

# INTRODUCTION

The growing demand for food of animal origin in developing countries, stimulated by population growth, gains in real per capita income, and urbanization, represents a major opportunity for poverty reduction, economic growth, and overall contribution to the post-2015 Development Agenda (Delgado *et al.*, 1999).

This is particularly the case for Africa where aggregate economic growth of over 5 percent per year over the period 2000–2013 has exceeded growth rates in many other world regions due to consolidated macroeconomic and political stability throughout the continent. Robust economic growth in Africa has been and is anticipated to translate into a growing demand for animal-source foods. Meat and dairy products are high-value food products for which consumption is well correlated with income level. In 2005/07, the average African citizen consumed about 11 kilos of meat per year and 35 liters of milk. This is projected to progressively increase in the coming decades, up to 26 kilos and 64 liters in 2050 respectively (Pica-Ciamarra *et al.*, 2013).

These projections are notable, but definitely more striking if one considers that by 2050 the African population will be 2.2 billion, more than doubling its 2005/07 level (0.9 billion). Overall, between 2005/07 and 2050 total milk consumption will increase from 32 to 83 million tons (+159%), and total meat consumption from 11 to 35 million tons (+218%). At constant farm-gate prices, the total market value of meat products will increase from US\$ 33 to US\$ 108 billion (+227%), and that of milk from US\$ 17 to US\$ 44 (+158%) (Nouala *et al.*, 2011; Pica-Ciamarra *et al.*, 2013).

Available data on livestock, stakeholders contend, are insufficient to formulate and implement the necessary public and private sector investments for livestock sector development, whose potential contributions to economic growth, poverty reduction and food security risk thus remain untapped. Most countries “lack the capacity to produce and report even the minimum set of agricultural data necessary to monitor national trends or inform the international development debate” (World Bank, 2011, p. 11). In particular, a review of existing livestock-related data/datasets for African countries suggests that:

- There exists a variety of livestock-related indicators within Africa at country level, including figures on animal

numbers and meat and dairy production, consumption, and trade flows of a number of livestock products, both raw and processed (e.g. FAOSTAT, 2013; WAHIS, 2013). The quality of available data, however, is often questioned by livestock stakeholders, even for the most basic indicators such as livestock numbers (see chapter 1.4).

- Nationally representative household, agricultural and/or farm surveys — which are more or less regularly undertaken by the National Statistical Authorities — tend to marginally appreciate livestock. The survey questionnaires contain only a few, if any, livestock-related questions, mainly focusing on the number of animals owned and value of production. These surveys, therefore, don’t currently lend themselves to generating comprehensive information on farm, non-farm and off-farm livestock-related activities (e.g. on livestock trade), which is much needed by policy makers (see chapter 1.3).
- Specialized livestock surveys are rarely undertaken by national governments. These surveys typically target technical issues — such as animal breeds, feed, animal diseases, meat production, etc. — with an ultimate objective of better understanding the determinants of livestock production and productivity. They represent a critical input for the design of effective policies and investments at farm level (see chapter 1.4).
- National governments collect on a regular basis data on animal diseases which, if uncontrolled, may cause major economic and social losses. However, the quality of the collected data, including their timing and accuracy, is uncertain. This limits the capacity of the government to effectively control and manage the spread of diseases, including zoonoses (Okello *et al.*, 2013).
- Finally, all sources of livestock data and statistics — such as agricultural censuses, livestock censuses, periodical and *ad hoc* agricultural sample surveys, household income or expenditure surveys — rarely if ever generate comprehensive information on pastoral production systems, which is of considerable relevance to many African countries, particularly those in the Sahel and the Horn of Africa (see chapter 1.4).

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To sum up, livestock data are not widely collected by national governments and rarely on a regular basis; and the quality of available data is mixed in its timeliness, completeness, comparability and accuracy. This makes it difficult the design and implementation of effective investments and policies in the sector.

Over the past decades a number of initiatives have been launched to support the collection and analysis of agricultural data and statistics, including the Partnership in Statistics for Development in the 21st Century (PARIS21), the Wye Group on Statistics on Rural Development and Agriculture Household Income, the UN *Global Strategy to Improve Agricultural and Rural Statistics* (World Bank, 2011), and the 2010–2013 *Livestock in Africa: Improving Data for Better Policies* Project. The latter, jointly implemented by the African Union — Interafrican Bureau for Animal Resources (AU-IBAR), the Food and Agriculture Organization (FAO), the International Livestock Research Institute (ILRI), the World Bank, and the national governments of Niger, Tanzania and Uganda, is possibly one of the first attempts to specifically address livestock data and statistical issues in Africa.

This Sourcebook on livestock data summarizes the activities and outputs of the *Livestock in Africa: Improving Data for Better Policies* Project. It provides guidance to decision makers responsible to collect and analyze livestock data from different perspectives on how to systematically address livestock data-related issues within the context of the national agricultural statistical system. In particular, it first develops the skeleton of a sound livestock statistical system — consistent with the demand of livestock information by stakeholders and the principles of the *Global Strategy to Improve Agricultural and Rural Statistics* (World Bank, 2011) — which represents the foundation for producing good livestock data. It then presents a sample of methods and tools – and associated examples — designed to improve the quantity and quality of livestock data available to decision makers. These tools and methods target household and farm level data — for example, trade data and the role of expert informants to generate statistics are not dealt with in the Sourcebook — and to a large extent have been tested in the context of the implementation of Living Standards Measurement Studies and small-scale data collection exercises in Niger, Tanzania and Uganda. They were jointly identified and developed based on dialogue between the *Livestock in Africa: Improving Data for Better Policies* Project and users and suppliers of livestock data and statistics at country level, including the

Ministry responsible for livestock development, the National Statistical Authority, and other national and pan-African public and private sector data stakeholders. As such, they address data issues which are of broad interest to livestock stakeholders: the 23rd session of the African Commission for Agricultural Statistics (AFCAS, December 2013) recommended country governments in the continent adopt some of the tools and methods presented in the following chapters to improve the quantity and quality of the livestock information available to decision makers.

**PART I** of the Sourcebook reviews the demand and supply of livestock data. It first presents the principles underpinning an effective agricultural and livestock statistical system, such as presented in the *Global Strategy to Improve Agricultural and Rural Statistics* (chapter 1.1). It then identifies the core livestock indicators needed by decision makers, not only for regular monitoring and planning (chapter 1.2) but also for policy and investment purposes (chapter 1.3). It finally investigates whether the prevailing agricultural data collection systems suffice to generate these indicators (chapter 1.4). In most cases the answer to this question is no, or only to a limited extent.

**PART II** presents tools and methods on how to improve livestock statistical systems, including the quantity and quality of livestock data. It proposes a livestock module for integrated household or agricultural surveys, which consists of a set of questions aimed at revealing the full role of livestock in the household and the farm economy (chapter 2.1); it reviews experiments in survey design, including one on milk production and one on pastoralist livelihoods, which provide guidance on how to develop or improve the content of household or farm level survey questionnaires (chapter 2.2); it addresses approaches to better estimate livestock technical conversion factors, and hence livestock production (chapter 2.3), and presents an institutional approach to improve the quality of routine livestock data or administrative records, which are a major source of information on animal diseases in the country (chapter 2.4).

**PART III** provides some practical evidence on how country governments produce or could produce some selected livestock indicators for the proper formulation of policies and investments. Chapter 3.1 highlights options for estimating livestock population in and in-between surveys, with examples from West Africa. Chapter 3.2 discusses how, using data from the implementation of the livestock module for

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multi-topic household surveys, the contribution of livestock to household livelihoods can be properly assessed and feed into the design of policies and investments that maximize the impact of sector growth to the broader goal of poverty reduction. Chapter 3.3, 3.4 and 3.5 bring to light that livestock data from most surveys — even when an effective agricultural statistical system is in place — are insufficient on their own to provide detailed guidance to investors and policy makers and present methods to fill this information gap. Chapter 3.3 gives an example of data integration to obtain statistically robust measures of the contribution of livestock to household income at district level in Uganda, by jointly using data from the 2008 Uganda Livestock Census and the 2009/10 Uganda Panel Survey. Chapter 3.4 presents and discusses the implementation in Tanzania and Uganda

of a methodology to collect data on the quality dimensions of the market for animal-sourced foods. This information is not captured by quantitative data, but it is essential to assess the opportunities for a demand-driven growth of the livestock sector which is inclusive of smallholder producers' participation. Finally, Chapter 3.5 reveals that available data are usually sufficient to identify broad categories of symptoms of constraints to livestock production and productivity, but do not suffice to provide clear guidance for policies and investments. It then presents a methodology, implemented and tested in Uganda and Tanzania, which helps mapping symptoms with a structured list of core constraints at farm level, thereby assisting decision makers in identifying priority areas for investments to increase livestock production and productivity.



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# PART I.

## DEMAND AND SUPPLY OF LIVESTOCK DATA: GAPS AND ISSUES

### 1.1 THE BASICS OF A PROPER LIVESTOCK STATISTICAL SYSTEM

#### KEY MESSAGES

Good livestock data originate from a functional agricultural statistical system.

A wide number of livestock data users require a multitude of data, but the agricultural statistical system should prioritize a minimum set of core data as the building block of good livestock statistics.

Data integration, i.e. the use of data originating from different livestock, agricultural and non-agricultural surveys, is essential for the design of effective sector policies and investments.

Good governance, institutional collaboration and capacity building are critical ingredients of a functional agricultural statistical system, which also includes livestock.

#### THE ISSUE

About 60 percent of rural households in developing countries are partially or fully dependent on livestock for their livelihoods. Livestock rearing provides them with a wide spectrum of benefits, such as cash income, food, manure, draft power and hauling services, savings and insurance, and social status. The livestock sector currently accounts for about one-third of agricultural value added in developing countries, and for over half of the value added in industrialized economies (FAOSTAT, 2013). While livestock farming might also have some negative effects on society, through animal-human disease transmission and environmental impacts, the sector remains critically important for millions of people in developing countries (Otte *et al.*, 2012).

The livestock sector, and the role that animals play in the household economy in developing countries, are anticipated to change rapidly in the coming decades. Consumers, including those in sub-Saharan Africa, are increasingly demanding high-value agricultural products such as fruit, vegetables, meat, and dairy products (Delgado *et al.*, 1999; Pica-Ciamarra *et al.*, 2013; Jabbar *et al.*, 2010). Producers will respond to this growing demand and, as a consequence, livestock will become an increasingly important sector of agriculture.

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*“Data not only measures progress,  
it inspires it.”*

**HILLARY R. CLINTON**

In this fast-changing context, good quality livestock data are needed for designing and implementing policies and investments that sustain and promote the sector’s socially desirable development. Available livestock data, and the derived statistics or indicators, however, are largely considered inadequate for effective decision making.

Perry and Sones (2009) present a review of major databases targeting livestock and conclude that *“often available data is not adequate to answer the questions being raised or to allow optimal targeting or design of interventions. Available data is patchy, often old, disparate, scattered and hard to combine and pull together. Even seemingly mundane and basic data, such as accurate estimates of the number of poultry in a country, are often unobtainable, let alone more complex questions such as what is the impact of a given disease”*.

A Report on Livestock Data and Information in Tanzania released in 2010 by the Ministry of Livestock and Fisheries Development reads: *“Livestock data are currently inadequate in Tanzania ... as they lack consistency through time and between sources; and are not complete as they possess a lot of gaps”* (MLFD, 2010b).

In 1999, LID produced a report on ‘Livestock in Poverty-Focused Development’: it estimated that about 70 percent of the rural poor, about 970 million people, were dependent on livestock for part of their livelihoods (LID, 1999). Ten years later, in 2009, the FAO State of Food and Agriculture ‘Livestock in the Balance’ (FAO, 2009), touching on the livestock and poverty equation, duplicated the table produced by LID, clearly illustrating that livestock poverty data are not updated regularly.

A National Livestock Census undertaken in Uganda in 2008 estimated the cattle population at 11.4 million. The day before the Census release, the national herd stood at 7.5 million cattle. In other words, overnight the Census increased the cattle population in the country by 3.9 million heads, with pre-census data underestimating it by 52 percent (MAAIF and UBOS,

2009). The budgetary implications for the Uganda Ministry responsible for animal resources cannot be overstated.

The estimation of livestock value added in the national accounts makes use of so-called technical conversion factors. These are coefficients that convert a measured livestock variable into a different unit of measure: for example, ‘milk yield per cow per day’ allows estimating milk production by only counting the number of milking cows in the country. In Tanzania, the livestock technical conversion factors used to estimate the livestock value added in the national accounts have been kept constant for over ten years, i.e. all possible increases in livestock productivity achieved in recent years are not captured in the official country statistics (MLFD, 2012).

The above examples, and others available from developing countries, highlight that livestock sector investments and policy decisions are often based on inadequate information, which results in a less than optimal allocation of scarce public resources. Investments that improve the quantity and quality of livestock data can thus generate handsome returns in the medium to long-term, provided they produce the information needed by decision makers to make evidence-based decisions for sector development.



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## LIVESTOCK IN THE GLOBAL STRATEGY TO IMPROVE AGRICULTURAL AND RURAL STATISTICS

Livestock is part of agriculture; livestock data are part of agricultural data. Indeed, livestock is usually a component of agricultural surveys, with countries seldom undertaking standalone livestock surveys. Improving the quantity and quality of livestock data available to decision makers requires, therefore, improving the functioning of the agricultural statistical system which, in turn, is part of the national statistical system.

*The Global Strategy to Improve Agricultural and Rural Statistics* (Global Strategy), endorsed by the UN Statistical Commission in 2010, provides broad guidance on how to improve the agricultural statistical system, and livestock data therein (World Bank, 2011). The *Global Strategy* recommends targeting investments to improve agricultural and rural statistics around three pillars:

1. The establishment of a minimum set of core data that country governments should collect on a regular basis;
2. The integration of agriculture into the national statistical system;
3. Governance and statistical capacity building.

### PILLAR 1 *Establishing a minimum set of core livestock data*

Different stakeholders demand a variety of data and indicators for a multitude of purposes, which all too often exceed the production capabilities of the national statistical system. The *Global Strategy* recommends that the starting point for the improvement of agricultural and rural statistics be the identification of a core set of data to be regularly collected. These core data, selected for their importance to agriculture, should target the social, the productive and the environmental dimensions of the sector. They will provide inputs to develop several indicators/statistics, including the national accounts and the balances of supply and demand for food and other agricultural products.

The *Global Strategy* identifies five core livestock items from which data should be collected, namely cattle; sheep; pigs; goats; and poultry. For these items, the *Global Strategy* urges

the collection of the following core data as a minimum: inventory and annual births; level of production; imports and exports; and producer and consumer prices. The *Global Strategy* also recommends that country governments should check the consistency of the suggested core items and data with their own information needs and, in some cases, add additional items and data.

### PILLAR 2 *Integrating livestock into the national statistical system*

Several governmental organizations/agencies collect and use agricultural data. These include, for example, the National Statistical Office, the Ministry responsible for animal resources; the Dairy/Meat Board; the Ministry of Trade, and others. These actors often collect the same data, but because of little coordination, end up producing indicators that are incomparable, or even conflicting in some circumstances. There are several reasons for this, such as the use of different sampling units and/or different samples; different concepts, definitions and classifications; different methods of data collection; different questionnaires; and other.

The *Global Strategy* recommends that country governments develop a unique master sample frame for agriculture. The frame is the means by which the statistical units to be enumerated in the collection are identified, such as a list of all rural households or agricultural holdings, identifying each unit without omissions or duplication. A unique master sample will provide the basis for the selection of samples of farms or households for all surveys, which allows linking farm and household characteristics and connecting both to the land cover and use dimensions. The “area sample” frame — which is essentially the country land mass divided into sampling units — is deemed appropriate to this purpose. The

**“The Global Strategy recommends that country governments develop a unique master sample frame for agriculture.**

**The frame is the means by which the statistical units to be enumerated in the collection are identified.”**

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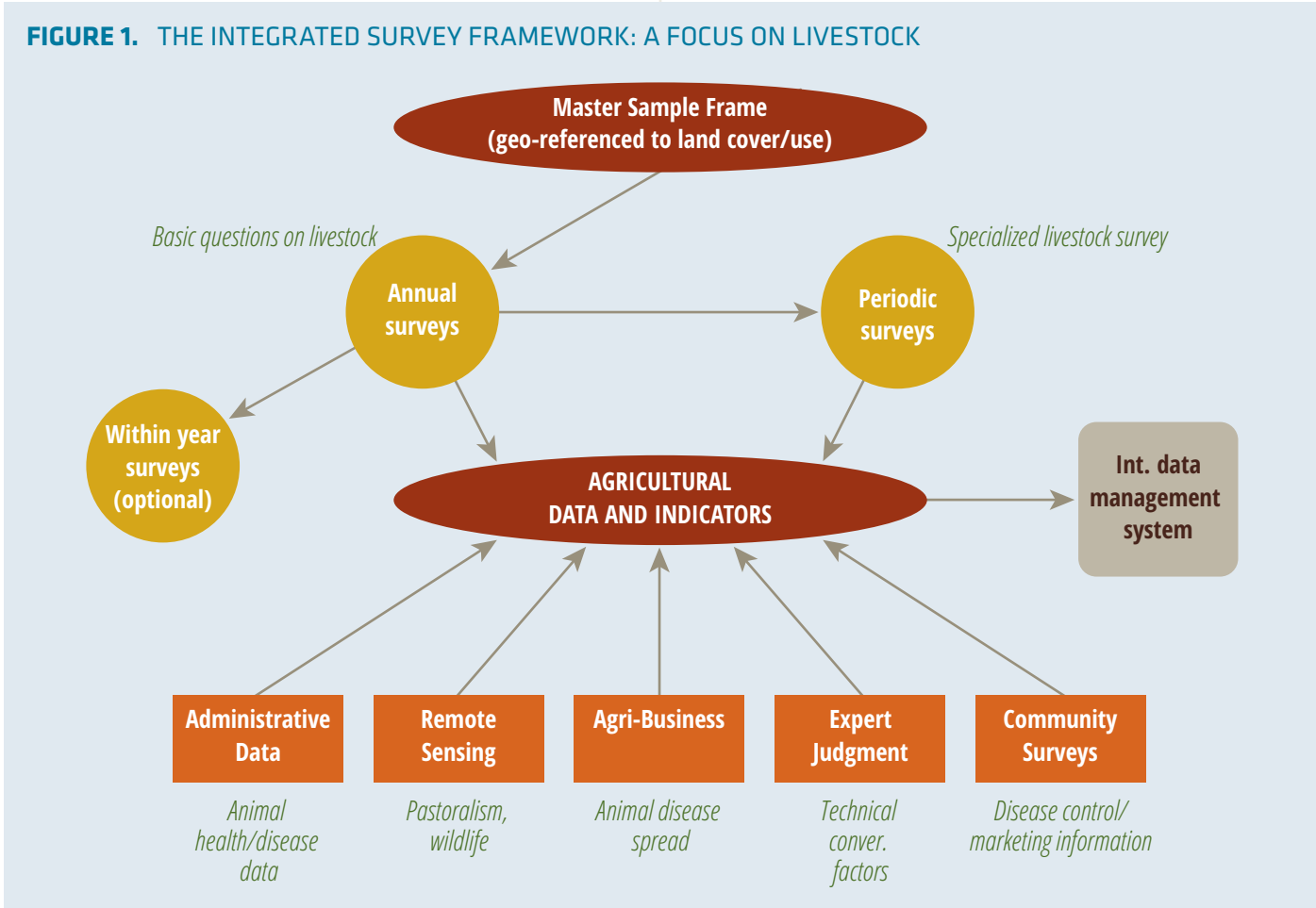
*“Using common classifications, concepts and definitions is critical to facilitate the use of data from different surveys.”*

adoption of a unique master sample for agriculture ensures that data from different surveys, including standalone livestock surveys, can be combined and jointly analyzed, thereby facilitating the appreciation of livestock’s role in the micro and macro economy. A unique master sample frame demonstrates its value when an integrated survey framework (Figure 1) is developed and when data collectors use common classifications, concepts and definitions. An integrated survey framework ensures that, with no duplication and at minimum cost, all core data, and additional needed data, can be collected as demanded by stakeholders. As to livestock,

the integrated survey framework could include, for instance, a light annual agricultural survey with basic questions on livestock; a specialized survey administered every other year collecting detailed data on the livestock sector; administrative records and community surveys used to collect data on animal diseases on a monthly basis; remote sensing surveys to count animals in pastoral areas at regular year interval; and expert judgments used to estimate and regularly update livestock technical conversion factors.

Using common classifications, concepts and definitions is critical to facilitating the use of data from the different surveys included in the integrated survey framework. For example, milking animals could be defined variously as all females in reproductive ages, or as females bred especially for milk production and actually milked during the reference period. Furthermore, milk production could be gross, which includes the milk sold and that suckled by young animals, or net, which

**FIGURE 1. THE INTEGRATED SURVEY FRAMEWORK: A FOCUS ON LIVESTOCK**



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excludes milk suckled by young animals. Alternatively, meat production could be quantified as dressed carcass weight, gross carcass weight (including the hide or skin, head, feet and internal organs, but excluding the part of the blood which is not collected in the course of slaughter), or live weight (FAO, 2000). As far as possible, countries should make use of the FAOSTAT Commodity List, which provides an international classification for agriculture commodities, including live animals and livestock primary and processed products.

## PILLAR 3 *Governance and capacity building*

Multiple organizations are involved in the collection and analysis of agricultural data, including livestock data. A functional statistical system requires that the roles and responsibilities of all actors be clear and agreed upon; that common concepts, standards and classifications are used; that samples are drawn from the sample master frame; and that there is no duplication of efforts, as all data collection systems will find their logical place in the integrated survey framework.

Data from livestock are collected not only by the National Statistical Office but also by other institutions, such as the Ministry responsible for animal resources, the Meat and Dairy Board, the Ministry of Industry, and the Ministry of Trade. It follows that any improvement in the quantity and quality of livestock data should involve not only the National Statistical Authority but also other actors, which require targeted statistical capacity building. On the other hand, the Statistical Authority would need to appreciate the peculiar characteristics of livestock, a pre-condition for ensuring that livestock is adequately represented in statistical surveys.

### *Implementing the Global Strategy*

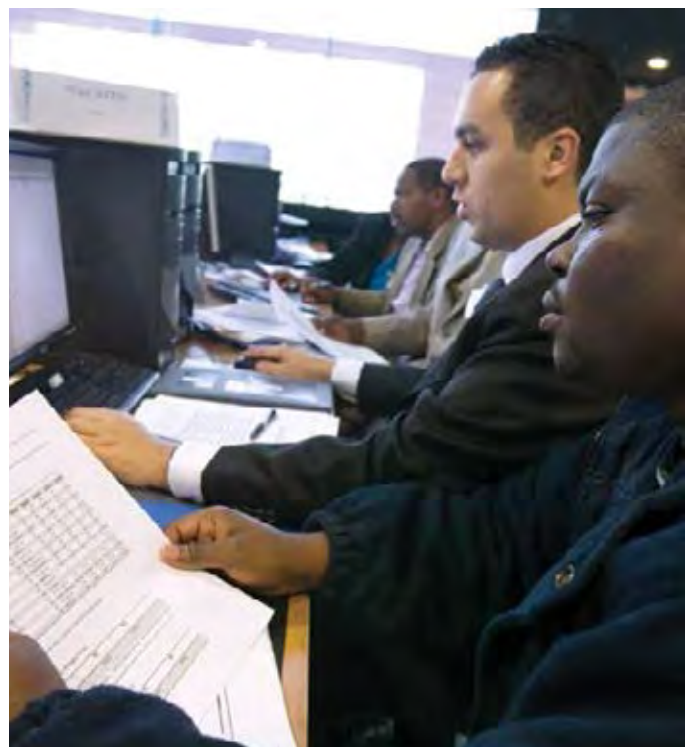
The *Global Strategy to Improve Agricultural and Rural Statistics* is implemented through a Global Action Plan which, in turn, is articulated in regional plans, including one for Africa. The Global Action Plan includes three major components: research, technical assistance, and capacity building. The research component aims at developing technical guidelines and handbooks on methodologies, standards and tools related to the pillars of the *Global Strategy*. Technical assistance is country specific and aims at assisting country governments in designing agricultural sector statistics plans

and establishing the governance structure underpinning a functional agricultural statistical system. Capacity building involves the improvement of statistical capacity at the country level to ensure that countries successfully implement the *Global Strategy*.

## THE SPECIFICITIES OF THE LIVESTOCK SECTOR

While improving the agricultural system is a pre-requisite to improve the quantity and quality of livestock data, the proper measuring of livestock requires addressing some unique sector characteristics.

Back in 1957 Hurley observed: “in analysing the [US] census experience covering 16 nationwide censuses and almost 120 years, one concludes that the nationwide collection of satisfactory livestock data ... is a difficult task and involves a number of problems. Even the job of obtaining a count of livestock is fraught with difficulties. Livestock numbers change every day of the year. Marketing is a continuous process. Livestock inventories are affected by births, deaths, farm slaughter, and by growth and change in age of animals” (Hurley, 1957, pp. 1420–1).



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While there are infinite issues to address in successfully assessing livestock, from a data collection perspective there are ultimately three broad areas that should receive attention: sampling; animal biology (zoology) and production systems; and animal health/diseases.

- **Sampling:** The presence of animals across space depends on a variety of factors, such as agro-ecological conditions and animal movements, which means the spatial distribution of livestock changes throughout the year and is somewhat uncorrelated to that of rural households and farm holdings, which are the typical sampling units. Selecting appropriate sampling points, appropriate samples and sample weights, and identifying the right time for any survey also targeting livestock can be therefore challenging, but it is critical for producing reliable livestock sector statistics.
- **Animal biology and production systems:** Animals' life cycles are affected by the way they are raised, i.e. by the production system. Measuring the latter is challenging when rural households — rather than commercial enterprises — keep animals, as these do not regularly record inputs and outputs along the production process. In these circumstances, a number of data-related issues need to be addressed before any livestock data collection starts. For example:
  - Which is the appropriate recall period for survey questions on the number of animals, given that species have different life cycles?
  - How to assess the grade of the animals, considering, for instance, that the monetary value of a herd of thin cattle differ from that of one of well-fed animals?
  - How to formulate survey questions on animal diseases? Should one follow an etiological or a symptomatic approach? Are household or community surveys the most appropriate survey tool?
  - How to quantify labor input, and hence labor productivity, when the herder manages a mixed herd, e.g. when s/he jointly takes different animals to water points?
  - How to measure the quantity of forage available from roadside hedges, often a major source of animal feed?

- How to ask milk production questions, so as to also measure the quantity of milk suckled by calves?
- How to quantify manure production in traditional production systems and how to value it?
- Other, such as measuring poultry meat production at farm level, or the value of the transport and draught services provided by animals.
- **Animal health/diseases:** The *Global Strategy* notes that “understanding the demand for statistical information at the national level [...] is a key element of the sustainability of an agricultural statistics system. Demand can be supported and strengthened if the statistical system is responsive to users and provides statistics that are relevant, accessible, timely, and with a level of accuracy that meets their needs” (World Bank, 2011, p. 27). Regarding livestock, stakeholders demand a variety of indicators (see chapter 2 and 3 in World Bank 2011), among which animal health/disease data require special attention for three reasons. First, the Ministry responsible for animal resources typically allocates a large, if not the largest, part of its resources to the management and control of epidemic and zoonotic diseases. Second, the Ministry itself often collects animal health/disease data, i.e. it is both a supplier and user of animal health data. Finally, country governments have international obligations to regularly report on their animal disease situation to the World Organisation for Animal Health (OIE) — including immediate notification (within 48 hours) of an outbreak of an OIE-listed disease. In Africa, they must also send monthly reports on their animal disease status to the African Union – Interafrican Bureau for Animal Resources (AU-IBAR). A statistical system that responds to users' needs, therefore, must be able to ensure the collection of timely and reliable animal health/disease data.

*“What we measure affects what we do; and if our measurements are flawed, decisions may be distorted.”*

STIGLITZ COMMISSION ON  
THE MEASUREMENT OF  
ECONOMIC PERFORMANCE AND  
SOCIAL PROGRESS, 2010

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## CONCLUSIONS

In the coming decades, the livestock sector is anticipated to grow rapidly in developing countries. This provides both opportunities and challenges, which are best dealt with through good quality livestock data and indicators. However, there is evidence that current agricultural data and indicators — including livestock data — are often inadequate, which prevents the design of effective policies and investment in the sector.

As recommended by the *Global Strategy to Improve Agricultural and Rural Statistics*, country governments should invest resources to improve the agricultural statistical system, starting with identifying a minimum set of core data; developing an integrated survey framework; and ensuring cross-institutional collaboration. At the same time, some livestock-specific data issues need to be

addressed for the agricultural data system to generate sufficient good quality livestock data, as livestock present peculiar characteristics that require *ad hoc* methods and approaches to data collection that need to be developed and implemented. The next three chapters in the Sourcebook assess the demand for and availability of livestock data, with the objective of identifying the major information gaps facing livestock stakeholders. Chapter 1.2 identifies the core livestock data and indicators that decision makers need on a regular basis to fulfil their mandate. Chapter 1.3 presents the information that decision makers need for policy and investment purposes, linking it to the various phases of the policy process, from agenda setting to policy implementation. Finally, chapter 1.4 examines whether the prevailing agricultural data collection systems suffice to satisfy the data demands of livestock stakeholders and identifies priority information gaps.



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## 1.2 CORE LIVESTOCK DATA AND INDICATORS

### KEY MESSAGES

Core livestock data of critical importance identified by the *Global Strategy to Improve Agricultural and Rural Statistics* include: 1) animal numbers and births; 2) production of animal products; 3) trade statistics; and 4) producer and consumer prices.

Livestock stakeholders recommend including animal disease-related data in the core data, such as number of animals vaccinated and outbreaks of animal diseases. These data are essential for the Ministry responsible for livestock which, to fulfill its mandate, allocates a large share of its budget to control and manage animal diseases.

The needs of livestock data users require that the institutions involved in the collection of livestock data provide statistics at different levels of aggregation and with different time frequency.

*“We, the Ministers responsible for Animal Resources in Africa... urge Member States to enhance capacity for timely collection, analysis and sharing of quality data to guide policy, strategy and investment programmes.”*

AFRICAN UNION, 2010

### AS MANY LIVESTOCK INDICATORS AS LIVESTOCK STAKEHOLDERS

A multitude of stakeholders make use of livestock data and indicators for a variety of purposes. Stakeholders include government ministries and other public or quasi-public agencies, such as dairy boards and statistical authorities; the private sector, encompassing small, medium and large scale livestock producers as well as input suppliers, traders, consumers and other actors along the value chain; livestock researchers and scientists in national, regional and international institutions; the civil society, such as NGOs, trade unions and indigenous peoples movements; international organizations and the donor community.

Livestock stakeholders have different objectives and look for different statistics, in terms of data items, variables, level of representativeness and time dimension. For instance, while indicators on livestock population and its trend at national level are of primary importance for the Ministry responsible for animal resources, these are of limited relevance for small or medium scale producers; while traders look for daily information on market prices of live animals and livestock products in terminal markets, this information is of little use to epidemiologists; while national governments, international organizations and the donor community have interest in accessing indicators on the incidence and distribution of poverty, including on poor livestock keepers, these statistics are of marginal, if any, significance for consumers.

Stakeholders are mostly dissatisfied with the quantity and quality of available livestock data and indicators (World Bank, 2011). Public investments are thus called for to enhance their quantity and quality. However, any attempt to improve the agricultural statistical system so that good data and indicators are provided to all livestock stakeholders as per each stakeholder's specific needs is destined to fail.

First, there are many stakeholders with a numerous information needs, i.e. thousands of indicators should be produced to satisfy their demand for information. Second, while some data and indicators are public goods, many others are private goods: these should not be generated by the public sector but by private actors with their own resources. Third, some

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indicators are needed only in specific circumstances, and it would be inefficient to generate them regularly within the context of the agricultural statistical system, i.e. *ad hoc* data collection exercises should be undertaken in these cases. Examples could be indicators on the nutritional value of raw milk, which are of use when a nutrition policy is formulated; or on the breed traits of local animals, which are largely static. Finally, the public sector acts on budget constraints, which prevent the establishment of a comprehensive agricultural statistical system capable of generating all conceivable livestock-related indicators.

## CORE LIVESTOCK DATA AND INDICATORS IN THE GLOBAL STRATEGY TO IMPROVE AGRICULTURAL AND RURAL STATISTICS

The *Global Strategy* recommends that a “*minimum set of core data is to be used as a starting point*” to improve the agricultural statistical system. These core data should target three major dimensions of agriculture, namely the social, the production and the environmental dimensions. The livestock sector falls under the production dimension and the *Global Strategy* identifies five core livestock items for which indicators are to be generated (World Bank, 2011, p. 14):

- Cattle;
- Sheep;
- Pigs;
- Goats;
- Poultry.

These items were selected because of their importance to livestock production globally: they contribute to over 99 percent of meat, milk and eggs production, with the remaining coming from animals such as camels, yaks, rabbits and equines (FAOSTAT, 2013). For the above items, the *Global Strategy* (World Bank, 2011, p. 14) identifies the following core data:

- Inventory and annual births;
- Production of products such as meat, milk, eggs, and wool, and net trade or imports and exports;
- Producer and consumer prices.

These data would help in the estimation of the two major livestock indicators identified in the *Global Strategy* (World Bank, 2011, p. 34), namely:

- Livestock value added — a critical component of the Gross Domestic Product — for the calculation of which data are needed on animal population, production level and use of inputs;
- Changes in components of livestock and poultry population by species, which encompasses data on trends in the livestock population and herd composition by gender, age and purpose (e.g. for breeding or fattening).

Before embarking in any effort to improve agricultural data systems, country governments — recommends the *Global Strategy* — should check the consistency of the suggested core items and data with their own information needs and, in case, add additional items and data. Camels and alpacas, for instance, could be a livestock item for Sahelian and Andean countries respectively. National governments are also recommended to determine how frequently data for the core items should be collected and associated indicators generated.

## PRIORITY LIVESTOCK INFORMATION NEEDS IN SUB-SAHARAN AFRICA

The FAO-World Bank-ILRI-AU-IBAR *Livestock in Africa: Improving Data for Better Policies* Project undertook four online surveys — two global and two targeting Ugandan and Tanzanian stakeholders respectively — and sponsored two international workshop in East Africa to better appreciate the information needs of livestock stakeholders and, in particular, of the National Statistical Authority and the Ministry responsible for animal resources (LDIA, 2011a, 2011b, 2011e; Pica-Ciamarra and Baker, 2011; Pica-Ciamarra *et al.*, 2012). The latter are the major actors in livestock data collection and statistics dissemination in developing countries, and any improvement in systems of livestock data collection should first target their priority information needs (MLFD and LDIP, 2011). Only then will these institutions will be willing to invest resources to collect and produce other livestock data and indicators to meet their additional information needs and/or the demands of other stakeholders.

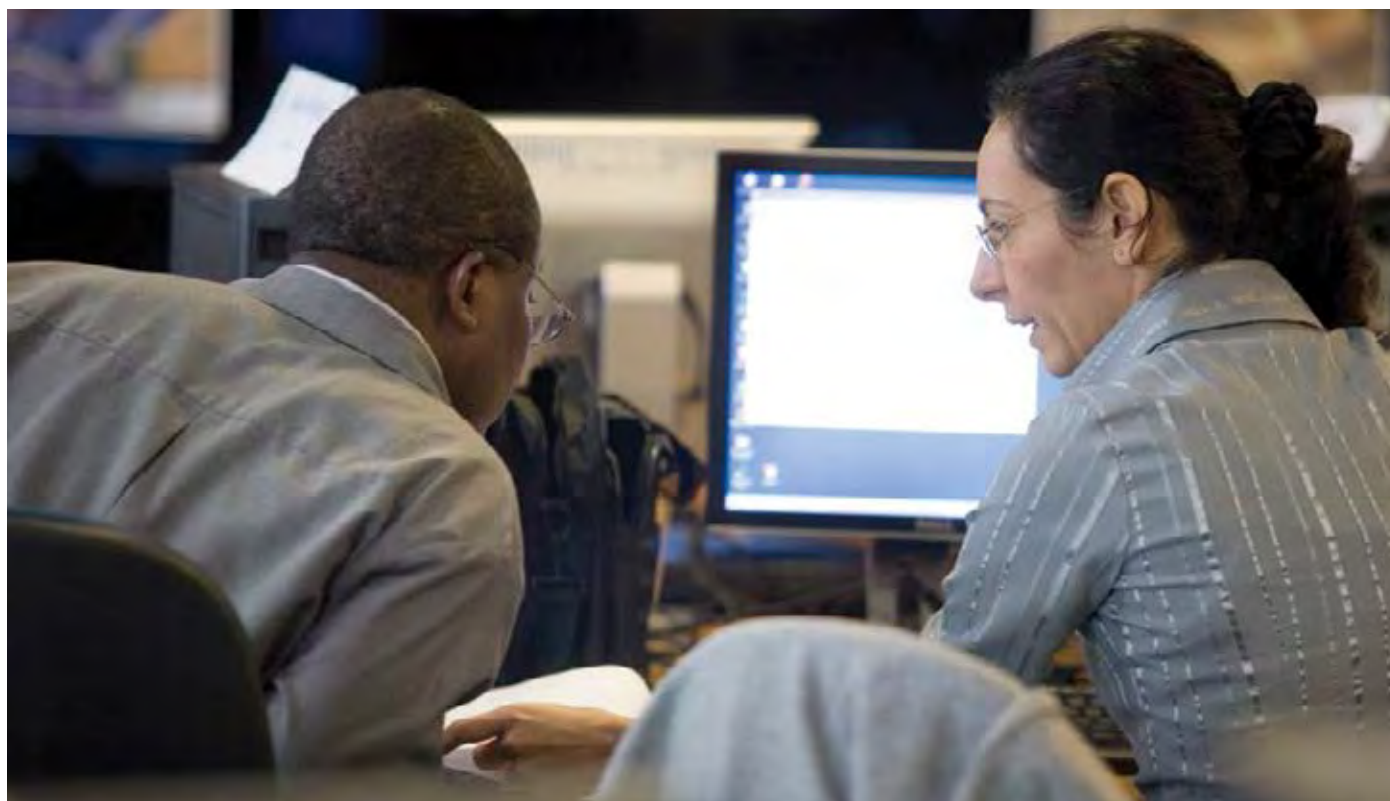
Priority information needs are here defined as the set of data and indicators that the National Statistical Authority and the

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Ministry responsible for livestock development require on a regular basis to properly fulfil their mandate, i.e. those data and indicators that are essential to deliver their monthly, quarterly and annual outputs, and whose generation is typically funded through the recurrent expenditure in their annual budget. Information needed on a larger frequency or irregularly is not considered a priority, even though it may well be of critical importance for livestock stakeholders.

### Priority livestock information needs for the National Statistical Authority

The National Statistical Authority is mandated to ensure the production and dissemination of reliable statistics in a

*“CPI is the most relevant measure of the cost of living in all countries and its trend is used to calculate the inflation rate, a major target of monetary policies.”*

variety of domains — e.g. social, economic and environment statistics — in order to meet the information needs of data stakeholders, including the government. This involves the administration of censuses and sample surveys; analysis of data and dissemination of statistics and statistical reports; the promotion of a coordinated, harmonized and efficient national statistical system; and training and guidance to other providers and users of statistics.

While the National Statistical Authority has a broad mandate, its priority livestock information targets the production of two major indicators, which it generates and disseminates at least once per quarter. These are:

- The Consumer Price Index (CPI);
- The Gross Domestic Product (GDP).

CPI is estimated monthly and is one of the several price indices calculated by the National Statistical Authority. It is the most relevant measure of the cost of living in all countries and its trend is used to calculate the inflation rate, a major target of monetary policies. It is also used as a price deflator in the compilation of real economic statistics, such as GDP at constant prices.

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CPI is a weighted average of prices of a representative basket of consumer goods and services, such as food and non-alcoholic beverages; housing water, clothing and footwear; electricity, gas and other fuels; health; transport; etc. Weights are (should be) updated every five years at least, based on budget/expenditure survey data. The food basket, which includes animal-source foods, is a major component of CPI. Prices are usually collected by data collectors in a sample of outlets in rural and urban areas (ILO, 2004).

GDP is the market value of all final goods and services produced in a country and its trend is a major indicator of growth in the economy. Most countries calculate GDP using the so-called production approach, which is basically the difference between the value of outputs for all sectors less the value of goods and services used in producing those outputs over the reference period. This is the so-called 'value added'. In developing countries, livestock value added is a relevant component of the GDP. GDP estimates are released by the National Statistical Authority quarterly and annually.



### Priority livestock information needs for the Ministry responsible for animal resources

The Ministry responsible for animal resources has the overall mandate to promote, regulate and facilitate the sustainable development of the livestock sector in the country. This involves the formulation, implementation and monitoring and evaluation of sector programs and policies, as well as the delivery of public services and goods, such as vaccinations against epidemic diseases. To fulfill its mandate, the Ministry requires a variety of information, but three set of indicators have been identified as the most needed, namely:

- Animal disease-related indicators, e.g. number and proportion of animals affected by a certain epidemic disease, number of animals at risk of infection, number of animals vaccinated against selected diseases, etc.;
- Indicators on animal population, e.g. number of animals by species, breeds, sex and age over a reference period;
- Production and productivity-related indicators, e.g. level of beef production per year and milk yield per cow.

In most countries, as Chapter 1.1 noted, the Ministry mandated for livestock development allocates a large share of its resources to animal health-related activities. For instance, over 26 percent of the recurrent expenditure of the Tanzania Ministry of Livestock and Fisheries Development is used for this purpose, according to the Medium Term Expenditure Framework 2010/11 – 2012/13 (MLFD, 2010a). The fundamental reason is that the Ministry is responsible for managing and controlling epidemic and zoonotic diseases, and particularly to intervene as rapidly as possible when there are outbreaks, in order to avoid disease spread and the associated socio-economic losses. In addition, country governments have international obligations to regularly report on their animal disease situation to the World Organisation for Animal Health (OIE) — including immediate notification (within 48 hours) of outbreaks of an OIE listed disease. In Africa, country governments must also send monthly reports on their animal health status to the African Union – Interafrican Bureau for Animal Resources (AU-IBAR).

Detection of animal disease outbreaks is of limited value on its own for the Ministry: updated information on the livestock population in the affected area, and beyond, is essential for designing effective interventions and budgeting them properly. Preventive vaccination or stamping out, for

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example, are best implemented when the number of animals at risk and those (potentially) infected by a certain disease are known with some statistical precision. Indicators on the livestock population, and its distribution across the country, are also essential for the Ministry to deliver public goods and services and formulate sector policies and programs.

Finally, the Ministry responsible for animal resources does need with some regularity, at a minimum once per year, indicators on livestock production and productivity, which are a major piece of information for monitoring and evaluating the effects of most interventions on the ground.

## CORE LIVESTOCK INDICATORS IN SUB-SAHARAN AFRICA

The priority information needs by the National Statistical Authority and the Ministry responsible for livestock helps identify the core livestock indicators for sub-Saharan African countries and, more in general, for developing countries as a whole, including frequency and level of representativeness. These are presented in Table 1 and discussed below.

### 1. Livestock value added

Livestock value added is a critical component of GDP. Its calculation requires (i) data on total number of animals and changes in the number of animals — which can be treated either as fixed capital (e.g. breeding animals) or as ‘work in progress’ animals (e.g. for slaughter) — over the reference period; (ii) on production of livestock products, such as meat of various types, milk, eggs, hides & skins, manure, etc; (iii) on the inputs used in the production process, such as animal feed/fodder and water; animal health services, vaccines, medicines and dips; fuel and electricity; repairs and maintenance; (iv) on imports and exports of live animals and livestock products; (v) on output and input prices. Outputs are valued at farm-gate prices that reflect the value of goods for the producers; inputs are valued at purchaser’s prices, i.e. the prices that are effectively paid by the producers (see Box 1 and LDIP 2012a). This information is needed on a quarterly basis at a minimum. Data from nationally representative sample surveys suffice for estimating livestock value added, as GDP is presented for the country as a whole and, in some circumstances, for its major regions.

**TABLE 1. CORE LIVESTOCK INDICATORS FOR SUB-SAHARAN AFRICA**

	INDICATORS	FREQUENCY	LEVEL OF REPRESENTATIVENESS
1	Livestock value added	Quarterly; Annually	Country; Major-regions
2	Average market prices for live animals and livestock products	Quarterly; Annually	Country; Major-regions
3	Outbreaks of animal diseases; Number of animals affected; Number of animals at risk.	Immediately after disease outbreaks; Monthly	District or lower administrative level
4	Total number of live animals	Quarterly; Annually	District or lower administrative level
5	Total production quantity of major livestock products	Annually	Country; Major-regions

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**BOX 1. LIVESTOCK'S CONTRIBUTION TO GROSS DOMESTIC PRODUCT**

The size of livestock's contribution to agricultural value added as well as to the gross domestic product (GDP), is a commonly quoted measure of livestock's role in the national economy. In all countries, GDP is estimated at least quarterly and annually by national statistical authorities. There are three ways of calculating GDP, which include the production approach, the expenditure approach and the income approach. All should lead to the same result. The production approach quantifies the difference between the value of outputs for all sectors less the value of goods and services used in producing those outputs during one year, i.e. it quantifies the so-called 'value added' for all sectors in the economy. The income approach measures the incomes of all individuals living in the economy over the reference year; the expenditure approach quantifies all expenditures by all individuals living in the country in the accounting period. Most country governments estimate GDP using the production approach. This method allows for measuring the overall performance of the economy as well as that of each productive sector (e.g. livestock) and of specific enterprises within each sector (e.g. beef and poultry). It also allows for tracking changes in the structure of the economy and within sectors. Values added at constant prices are useful to estimate growth rates/performances of the economy as a whole or of sector/sub-sectors over time; values added at current prices

are useful for analyses of structural changes in the economy and within sectors.

Value added is defined as the value of the output of a sector minus the value of all intermediate inputs. It is calculated without making deductions for depreciation of fixed assets and depletion/degradation of natural resources. Outputs from the livestock sector include the increase in the number of animals and the production of livestock products. The increase in number of animals is represented by both fixed capital formation – i.e. animals that are inputs into the production process, such as breeding animals and adult males for breeding or animal traction – and by so-called 'work-in-progress' animals, namely those reared for slaughter and young animals reared to become fixed assets. Livestock products include meat, milk, eggs, and other by-products, such as manure, hides and skins, fat, offals, honey, transport services, etc. Intermediate inputs comprise animal feed/fodder and water; animal health services, vaccines, medicines and dips; fuel and electricity; repairs and maintenance, such as fences and equipment, etc. Outputs are valued at so-called basic prices, i.e. farm-gate prices that reflect the value of goods for the producers. Intermediate inputs are valued at the purchaser's prices, i.e. the prices that are effectively paid by the producers. ■

## 2. Average market prices for live animals and for major livestock products

Average retail market prices, including for live animals, animal-source foods and livestock by-products are needed for the National Statistical Authority to produce the CPI. Quarterly data, representative of the country and of its major regions, suffice to produce CPI.

## 3. Outbreaks of select animal diseases; number of animals affected; number of animals at risk.

These indicators are essential for the Ministry to control and manage the spread of epidemic and/or zoonotic diseases, i.e. to identify outbreaks; treat and destroy animals; and to vaccinate those at risk and/or control animal movement. In addition, countries must report outbreaks of selected diseases within 48 hours to OiE, send monthly animal-disease reports to IBAR, and six-monthly and an annual report to

OiE (OiE, 2011). These reports contain detailed information on disease outbreaks, with information on latitude and longitude and first administrative division, and actions taken to monitor and control the outbreak's spread.

## 4. Total number of live animals by major species at district or lower administrative level.

These indicators are critical for the Ministry responsible for livestock not only for efficient interventions when animal disease outbreaks occur but also for the Ministry or Local Governments to supply other goods and services — such as the construction and maintenance of market facilities or the administration of vaccines against Foot and Mouth disease — and to design sector policies and programs, such as on animal health or water for livestock. Quarterly data are preferred, as this allows monitoring changes in the livestock population, inclusive of large and small animals.

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## 5. Total quantity of production for major livestock products.

Information on production levels is critical to monitor trends in the sector and, combined with indicators on animal populations, it allows the generation of basic productivity indicators, such as milk yield per cow or eggs per laying

hen. Production and productivity indicators, as said, are the basics to measure the performance of whatever intervention undertaken by the Ministry or other livestock stakeholders. Annual data for the country as whole and its macro-regions are typically sufficient.

## CONCLUSIONS

There are few core livestock indicators for sub-Saharan African countries, defined as those needed monthly, quarterly and annually by either the National Statistical Authority or the Ministry responsible for livestock, and which should be generated through the recurrent expenditure budget. These are livestock value added, average market prices for live animals and livestock products; outbreaks of selected animal diseases, number of animals affected, number of animal at risk; total number of live animals by main species at district or lower administrative level; total quantity of production for major livestock products.

- Livestock value added contains, in principle, almost all information needed to monitor sector trends, particularly as it is released quarterly and annually. However, it does not include data on animal diseases, which are critical for the Ministry of Livestock. The details and precision with which countries estimate livestock value added vary, e.g. some may differentiate between local and exotic breeds of cattle and some not; some may include manure as one of the outputs of livestock, some others may not.
- Data needed to estimate the livestock value added, including on animal population, are of little use for the Ministry responsible for animal resources if collected, as in most of the cases, from sample surveys. Indeed, to deliver its services the Ministry needs indicators on the distribution of the livestock population at district or lower administrative level.
- Animal health indicators are of interest only to the Ministry of livestock and should be regularly collected at district or lower administrative level.

- While the core indicators for the Statistical Authority should be representative of the country as a whole and of major regions, the population and animal disease-related core indicators for the Ministry responsible for animal resources should be representative at district or lower administrative level.
- The National Statistical Authority demands data on a quarterly and annual basis. The Ministry of Livestock needs data more frequently, often on a monthly basis.
- The identified core data and indicators correspond to those in the *Global Strategy*, with the relevant exception of animal disease-related indicators that are not mentioned therein.

Investments aimed at improving livestock data systems in sub-Saharan African countries should first assess the prevailing agricultural (and livestock) data collection systems to evaluate whether they generate enough data to produce the identified core indicators. If this is not the case, then investments should be made to strengthen the production of such indicators (Chapter 1.4 presents a critical review of the prevailing agricultural and livestock data collection system in sub-Saharan Africa). It is also worth noting, however, that the availability of core livestock data and indicators is not sufficient for the statistical system to provide all the information needed by stakeholders to effectively design and implement livestock sector policies and investments. The latter should be based on a much wider set of data and indicators, many of which are not to be generated on a regular basis. The next chapter explores the kind of information needed for making effective evidence-based livestock sector policies and investments.

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## 1.3 DATA AND INDICATORS FOR EVIDENCE-BASED LIVESTOCK POLICIES AND INVESTMENTS

### KEY MESSAGES

Different data and indicators are needed throughout the various phases of the policy process, from agenda setting through policy and investment design to implementation.

The statistical system provides enough information to broadly depict the livestock sector, including major trends, opportunities and constraints of different segments of producers.

The statistical system should provide all information needed to design and implement livestock sector policies and investments. Country governments need to allocate resources for *ad hoc* data collection when the time comes to design and implement interventions in the livestock sector.

*“What we measure affects what we do; and if our measurements are flawed, decisions may be distorted.”*

STIGLITZ COMMISSION  
ON THE MEASUREMENT OF  
ECONOMIC PERFORMANCE AND  
SOCIAL PROGRESS, 2010

### INTRODUCTION

The core livestock indicators identified in the previous chapter are, on their own, insufficient to provide adequate information for the proper design of livestock sector policies and investments. Indeed, so-called evidence-based policies and investments require a wider spectrum of data and indicators – e.g. the number of cattle keepers and their average herd; the seasonality of feed available and feed quality; marketing facilities and animal health posts along marketing routes; etc. They also need to be based on participatory and inclusive policy processes and, in many circumstances, on some *ex ante* pilots, primarily to test on a relatively small scale the effects of prospective interventions by comparing outcomes for those (households, communities, etc.) who participate in a given program against those who do not.

A larger set of good-quality data and indicators, participatory decision processes and *ex ante* pilots are complementary ways to enhance the quality and quantity of information for evidence-based policies and investments. The entry point for their usefulness, however, changes throughout the decision making process.

For example, good data are useful in identifying binding constraints to livestock productivity, and hence priority areas for investments; while *ex ante* pilots are more appropriate for identifying effective interventions to remove those constraints. This chapter systematizes the overall information needed by decision makers to effectively formulate and implement policies and investments in the livestock sector. It provides guidance on when and which data and indicators are needed in the policy/investment dialogue; when participatory decision making processes are most valuable; and when *ex ante* pilots are most appropriate.

It is recognized that the formulation and implementation of policies and investments is a continuous process and that many development partners condition the final outcome. For clarity, however, it is assumed here that the decision maker is the Ministry responsible for animal resources, and that the Ministry’s overarching objective is the promotion

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of sustainable and inclusive growth in the livestock sector. Therefore, the Ministry should consider the following questions:

### 1. Why invest in livestock?

Allocating resources to the livestock sector makes sense only if its development contributes to the broader socio-economic development goals of the country. It is therefore necessary to understand the extent and nature of livestock's development contribution, both negative and positive.

### 2. Whom to target?

There is heterogeneity among livestock producers, and variety in their responses to changes in the economic and institutional infrastructure as determined by policy. Characterizing livestock producers is thus essential to formulate appropriate policies and investments. Identifying other benefactors from, and stakeholders in, livestock development is also valuable, particularly as conduits to value chain-based change.

### 3. Which constraints?

Identifying the binding constraints that prevent different types of livestock producers and stakeholders from making efficient use of their animals is indispensable in identifying priority areas for investment, and for policy reform. Such constraints can impede development in various ways, at local, national, regional and continental levels.

### 4. What to target?

Understanding and interpreting the root causes of binding constraints is necessary for the formulation of policies and investments that ease or eliminate those constraints, thereby allowing livestock producers and other stakeholders to capture all the potential benefits from livestock production and commerce.

### 5. How to design policies and investments?

Decision makers need to be informed of the pros and cons of alternative ways and means of easing and/or removing one or more binding constraints. This requires assembly and analysis of information in appropriate forms and formats.

### 6. How to ensure effective implementation?

Monitoring and evaluation are necessary to ensure that policies and investments be properly implemented and that the necessary adjustments can be made. This requires an information and analytic base that is iterative with the answers to the questions posed above.

The following sections address the above questions. The final section synthesizes the main points, focusing on the importance of accessing data and indicators, which provide a statistically precise picture of the country as a whole and of its major agro-ecological/administrative regions, a vital aspect for investment and policy design. This chapter does not specifically deal with the demand for information by the private sector, which is briefly discussed in the following box.

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**BOX 2. UGANDA: THE DEMAND FOR INFORMATION OF A MILK PROCESSOR**

The Sameer Agriculture & Livestock Ltd. (SALL) – a joint venture company established by the Sameer Group of Kenya in conjunction with RJ Corp. of India – took over of the former government parastatal Uganda Dairy Corporation in August 2006. Out of 39 large, medium and small dairy processing plants in Uganda, SALL is today the largest. SALL is manufacturer of the ‘Fresh Dairy’ range of dairy products. These include: fresh pasteurized milk; Ultra-Heat-Treatment (UHT) milk; yogurt; butter; ghee, and powder milk. Fresh pasteurized milk represents the major business for SALL, with about 45 to 50 percent of the milk processed daily used to produce pasteurized milk. About 30 to 40 percent of the processed milk goes into UHT milk, and the rest into the other dairy products.

SALL is a buyer of milk and a seller of dairy products. It largely buys from district cooperatives in Western and Central Uganda, which have established about 135 milk collection centers equipped with coolers and generators as well as testing kits provided by SALL. The milk is transported to the so-called Bulking Centers, managed by the Cooperatives, where it is chilled a second time. SALL insulated tankers then take the milk to the processing plant in Kampala.

Milk production in Uganda is insufficient to satisfy existing demand (the country is a net importer of milk) and SALL finds difficulties in getting sufficient and timely supply of milk (which leaves over 80 percent of its processing capacity unused). SALL has its own sources of information and, like all active companies, gets direct and indirect information on market status and trends through its business partners and through observing daily price trends. However, with the aim of expanding its operation and satisfying the unmet and growing demand for milk in Uganda, SALL would appreciate updated information on districts with relevant surplus production of milk as well as on potential trends of milk production in the country. Some of this information is available, but in most cases is either presented in formats which are of little use to SALL (e.g. only regional data are available or data are summarized in maps with no detail numbers attached) and based on data which are more than a few years old. Delayed availability of data is problematic in a country where, according to the Uganda Bureau of Statistics, annual GDP growth averaged over 7 percent over the past ten years, a growth which translates into changing consumers’ food preferences and demand for livestock products. ■

## WHY INVEST IN LIVESTOCK?

A pre-condition for investment in improved livestock data systems by the Ministry responsible for animal resources is access to adequate resources, through the Ministry of Finance or via other funding sources, such as the Regional Economic Communities, donors and financial partners, including the private sector. Access to such funds requires demonstrating that investment in livestock contributes to the overarching development goals of the country. Such contributions might relate to income generation and/or poverty reduction and food security, support enhanced resource use efficiency, and/or generate economic gains through stimulating trade. These contributions may also be regional in nature, such as the collective contribution to a goal like controlling animal disease. Success in generating investment funds to support sector development requires that the following question be answered.

In much of the developing world, a convincing answer to this question should provide evidence that the development of

the livestock sector contributes to economic growth, poverty reduction, food security, reduced vulnerability and other socio-economic goals. To this end, the Ministry should be able to access and package for advocacy purposes the livestock-related and socio-economic data and indicators which reveal sector trends, shares in various aggregates, and their correlations with key socio-economic variables. Examples of such indicators are listed below; the figures are often more illustrative and compelling when comparing between countries.

- **Trends and projections in total and per-capita consumption of animal-source foods**, at country and regional level, and in specific locations or zones. This information could provide a rationale for supporting sustainable livestock sector growth in response to observed growth in demand for high-value foods, including animal-source foods.
- **Trends in livestock value added over the years**, in absolute terms and as proportion of agricultural value

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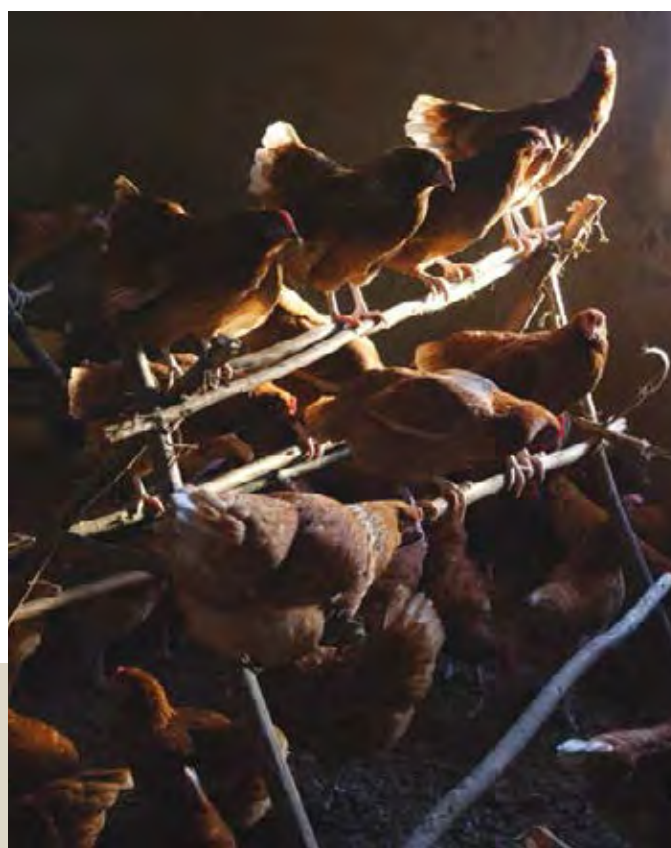
added and GDP. Given that the importance of livestock in agriculture tends to increase with economic development, this information could highlight that investments in the sector are needed to ensure its efficient and equitable growth.

- **Number and proportion of rural households keeping selected livestock species.** disaggregated by income, region, gender and other variables of development interest. Available data from developing countries show that, in most cases, the majority of rural dwellers keep livestock, which suggests that broad-based increases in livestock productivity could directly support their livelihoods, while also increasing the availability of animal protein to urban dwellers.
- **Rates of under-nutrition, daily per capita intake of meat and milk, and the proportion and section of the population not consuming animal-source foods.** These indicators could highlight the nutritional benefits available from increasing the availability of affordable livestock products.
- **Number and type of persons employed along selected livestock value chains.** This provides guidance on the potential for investments in the livestock sector to generate employment, which represents a major pathway out of poverty for the less well-off, amongst both urban and rural populations, and amongst vulnerable stakeholders such as women.

Simple data and indicators as the ones mentioned above can help make the case for investing in livestock. However, more powerful advocacy can be achieved by presenting rigorous statistical associations between livestock-based development and overall development. The following list of studies provides examples of such work, which requires high quality data that is standardized within or across countries. This list also supports the development and use of more advanced sets of indicators more geared to advocacy.

- In a seminal study on agricultural productivity differences across countries, Kawagoe *et al.* (1985) find that livestock — considered as an input representing long-run capital formation in the agricultural sector — is a significant determinant of agricultural production, as measured by gross output net of agricultural intermediate products.

- Bogale *et al.* (2005) look at the determinants of rural poverty in three Ethiopian districts, with poverty defined in terms of both per capita household calorific consumption and per capita household expenditure on basic needs. They show that the probability of a household being poor declines as the number of oxen owned increases.
- Benin *et al.* (2008) use an economy-wide model to estimate the responsiveness of the poverty rate to per capita agricultural GDP growth in Malawi. A one percent increase in livestock GDP per capita is anticipated to reduce national poverty by 0.34 percent.
- Pica *et al.* (2008) show that increases in livestock productivity — as measured by value added per Tropical Livestock Unit — appear to be/have been a cause of per capita GDP growth in 33 developing countries in Africa, Asia and Latin America.
- Bashir *et al.* (2012) estimate the contribution of livestock to food security in the State of Punjab, Pakistan, using data from 12 out of its 36 districts. Food secure households are defined as those with calorie intake at or above 2,450 Kcal/per capita/day. Results show that ownership of large and small ruminants has a positive impact on household food security.
- Otte *et al.* (2012) estimate household livestock income multipliers for major world regions, defined as the impact on total household income of a 1 US\$ increase in either



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livestock production or livestock processing. Calculated multipliers range from 2.0 to 6.8, and are found to be larger than those associated with crops, fruits and vegetables, manufacturing and the service sector.

While basic data and indicators on livestock-related and socio-economic variables are available for most countries — though often not sufficiently disseminated or adequately analyzed — there are few examples of rigorous statistical analysis and modelled projections, and still fewer that can generate causality arguments to demonstrate the contribution of livestock to socio-economic development. This is partly because comprehensive datasets on livestock are not usually available — e.g. in most economy-wide models, livestock is included in the agriculture aggregate. At the same time, the Ministry responsible for livestock is not mandated, and often not equipped, to undertake such analyses. Nor does the Ministry typically have the power to influence significant change in data collection systems by national authorities, usually the national offices of statistics. However, it can collate and interpret existing documentation, including from neighbouring countries, and collaborate with regional, national and international research institutes to rigorously demonstrate that investing in livestock is an effective way to contribute to a number of socio-economic goals.

## WHOM TO TARGET?

Once the Ministry responsible for livestock development demonstrates that livestock sector investments can contribute to some broad economic goal, and hence acquires resources to invest for sector development, the next relevant question to answer becomes:

Policies and investments are effective when they are consistent with the incentives of the livestock stakeholders, amongst which the producers are likely to be assigned some priority. The Ministry, therefore, needs information on current and emerging growth opportunities for animal-based food, the distinguishing characteristics of livestock producers and products, and on the prioritized use of animals in targeted households. Basic data and indicators that serve this purpose include:

- Trends in, and the form of, the demand for various animal-source foods, including unprocessed and processed products nationally and regionally;

*“At present there is a serious paucity of statistical data on which to base marketing, investment, or policy decisions, or with which to assess the efficacy of current commitments or policies.”*

### GLOBAL STRATEGY TO IMPROVE AGRICULTURAL AND RURAL STATISTICS, 2011

- Number of commercial livestock enterprises and number/share of rural households keeping farm animals;
- Herd size and herd composition of livestock producers;
- Livestock production per TLU and/or per unit of labor;
- Total income and share of total income derived from livestock for livestock-keeping households, disaggregated into rural/urban, male/female headed, and other variables of development interest;
- Level of livestock production, including shares of home consumption and marketed product, for livestock-keeping households.

These and other indicators should be used to identify a typology of producers, spanning the range from subsistence-oriented to specialized market-oriented livestock producers, through to large commercial farms. General typologies avoid *pre ante* targeting, which is often based on ethnic or other socio-cultural dimensions. Different typologies of producers keep livestock for different purposes, use a variety of technologies and respond uniquely to changes in the economic and institutional infrastructure, as determined by policy reforms within (and beyond) the sector. Such a typology has been proposed by Nouala *et al.* (2011):

- **Mixed subsistence-oriented livestock producers** are rural households that keep small herds, often mixing animals of different species; they sell a negligible part, if any, of their livestock production; and derive a relatively small share of their cash income from livestock. For them, any increase in livestock productivity — such as through

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reduction in animal mortality rate — has a positive impact on welfare.

- **Specialized market-oriented livestock producers** are rural households that keep a (relatively) homogenous herd — e.g. they could be specialized in milk or egg production — sell a significant share of their livestock production; and derive a significant part of their cash income from livestock. Improvements in livestock productivity for specialized market-oriented producers increase their cash income, assuming access to existing and growing market opportunities. These economic operators can also contribute to the generation of off-farm jobs along the value chain.
- **Commercial farms** are specialized enterprises: that maintain large homogenous herds, some permanent employees, and produce only for the market. Policies and investments to increase their productivity — such as reducing trade barriers to access inputs — make their business more profitable and competitive vis-à-vis imports. Increases in their efficiency could also potentially reduce the real price of animal-source foods in national markets — thus contributing to the food security of the (majority of) households that are net buyers of food — while generating a number of full time on- and off-farm jobs.

A variety of indicators can be used to define typologies of livestock farms — e.g. herd size and composition, husbandry practices, market participation, etc. Depending on the data available, countries may define their own typologies. While these data are useful, consultations with expert informants provide a complementary source of information on meaningful producer typologies. Indeed, data alone may generate typologies which are of little use to decision makers — e.g. a representative dairy farmer with 1.7 cows and selling 12 percent of the milk produced may be generated as an average taken across multiple modes in a dataset containing very few such individuals. A distinguishing element that in all cases should be taken into account is the household's motive for keeping farm animals, in particular whether it is related to subsistence or profit. This one factor will often condition the livestock producers' response to different types of policies and investments.

## WHICH CONSTRAINTS?

Once typologies of livestock producers have been constructed, the challenge arises as to how to create opportunities for growth and the following question becomes relevant:

### What are the critical and binding constraints that prevent the different livestock producers from making better use of their farm animals?

Policies and investments should attempt to relax or remove such constraints, particularly for key performance indicators such as livestock productivity, which limit the benefits that producers derive from their animals. Simple data and indicators on factors that are deemed to influence production and productivity provide preliminary information to decision makers. Examples are:

- Prevalence of selected animal diseases, i.e. proportion of small ruminants affected by goat plague (PPR, *Peste des Petits Ruminants*) over the reference period;
- Number and proportion of livestock producers with access to veterinary services; who regularly vaccinate their animals against selected diseases; who use de-wormers; who spray/dip animals against tick-borne diseases;
- Number and proportion of livestock producers feeding their animals with selected feeds or feed concentrates;
- Number and proportion of livestock producers with access to extension and financial services;
- Number and proportion of livestock producers who raise improved/exotic breeds;
- Number and proportion of livestock producers with social networks/capital such as membership in marketing cooperatives;
- Difference between farm-gate and retail-level prices for live animals and major livestock products;
- Number and types of livestock markets (e.g. primary, secondary), including location, frequency of operation and size;
- Access to common property resources, availability of forage, and sources and reliability of water used;

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- Access to infrastructure such as roads and telecommunications;
- Number of processing plants, including potential and used capacity.

While levels, trends and shares of input-, output- and marketing-related variables provide relevant information to decision makers, more sophisticated analyses — which systematically link outputs and inputs — are critical to identify major determinants of production and productivity, and hence to point to binding constraints and priority areas for investment. Not undertaking this type of more detailed analysis often leads to investments that do not address critical constraints, thus minimizing the impact of overall investment. What follows are examples of multivariate analyses that attempted to identify the determinants of livestock production and productivity.

- Akter *et al.* (2003) examine the efficiency in poultry and pig production systems in Vietnam. Output is measured as value of production plus the change in inventory. For pigs, it was revealed that land size, herd size, education of household head and proximity to market are positively associated with efficiency. Conversely, the age of the household head, female-headed households, greater access to government supplied inputs, and higher proportion of family-supplied feed materials significantly increase inefficiency.
- Ishaq *et al.* (2007) find that, in the small ruminant system of Southern North West Frontier Province of Pakistan, expanding the herd size generates larger returns, in terms of milk production, than any other investment. In addition, the study indicates that doubling all inputs more than doubles total milk output.
- Ashagidigbi *et al.* (2011) examine the production and productivity of egg producers in Jos metropolis of Nigeria's Plateau State. They find that larger flock sizes and a reduction in the cost of drugs would lead to an increase in total production, as measured by the total number of eggs produced.
- Gelan and Muriithi (2012) assess the economic efficiency of 371 dairy farms in Kenya, Rwanda and Uganda. They show that the adaption of improved breeds in the herd and feed and fodder innovations have significant positive effects on the levels of economic efficiency. The latter is

calculated as a function of total outputs (milk consumption, milk sales, animal sales and manure outputs) and total inputs (family and hired labor, fodder and feed, veterinary costs and other).

- Otieno *et al.* (2012) examine the determinants of technical efficiency in different beef production systems in four Kenyan districts. They conclude that the value of beef production would increase if farmers adopted controlled breeding methods; signed marketing contracts; hired farm managers; and if their off-farm income increased (due to its being invested in the cattle operation).

A critical challenge to formulating targeted interventions/ investments that ensure development impact is the paucity of basic and comprehensive data and indicators on input-, output- and marketing-related variables. Consequently *ad hoc* data collection and participatory processes are essential to identify productivity constraints, but a review of existing work is also revealing. Such reviews find that, in general:

- When livestock data are available from household surveys, most subsistence-oriented livestock keepers are shown to lack access to even the simplest production inputs, such as animal health services and feed (Bocoum *et al.*, 2013; Covarrubias *et al.*, 2012). This implies that interventions that focus on ensuring access to basic inputs are a straightforward way to improve livelihoods through investments in livestock. Indeed, analyses that target subsistence-oriented livestock keepers invariably conclude that increases in the use of basic input— such as forage, feed and animal vaccines — significantly increase production.
- Analyses that target market-oriented specialized rural households and commercial enterprises typically conclude that increases in productivity (efficiency) could be triggered by dozens of different actions, many of which are beyond the control of the Ministry responsible for livestock (e.g. education, credit or year-around access to roads). This calls for collaboration among government agencies, public and private decision makers, and an agreement to use livestock as a catalyst for economic growth.

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## WHAT TO TARGET?

Once there is information on whom to target (with a clear distinction of the intervention's objectives, i.e. supporting livelihoods or expanding the sector's contribution to economic growth), and on the binding constraints they face — e.g. limited access to veterinary services for subsistence-oriented livestock producers, or lack of credit for market-oriented livestock producers — the following area to explore is:

The identification of constraints and their subsequent prioritization, in practice, provides little guidance on how to relax and remove them, nor the sequencing of interventions that is required to induce positive change. For example, what can or should be done to ensure that farmers feed their animals with concentrates? How can the prevalence of selected animal diseases be reduced? How to promote the use of controlled breeding methods? In order to address the root causes of constraints, decision makers need a multitude of data and indicators. Indicators relevant to our example of

feed concentrates, the use of which is anticipated to increase productivity, are:

- Availability of feed concentrates in rural markets;
- Number of feed producers and their productive capacity;
- Availability of pasture;
- Relative prices of feed concentrates to the products to be produced, including their seasonal fluctuations;
- Quality of available feed concentrates;
- Access to information on feed concentrates by livestock producers.

Summary statistics associated with a particular constraint or set of constraints, such as those listed above, help disentangle the root cause(s) of a constraint and, therefore, to better focus any prospective investment. Analyses that attempt to identify rigorously the root cause of a constraint provide

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additional information for better targeting interventions on the ground. Below are a few such examples of analyses:

- Jabbar *et al.* (2002) examine the supply and demand for livestock credit in Ethiopia, Kenya, Nigeria and Uganda. They find that gender of household head, education, training, prevalence of outstanding loan and the number of improved cattle on the farm, all have significant influence on household borrowing and liquidity.
- Ajuha *et al.* (2003) study the demand for veterinary services in three States of India, namely Gujarat, Rajasthan and Kerala. They show that in all the States the demand for veterinary services, as measured by the number of veterinary visits over the reference period, is negatively associated with the price of the services and positively associated with the service time, a quality indicator.
- Bahta and Bauer (2007) assess the determinants of market participation among small-scale livestock producers in the Free State Province of South Africa. Their results suggest that market information, distance to the preferred marketing outlet, level of training, access to extension services and livestock fertility rate all have positive impact on farmers' participation in livestock markets.
- Costales *et al.* (2008) study the factors that influence participation in contract farming of pig producers in Northern Vietnam. They conclude that level of education and large physical access holdings facilitate a farmer's engagement in formal contracts with large integrators.
- Achoja *et al.* (2010) examine the determinants of the demand for veterinary services by commercial poultry producers in the Delta State of Nigeria. They find that scale of production and distance to the nearest veterinary office significantly influence the use of veterinary services.

It is not feasible to access detailed information on all constraints affecting livestock producers in all locations and contexts of interest. Often, the most marginalized livestock systems offer the least amount of information. There are not, for example, readily available datasets with information on the quality of animal feeds in a long list of rural markets or on the price paid by farmers to vaccinate their animals. This makes it challenging to both present basic statistics and conduct analyses of constraints. In formulation of policies and investments, decision makers should thus consult expert informants, promote participatory processes and, if

*“There is... inadequate data to demonstrate quantitatively the role of animal resources in African economies, and to use such data to create broad awareness among policy-makers and investors.”*

AU-IBAR STRATEGIC PLAN,  
2010–2014

possible, invest resources to undertake specialized surveys targeting a set of likely constraints. Chapter 3.5, on combining micro data with farmers' views, presents a methodology to identify the root causes of binding constraints, thereby facilitating the identification of priority areas for policies and investments.

## HOW TO INVEST?

Once information has been collected on whom to target, the constraints they face, and their root causes, the following process needs to be followed to determine:

Decision makers should draft an implementation plan — including roles and responsibilities of various actors and an estimated budget — which works to identify actions needed to relax or remove the root causes of one or more binding constraints. It is clear that the uniqueness of countries' or localities' investments and limitations on data and indicators preclude the drafting of a fully informed evidence-based implementation plan. Indeed, implementation of policy reforms and investments usually entail or include some form of institutional change — new ways of doing things that have not been yet tried out and for which data is therefore not available.

For example, available information is unlikely to be of use in assessing whether or not the quantity and quality of veterinary services in rural areas is best improved through forming a cadre of community animal health workers (a supply side intervention) or, alternatively, through the provision of

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veterinary vouchers to livestock keepers for the purchase of veterinary services and drugs (a demand side intervention).

This in turn leads to a series of development questions for which little supporting information is usually available. How many animal health workers should be trained? Does a one week training suffice or is a two week course preferable? How frequently should refresher courses be held? Should community animal health workers be given basic equipment (e.g. needles, thermometers and a small stock of medicines, etc.) for free, or at cost?

In order to answer these types of questions, decision makers can review development projects and examine past experience, conduct participatory decision making processes, or set up pilots by which different alternatives are tested on a small scale to identify the most effective, which can then be scaled up. Some reviews include the following:

- Pica-Ciamarra *et al.* (2010) provide a comprehensive review of alternative policy instruments, including pros and cons for their implementation, in different livestock-related domains, such as risk-coping; animal health; feed and forage; access to credit; livestock research; trade; and other. They show, for example, that the quantity and quality of veterinary services could be improved through alternative institutional reforms, such as cost-recovery mechanisms; joint human-animal health service delivery; sub-contracting; provision of smart subsidies to service providers or to livestock farmers; the establishment of community-based animal health workers; and other.
- Murphy *et al.* (2003) compare the efficacy of three school snacks in improving growth and cognitive function of children in rural Kenya. The snacks are composed of equi-caloric portions of *githeri* (a vegetable stew), including *githeri* alone, *githeri* plus milk, and *githeri* plus meat. Total energy intake increases more with the *githeri* plus meat snack than with the other two, because the additional energy provided by the *githeri* alone and by the *githeri* plus milk is counterbalanced by a decrease in the energy content of the food consumed at home. From a policy perspective, the provision of *githeri* meat snacks to rural schoolchildren is shown to be an optimal strategy if the objective is to improve their nutritional status.
- Grace *et al.* (2008) carried out a control trial in South Mali to assess the effects of providing information on the diagnosis and treatment of bovine trypanosomiasis by

farmers. Information was given through an eight-page booklet containing pictures with messages on diagnosis and proper treatments. Results show that knowledge of trypanosomiasis diagnosis and treatment are 23 and 14 percent greater, after 2 weeks and 5 months respectively, in the treatment group than in the control group. Relatively simple information seems sufficient to reduce the incidence of selected animal diseases.

- Henning *et al.* (2009) conducted controlled trials in 124 randomly selected backyard poultry keepers in nine villages in Myanmar to evaluate two strategies aimed at reducing chicken mortality, namely Newcastle disease (ND) vaccination using a thermostable vaccine and changes in the management of chick rearing (confinement and supplementary feeding). They find that vaccination against ND resulted in a lower incidence rate of mortality during ND outbreaks in households with vaccinated birds, but that crude mortality rate in chicken did not decline and was lower in households with altered chick management. From a policy perspective, investing resources to reduce mortality incidence due to ND makes sense only if all-cause mortality incidence is also reduced.
- Bandiera *et al.* (2012) undertook a randomized evaluation of an entrepreneurship program that provides assets — including cows, goats and poultry birds — and training to run small businesses to the poorest women in rural Bangladesh. They find that, after two years, women participating in the program allocate more time to self-employment (and less to wage-labor), which results in higher income, higher per-capita expenditure, and improved food security for their families.
- Wanyoike and Baker (2013) analyzed 58 livestock development projects to identify factors affecting their effectiveness. Key factors were revealed to be large project size, specialization in livestock issues, inclusion of government in key communication roles, inclusiveness of implementation of exit strategy formulation, and targeting of interventions at several levels of the value chain.

To enhance the probability of good intervention design and implementation, decision makers should assess and rank alternatives, with additional information sourced from expert informants, through participatory and consultative processes; and from past projects and experience, including

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those from other countries. As a practical alternative, one more visible to stakeholders, *ex ante* evaluations can be undertaken through pilots on a limited scale that are geared for scaling up.

## HOW TO ENSURE EFFECTIVE IMPLEMENTATION?

Once investment choices have been examined and policy options identified, impact is often determined by anticipating data and information needs that ensure effective policy implementation and targeted investments.

Critical to monitoring the effectiveness of development interventions is the existence and/or establishment of a robust monitoring and evaluation system, which regularly assembles quantitative and qualitative indicators of success and project progress. There exist large numbers of reference documents on monitoring and evaluation (e.g. EC, 2006; UNDP, 2009), which target four types of indicators:

- **Input indicators**, which show whether appropriate financial, human and physical resources are allocated to policy and investment implementation. An example is the number and recruitment of public veterinarians.
- **Output indicators**, which measure the immediate effects as determined by access to inputs, e.g. whether more animals are vaccinated against certain diseases as a consequence of increased numbers of veterinarians.
- **Outcome indicators**, which quantify the effects generated by the outputs, e.g. reduced incidence of certain animal diseases.
- **Impact indicators**, which measure the effects of the outcome beyond its direct and immediate results, e.g. increased animal productivity and improved households' livelihood.

In general, input and output indicators should be readily accessible and measurable, as they relate and can be collected within the daily or regular activities of some actors. Outcome and impact indicators are harder to measure and baselines more difficult to derive, which often makes it difficult to properly monitor and assess project/policy impact. In addition, attribution is complicated in many circumstances with outcomes and impacts influenced by a variety of factors, including but not restricted to changes in the known inputs and outputs.

## CONCLUSIONS

Decisions on investment and policy formulation in the livestock sector entail a thought process that has been detailed here in terms of sequencing and specificity of information needs. It is clear that decision makers need information on a variety of data domains in order to:

- Demonstrate that livestock sector development can contribute to the broader socio-economic goals of the country.
- Define some typologies of livestock stakeholders, including a clear distinction between market-oriented and subsistence-oriented producers, who have different needs and respond differently to policy and institutional change.
- Identify the major constraints that prevent the various types of livestock producers from making the best use of their animals.
- Identify and rank the root causes of the constraints, which represent the priority areas for investments.
- Design effective policy and investment implementation plans, including specification of roles and responsibilities of the various actors and an estimated budget.
- Monitor and evaluate the implementation of policy reforms and investments.

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**BOX 3. A TOOL FOR THE INCLUSION OF LIVESTOCK IN THE CAADP COMPACTS AND INVESTMENT PLANS**

The Comprehensive Africa Agriculture Development Programme (CAADP) has been endorsed by African heads of state and governments as a vision for the restoration of agricultural growth, food security and rural development in Africa. CAADP aims to stimulate agriculture-led development that eliminates hunger and reduces poverty and food insecurity by targeting investments in four pillars: land and water management; market access; increasing food supply and reducing hunger; and agricultural research. AU-IBAR is mandated to assist AU member countries to implement the livestock component of the CAADP. To this aim, it has developed a Tool for the Inclusion of Livestock in the CAADP Compacts (AU-IBAR, 2013), which is largely consistent with the stepwise approach presented in this chapter. The Tool identifies a number of core livestock indicators that country governments should collect/generate to adequately represent livestock in the CAADP Documents. The Tool consists of five interrelated modules.

Module I, Mapping and Consulting Stakeholders, assists the CAADP Country Teams (CCTs) in identifying and consulting stakeholders who appreciate the many channels through which livestock contribute to economic growth and livelihoods, including the monetary and non-monetary value of farm animals.

Module II, Livestock in the National Economy, suggests that the CCTs collect/generate a key set of core livestock

indicators at national level, which help appreciate whether there are opportunities for livestock sector development to contribute to economic growth, food security and poverty reduction.

Module III, Livestock in the Household Economy, recommends that the CCTs collect/generate core livestock indicators at household level, to help understand the role of livestock in the household economy, including constraints to productivity. Ultimately, this module aims at identifying priority areas for livestock sector investments.

Module IV, Livestock in the CAADP Compacts, clusters Module I and Module II national and household level indicators around the four CAADP pillars, namely land and water management; market access; food supply; and agricultural research. This module assists the CCTs in ensuring that livestock investments are consistent with the CAADP framework and priorities.

Module V, Post-Compact Livestock Investments, gives some basic indications on the data/indicators needed to formulate, implement and monitor & evaluate the livestock component of the CAADP National Agriculture Investment Plan. It also delves into the importance of experimenting or testing alternative implementation mechanisms on a small scale before scaling out investments to the entire country. ■

In particular, knowing with statistical precision the number of animals and the number of livestock farmers at some low administrative level, such as the district or county level, is essential information for effectively designing any intervention on the ground. At the same time, it should be recognized that the data and indicators needed to properly design policy and investment implementation plans are largely unavailable or inadequate due to the novelty and uniqueness of the intervention. Targeted *ad hoc* surveys may help reduce this information gap at one or more stages of the question-driven process described here.

Complete information with all the desired data sets is obviously not achievable, nor economically optimal, and the risk of designing bad policies and investments can never be reduced to zero. However, a statistical system that generates

the core livestock indicators as identified in chapter 1.2 and some other data and indicators, complemented by inclusive participatory policy processes, consultations with experts, synthesis of existing experience and analysis, and rigorous *ex ante* pilots, can assist decision makers in designing and implementing policies and investments that are to a large extent effective in promoting a sustainable livestock sector. The next chapter presents a critical review of the prevailing agricultural/livestock data collection system to appreciate what indicators/statistics they are able to produce on a regular basis.

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## 1.4 DATA COLLECTION SYSTEMS AND LIVESTOCK INDICATORS: GAPS AND PRIORITY ISSUES

### KEY MESSAGES

Numerous methods exist for collecting livestock data which range from regular sample surveys and complete enumeration censuses to administrative records and one-off, or *ad hoc* surveys.

Because the spatial distribution of animals is only partially correlated with the distribution of rural households or farms, sampling issues should be given particular attention when designing surveys that aim at generating official livestock statistics.

While a variety of methods exist for collecting livestock data, no single survey satisfies the information needs for policy and investment requirements. Data integration and *ad hoc* collection of data are recommended to generate adequate information on livestock.

### MULTIPLE SOURCES OF LIVESTOCK DATA

Core livestock indicators and other indicators needed for livestock sector policies and investments could be generated by multiple data collection systems, including regular and one-off, or *ad hoc*, surveys. Each country, depending on its priorities and resources, could implement — with some regularity — a variety of agricultural surveys, which also target livestock, as well as other non-agricultural surveys which may collect livestock-related information.

This chapter reviews the prevailing and most common systems of agricultural and non-agricultural data collection implemented across Africa, with the ultimate objective

to assess if the collected data suffice to generate the core livestock indicators (as identified in chapter 1.3), namely livestock value added; livestock population; livestock production; average market prices for live animals and livestock products; outbreaks of animal diseases, number of animals affected, and number of animals at risk. It also identifies other relevant livestock indicators that major surveys help generate. Below are the major systems of data collection that are discussed in the following sections:

- 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 labor surveys.

The chapter concludes with a summary table that highlights the main core and other livestock indicators available from major agricultural and non-agricultural surveys, and identifies gaps in the demand and supply of livestock data, both from a quantity and quality perspective, as per the findings of a global survey undertaken by the *Livestock in Africa: Improving Data for Better Policies* Project.

### 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;

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*“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.”*

- Generate data to use as benchmarks for other agricultural statistics;
- Provide frames 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 agricultural holdings, land tenure, land use, crop areas, irrigation, livestock numbers, labor, 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 with the agricultural holder or the enterprise manager by trained enumerators 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, 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 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 villages, cannot 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, such 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 programs which need to be monitored and evaluated. This may include one or more of the following (MAAIF and UBOS, 2009; République du Mali, 2007; République du Niger, 2007b; 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;

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- 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 the value of production, as 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 the data are from agricultural sample censuses that collect information from 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 that 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;
- Help monitor trends in structure and assess performance of the agricultural / livestock sector.

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 representative on a national level and for major agro-ecological zones/administrative regions. In few cases, such as the 2011–12 Ethiopia Livestock Sample Survey that covered about 68,000 agricultural households, statistics can be also generated for lower administrative units, such as local districts (CSA, 2012). Sample surveys may cover the entire livestock sector, or 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

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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 births and 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 and hedges; scattered stalks and market purchased feed, etc.;
- Water sources, e.g. rivers, boreholes, wells, etc.;
- Family and employed labor 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 space);
- Market infrastructure (e.g. animal health posts; slaughter slabs; markets);
- Consumption of animal-source foods.

Four features of agricultural/livestock sample surveys are worth noting. First, they attempt to capture information on both inputs and outputs, which allow building some indicators of productivity. Second, 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. Third, they capture information about seasonality in livestock farming through enumerators visiting households in different seasons, or when respondents are 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. Fourth, these surveys occasionally include a question on the household rationale for keeping farm animals, which is a crucial consideration when seeking to make effective investments. Interventions need to be consistent with the incentives influencing households' objectives for rearing livestock. Objectives could include self-consumption of animal food, income generation, security/insurance, and input into the agricultural sector (manure/animal traction) among others.

Agricultural and livestock sample surveys are often perceived as the best information sources for identifying major constraints to livestock productivity and opportunities for investments at the farm level. However, they rarely cover all dimensions of livestock production, nor do governments in sub-Saharan Africa systematically undertake them. Finally, it is worth noting that there are sampling errors when deriving national/regional/district livestock statistics from agricultural and livestock sample surveys. These are more pronounced in the case of agricultural sample surveys, where the statistical unit is the agricultural holding that may or not keep farm animals.

*“Agricultural and livestock sample surveys are often perceived as the best information sources for identifying major constraints to livestock productivity and opportunities for investments at the farm level.”*

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## HOUSEHOLD BUDGET SURVEYS

Household Budget Surveys — also called Family Expenditure Surveys, Expenditure and Consumption Surveys, and 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 CPI, 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 and for agro-ecological zones/major regions. For example, 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); the 2001 Household Survey of Senegal included 6,624 households, representative nationally and for the 14 regions of the country (DPS, 2004). Similar to other surveys, data are usually collected through face-to-face interviews, but these surveys are unique in that the data is usually collected over a one year period to capture seasonal variations in expenditure patterns. Some information may be also collected daily, such as 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 well-being;
- 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, and 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 a 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. For example, 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, 2007b) includes 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 representative at the national level and for macro-regions/agro-ecological zones. Again, challenging the compilation of results and the reliability of the statistics on livestock variables, except 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.



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## LIVING STANDARDS MEASUREMENT STUDIES

Living standards measurement studies (LSMS) are multi-topic household surveys that aim to:

- Measure poverty and well-being and understand their major determinants;
- Provide evidence for planning, monitoring, and evaluating economic policies and social programs in relation 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 — with increasing use of computer-assisted technologies — through face-to-face interviews, often over a period of 12 months in order to take into account any seasonality.

A unique feature of LSMS surveys is their inclusion of several questionnaires that target a variety of information at the household and community level. They include a household questionnaire, a community questionnaire, a price questionnaire and, in some cases, questionnaires on agriculture, gender, and/or fisheries. The household questionnaire comprises sections on education, health, etc.; the agriculture questionnaire includes modules on crops, extension services, and in some countries a significant number of livestock questions; the community questionnaire targets information on local infrastructure, availability of public services, and distances 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, 2012a) 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, labor;
- Access to livestock-related 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 provided by livestock, such as transport.

LSMS surveys, and particularly those with a comprehensive livestock module, are the best sources 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, in most cases livestock is still unappreciated in LSMS surveys and, 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 from these surveys.

## 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.

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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, uses it when needed, and then reports to a higher level in the administration. The Agriculture and/or Livestock Ministry obtain 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), or be by head or weight (kg/live animal). In principal, whatever the statistical unit, government officers are expected to collect data on a complete enumeration basis, i.e. sampling errors are not anticipated in routine data (LDIP, 2010b, 2010c, 2011c, 2012b).

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;
- Market prices of major livestock items to be included in the CPI.

The content of administrative data varies by country and reporting period (e.g. monthly, quarterly). In Uganda, for

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

Some of the information and data collected, particularly that 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 (OIE) — the reference organization to WTO for trade-related animal disease matters — the Africa Union-Interafrican Bureau for Animal Resources (AU-IBAR); and selected Regional Economic Communities (RECs).

The importance of animal numbers data, 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 programs. 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 regular information flow, they are essential to deliver public services and monitor the animal health status in a country as well as trade movements. 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 district to district. There is a need for caution, therefore, when using administrative records to generate official statistics (Okello *et al.*, 2013).

## OTHER SOURCES OF LIVESTOCK DATA

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

- The Population and Housing Census;
- Service Delivery Surveys;
- Labor 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 governments, may include one or more screening questions on livestock. Typically, one question will target ownership/non-ownership of farm animals and a second one the number of animals owned by species. This is the case in the 2012 Population and Housing Census of Tanzania (NBS, 2012b). 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 and statistically precise estimates of the livestock population. There are concerns, however, whether households correctly report their livestock assets in the context of such surveys. Another issue is that animals in commercial enterprises are not counted in the census.



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**BOX 4. LIVESTOCK QUESTIONS IN THE POPULATION AND HOUSING CENSUS**

The Population and Housing Census is the largest statistical operation undertaken by country governments, every ten years on average. The census collates information on the quantity and quality of so-called human capital at the national, regional and small area level, and on housing and a population's access to basic services, such as water, electricity and telephone landlines. Results of the census, which have very limited sampling errors, are used to ensure efficiency and equity in the distribution of public resources, such as for roads, human health facilities and schools. They are also used as benchmarks for statistical compilation and as a sampling frame for sample surveys, upon which many countries rely for the generation of good quality statistics on targeted domains. The Population and Housing Census uses the household as its basic unit. The Census of Agriculture and other agricultural sample surveys use the agricultural holding as their basic unit. In developing countries, the largest share of agricultural holdings are managed by the farm household, i.e. a household in which one or more members are engaged in agricultural production activities. It follows that, if farm households were identified in the Population and Housing Census, linkages with the census and the Agricultural Census and other agricultural surveys could be generated, with a multitude of benefits:

The inclusion of farm households in the Population Census allows for identifying all agricultural holdings in the country and, hence, provides a basis to build a sound sample frame for the agricultural census and for agricultural sample surveys. If some questions on agriculture were asked in the population census, the agricultural census could be reduced in scale, thereby generating savings. This information could also be used to better define the coverage of the agricultural

census and of agricultural sample surveys, e.g. by improved targeting (minimum farm size). Undertaking the Population and Housing Census jointly with the Agricultural Census or with agricultural sample surveys, or the latter soon after the former, would enable the analysis of a much wider set of data, with the farm household allowing for direct linkages between the different datasets.

A number of agricultural data items can be included in the Population and Housing Census, including on agricultural holders and their characteristics (e.g. sex and age); farm area; crops grown; ownership of agricultural machinery; types of production system and purpose of production; ownership and use of livestock; land tenure; agricultural labor force; gender; and other. The FAO UNFA Guidelines for Linking Population and Housing Censuses with Agricultural Censuses present examples of Population Census Questionnaires (FAO and UNFPA, 2012). These, in most cases, contain the following two questions on livestock:

- Whether the household rears farm animals and, if yes, which species (e.g. cattle; pigs; poultry; etc.);
- The number of animals reared by species.

Responses to the first question are essential to build an effective and up-to-date frame for a livestock census or a specialized livestock sample survey, which may even target one specific sub-sector of livestock (e.g. small ruminants). Responses to the second question provide an estimation of the livestock population in the country, which is particularly relevant for countries that rarely undertake the Agricultural Census and/or undertake Agricultural Sample Censuses. ■

**Service delivery surveys** aim at providing an assessment of quantity/quality trends in public service delivery. They are sample surveys that allow the generation of national level statistics, which are also differentiated by rural and urban areas and macro-regions. Some questions in this type of survey 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.

**Labor force surveys** facilitate an understanding of the status and trends of local labor 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 economically-active population working in commercial livestock and poultry enterprises (CSO, 2008).

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**Enterprise surveys** are firm level surveys of a representative sample of commercial private enterprises, which include livestock-related businesses, such as milk processors and commercial ranchers. Unless they specifically target agriculture, and livestock within agriculture, these surveys do not supply enough data to produce official livestock-related statistics, such as the average number of full and part-time employees; level of production; share of production sold internally, or exported for commercial livestock-related companies.

**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, radio, and 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 (LDIP, 2011d).

**Experimental stations** are usually mandated by research agencies/institutions to conduct field-level research with 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 data quality from other statistical sources, and for identifying options for technical investments in the livestock sector.

Finally, there are **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 better investment decisions and increased understanding of their impact on the ground.

## DATA COLLECTION COSTS

Cost of surveys depend on a variety of factors, including sample size, length and complexity of questionnaire, distribution of the population across the territory, and method of data collection (e.g. paper versus computer-assisted data collection). In addition, the budget should also consider costs related to survey preparation, such as sample design and training of enumerators, and for data analysis and dissemination. Major costed activities while undertaking a statistical survey are the following:

- Preparation and testing of the questionnaire;
- Printing of questionnaire and/or purchase of computer-assisted interviewing equipment;
- Training of enumerators;
- Sampling;
- Data collection, including travel;
- Data analysis;
- Report writing and dissemination.

The main budget items include:

- Personnel (salaries), including survey designers, enumerators, drivers, translators, etc.;
- Personnel (per diem);
- Transportation;
- Consumable, such as papers, pencils, cartridges, etc.;
- Equipment, such as weighing scales and meters and, in some cases, computers;
- Miscellaneous costs, such as phone calls and photocopies.

While identifying major budget items is straightforward, arriving at some general estimation of the costs of agricultural/livestock surveys is difficult, because costs differ by country. In general, the largest cost is that for personnel, which can account for up to three-quarters or more of the total cost of the survey. Transport costs are second. Evaluating the benefits of the surveys is even more challenging, as this depends on

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the subsequent constructive use of the data which, alas, often remain largely unused.

## AGRICULTURAL LIVESTOCK DATA COLLECTION SYSTEM AND LIVESTOCK INDICATORS

Table 2 summarizes the major livestock indicators that the reviewed surveys can, on paper, help generate, starting with the core indicators needed by the Ministry responsible for livestock and the National Statistical Authority. It offers six major comments:

- The prevailing system of agricultural/livestock data collection, if functional, could on paper help generate the core livestock indicators, in addition to other indicators needed for policy and investment purposes;
- There is no single survey which, on its own, satisfies the demand for livestock data, not even that for core livestock indicators. Data integration, therefore, is essential for ensuring the generation of good quality core livestock indicators.
- Administrative records are the only data that are regularly collected and, therefore, they are critical to updating the value of core indicators during in-between surveys. Indeed, censuses are undertaken every five or ten years, and sample surveys are rarely done every year. In addition, once collected, it takes at least one year before the data from these surveys are cleaned, processed and results produced and disseminated.
- For the design of livestock sector policies and investments that aim at increasing livestock productivity while also contributing to poverty reduction and food security, data from both agricultural/livestock sample surveys and living standards measurement studies are needed: the former help appreciate constraints to livestock productivity/profitability and the latter the role of livestock in the household economy, and hence the incentives and disincentives that underpin household's livestock-related decisions. However, as said above, neither agricultural/sample surveys nor living standard measurements studies are regularly undertaken in sub-Saharan African countries and, when they are, the livestock sector is often unappreciated in the survey questionnaires.

Sampling is a major issue when official livestock statistics are generated from sample surveys, as the spatial distribution of animals is often not well-correlated with the distribution of the sampling units, namely rural households and/or farm holdings. This is particularly true in countries with relatively large tracts of arid/semi-arid areas.

- The *Livestock in Africa: Improving Data for Better Policies* Project undertook four online surveys on livestock data/indicators that also targeted stakeholders' perception of the quantity and quality of livestock data. Data availability is often highlighted as a problem by international and national livestock stakeholders, not only because some indicators are seldom available or not accessible when needed, but also because most surveys target farm level and consumption related issues, with little information on factors along the input and output value chains. The quality of data, usually 'fitness for purpose' amongst most National Statistics Office, includes various dimensions (e.g. relevance, accuracy, timeliness, accessibility and interpretability) and qualitative categories (e.g. excellent, good, adequate, poor and very poor), which are subject to personal interpretation. Again, stakeholders tend to not trust the quality of available livestock data: results of a Global Survey (Pica-Ciamarra *et al.* 2012) on livestock data and indicators indicates that over 41 percent of the 641 respondents rate as poor or very poor the quality of available livestock indicators, with only 21 percent assessing them as good (Figure 2).



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**TABLE 2. DATA SOURCES FOR LIVESTOCK INDICATORS**

Core indicator		Survey	Agricultural / Livestock Census	Agricultural / Livestock Sample Surveys	Household Budget Surveys	Living Standards Measur. Studies	Administrative Records
Livestock Population			***	**	No	*	**
Livestock production			*	***	No	*	**
Market prices			*	***	***	**	***
Outbreaks of animal diseases / animals affected / animals at risk			no	no	No	no	***
Livestock value added	Animal stock, beginning and end of reference period		*	**	No	**	***
	Production, quantity		*	***	No	**	**
	Input, prices		no	**	No	*	no
	Production, prices		*	**	No	*	***
	Input, prices		no	**	No	*	no
	Imports / exports		no	no	No	no	**
Core indicator		Survey	Agricultural / Livestock Census	Agricultural / Livestock Sample Surveys	Household Budget Surveys	Living Standards Measur. Studies	Administrative Records
Productivity-related indicators			*	***	No	*	*
Profitability-related indicators			no	***	No	*	no
Constraint-related indicators			*	***	No	*	no
Livestock-livelihoods indicators			no	*	No	***	no

\*\*\* very likely; \*\* likely; \* possible

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**FIGURE 2. QUALITY OF LIVESTOCK DATA AS PERCEIVED BY STAKEHOLDERS**

Source: Pica-Ciamarra *et al.*, 2012

## CONCLUSIONS

It is clear that a multitude of surveys regularly collect data on livestock and that, on paper, a functional agricultural/livestock statistical system could support the generation of the core livestock indicators and some other key livestock policy/investment indicators. However, given that there is no single survey that fully responds to the information needs of major livestock stakeholders, the possibility of making effective investments in the sector strongly depends on undertaking specialized surveys when policies and investments are designed and on the possibility of jointly using data from different surveys; in other words, on the possibility of data integration.

Currently stakeholders contend that their demand for information remains often unmet, including both the quantity and quality of available livestock data. This suggests the need for investments to improve the agricultural data collection system targeting livestock and/or addressing livestock-specific data issues. Part II of this Sourcebook presents examples of methodologies that governments can apply/adapt to produce more and better quality livestock data.



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