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Recent Advancements in Livestock Statistics: Animal Diseases, Technical Conversion Factors and Survey Questionnaires

Contributed by: FAO Animal Production and Health Division, Rome; and FAO Regional Office for Asia and the Pacific, Bangkok.

Abstract

The livestock sector is one of the fastest-growing sub-sectors in agriculture: its development cannot only contribute to economic growth and poverty reduction but also generate negative environmental and health externalities. Stakeholders contend that the quantity and quality of available livestock statistics is inadequate for the design of effective sector policies and investments. This paper presents three recommendations on ways to improve the quantity and quality of livestock statistics as part of the implementation of the Global Strategy to Improve Agricultural and Rural Statistics: (1) Including animal health-related data among the core data of the national statistical system, consistent with the first pillar of the Global Strategy; (2) Regularly updating livestock technical conversion factors to properly estimate livestock production, one of the core indicators identified by the Global Strategy; (3) Implementing a specialized livestock survey as one of the periodical surveys of the integrated survey framework recommended by the Global Strategy.

Introduction

Over the past decades the Asian continent has experienced a dramatic turn-around in its economic conditions and achieved unprecedented levels of prosperity. In developing Asia – including countries in Central and West Asia, East Asia, South Asia, Southeast Asia and the Pacific – GDP at current international dollar increased from 8.1 to 25.3 trillion between 1990 and 2012, and on a per-capita basis from 2,513 to 6,788 international dollars per year. Growth rates are anticipated to remain high also in the coming years (ADB, 2013).

Such remarkable economic performance has been translating into an increased demand for high-value agricultural products, including meat, milk and other livestock products, which is expected to continue growing in the coming decades. FAO estimates that the market size for meat and milk increased by 139 and 122 percent in the last 20 years respectively, reaching about 125 million tonnes for meat and 220 million tonnes for milk in 2009 (FAOSTAT, 2014).

As a consequence, the livestock sector, which in Asia accounted for about 1/4 of agricultural value added in 1990, currently accounts for about 32 percent of agriculture value addition. Given the current growth in consumption of animal source foods in Asia, it is anticipated to become one of the main, if not the largest contributor to agriculture in the coming decades (in industrialized countries, the livestock sector accounts for between 50 and 60 percent of the agricultural value added) (FAOSTAT, 2014).

To guide livestock sector development on an equitable, efficient and safe growth path, decision makers need accurate statistics, including information on major production and productivity trends; on faming systems; on the livestock-livelihoods relationships (at least 40 percent of rural households in Asian developing countries are estimated to keep farm animals, with this share being as high as 80 percent in some countries; FAO, 2012); on livestock, environment and climate change; on animal diseases (zoonoses in particular) and public health; on the contribution of livestock to the rural non-farm economy, etc. Information and statistics on livestock, however, are often inadequate for reasons that go beyond sampling and non-sampling errors.

- Data on agriculture usually focuses on the main staple crops, and only marginally covers non-crop items such as livestock and fish. Food security and agricultural development has been long associated with increases in staple productivity and, in spite of animals being a widely owned asset among rural households and despite the emerging opportunities for a market-driven growth of livestock production, the focus is still largely on staples.

The Global Strategy to Improve Agricultural and Rural Statistics (World Bank, 2011) – a major multi-stakeholder initiative endorsed by the United Nations in February 2010 – represents an unprecedented opportunity to ensure that any improvement in the agricultural statistical system adequately takes into account the information needs of livestock stakeholders. Indeed, the Strategy differentiates crops and livestock as two sub-sectors of agriculture.

This paper presents three recommendations on priority areas of investments to improve the quantity and quality of livestock data and statistics available to decision makers as part of the implementation of the Global Strategy to Improve Agricultural and Rural Statistics. These targets:

- Animal health related data, which should be considered for inclusion among the core data on livestock identified by the Global Strategy.
- Livestock technical conversion factors, the estimation of which is critical to generate key livestock statistics as identified by the Global Strategy, including production levels and livestock value-added.
- The implementation of a specialized livestock survey as one of the periodical surveys recommended under the integrated survey framework of the Global Strategy.

The recommendations presented here draw on data-related work undertaken by major suppliers and users of livestock statistics in developing countries – notably the national statistical authorities and the ministries responsible for livestock development – in collaboration with the FAO, the International Livestock Research Institute (ILRI) and the World Bank. As such, they target selected dimensions of the livestock statistical system; for example, livestock social and environmental statistics, which deserve attention, are not specifically dealt in this paper. APCAS members are requested to comment and deliberate on the recommendations presented in this paper.

1. Animal health related data

The first pillar of the Global Strategy to Improve Agricultural and Rural Statistics is "the establishment of a core set of data the countries need to collect to meet current and emerging demands"... "core data provide inputs into the national accounts and global balances of supply and demand for food and other agricultural products" (World Bank, 2011). The Global Strategy presents a list of core data and recommends that "each country needs to select which items to include in its national system. It must add other items relevant to its economy and determine how frequently data will be provided and the scope of the national coverage required" (World Bank, 2011).

Regarding livestock, the Global Strategy recommends that countries collect data on five major livestock groups, including cattle (and buffalo), sheep, goats, pigs and poultry (chicken, ducks, geese, etc), and on:

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

In 2012, the FAO undertook a Global Survey on core livestock data and indicators, with the objective to identify priority information needs of livestock stakeholders (Pica-Ciamarra *et al.* 2012). A total of 641 respondents participated in the survey, which also requested participants to rank by importance a given list of data and indicators, from livestock population through feed for livestock to meat and milk production. Stakeholders agreed that the core livestock data identified by the Global Strategy need to be regularly collected with statistical accuracy, but information on animal health and disease was considered by far as the most important, with over 85 percent of the respondents ranking it as their first or second priority information need. This holds true also for Asian stakeholders, as in the continent animal diseases – such as porcine diarrhoea or avian

influenza – unless properly managed and controlled, can lead to major economic losses, both in livestock and other sectors (e.g. the feed and tourism industries). In particular:

- Animal diseases are one of the main determinants of livestock production, and are cause of major swings in production and trade patterns.
- The largest share of the resources of the Ministry responsible for livestock is allocated to control and management of animal diseases. Including information on the latter in the national statistical system – such as on disease outbreaks, animal vaccination and deworming – will provide incentives to the Ministry to fully contribute to the improvement of the national statistical system, thereby supporting its governance (pillar 3 of the Global Strategy).
- The Ministry responsible for livestock often manages a stand-alone system of livestock data collection, targeting mainly information on animal diseases but also on other livestock-related variables, such as animal population and production level.
- International obligations require that country governments submit monthly, six-monthly and annual animal disease reports to the World Organization for Animal Health (OIE) – the WTO appointed standard-setting organization with respect to zoo-sanitary issues.
- Livestock value-added is one of the statistical indicators that the Global Strategy recommends country governments to regularly produce (World Bank, 2011; table 1, annex A). Estimation of livestock value-added requires data on outputs and inputs. The latter include not only feed – as indicated by the Global Strategy – but also other inputs and particularly in support of animal health, such as vaccinations and deworming, which influence output level.

Given the above, APCAS members are invited to consider whether at least the following data on animal health and diseases should be collected as part of the national statistical system.

- Data on outbreaks of major animal diseases, notably on notifiable terrestrial animal diseases as identified by the World Organization for Animal Health. Depending the country, the priority diseases for which information should be collated as part of the national statistical system can vary.
- Data on animal-health related inputs, including at least on vaccination against major animal diseases. Other data could also be considered for collection, such as on deworming and dipping.

The proposed data are essential not only for the Ministry responsible of livestock to design and effectively implement animal health policies and investments, in which animal vaccination is a key component, but also for accurate estimates of livestock production and livestock value-added.

2. Livestock technical conversion factors

The Global Strategy to Improve Agricultural and Rural Statistics identifies livestock production as one of the core data that country governments should regularly collect. Quantifying livestock production is challenging, particularly in traditional farming systems, which account for the largest share of the animal populations in most developing countries.

Animals produce multiple outputs, such as meat, milk, manure, and hides and skins, some of which are notably difficult to measure (e.g. manure); quantifying embedded production – i.e. changes in animal weight over the reference period – using traditional survey methods is also

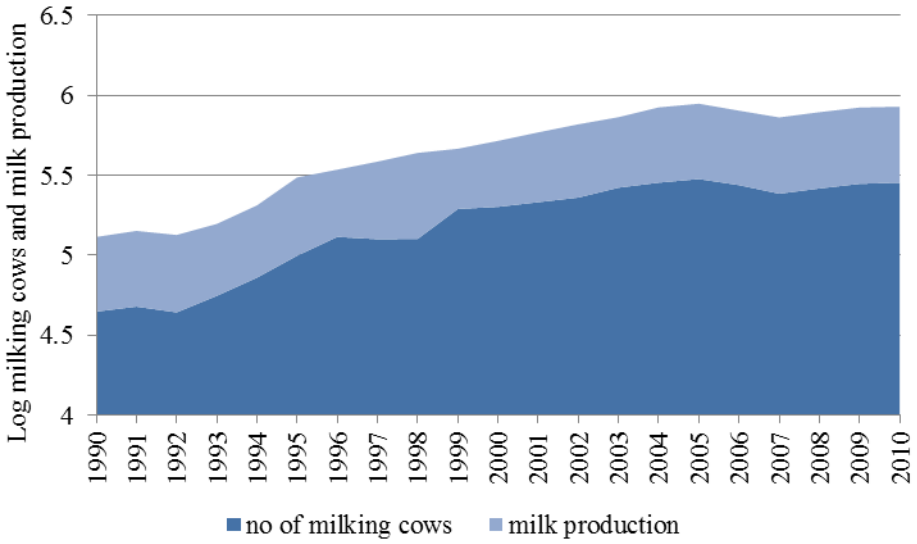
challenging, if not impossible. In general, a major challenge in quantifying livestock production in traditional farming systems is that survey respondents are unable to provide accurate answers to questions such as:

- How much milk did your cows produce per day in the last month or lactating period?
- What was the average carcass weight (meat content) of the cattle slaughtered in the last six months?
- How many eggs did your hens lay in the last three months?

Statistical authorities are aware of these difficulties and, therefore, make use of so-called technical conversion factors (TCFs) to estimate livestock production in the different production systems (Blum *et al.*, 2013). These coefficients convert a (easily measured) livestock variable into a different unit of measure (and are widely used by the scientific community). For example:

- Milk yield per cow per day (TFC) allows estimating milk production by only having information on the number of cows in milk in the country;
- Carcass weight (TCF) allows estimating meat production by only collecting information on the number of animals slaughtered;
- Eggs per laying hen per clutch (TCF) allows producing estimates on egg production by only counting the number of laying hens and the number of clutches per year.

The technical conversion factors used by national statistical authorities, however, are rarely based on a nationally representative sample. They rather rely on expert opinions, the grey literature, or are taken from neighbouring countries; they are infrequently, if ever, updated. The consequence is that trends in livestock production accounted for in official statistics are, in most cases, explained by changes in the underlying livestock population and not by changes in livestock productivity. As an example, figure 1 presents trends (log) in the number of milking cows and milk production for one of the fastest-growing Asian economy over the last 20 years: the two curves have basically the same slope over the reference period, which is suggestive that increases in livestock productivity – which would have been highlighted by an increased distance between the two curves – have not been captured in the national accounts. In practice, the impact of productivity-enhancing policies and investments undertaken by the Ministry responsible for livestock are not reflected in official statistics, including the national accounts.



Source: elaborated from FAOSTAT, 2014

Fig 1. Milking cows, milk production and productivity in a fast growing Asian country, 1990-2010

Estimating technical conversion factors is not complex: it requires the selection of different livestock production systems and information on the number of animals in each system, which is on paper available from the agricultural / livestock census (which often targets information on small farms on a sample basis and on commercial farms on a complete enumeration basis) and/or agricultural surveys and administrative records; the identification of a representative sample of enumeration units; the physical quantification of production level at each unit for a certain time period. The latter involves the use of some measurement tool, such as a transparent plastic container with measurement ticks for quantifying milk production, or a scale / carcass weigher to measure meat production for slaughtered cattle. Recent FAO experience indicates that: (i) a stratified sampling approach supports appropriate targeting and reduces the cost of data collection; (ii) seasonality in livestock production calls for collecting data in the different seasons; (iii) in order to arrive at proper estimates of production, data should be collected on a daily basis for two or more weeks in a row; and (iv) basic equipment suffices to accurately quantify production level (Blum *et al.* 2013). Note that the estimation of technical conversion factors is particularly relevant in traditional production systems, as commercially oriented enterprises keep detailed records of inputs and outputs, i.e. face-to-face interviews are usually sufficient to estimate TCFs in large farms.

Given the above, APCAS members are invited to consider:

- Allocating resources to regularly update key livestock technical conversion factors in traditional production systems, so that livestock productivity is properly captured in official statistics. These should comprise as a minimum: milk yield per animal; meat per carcass (carcass weight) and eggs per laying bird. In addition, other indicators of productivity – such as manure per animal, weight of mature animals and fat/offals per carcass – should be estimated depending on the country priorities.
- Investigating whether the data collected through regular surveys / administrative records can be used to accurately estimate livestock technical conversion factors. If not, explore ways to improve existing survey questionnaires to also collect good

quality data on production, including through physically measuring livestock production in a sub-sample of farm households (such as in crop-cutting surveys for yield estimation).

4. Periodical livestock surveys

The Global Strategy to Improve Agricultural and Rural Statistics suggests that country governments implement an integrated survey framework, whose central element is the development of a common master sample frame. The implementation of the framework involves the annual collection of core agricultural data, and the administration of periodic surveys at regular year intervals (rotating panels) to collect detailed information on selected agricultural sub-sectors. Basic information on the livestock sector will be thus collected in the annual survey, while detailed information could be obtained through implementing a specialized livestock survey at regular year intervals. The latter collects detailed information on tradable and non-tradable inputs and outputs and allows quantifying with statistical accuracy production and productivity.

However, currently no guidelines are available to adequately include livestock in basic agricultural surveys or to design specialized livestock surveys, as the focus of agricultural statistics has been largely on crop agriculture (see questionnaires in Grosh and Glewwe, 2000). For example, the questionnaire of the latest Agricultural Census of a major East Asian country included 19 questions on crops but only 2 on livestock; the questionnaire of a recent integrated household survey for a South Asian country – which aims at collecting detailed information on household characteristics, assets and production and consumption behaviour – included 29 questions on crops and 11 on livestock, which are insufficient to appreciate the role of livestock in the farm and household economy.

With the objective to assist country governments in better including livestock in household / agricultural surveys as well as in designing specialized livestock surveys, the FAO, the World Bank and the International Livestock Research Institute (ILRI) collaborated to draft survey questionnaires aimed at collecting comprehensive information on livestock farming systems. In particular, three livestock questionnaires were developed including a short, a standard and an expanded version, which provide guidance for the adequate collection of data on livestock at household or farm level. The three versions vary in size, but all target information on three domains, including animal ownership; livestock inputs, i.e. husbandry practices; and livestock outputs (table 1). They have four common overarching goals:

- Generate basic statistics on livestock production practices;
- Measuring the cash and in-kind production from livestock;
- Measuring the value of household's livestock, which are an important economic asset;
- Modelling household's livestock-related decisions, which – depending on the context in which the questionnaire is administered (e.g. as part of a living standards survey or a farm survey) – may target livelihoods or production-related decisions.

Table 1: Content of the livestock survey questionnaire

Livestock domain	Sections	Remarks
Livestock ownership	Number of animals Change in stock in past 12 months	Questions are asked for individual animals, often differentiated by age, gender and breeds (local/indigenous and improved/exotic), which helps to appreciate herd age structure and species composition.
Inputs and husbandry practices	Breeding Feeding Watering Animal health Housing	Questions are asked for major groups of animals (e.g. large ruminants, small ruminants, pigs, poultry birds, equines, other), as management practices usually do not differ between animals of the same species
Monetary and non-monetary outputs	Meat production Egg production Milk production Animal power Dung	Questions are asked for major groups of animals, including both the monetary and non-monetary value of production

Data collected by adopting the proposed questionnaires are anticipated to provide a much improved picture of the smallholder livestock sector in the countries. For example, nationally representative indicators could be generated on the number and share of households keeping exotic breeds of livestock or using their animals for transport; on feed intake and manure production and storage; etc. In addition, analysis of the data can generate a better understanding of the role of livestock in the household economy, an essential piece of information for designing appropriate sector policies and investments, on production level and, to some extent, on the positive and negative externalities that livestock farming might generate.

APCAS members are invited to consider:

- Making use of available livestock questionnaire(s) – and in particular the short version – when drafting the livestock content of agricultural-related surveys, such as the agricultural census questionnaire or the questionnaire of the annual agricultural survey recommended by the Global Strategy to Improve Agricultural and Rural Statistics. This will ensure that basic and consistent information on livestock is adequately captured in national surveys.
- Making use of the standard or expanded version of the livestock questionnaire to design and implement a specialized livestock survey, as one of the periodical surveys suggested by the Global Strategy as part of the integrated survey framework. The implementation of a specialized livestock survey will provide country governments with often missing, yet key information on the livestock sector, including details on tradable and non-tradable inputs and outputs.

5. Conclusions and Issues for Discussion

Livestock is one of the main sub-sectors of agriculture and expected to become one of the largest if not the largest contributor to agricultural value-addition in Asian economies in the coming decades. Accurate statistics on livestock are essential to design and implement proper sector policies and investments, and monitor sector trends. The sector, however, has been so far given little priority in the national agricultural statistical system.

This paper presents three recommendations on ways to improve the quantity and quality of official livestock data and statistics available to decision makers as part of the implementation of the Global Strategy to Improve Agricultural and Rural Statistics. These recommendations target three domains, including animal health and diseases; livestock technical conversion factors; and periodical livestock surveys.

APCAS members are asked to express their views on:

1. Including animal health- and disease-related data among the core data of the national statistical system, going beyond information on disease outbreaks and encompassing information on animal-health related inputs, such as on vaccination. The inclusion of such data will support the sustainability of the agricultural statistical system, given the major role that animal health/disease indicators play for the Ministry responsible for livestock. It will also contribute to better estimates of livestock production and livestock value-added, which are among the core livestock data and indicators identified by the Global Strategy.
2. Regularly updating livestock technical conversion factors, including through *ad hoc* data collection and/or agricultural and specialized livestock surveys. This is essential to ensure that official statistics fully capture sector dynamics, and to properly quantify the impact on the ground of livestock sector policies and investments.
3. Implementing a specialized livestock survey at household level as one of the periodical/rotational surveys to be administered in the context of the implementation of the integrated survey framework of the Global Strategy. Questionnaires are available, on which countries can rely upon to draft their specialized livestock survey, the implementation of which is critical to collect key yet often missing information on the livestock sector.

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