The livestock sector transformation in Ethiopia: the fundamental role of animal identification, registration, data recording and traceability systems

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Abstract

Livestock production in Ethiopia is predominated by extensive production systems where animals graze in communal grazing lands that exposes to disease transmission and indiscriminate breeding. Intensive stall feeding occurs, mostly in peri-urban settings, with cows mainly fed on straw and limited fresh forages. Animal movement within the country for herd replacement poses disease risk due to lack of movement control. Export of live animals and animal products, mostly meat require traceability system which not only able to identify the animal and the premises, where they are raised, but also traces how they left such premises to the ultimate markets. Ethiopia has developed a road map for livestock information system which also requires household, farm, and animal level information. This paper describes and discusses the need for a harmonized national livestock identification, registration, and data recording system, review existing experiences in the country and elsewhere in Eastern Africa, based on which recommendations in the related areas are made. The critical place of animal identification, registration and data recording as the basis for animal and animal product traceability, disease control, genetic improvement of farmers' animals, annual planning, acquisition of bank loan and insurance are outlined. The need and values of adopting standardized identification system, establish a centralized database, and data capture tools are articulated. In addition, for success, the importance of long-term commitment, at different levels, including the role of both the public and private sectors are emphasized. The role of government in enforcing the related laws and policies, the requisite organizational structure, infrastructure, and human capacity needs are also pointed out. Professional societies like the Ethiopian Society of Animal Production (ESAP), and Ethiopian Veterinary Association (EVA) are platforms to exhaustively discuss and promote establishment and implementation of national system for animal identification, registration, and data capture are underscored.

Key words: animal identification, traceability, livestock transformation

Introduction

Ethiopia is endowed with a huge livestock population for that contributes to food and nutrition security, poverty reduction, export earnings and economic growth. Animal identification, registration, herd performance recording and traceability are the bases for livestock development and export of animals and animal products. Among others, livestock production in Ethiopia is challenged by animal disease due to inadequate pest and disease management systems. Movement of animals within a country and across countries poses risks of animal disease transmission and spread. Due to the presence of endemic and transboundary diseases, animal and animal product export is adversely affected unless countries put in place and fulfil quality and safety requirements and enforce traceability systems for animal products. Traceability entails provision of information on the premises in which the animals are reared, diseases status, measures taken to prevent and control diseases, policies, and strategies (ICPALD, 2014). From the genetic improvement perspective, animal identification and registration are the foundations for establishing pedigree and genetic relationships among animals, individual animal performance data capture as well as controlled mating to avoid inbreeding. Pedigree information together with individual performance data and the associated environmental conditions, are used for genetic evaluation, the results of which are used to rank the animals based on their genetic merit, with the best being selected as parents of future generations.

In Ethiopia animal identification using ear tags was initiated long time ago in public universities, research and large-scale commercial herds, following the introduction of artificial insemination services and import of dairy animals. However, the identification system has not been organized, harmonized and systematized. Farmers traditionally use branding for animal identification but influenced by livestock research and development projects and livestock product export requirements, farmers are now increasingly embracing ear-tagging of their animals. The identification system in the country mainly involves the use of plastic or metal ear tags. However, the uniqueness of the ear tag number is limited within the farm. In response to the requirements of meat and live animal importing countries, the Ethiopia government has established a cattle traceability system where export animals are identified and registered in the primary market. Animal identification and registration if accompanied by performance data capture system and could support the annual census of the livestock population and productivity carried out by the central statistical agency, thus, eliminating biases in sampling and improving accuracy of data collected on subsets of the national herds/flocks. Such information can then be duly imputed at national levels. This paper defines animal identification and registration, discusses the status of animal identification in Ethiopia and the progresses so far made. In addition, it presents the need for designing and implementing a harmonized national animal identification and registration system, and establishment of a national database to support research, development and evidence-based decision making at herd, regional and national levels.

Animal identification and registration

Animal identification is a system whereby animals are given a unique lifetime identification number. The official identity number given to an animal always remains unique to that animal, is used throughout the life of the animal, both in the country of birth and by all other countries and such a number is never shared by any other animal of the same or different species (ICAR, 2014). Animal registration is a system where animals and their identification and related pedigree and performance information are registered in a national database for different purposes. A national database is a data storage facility with high-capacity, and secure server, which receive data captured by tools used to record herd location, animal identity, performance, pedigree, breeding and other related events, such as vaccinations, disease occurrences, marketing as well as any other related time series data. The identification is mainly done using a standardized national animal identification system.

Registration requires establishing a database center, installing servers, training on the systems and continuously harnessing data using the various data capture tools thus enabling seamless flow of information or performance data to the data base. The information can also include geographic location, household characteristics, farm environment and resources, and animal characteristics. To make the database robust, and able to serve different purposes and actors in the value chain, different household level and socio-economic parameters could also be captured and stored using an established system.

The data collected is of little use if it is not analyzed to generate informative results, summary statistics and trends, which through purposive actor engagements are relayed back to the different actors. Using established ICT infrastructure, analytics could be automated with regular review and enhancement in line with the evolving data. Results and information can then be used by the various actors, including farmers themselves who are the primary generators of data to inform their respective herd management decisions. The data could also be subjected to specialized analysis and interpreted at local and national level for specific evidence-based decision making. Increasingly, the use of digital tools and applications for data capture is being adopted. Examples of such tools include Open Data Kits (ODK), i-Cow and other mobile based Applications could be used either by designated data recorders or directly by farmers themselves, to send data directly to a centralized data platform. The Africa Dairy Genetic Gains (ADGG) project has exploited both data capture tools in Ethiopia, Tanzania, and Kenya.

Why animal identification is important?

Confirm ownership and animal movement: If animals are uniquely identified and registered its owner and place of birth, movement and related information, etc. could easily be traced, which is of fundamental importance for health surveillance and effective design of farm management systems

Disease control **and** *traceability of animals and animal products*: Developing countries fail to access remunerative live animal and animal product markets due to lack of confidence by buyers on the sources of the products. The objective of traceability is to trace the holdings where the animal was reared from birth, points of slaughter, processing, and packaging to brand products for food safety, food quality, and veterinary concerns (Rehben, 2004). The lack of access to the lucrative markets is aggravated by rampant endemic diseases and lack of traceability systems in developing countries. Systematically and uniquely identified animals are easier to trace back to the various key production marketing and slaughter points, thus making documentation of their products and health status, and genetic makeup possible. Animal movement from farm to farm or from place to place within a country as either part of herd replacement, marketing or other forms of social exchanges should be supported by a certification system that allow control and tracing movements of diseased animals to avoid spread of livestock and zoonotic diseases. Establishing a system for traceability of animal and animal products impacts export of animals. Thus, will impact the safety and quality of products, and health of the animal and people.

Genetic improvement: In Ethiopia's livestock production setting, animals are managed under extensive, often communal grazing system and are exposed to indiscriminate mating through natural service predominated with uncertified bulls, bucks and rams serving cows, does and ewes. Such systems of mating allow for genetically related animals (i.e. half/full siblings, and even son to mother or daughter to son) to mate, resulting in inbreeding and its negative consequences. Within the different farming systems, animals born through use of artificial insemination (AI), including crossbreds, are not identified or their information recorded and curated at birth and thereafter. When these animals reach breeding age, they are bred to unknown bulls or inseminated with any AI sire without considering its dam and sire information or exotic breed proportion. Under such conditions it is difficult to genetically improve livestock herds/flocks and by extension, the national livestock populations, neither can crossbreeding be managed to suit to the production environment. Strucken *et al*. (2017) in their study to determine the dairy breed proportion in dairy cattle managed by smallholder farmers in Ethiopia reported an average of 78% exotic breed proportion which is very high in relation to the management, feeding and health care provided by farmers. Such high-grade animals if not managed properly exhibit poor production and productivity with low survival rates. Costs of rearing these animals are very high for the farmers resulting in reduced profitability of the dairy enterprise.

Access to credit or financial loan: Animal identification provides an avenue for livestock producers to approach financial institutions for credit using the uniquely identified animal as collateral in line with their potential market value. Identified animals, especially those with verified performance recording could enable financial institutions which give credit to more objectively determine the value of livestock which are presented as collateral and therefore the ability of their owners to pay back credit extended within stipulated periods. Evaluation of animals to be used as collateral based on phenotypic performance alone could favor animals with phenotypically good body conditions but with a low productivity potential. On the other hand, animals with poor body conditions, but greater genetic potential for productivity, may not be favored if their productivity potential are unknown or not considered. Therefore, keeping of phenotypic performance and pedigree records are important, as both enable the genetic worth of the animals to be computed or predicted.

*Value addition to animals***:** Identified animals, especially with pedigree and performance records, enjoy added values, as the bargaining power of their owners are improved, thus raising the confidence of buyers of such animals. For example, a farmer who wants to buy a milking cow will be more confident to spend his money on an animal that has record, and the seller will have better bargaining power for animals with record than a farm with no recording.

Support for planning and policy making: Identification of animals supports national planning on production and productivity, investment, budgeting, service delivery, input demands, and estimation of annual production and productivity. For example, in planning resource allocation for annual vaccinations, accurate information on the numbers and types of animals to be vaccinated will determine the domestic production and import of vaccines. Movement of animals should be accompanied with a certification system to avoid movement of diseased animals. The Ethiopian central statistical agency annual livestock census of population, production and productivity could be qualified more with the support of animal identification, registration and data capture. Data capture system being used for this purpose can also be used to do different studies at country level.

Regulated across border animal movements and unregulated ones such as rustling: In communities living across country borders, animal movement in search of pasture and water is common. In some areas animal rustling often occurs. Although there is no reported number of animals lost due to cross border theft in Ethiopia, reports of such acts have been documented in other African countries (Phillips, 2019). Rustled animals can easily be traced and recovered if they hold unique identification number.

Animal identification experience in developed and developing countries

Different developed and developing countries have been implementing animal identification, registration, and performance recording (ICAR, 2021). More recently, Rwanda has taken a bold step by developing Rwanda National Livestock Database and has gone ahead to digitally register all its livestock in the database (RAB, 2021). The program started with cattle (RAB, 2021). In Kenya, animal identification, registration and data recording in separate databases have been on-going for long time with the existence of government farms, large private farms and breed societies, and recent efforts is being focused on harmonization of the identification system and centrally curating the related data in a centralized database managed by the Kenya Livestock Breeders Association (KLBA). Besides, ADGG is working with KLBA to incorporate the large number of small holder farms using a nationally determined harmonized identification system.

The Kenyan Government has developed a strategy for 2020 to 2030, to support ongoing efforts on animal identification, registration, and data recording. In Tanzania, the Government enacted the livestock identification, registration, and traceability Act No 12 of 2010 (2010) to provide for the establishment of the National Livestock Identification, Registration and Traceability System for purposes of controlling animal diseases and livestock theft, enhancing food safety assurance, regulate movement of livestock, improve livestock products and production of animal genetic resources and to promote access to market. The European Union regulation which came into force in 1992 directs keepers of farm animals to maintain up to date records and the competent authority in member states must have access to the records on request (Wismans, 1999; Richard *et al*., 2002).

Countries with good animal identification, database, data capture and genetic evaluation systems can easily pool their data and use it effectively to undertake genetic evaluations (Cordoso *et al*., 2021) Such countries could also then be part of a regional or international animal evaluation program to benefit from across country pooled data-based evaluation of sires (Mrode *et al*., 2022). The International Bull Evaluation service (INTERBULL), which is a permanent sub-committee of the International Committee for Animal Recording (ICAR), provides genetic information services and applied research for improvement of livestock to a worldwide network and contributes to the harmonization and improvement of the methods of performance testing and genetic evaluation of purebred breeding animals of the bovine species (https://interbull.org/index). The African animal breeding Network (AABNet) is a newly established pan African initiative to develop capacity and knowledge transfer for animal breeding and create innovations to support livestock genetic improvement in Africa with strategic objectives of multi-country genetic evaluation, professional development, advocacy and awareness and business development

(http://animalbreeding-africa.org/). To participate and benefit from this initiative, animal identification, registration and data collection are the requirements. Countries will benefit from joint genetic evaluation of their animals, and this will enable them exchange animals which are productive and adaptable to local environment.

Animal identification methods

Different animal identification methods are in use, such as ear tag, tattoo, ear-notching, branding, paint marking, radio-frequency identification (RFID; injectable, ear tag and bolus), or any combination of these (Wismans, 1999; Caja *et al*., 2004; Richard *et al*., 2002; Moreki *et al*., 2012). With all the advancement in tools or methods used, appropriate tools should be adopted which are easy to apply, affordable and accessible to farmers. Currently, the ADGG program has started animal identification, registration, and data recording for registered project farmers. The ADGG system uses plastic ear tags and an ear tag numbering system recommended by ICAR (2014). As it is indicated in Figure 1 the animal ID on the ear tag contains 11 characters with a country code (eg. "ET"), and the nine-digit numbers in the second row, and the numbers in the third row are the last four digits of the full ID code in row two printed in a bigger font to improve visibility from distance. The tags are placed on both ears. To easily identify locations in a country, codes can be given to different administration structure, farms, or herds. The ID number is species-specific with no duplication. For instance, the identification system currently used by ADGG project is designed to identify at least one billion animals in a country.

Figure 1: Plastic ear tags and identification number in Ethiopia

Implementation of animal identification: Approaches and Infrastructure

Policies, legislations and regulations that support and enforce animal identification and registration should be developed and enforced by government and respected by all. Implementation modalities could be public, or both public and private. Identification and animal registration could also be subcontracted to private companies or managed as a project as part of the national program at the start of the implementation. Centralized national databases accessible at regional levels are important for a devolved administration structure to co-administer region specific information and make use of it for specific purpose at different levels. Data sharing agreements among actors with permits to use different aspects of

the data could be vested to responsible institutions. Livestock keeper associations, organizations or cooperatives can play a bigger role in creating awareness and mobilizing members, and as a center for implementation.

Recommendations for animal identification

To have the system of animal identification, registration, and traceability at the national level the following are key recommendations for success:

- Consensus needs to be built among all the key value chain actors, including policy makers and relevant professionals
- Manual that guides its implementation needs to be developed
- The very first step should be harmonization of existing animal identification systems, an exercise that should be undertaken with full participation of the relevant public and private institutions
- Anchoring of the process in legislation, policy, and regulations, thus providing custody of its overall coordination and implementation to a specific institution and office in the country.
- Launch and institutionalize animal identification and registration system as a national program and establish a national database to store the data
- Encourage participation of the private sector and farmer organizations/cooperatives and mainstream its implementation for input supply, livestock product marketing and related animal health, extensions, and breeding service providers.
- Create awareness at different levels and ensure participation and benefit sharing for producers
- Use a phased implementation approach to ensure that available resources can be effectively used to initiate and complete animal identification within a set time.
- Resource mobilization to support the program
- Develop and build capacity at different levels to on-board everybody and obtain their inputs and buy-in, thus enable joint participation in data collection, analyses and use of the results there in obtained, thus providing evidence required by the different value chain actors to inform their decision making. Consistency and harmony in the system of animal identification and implementation

Conclusion

Professional societies like the Ethiopian Society of Animal Production (ESAP), and Ethiopian Veterinary Association (EVA) are professional platforms to discuss national issues like establishing national system

for animal identification, registration, and data capture. Commitments of members to implement a harmonized system should be realized through discussions led by ESAP and EVA.

Acknowledgement

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