Collecting livestock data: a snapshot of survey methods

A background document for the SOURCEBOOK ON LIVESTOCK DATA IN AFRICA: COLLECTION AND ANALYSIS AS ADECISION-MAKING TOOL

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**MULTIPLE SOURCES OF LIVESTOCK DATA**

The design, implementation and monitoring and evaluation of livestock sector public and private sector investments are based on evidence and information generated by a multitude of data collection systems, including regular and one-off, or ad-hoc, surveys. With the objective of providing guidance on effectively using available livestock data and indicators and designing effective national livestock data systems, this note reviews the major survey methods that are regularly implemented by developing country governments, including:

- The agricultural / livestock census;
- Agricultural and livestock sample surveys;
- Household budget surveys;
- Living standards measurement studies;
- Administrative records or routine data;
- Others, such as the population and housing census and labour surveys.

It identifies the major livestock-related indicators that the various surveys – for which the prime target rarely is livestock - are likely to generate. Understanding these data sources is critical for decision makers to make appropriate use of available data and indicators, and is the first step in designing and setting up a comprehensive livestock data collection system. The note concludes by highlighting that a system of livestock statistics must be seen as part of a broader framework of statistical collection on a national level and that the effective integration of livestock data, whether derived through broader agricultural surveys, administrative records or one-off surveys, is essential for ensuring quality data which can feed into policy formulation or designing effective investments in the livestock sector.

**THE AGRICULTURAL CENSUS AND THE LIVESTOCK CENSUS**

The largest agricultural statistical operation in any country is the agricultural census. Country governments – namely the Statistical Authority in collaboration with relevant Ministries – usually undertake the agricultural census every ten years, with the objectives to:

- Generate information which reveals the structure of the agriculture sector, especially for small administrative units;
- Generate data to use as benchmarks for other agricultural statistics;
- Provide frames¹ for agricultural sample surveys.

The agricultural census collects, processes and disseminates data on a limited range of structural items of agriculture, which change relatively slowly over time. These typically include size of

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¹ In a statistical collection, the frame is the means by which the statistical units to be enumerated in the collection are identified. For the livestock sector, an ideal frame would be a list of all rural households or agricultural holdings keeping livestock, identifying each unit without omissions or duplications and without any units other than rural households or agricultural holdings. Such a list could be obtained through a census, a farm register, or another source.
agricultural holdings, land tenure, land use, crop areas, irrigation, livestock numbers, labour, ownership of machinery and use of some agricultural inputs.

Data are collected from agricultural production units, or agricultural holdings. In developing countries, most agricultural holdings are associated with a small farm household and relatively few commercial farms, i.e. data are largely collected from smallholders. Face to face interviews by trained enumerators with the agricultural holder is the most common technique of data collection, though telephone and internet-based interviews have been also utilized. Data are collected in a short time-span, occasionally in just one week.

Data are collected on a complete enumeration basis—i.e. information is obtained from all production units in the country—which allows for the compilation of statistics even at the lowest administrative units, such as the village. Complete enumeration is, however, costly and difficult to implement. Consequently, many countries have been undertaking sample agricultural censuses or large scale surveys which collect information from a sample of agricultural holdings. For example, the National Sample Census 2007/08 of Tanzania collected data from about 53,000 farming households in Tanzania or about 17 percent of all farming households (URT, 2010); the 2008 National Livestock Census of Uganda collected information from about 964,000 households, or 15.1 percent of all households (MAAIF and UBOS, 2009). Samples of such sizes are usually sufficient to retain many of the attributes of a full census, even if statistics at the lowest levels, such as for villages, cannot not be generated.

The livestock content of the agricultural census always includes information on:

- The number of animals on the holding by species.

Species include cattle and buffaloes; sheep and goats; pigs; chicken, ducks, geese and turkeys and other birds; horses, asses, mules and hinnies; other animals, rabbits, dogs and cats; and insects such as bees (counted on the basis of hives) and silkworms. The number of animals refers to those animals raised/held by the holding on a specific reference date, which is usually the day of enumeration. Sometimes animals are differentiated by age and sex, e.g. cattle are split into cows, bulls, steers, heifers, male and female calves; occasionally, differentiation is made between indigenous/local and improved/exotic breeds.

Compared to agricultural censuses, livestock censuses collect more detailed information on livestock, the content of which varies by country and the focus is often dictated by the prevailing policies and programmes which need to be monitored and evaluated. This may include one or more, but not necessarily all of the following (MAAIF and UBOS, 2009; République du Mali, 2007; République du Niger et al., 2007; URT, 2010):

- Livestock numbers by type of breed;
- Livestock numbers by production systems (e.g. zero grazing; tethering; communal grazing; stall-fed; etc.);
- Economically active population in the livestock sector;
- Livestock pest and parasite control methods and access to animal health services / drugs;
- Types of animal feed used;
- Sources of water for animals;
- Level of production, i.e. number of animals slaughtered; litres of milk produced and number of eggs. Usually, censuses provide information on the quantity of production, not on value of production since price data are not collected;
- Ownership of equipment, such as ox-ploughs, ox-planters and ox-carts;
- Consumption of animal-sourced foods.

Agricultural / livestock censuses provide the “gold standard” in generating accurate statistics on the livestock population in a country, while also providing critical information on the geographical distribution of animals. They also generate information on the structure of the herd, which is required to estimate and project growth rates of animal populations. Of course, when sample censuses are conducted, there are sampling errors linked to the estimates of the livestock population. This is more the case when deriving the data from agricultural sample censuses that collect data from selected agricultural holdings, which may or may not hold livestock. Sampling errors are less pronounced for data derived from livestock sample censuses, where statistical units are livestock holdings. These are thus expected to provide a more precise estimate of the livestock population than agricultural sample censuses.

**AGRICULTURAL AND LIVESTOCK SAMPLE SURVEYS**

Agricultural sample surveys, including specialized livestock sample surveys, provide governments with structural data on the sector to supplement census information which is usually available every ten years. These surveys provide additional information needed to better design, implement and monitor sector investments. Data from sample surveys:

- Provide broad indications for development planning and investments in the sector, including public sector interventions;

Agricultural/livestock sample surveys target a relatively small sample of agricultural holdings. For instance, the sample of the Rwanda National Agricultural Survey (NISR, 2010) and that of the Permanent Survey of Agriculture of Burkina Faso (MAHRH, 2009) both consisted of about 10,000 households. Samples are usually large enough to generate statistics that are nationally representative or of agro-ecological zones/macro-regions. In few cases, such as for 2011-12 Ethiopia Livestock Sample Survey that covered about 68,000 agricultural households, statistics can be also generated for lower administrative units, such as the districts (CSA, 2012). Sample surveys may cover the entire livestock sector, but may also target only some specific livestock sub-sectors and/or geographical areas, such as the 2004 National Cattle Survey in South Africa (Scholtz et al., 2008) or the 2005/06 Livestock Survey in the Arid Land Districts of Kenya (ALRMT, 2007). Similar to agricultural censuses, face to face interviews by trained enumerators with the agricultural holder is the most common technique of data collection. These surveys are usually undertaken by the Statistical Authority, even though the Ministries responsible for animal resources may also carry out livestock sample surveys.
The livestock content of agricultural and livestock sample surveys is significant, and particularly comprehensive in the latter. In addition to an agricultural questionnaire, which collects information on basic household characteristics and detailed information on agriculture / livestock, these surveys often include a community questionnaire that collects information on public services, community infrastructure, market prices, etc. The livestock information available from these surveys usually comprises (ALRMT, 2007; MAHRH, 2009; NISR, 2010; Scholtz et al., 2008; Somda et al. 2004):

- Livestock number, by species, breed and age;
- Herd dynamics over the reference period (usually one year). Indicators include animal born, deaths, animals lost, slaughtered, marketed and given/received as gifts, etc. This allows projecting herd growth, a critical piece of information for investment design;
- Livestock production (meat, milk, eggs, etc.), including both quantity and value, i.e. price data are collected in these surveys;
- Animal vaccination, diseases outbreaks and treatment, and access to animal health services.

Supplemental livestock information, dependent on the type and objectives of the survey, can include:

- Feed for animals, e.g. fodder from land; hedges; scattered stalks as well market purchased feed, etc.;
- Water sources, e.g. rivers, boreholes, wells, etc.;
- Family and employed labour devoted to livestock by type of activity, e.g. feeding, watering, sales and other;
- Ownership of livestock-related assets, such as ox-carts, ox-ploughs, sheds for animals, etc.;
- Distance to markets (in time or in distance);
- Market infrastructure (e.g. animal health posts; slaughter slabs; markets);
- Consumption of animal sources foods.

Four features of agricultural / livestock sample surveys are worth noticing. Firstly, they attempt to capture information on both inputs and outputs, which allow building some indicators of productivity. Secondly, these surveys often include information on prices, both for inputs and outputs, which are essential to arrive at some measure of profitability and competitiveness of livestock farming. Additionally this facilitates an identification of bottlenecks along the value chain. Thirdly, they capture information about seasonality in livestock farming through enumerators visiting the households in different seasons, or respondents asked to provide information for selected questions by season. For milk production, disease outbreaks, live animals marketing and other dimensions, this seasonal information is important for monitoring the sector. Finally, these surveys occasionally include a question on the household rational for keeping farm animals which is a crucial consideration when formulating effective investments. Interventions need to be consistent with the incentives influencing households’ objectives for rearing livestock which could include self-consumption of animal food, income generation; security/insurance, input into the agricultural sector (manure/animal traction), among others.
Agricultural and livestock sample surveys are often perceived as the best sources of information to identify major constraints to livestock productivity and opportunities for investments at the farm-level. However, they don’t always cover all dimensions of production nor they are systematically undertaken by country governments in sub-Saharan Africa. Finally it is worth noting there are sampling errors when deriving national / regional / district livestock statistics from agricultural and livestock sample surveys, which are more pronounced in the case of agricultural sample surveys, when the statistical unit is the agricultural holding that may or not keep farm animals.

**HOUSEHOLD BUDGET SURVEYS**

Household Budget Surveys, also called Family Expenditure Surveys, Expenditure and Consumption Surveys, Income and Expenditure Surveys, collect, process and disseminate information on key components of household’s budget and expenditures with the objective to:

- Update the weights in the consumer price index, a critical piece of information to estimate national macro indicators, such as the level of inflation;
- Measure poverty and well-being;
- Generate estimates on household consumption which feed into the calculation of the Gross Domestic Product (GDP).

Household budget surveys are conducted on a sample of nationally representative households as well as for agro-ecological zones / major regions. As examples, the sample size of the 2002/2003 Lesotho Household Budget Survey comprised 5,992 households, which was representative of the country and its ten districts (LBS, 2008); that of the 2001 Household Survey of Senegal included 6,624 households, similarly being representative nationally as well as for the 14 Regions (DPS, 2004). Similar to other surveys, data are usually collected through face-to-face interview but unique in that the data is collected over a one year-period to capture seasonal variations in expenditure patterns. Some information may be also collected daily, such as on food consumption and/or expenditures. The responsible agency for implementation of Household Budget Surveys is the national Statistical Authority.

Two relatively unique data sets typically collected through Household Budget Surveys include:

- Consumption of animal source-foods, an important indicator of nutrition and wellbeing;
- Livestock income and its contribution to total household income.

Questions on consumption of animal foods are usually based on a seven-day recall period. For example, the 2002/03 Lesotho Household Budget Survey includes questions on weekly expenditures on several livestock products, ranging from fresh, chilled and frozen beef to dried, salted or smoked meat, from whole milk to cheese and curd (LBS, 2008).

To measure livestock income, a direct question is usually asked about revenues from different activities, including wage employment and self-employment in crops and livestock; in few cases, some details about sales of livestock and livestock products and expenditures are asked to the respondents, which allows for a better estimate of livestock income. As examples, the 2009/10 Uganda National Household Survey includes a question about income from livestock farming over
the last 12 months, differentiated by cash and in-kind income (UBOS, 2009); the 2007 Niger Household Budget and Consumption Survey (République du Niger, 2007) includes more detailed questions about ownership of livestock and sale of live animals and livestock products.

Statistics on consumption from Household Budget Surveys are designed to be nationally representative as well as representative of macro-regions / agro-ecological zones. Again, challenging the compilation of results and the reliability of the statistics on livestock variables, but for consumption of animal-sourced foods, is the issue of potential sampling errors as all households and not just livestock keeping households are the statistical units for this type of surveys.

LIVING STANDARDS MEASUREMENT STUDIES

Living standard measurement studies (LSMS) are multi-topic household surveys which aim to:

- Measure poverty and well-being and understand their major determinants;
- Provide evidence for planning, monitoring, and evaluating economic policies and social programs with respect to their impact on household living standards, especially those of the poor.

LSMS surveys are administered to a nationally representative, but relatively small sample of households. This allows the generation of accurate, or nationally representative, statistics for the country as a whole and for large sub-areas (e.g. rural and urban areas; macro-regions). For instance, the sample of the 2005 Ghana Living Standard Survey consisted of 8,700 households (GSS, 2008); that of the 2004 Zambia Living Conditions Monitoring Survey comprised about 20,000 households (CSO, 2005). Data in these surveys are collected by the National Statistical Authority through face-to-face interviews, with increased use of computer-assisted technologies, and over a period of 12 months, in order to take into account any seasonality.

A unique feature of LSMS surveys is that they include several questionnaires that target a variety of information at household and community level. They include a household questionnaire, a community questionnaire, a price questionnaire and, in some cases, an agriculture questionnaire as well as other questionnaires, such as on gender or fisheries. The household questionnaire comprises sections on education, health, etc; the agriculture questionnaire includes modules on crops, extension services, and in some countries more expanded livestock questionnaires; the community questionnaire targets information on local infrastructure, availability of public services, distance to major markets, etc.

LSMS surveys include some livestock-related questions, which target:

- Livestock ownership, sometimes with details on herd dynamics (animals born, death, lost, etc.) over the reference period, usually one year;
- Consumption of animal products, including self-consumption and market purchases.

In recent years, with the growing recognition of the role of agriculture for livelihoods, poverty reduction and economic growth, the agricultural section of LSMS surveys has been expanding in its coverage, including its livestock content. Recent LSMS surveys in Niger (République du Niger, 2010), Tanzania (NBS, 2012) and Uganda (UBOS 2011) include a specific section on livestock that
collects not only information on livestock ownership, herd dynamics and consumption of animal sourced-foods but also on:

- Breeds, differentiated by local/indigenous and improved/exotic;
- Use of inputs, including feed, water, labour;
- Access to livestock-relayed services, such as veterinary drugs, vaccination, extension;
- Husbandry practices, e.g. housing and breeding practices;
- Production of livestock products, including not only meat, milk and eggs, but also dung and other services provide by livestock, such as transport.

LSMS surveys, and particularly those with a comprehensive module on livestock, are the best source of information for quantifying the contribution of livestock to household livelihoods, including both its monetary and non-monetary value. In addition, this type of data can facilitate analysis, ex-ante and ex-post, of the impact on livelihoods of selected livestock sector interventions. However, given that the sample of agricultural questionnaires targets only rural households and that sample sizes are small, national level statistics for livestock cannot be always generated with precision.

**ADMINISTRATIVE RECORD DATA**

Administrative record data, also referred to as routine data, are regularly collected by national governments, in collaboration with districts or lower level administrative units, with the objective of:

- Planning, implementing and monitoring the delivery of public services.

Within a country, government officers at a specifically designated local administrative level (e.g. sub-county, district) collect agricultural data, including livestock-related data, on a regular basis – such as monthly or quarterly. They report to the district administrative unit, which processes the data, use them when needed, and then reports to a higher level in the administration. The Agriculture and/or Livestock Ministry obtains thus access to this livestock data and statistics on a regular, or occasionally irregular, basis. An example of administrative data includes cross border trade statistics with Customs Authorities at border points documenting trade flows of imports and exports (quantity and value) of live animals, animal-source foods and other livestock products (e.g. hides and skins), which are then summarized in monthly, quarterly and annual reports.

The statistical unit for administrative record data varies and is a function of what data is being collected by which administrative office. For instance, data on prices of live animals may be collected by extension officers at local markets, or by custom officers at the border; the price may refer to live cattle in general, live cattle by breed (e.g. local/indigenous versus improved/exotic), be by head or by weight (kg/live animal). In principal, whatever the statistical unit, government officers should collect data on a complete enumeration basis, i.e. sampling error is not anticipated in routine data (LDIP, 2010a, 2010b, 2011a, 2012).

In general, routine data primarily target:

- Outbreaks of animal diseases and other animal-health related indicators;
- Livestock population;
• Production of livestock products;
• Trade of live animals and livestock products.

The content of administrative data varies by country and reporting period (e.g. monthly, quarterly). In Uganda, for instance, livestock/veterinary officers at sub-county level collect information on a monthly basis at the village level, including on the number of animals by production system and species; on animal movements; on outbreaks of contagious diseases, including the number of animals affected, dead/slaughtered and treated, as well as control measures; number of animals vaccinated against selected diseases, such as Contagious Bovine Pleuropneumonia (CBPP), Brucellosis and Rift Valley Fever; on clinical cases handled by local animal health staff by type, such as for diarrhea or mastitis; on number of meat inspections (ante-mortem and post-mortem) as well as condemnations rate; on numbers of animals slaughtered; sales of livestock animals, and prices (average, minimum, maximum); etc. (MAAIF, no date).

Some of the information and data collected, particularly those related to animal disease outbreaks, respond to international obligations which require African countries to submit monthly, quarterly and annual animal health/disease reports to the World Organization for Animal Health – the reference organization to WTO with respect to trade-related animal disease matters; the Africa Union Interafrican Bureau for Animal Resources (AU-IBAR); and selected Regional Economic Communities (RECs).

The importance of data on animal numbers, in particular, the number of animals affected by a disease, is a critical piece of information for emergency interventions related to animal health, e.g. to assess the number of vaccines needed to prevent the spread of some epidemic disease. Data on production of livestock products (quantity rather than value) are collected as a rough measure of the performance of the sector, which helps monitor the impact of government policies and programmes. Finally, statistics on trade are a critical piece of information to estimate livestock value added, and hence GDP.

Routine data provide a major source of information for the livestock sector. Because of the regularity of the flow of information, they are essential to deliver public services and monitor the animal health status in a country as well as trade flows. However, there is dissatisfaction with the quality of routine data in African countries. Financial and human resources are limited at the local level as are incentives for data collectors. There is rarely a systematic and common approach to collect routine data at local level, with local governments and extension officers using different methods. Routine data are rarely collected from all the relevant statistical units and no statistical procedures are used to select the sample population while concepts and definitions used are often unsuitable for statistical purposes. Furthermore, they rarely conform to international standards and may even differ from districts to districts. There is need of caution, therefore, when using administrative records to generate official statistics.
OTHER LIVESTOCK DATA SOURCES

There are a number of other sources of livestock-related data, including:

- The Population and Housing Census;
- Service Delivery Surveys;
- Labour Force Surveys;
- Marketing Information Systems;
- Experimental Station Records;
- One-off Livestock Surveys.

The Population and Housing Census, which is conducted every ten years by almost all country governments, may include one or more screening questions on livestock. Typically, one question could target ownership / non ownership of farm animals and a second one the number of animals owned by species. This is the case, for instance, of the 2012 Population and Housing Census of Tanzania. Since the Population and Housing Censuses target all households, the inclusion of livestock screening questions help generate an appropriate sample frame for specialized livestock sample surveys as well as statistically precise estimates of the livestock population. There are concerns, however, on whether households correctly report their livestock assets in the context of such survey.

Service delivery surveys aim at providing an assessment of quantity / quality trends in public service delivery. They are sample surveys which allow the generation of national level statistics, also differentiated by rural and urban areas and macro-regions. Some questions in this type of surveys can target livestock-related services, such as access to animal health and extension services. Sampling errors, however, may make it difficult for these surveys to properly assess the quality of livestock-related services, which are targeted at a relative small segment of the population.

Labour force surveys facilitate an understanding of the status and trends of local labour markets. These sample surveys ask questions on the status of employment for the economically active population (e.g. full-time or part time; employee or self-employed; unemployed; etc.). They may include some questions on livestock. For instance, the Botswana Labour Force Survey explicitly estimates the number of economically active population working in commercial livestock and poultry enterprises (CSO, 2008).

Market information systems (MISs) aim to provide farmers, traders and other actors along the supply chain with short-term information on price levels (to guide marketing decisions) and generate medium/long-term information on market trends (to guide investment decisions). Data are usually collected by so-called market monitors in major markets in the country and disseminated through a variety of means, such as market boards, newspapers and radio programmes as well as websites, such as for the Tanzania Livestock Information Network Knowledge System (LINKS). There hardly any examples of market information systems that have been operational for more than a few years without some external support (FAO, 2010; LDIP, 2011).
Experimental stations are usually mandated by research agencies / institutions to conduct field level research with the objectives to assess performance of certain breeds / vaccines / drugs / feed / husbandry practices / etc. in targeted agro-ecological zones. Data from these stations cannot be used to generate statistics, but are highly valuable in providing indications on the quality of data from other statistical sources as well as for identifying options for technical investment in the livestock sector.

There are, finally, one-off livestock surveys, which are undertaken to respond to specific information needs. These can be quantitative and/or qualitative; target the entire livestock sector or only specific sub-sectors; review the entire livestock supply chain, from input supply to production to consumption of animal sourced foods, or only focus on some of its segments; be nationally representative or be implemented in selected regions and zones; target actors along the livestock supply chain or expert informants. While not implemented on a regular basis, these surveys provide critical information that complement or validate data from regular surveys, thereby contributing to a better design of investments and a better understanding of their impact on the ground.

CONCLUSIONS

It is clear that a multitude of surveys regularly collect data on livestock, but few explicitly target the livestock sector. Surveys have different purposes and allow the generation of different livestock sector indicators; however, the livestock data generated by different surveys are often not compatible, nor comparable due to difficult statistical units, methodologies of collection, time frame for collection, etc. Most surveys target information either at the production or consumption level, with little information regularly available along the value chain.

The overall information available on the livestock sector varies by country, depending on the surveys which are undertaken. Given that there is no any survey which fully responds to the information need of major livestock stakeholders, the possibility of designing effective investments in the sector strongly depends on the possibility of jointly using data from different surveys, i.e. on the possibility of data integration.

Livestock data from surveys which are regularly undertaken provide broad indications on priority areas for investments in the sector. However, they need to be complemented by targeted, ad hoc surveys for detailing effective investment plans.

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