<td></td>
<td>- Explore possibility of up-scaling the system regionally (IGAD, COMESA)</td>
</tr>
</tbody>
</table>

**Organisational constraints of the Department of Veterinary Services**

From the study, it was realised that the DVS experienced a number of limitations in addressing its core functions as regards livestock identification and traceability. These included: 1) inadequate capacity to coordinate the activities of livestock traceability due to inadequate staff establishment, poor deployment of human resources and inability to retain highly trained staff; 2) inadequate skills in information communication technology (computers and modems) to facilitate the implementation of the departmental activities on disease control and international trade; 3) lack of reliable data on national herd numbers, productivity, slaughter numbers and imported cattle numbers, prices, livestock weights and consumption levels per capita; 4) limited/poor market infrastructure due to loss of land and livestock handling facilities such as holding grounds, water pans, sale yards, weighbridges, crushes, loading ramps along the strategic livestock trade and marketing routes; 5) DVS lacks a dedicated Division that deals with livestock identification and traceability on a full time basis; and 6) inefficiency in the marketing chains: where too many middlemen, traders and brokers taking relatively high margins, plus restrictive practices in parts of the chain, leading to overpriced meat.

**The process of implementing LITS**
Initially, each District Veterinary Officer (DVO) was required to establish the number of RFID tags (rumen boluses or ear buttons) and this information summarised into a District RFID Requisition form. This document was then transferred electronically to the CVFO. The information would then be collated into a National Total RFID Summary sheet for purchase, distribution and storage. Ideally, storage should be after confirmation that each RFID tag had a valid read, whilst those that could not be read were discarded in order to avoid their entry into the traceability system.

At the Garissa market, cattle from registered traders were consigned to the market sale yard 24 hours prior to market day. The cattle were then clinically inspected for signs of ill health to determine their fit-for-sale status particularly FMD by looking for presence of mouth lesions and excess salivation; and other trans-boundary diseases. Those fit-for-sale were traded after payment of all the requisite levy and levies to the county and the municipal council. After purchase by the traders cum ranchers, cattle were transferred to the veterinary holding ground at Modika market for ease of handling during registration.

At Modika, the ancillary information was collected, while the cattle were checked by scanning with an RFID reader for any RFID tags already inserted. Subsequently, the study tags were inserted and the individual cattle registered into the local LITS database. The cattle were then subjected to a serological test for CBPP using the Complement Fixation Test. Animals that tested negative were branded P-1 and dispatched using a dispatch animal module to the staging post. Such animals were accompanied by a movement permit given to the trader. The animals departed from Garissa while grazing along one of a number of predetermined routes. Animals usually arrived at Chakama ranch (staging post) approximately one month from the day of departure from Garissa. On the other hand, positive testing animals were dispatched to the slaughter house, where they were received, slaughtered and the boluses/tags recovered. The tags were then sent to the CVFO for recycling.

After arrival in Chakama-Malindi District, the whole process of RFID reading and serological testing was repeated. This included use of receive animal, animal health and dispatch animal modules. Occasionally, the animal sale module was used when the traders decided to sell their animals. The cattle were tested again for Contagious Bovine Pluropneumonia (CBPP) at least 21 days after the first and branded P-2. They were also treated for trypanosomiasis, vaccinated for anthrax and blackquarter. Cattle that passed the second serological test (P-2) were released to enter the ranches within the Coast Province of Kenya. Positive animals were dispatched for immediate slaughter.

Animals reaching the coastal ranches were cleansed (treated and fattened) over a period of up to one year. This was done with regular monitoring by the local DVO until trade enquiry was received from an importing country. Based on this enquiry, the Director of Veterinary Services sought a no-objection that provided conditions for the importation of cattle from Kenya. The Director of Veterinary Services liaised with the Coast Provincial Director of Veterinary Services (PDVS) to get the traders mobilise the desired numbers of cattle. Samples were taken 30 days before export for RVF and FMD. If confirmed negative, the animals had a health permit issued. They were then weighed; sprayed 24
hours before shipment and a movement permit to the exit port issued. The LITS dispatch module was used to release the animals to the port. After satisfying the Kenya Revenue Authority (KRA) requirements, the cattle were again inspected as they were being consigned to the ship and the export module used to flag off the RFID.

Conversely, if the trader was able to obtain a supply order from the KMC, he/she was expected to ensure that all the relevant documentations were available as the animals arrived by road. The sick cattle were sent for emergency slaughter, while carcasses of those dead on arrival were removed for further processing. In either case the RFID boluses were recovered for recycling while the button tags are deregistered from the system.

If the cattle were negative for diseases, they were assigned a mob number, weighed and entered into the LITS slaughterhouse module. They were committed through the normal slaughter process and the RFID recovered for recycling. At the same time the animal is graded and sent out as fresh meat or to the chillers for further processing. The carcass information such as grade and weight were added using the slaughter module and linked to the identification applied to the cut portions. Overall flow chart and organisational processes for the traceability system as described above is shown in Figure 3.
Figure 3. Overall flow chart and organisational processes for the traceability system.
In addition, the various LITS modules utilised as the cattle moved along the beef cattle market value chain is illustrated in Figure 4.
Role of other stakeholders

The Kenya Meat Commission (KMC) is a state corporation under the MoLD. KMC is a state controlled abattoir with the capacity to slaughter 1,200 smallstock and 1,000 cattle per day. Re-opened in the year 2006, KMC is expected to export 60% of its products while 40% would be sold in the local market. To meet the export target, the factory must acquire the requisite certifications enabling it to access the lucrative European Union market. A second plant with a smaller capacity was re-opened in mid 2007 in Kibarani (Mombasa). However, the existing machinery are old and dilapidated. Investment will need to be made in a state of the art slaughter infrastructure.

Kenya Dairy Board (KDB) refers to a state corporation under the MoLD. It was established in 1958 by an Act of Parliament, the Dairy Industry Act Cap 336 of the Laws of Kenya. The mandate of KDB is to efficiently develop, promote and regulate the dairy industry in Kenya. The KDB would need to sit with the beef counterparts to agree on common informational need for the traceability system.

The Kenya Livestock Marketing Council (KLMC) established as a non-profit service organization, was a culmination of extensive work involving livestock and livestock products marketing stakeholders. The core purpose is to protect and develop the interests of livestock producing communities for greater contribution to economic development of Kenya. The Livestock Trading and Marketing Society of Kenya (LTMSK) refers to the only private sector livestock organization that deals in the export of both live animals and chilled meat. They run and maintain ranches across the country and represent the sector in all fora. Both trader associations should be engaged in awareness and recruitment of their members to register their livestock.

Conclusions
The study established that management played a vital role in both implementation and adoption of electronic traceability systems in Kenya.

- Kenya faced a number of organizational challenges during the development of LITS. Primary to this included the perception that traceability systems was optional and of low priority. Therefore, the allocation of time, staff, and resources was not adequate. Moreover, the roles of different stakeholders in the implementation process were poorly articulated due to the perceived imbalance between the work involved in setting out a LITS and the potential benefits.

- Individual country efforts are ad hoc and localised, whereas a combined commitment and responsibility is required. For example, in Kenya there was a parallel effort to develop traceability systems for both beef and dairy industries at the time of the study. The two sub-sectors failed to pursue a common understanding of the end-user requirements. This resulted in a tendency to focus only on their immediate and visible needs. Poor feedback regarding best practice and little dedicated support (be it clerical, procedural, or computer support), perpetuated the same problems and restricted advances.

- Addressing the institutional and organizational requirements provided an effective means of facilitating communication among the success-critical stakeholders. It also eased the determination of the impact of changes and supported their integration, preserved knowledge and dependencies created during the design process ensuring quality and preventing misunderstandings.

- A public sector driven mandatory traceability with a high degree of private sector participation is likely to be more successful due to availability of budgetary support, human resource after retraining and a more significant level of credibility for a regional approach covering multiple countries via intensive stakeholder education are essential.

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CHAPTER 357 - Branding of Stock Act Commencement Date: 1907-12-12.


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