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Methodology and Statistical Production
Division (DIMPE)

LIVESTOCK SLAUGHTER SURVEY (ESAG)
GENERAL METHODOLOGY

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NATIONAL ADMINISTRATIVE DEPARTMENT OF STATISTICS

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ASOPORCICULTORES Colombian Association of Pig Farmers

CONPES National Council for Social and Economic Policy

DANE National Administrative Department of Statistics

DIG Geo-Statistics Information Division (DANE)

DIMPE Methodology and Statistical Production Division (DANE)

DIRPEN Statistical Regulation, Planning, Standardization and Normalization Division (DANE)

DIVIPOLA Political Administrative Division of Colombia

ESAG Livestock Slaughter Survey

ESTMAS Stratified Simple Random Probability Sampling

FEDEGAN Colombian Federation of Cattle Farmers

ICA Colombian Agriculture Institute

INVIMA National Institute for Medicine and Food Surveillance

MAS Simple Random Sampling

NSS National Statistical System

NUTE Nomenclature of Territorial Units

PHP Personal Home Page (programming language)

SPGI Institutional Planning and Management System

PRESENTATION

The National Administrative Department of Statistics (DANE), as the coordinating entity of the National Statistical System (NSS), and in the framework of the Statistical Planning and Harmonization project, works toward the strengthening and consolidation of the NSS through the following processes: the production of strategic statistics; the generation, adaptation, adoption and dissemination of standards; the consolidation and harmonization of statistical information and the coordination of instruments, actors, initiatives and products. These actions aim at improving the quality of the strategic statistical information, its availability, timeliness and accessibility to meet the high demand that there is for it.

Aware of the need and obligation of providing users with better products, DANE developed a standard guide for the presentation of methodologies, which contributes to the visualization and understanding of the statistical process. With this instrument, the entity developed the methodological papers of its statistical operations and studies that are made available to specialized users and the public in general. Those papers present in a standard, complete and easy-to-read manner the main characteristics of the technical processes and sub-processes of each study, thus enabling its analysis, control, replicability and evaluation.

This set of papers promotes transparency, trust and credibility of the technical quality of the entity for a better understanding and use of statistical information. Such information is produced under the principles of coherence, comparability, comprehensiveness and quality of statistics.

This document responds to the standard adopted by DANE in order to expose the set of methods and procedures by which the Livestock Slaughter Survey (ESAG) is constructed, providing users with an informative and clear document.

INTRODUCTION

Slaughter is the process by which death is caused to an animal in a proper manner sparing it suffering, with the purpose of using its meat and parts mainly for human consumption and use. This process is a fundamental part of the meat chain, which consists of the stages of production (rearing, raising and fattening), transport, slaughter plants benefit and commercialization.

DANE aware of the importance of providing basic information pertaining to trends in the livestock sector and meat production sector for the planning of the livestock farming activity in the country, conducts the ESAG study, whose origins date back to the fifties, which is why it became a traditional series of statistical information in the country.

Its main objective is to provide statistical information pertaining to the number of heads, the liveweight and carcass weight, obtained from the slaughter of the big livestock (bovines and buffalos) and small livestock (pigs, sheep and goats) for the national total and different disaggregation levels, with the timeliness and reliability required to facilitate the analysis and planning of the livestock subsector in the country.

The sources of information of the ESAG are slaughter plants (abattoirs and refrigerators), mayors' offices, municipal treasuries or where the livestock slaughter is reported. This statistical study has national coverage, with departmental breakdown of results for the bovine and pigs and national for the buffalos, sheep and goats. It disseminates the results on a monthly basis with a special publication each quarter.

The information obtained enables to complement the knowledge of the evolution of the livestock subsector, being a benchmark in the calculation of livestock GDP and the determination of specific indicators of productivity and extraction of the cattle ranching among the main uses of this information.

The dynamics of the livestock sector requires this statistical operation to continually be renewed in order to provide information with the levels of disaggregation required by the industry.

This methodological document describes the set of steps and procedures whereby the ESAG is structured and developed from its departmental breakdown to date, defining the object of study and how it is articulated in the economic environment, the theoretical and practical elements used and the expected results.

The document consists of three chapters: the first part presents the background of the survey, its origin and historical evolution, highlighting the most significant changes that affected the supply of information to users; the second part sets forth the elements that make up the whole design of the statistical operation, which include the thematic, statistical, performance and systems designs; and the third part lists the materials supporting the statistical operation.

1. BACKGROUND

This statistical operation «began in the country in 1915 and from then until 1951 the entity responsible for providing information was the Comptroller General's office» (DANE, 1998: 7).

The statistics were compiled by the General Directorate of Statistics, attached to the Comptroller General's office; from 1951 to August 1953 it was compiled by the National Bureau of Statistics, entity attached to the Presidency of the Republic, as of its creation in October 1953, «DANE resumed the study within its program of fiscal statistics and started to publish information pertaining to livestock slaughter» (DANE, 1998).

Initially it was considered a fiscal statistics as it allowed knowing the revenues of municipalities for collection or tax on guides or permits for the throat cutting of livestock1.

The study covered all the country from 1953 to 1997 and during this period, the following phases were implemented, aiming at a greater opportunity for the dissemination of information:

In 1970, it was decided to implement a simultaneous probability sample with the Slaughter Plants Census, in order to produce more timely data on a monthly basis. In 1979 an operation covering 42 cities was conducted, which were selected according to the highest participation in the livestock slaughter in the national total, based on data collected in 1977 and 1978. These cities together accounted for 52 % of the national slaughter. The above allowed achieving the publication of data for the slaughter of bovine and pigs for 42 cities with a greater timeliness.

In 1991, the probability sample was redesigned in order to correct biases resulting from the expansion of the figures; however, this method was definitely suspended as of 1994 because the results were not fully satisfactory. Instead, it was agreed to implement the monthly publication of preliminary figures pertaining to the livestock

[1] «Until 1969, it was called throat cutting of livestock because it was the most common way of killing animals for consumption» (DANE, 1998: 7).

slaughter census, as a new way of producing timely and reliable statistics, with results for the levels: national, departmental and department capitals, based on the records that were obtained from the livestock slaughter census (DANE, 1998).

For the livestock slaughter census, the census results were published approximately on October of the year following the reference year in municipal, departmental and national aggregates, including all the variables month-by-month and accumulated.

For the census operation, the results were presented for the levels: departmental and departmental capitals, for bovine and pigs, on the number of heads, liveweight and by sex.

For the operation covering 42 cities, the results were published monthly and cumulatively including the variables such as number of heads and liveweight of males and females (DANE, 1998: 23).

The slaughter of livestock has a strong dynamics, due to a continuous closing and opening of establishments for non-compliance of phytosanitary standards. The final or temporary closures of some abattoirs affected the results, causing a gradual loss of participation and representativeness of the sample and the operation covering 42 cities in the national total. This dynamics of the establishments engaged in this activity continues to set the composition of the sample of this statistical operation in the subsequent years.

In accordance with the above, late 1996 DANE performed a redesign to the ESAG after a technical evaluation of its methodology and representativeness. The adjustments implemented in 1997 made it possible for the survey to cover the slaughter in 67 municipalities, which were selected based on their participation in the total slaughter of the country, 68,6 % according to the 1995 Census data, forming a non-probability sample (DANE, 2007).

Subsequently in 2002, the measurement was performed in 61 municipalities due to the closure of processing plants or abattoirs Cajicá, Cúcuta, Itagui, Jamundí, Sincelejo and Yumbo.

For 2003, the ESAG covered 63 municipalities, due to the inclusion of Cucuta and San Cayetano.

In 2007, 9 municipalities were added and the historical information thereof was reconstructed as of 2004, obtaining a non-probability sample with a total of 72 municipalities.

In the fourth quarter of 2008, DANE performed a new redesign of the ESAG, a probability sample was generated that allowed producing results of the slaughter with national coverage and disaggregation by regions according to the Nomenclature of Territorial Units (NUTE)2 and the publication started of variables such as carcass weight, origin of the slaughtered livestock (with the aim of publicizing the departments of origin or that supply different plants or recipient centers) and the dissemination of information pertaining to buffalo, goats and sheep.

The redesign that incorporated the expansion of the geographical and thematic coverage, in addition to the adoption of electronic means for the collection of information through the form provided on the web.

In 2013, the sample of the ESAG was expanded going from a sample of 267 establishments located in 247 municipalities to 406 establishments located in 386 municipalities, with the main objective to disaggregate the results at the departmental level for bovine and pigs and thus enrich the regional analysis of the livestock farming subsector. In addition to improving the accuracy of the slaughter estimations at the national level.

During 2013, the monthly results were delivered with the previous sample (267 establishments); for the publication of December 2013, the monthly results for 2013 were submitted with estimates of the two samples with the respective analyses of the effects of the sample change, and the new estimates so that they were the basis of comparison with the estimates that would be made in 2014.

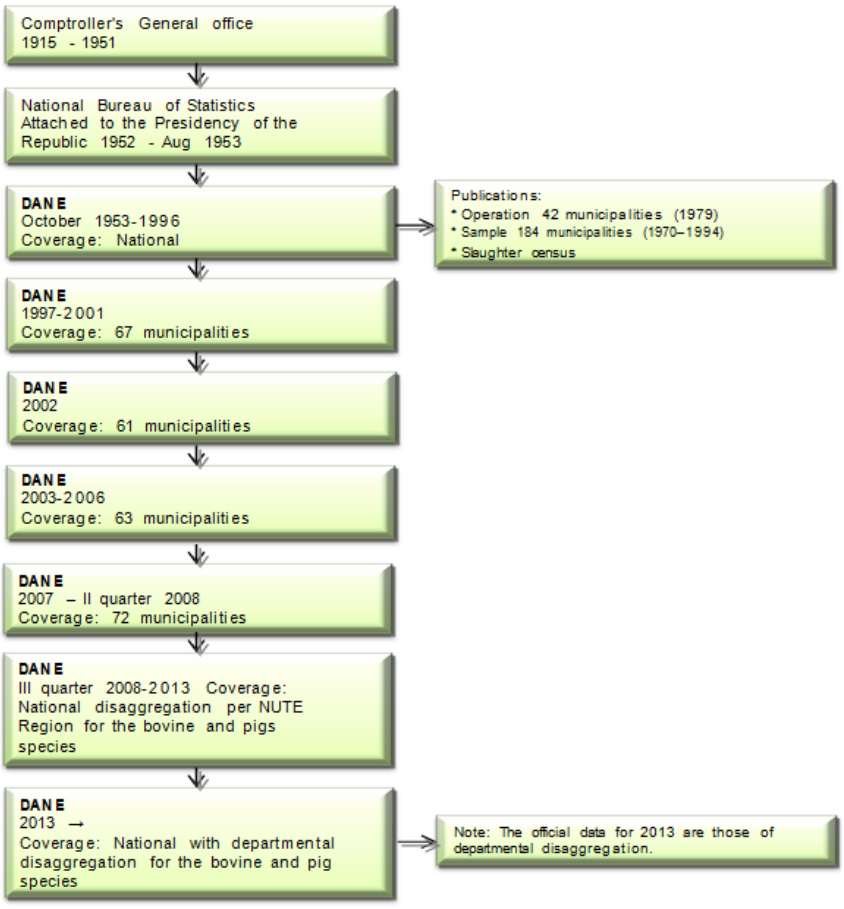
In this new sample, in departments with less than 30 establishments engaged in livestock slaughter, it was decided to conduct a census; the establishments that reported the slaughter of buffalo, goats and sheep are of forced inclusion.

[2] This corresponds to a single numeric identifier used by member countries of the Andean Community, which is assigned to each statistical territorial unit. For the study of livestock slaughter, it reaches three digits representing six regions: Atlantic, Pacific, Amazon, North Andes, South Andes and Orinoquía..

Subsequently, from the delivery of results for the fourth quarter of 2015, 54 new sources were included in the estimate of the results, going from a sample of 406 establishments to 460 sources located in 432 municipalities and the published figures were reprocessed for period comprised between January 2013 and December 2015.

The inclusion of these sources is due to sources that reported significant growth as of 2013 and sources that began to slaughter new species to those initially reported. With this expansion, a greater accuracy is achieved in the data provided for some departments.

Figure 1. Evolution of the Livestock Slaughter Survey (ESAG)



2. DESIGN OF THE STATISTICAL OPERATION

2.1. THEMATIC/METHODOLOGICAL DESIGN

2.1.1. Information needs

The slaughter plants perform two main activities: to provide the livestock slaughter services and sometimes, to purchase and sell the meat, therefore it is a key link in the meat chain, since the meat for consumption and other products derived from the slaughter for other uses are obtained at this stage. However, much of the country's refrigerator facilities and abattoirs do not have all the technical requirements under the law.

Meat processing plants in the country have a significant variability that became more noticeable with the issuance of Decree 1500 of May 4, 2007, whereby the technical regulations and the health and safety requirements that need to be met in the primary production, processing, deboning and other activities related to the livestock slaughter. Failure to comply with these requirements caused several temporary or permanent closures of establishments, which did not meet them due to the lack of technical and technological resources for setting up modern management and implementation of best practices that allow the safety of meat. The above, not to mention that the clandestine slaughter phenomenon could be increased.

DANE meets these needs by focusing its efforts on building the directory of establishments that perform livestock slaughter, as basic input for a sampling framework that allow generating the big and small livestock slaughter in the country, with a representative coverage of the national actual situation.

For these reasons, an estimate based on a process of continuous review with respect to the framework of establishments engaged in livestock slaughter was necessary, detecting the novelties that arose and including them in the estimates. Also, to provide volume, class (domestic consumption or export) and location indicators, in order to have a complete outlook of the livestock slaughter carried out in the country with timely figures that allow obtaining all the elements for the planning of the livestock sector.

Moreover, in spite of the preference of beef consumption in the country, it is of interest to this subsector to identify how is the consumption of new species shown and how does it evolve as well as to know the origin of livestock and the location of the plants.

In addition to providing historical statistics with respect to the livestock slaughter by species, disaggregated by sex, with a geographical scope by department, which allows the collection of information from all sources (slaughter plants [abattoirs and refrigerator facilities], mayor's offices, municipal treasuries or where the livestock slaughter is reported) that are registered in the country.

The ESAG provides tools for the analysis of the livestock subsector through indicators of the number of slaughtered animals, the livestock's liveweight and carcass weight, as a determinant of livestock production, providing a baseline for the public and private sector, researchers, as well as for international comparisons.

It is also used to determine the production of meat that is suitable for human consumption and supply regions.

Another important use of this statistic is the construction of indicators pertaining to the development of the sector such as the livestock extraction rate by sex, the preparation of annual balances of livestock population, indicators of livestock productivity such as the average liveweight and average performance of carcass by department and the measurement of the per capita consumption of meat of different species.

In addition, the livestock slaughter is one of the primary components of information to calculate the livestock GDP, which is calculated by the Synthesis and National Accounts Division of DANE in a quarter and annual basis as part of the country's macroeconomic indicators.

2.1.2 Objectives

General objective

To provide statistical information on the number of animals, liveweight and carcass weight obtained from the slaughter of the big (cattle and buffalo) and small (pigs, sheep and goats) livestock for the national total and different levels of disaggregation, with the required timeliness and reliability, in order to facilitate the analysis and planning of the country's livestock subsector.

Specific objectives

- To estimate with national coverage for the five species under study, the number of slaughtered animals, their liveweight and carcass weight.
- To establish the evolution of the livestock slaughter by species, through annual changes and year-to-date for total animals, liveweight and carcass weight.
- To estimate the livestock slaughter of bovine and pigs concerning the number of animals, their liveweight and carcass weight, with departmental disaggregation.
- To provide information pertaining the livestock slaughter of the species under study, disaggregated by sex, category (domestic consumption and export), destination of meat for domestic consumption (market places and butcher's shops, supermarkets and institutional market), origin of the slaughtered livestock (by department).

2.1.3 Scope

To estimate the behavior of the livestock slaughter of bovine, buffalo, pigs, sheep and goats, their liveweight and carcass weight, discriminated by sex, through a probability sample of establishments carrying out or reporting livestock slaughter (slaughter plants [abattoirs and refrigerator facilities], mayor's offices and municipal treasuries).

The breakdowns and variables included have the following uses and scope:

- Breakdown by age (bovine) and sex of slaughtered livestock: from these variables specific information is obtained for its use in areas such as the livestock extraction rate disaggregated by males and females.

- Liveweight of the slaughtered cattle and carcass weight for each of the species: these variables allow determining the evolution of livestock productivity for internal and external consumption.

- Destination of meat in carcass (only for domestic consumption): this disaggregation allows knowing the commercialization channels and the participation of different destinations such as local or nearby market, supermarket or large distributors, or the institutional market.

- Origin of the slaughtered livestock: this variable determines the department of origin of the livestock being slaughtered, providing the livestock map and information on the mobilization of livestock to be slaughtered different from their origin.

The ESAG has national coverage and each month it collects information from a sample of 460 slaughter plants legally established of big and small livestock distributed in the country. The results are published monthly and quarterly; interest changes for the sector are also shown.

2.1.4 Reference framework

a. Theoretical framework

The slaughter of livestock is related to important social and economic elements. From the social standpoint it becomes important when associated with the concept of food security, which exists when «all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life» (FAO, 2011: 1).

According to FAO (2012), «Meat can be part of a balanced diet contributing valuable nutrients that are beneficial to health. Meat and meat products contain important levels of protein, vitamins, minerals and micronutrients which are essential for growth and development». In this sense, a proper nutrition takes people far from poverty situations that violate their food security.

From the economic standpoint, the slaughter of cattle is associated with concepts such as meat chain and extraction of the cattle herd. The latter is one of the basic

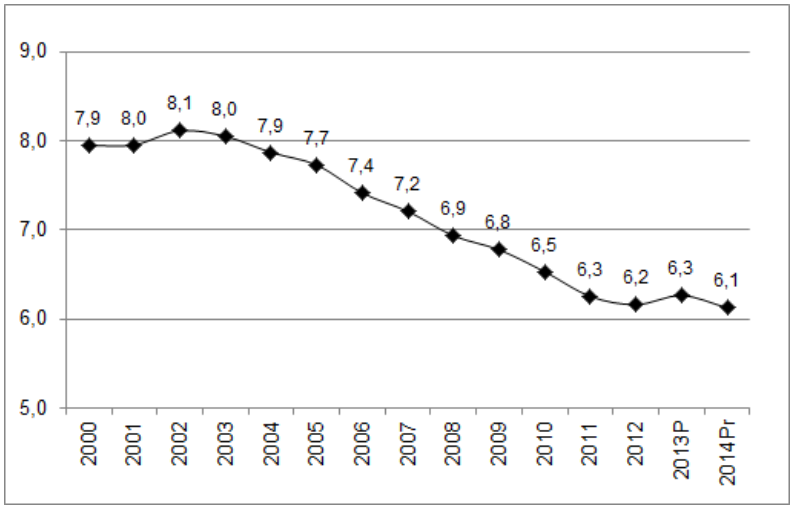
indicators for the analysis of the evolution of the subsector and is expressed as the percentage resulting from the number of animals slaughtered over the total volume of the herd.

One of the main issues associated with livestock slaughter is the safety of meat, about which there are several developments or documents that refer to the sanitary requirements that need to be met in slaughter plants so that they are suitable for human consumption.

In this respect, there are papers performed by the FAO, the European Union and the Colombian Federation of Cattle Farmers (Fedegan), among others. The main theoretical framework pertaining to livestock slaughter, is provided by the legislation that each country issues in this regard, which presents the recommendations and studies that are proposed on the subject by the agencies and entities related to the livestock sector.

These concepts show the importance of the study regarding the livestock subsector and the boost it needs to evolve within the national economy, since it has gradually lost participation in domestic production.

Graph 1. Participation of the branch of agriculture, hunting, forestry and fisheries in the 2000-2014pr GDP



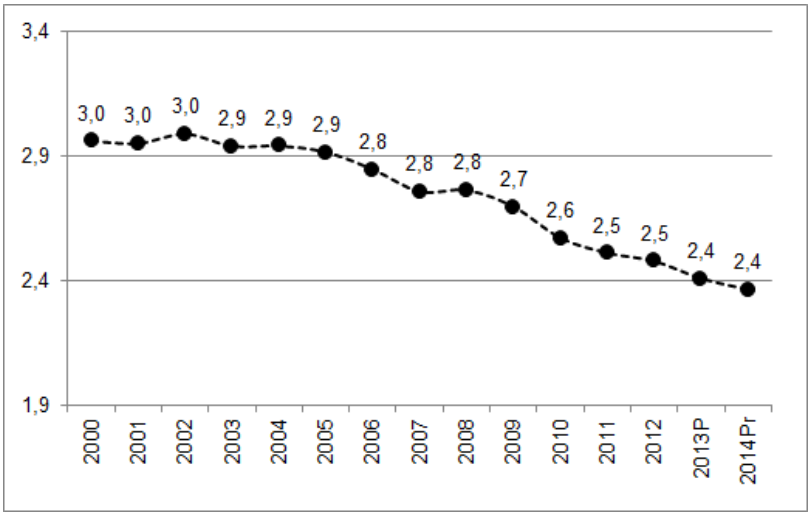
Source: DANE - Synthesis and National Accounts Division.

pr: preliminary figures.
p: provisional figures.

In the domestic production scenario, the branch of agriculture, hunting, forestry and fishing (to which the livestock subsector belongs) in spite of its important role in the economy, expressed through its chains and contributions to value-added, in the 2000 to 2014 period, has decreased its participation in the Gross Domestic Product (GDP), since it has gone from an average participation of 7,9 % in the 2000-2005 period, to an average participation of 6,3 % in the GDP in the last five years3.

In turn, the livestock production and hunting subsector (one of the four sub-sectors within the branch of agriculture, hunting, forestry and fishing) has an equally downward trend, although slightly less noticeable. In the 2000-2014 period, a participation fluctuating between 3,0 % and 2,4 % in total GDP was observed. In the last five years of this period, their participation is on average 2,5 %, whereas their average participation during the first five years of the observed period was 3,0 %.

Graph 2. Participation of the livestock and hunting subsector in the 2000-2014pr GDP



Source: DANE - Synthesis and National Accounts Division.

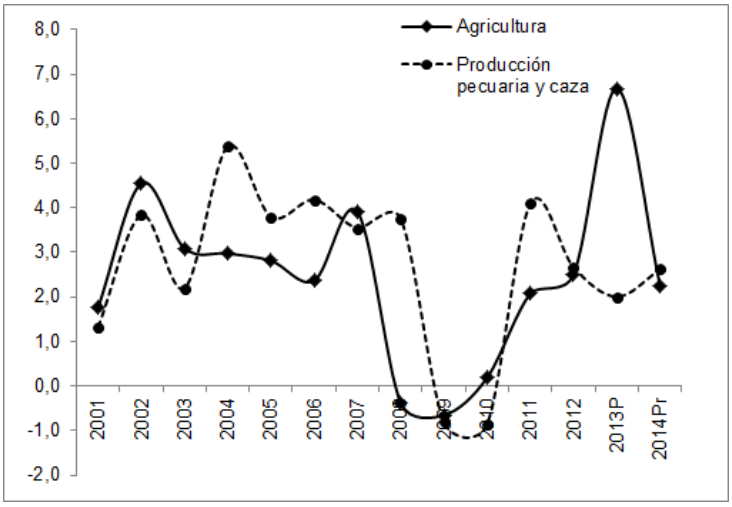
pr: preliminary figures.
p: provisional figures.

[3] Participations were calculated from the annexes published by the Synthesis and National Accounts Division on the DANE website at constant prices, seasonally adjusted series. The figures are revised up to September 10, 2015, in billions pesos.

The annual change or growth of value added of the livestock production and hunting subsector shows important fluctuations. The period of greatest growth is observed during the 2004-2008 period, being 2004 the year with the highest growth with a rate of 5,4 %. In contrast, 2009 and 2010 presented negative rates.

During the last four years of the 2011 and 2014 series, the subsector shows a significant recovery with an average rate of 2,8 %, after two years of a noticeable contraction.

Graph 3. Value added growth rates of the branch agriculture, livestock, forestry, fisheries and the livestock production and hunting subsector. 2000 – 2014pr



Source: DANE - Synthesis and National Accounts Division.

pr: preliminary figures.
p: provisional figures.

The cyclical behavior of the sector, its important dynamics, its relationship with other branches of the economy and the need to complement the study and monitoring of the livestock subsector calls for the design, implementation and continuity of the ESAG as a strategic statistics for the livestock subsector.

The most widespread practice in the countries to obtain information on livestock slaughter were administrative records, but the need for more detailed and accurate information, and the requirement of updated directory of establishments performing

the activity, made necessary the conduct of surveys to establishments. In the case of Colombia, these correspond to slaughter plants (abattoirs and refrigerator facilities), mayor's offices and municipal treasuries.

Traditionally, the ESAG collects information on the number of slaughtered animals, the livestock liveweight and carcass weight as a determinant of livestock production (expressed in kilograms or tons). These variables provide a baseline for analysis, monitoring and international comparisons

b. Conceptual framework

Carcass. The carcass is defined by Decree 1500 as «the body of an animal after being slaughtered, throat cut, «deshuellado» and gutted leaving only the bone structure and the meat attached to it limbless» (Ministry of Social Protection, 2007: 5).

Bovine and buffalo carcass. The definition of these carcasses is adopted from the Regulation (EEC) no. 1165/2008 on livestock statistics and meat production. The definitions for the bovine, pig, ovine and goat species are found there. The whole body of a slaughtered animal as presented after bled, eviscerated and skinned, headless (separated from the carcass at the altoid-occipital joint); without the feet (severed at the carpal-metacarpal or tarsal-metatarsal joints); without the organs contained in the thoracic and abdominal cavities with or without the kidneys, the kidney fat and the pelvic fat, without the genitalia and the attached muscles and without the udder or the mammary fat (European Parliament and Council of the European Union, 2008: 10).

Pig carcass. «Animal's body of the pig domestic race after slaughter, bleeding, evisceration and shaved, stripped of tongue, hooves, genitalia, kidneys and pelvic fat, with or without head. Even though Regulation (EEC) 3220/84 does include the kidneys and the diaphragm» (Sánchez Rodríguez, s. f.).

Goat and ovine carcass. «The whole body of a slaughtered animal as presented after operations of bleeding, evisceration and skinning, headless (separated from the carcass at the atloid-occipital joint), the feet (severed at the carpal-metacarpal or tarsal-metatarsal joints), or tail (severed between the sixth and seventh caudal vertebrae); without the organs contained in the thoracic and abdominal cavities (except the kidneys and kidney fat), and without the udder and genitalia; the kidneys

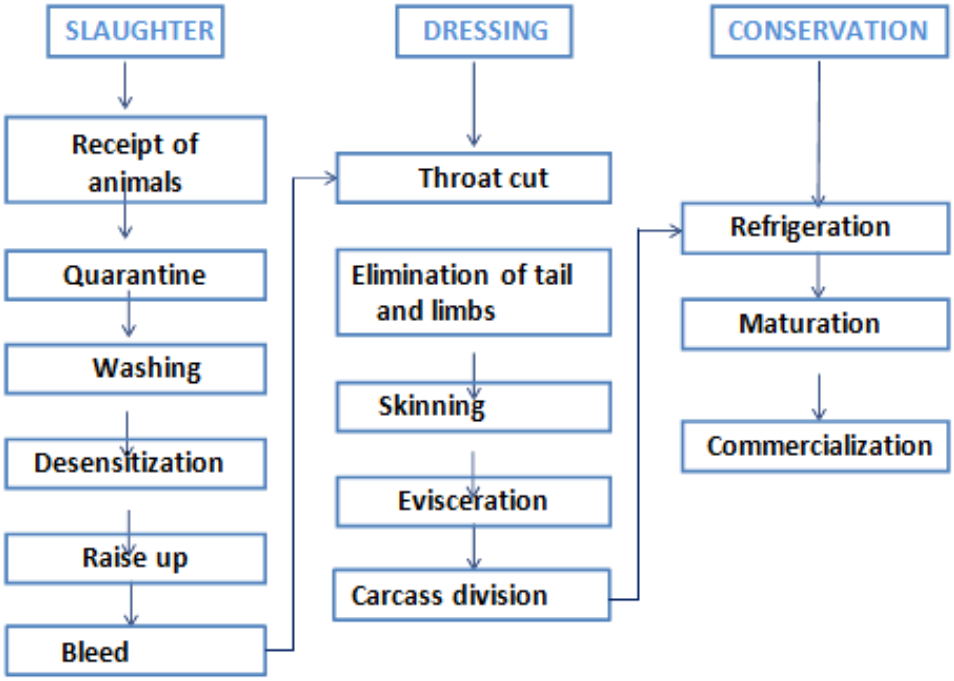
and kidney fat are part of the carcass» (European Parliament and Council of the European Union, 2008: 10).

Destination of carcass meat. It refers to the kind of markets to which the product is directed; the destinations included in the research: marketplaces and local butcher's shop, supermarkets and institutional market.

Dressing. «Process of progressive separation of the body of an animal carcass and other edible and inedible parts» (Ministry of Social Protection, 2007: 7).

It is the hygienic process performed with the animal in order to obtain meat for human consumption; which begins with the receipt thereof to the shipment of the carcass (Páez, 2012).

Figure 2. Outline of the slaughtering, dressing and conservation procedures



Source: Solano Figueroa (2012).

Cattle. It is the set of animals raised for exploitation and is defined as: Conglomerate of animals, majorly four-legged mammals, bred by man for their maximum exploitation and trade; among these, the production of meat and all its derivatives are the main purpose of feeding the human species.

The practice of cattle breeding is known as cattle farming, a work done by humans since ancient times. It is worth mentioning that these animals have provided great benefits since the beginning of man, especially food; but not only that, also derivatives from cattle, their skin and others can also be used; therefor it could be said that it represents one of the most important elements of the economic activity of mankind, thus giving rise to more complex societies (Santaella, 2014).

Bovine cattle. Set of cows, oxen and bulls that are domesticated by humans for their use and production, and to meet certain needs, whether food or economic. Various elements can be obtained from them, such as meat, skin or milk; furthermore, its derivatives are used for the making of other products for human use.

The bovine is a large ruminant mammal with a robust body; in the beginning they were primarily used for the production of milk and meat along with the treatment of land, subsequently it was the use of its derivatives and its horns; its excrement as a kind of fertilizer or fuel; and its skin for the production of clothing. These are part of the big livestock.

Buffalo cattle. Set of buffalo for their exploitation. The buffalo is a ruminant mammal bovid, with robust body, long and thick horns placed far back on the skull, bulging forehead and little fur (www.definicionesde.com, 2011).

The two main buffalo species are the African buffalo and Asian buffalo. It is part of the big livestock.

Goats cattle. Set of goats for exploitation. The goat is a mammal of a ruminant type, is a major producer of milk and meat, in addition to its fur, skin and manure can be used for several things. The male goat is known as «goat» or «billy-goat» whereas the young are called «goat» or «kid« (Santaella, 2014).

It has high adaptability and from its breeding the following products can be obtained: meat, milk, leather and fur. They are part of the small livestock.

Ovine cattle. Set of sheep bred for exploitation; they are major producers of milk, meat and wool for making cloth. Sheep are herbivore mammals.

It is one of the species with greater exploitation in arid and dry areas, ecosystems that are unsuitable for other livestock such as cattle.

The females are known as sheep, the male it is called ram; and the young are called lambs (Santaella, 2014). They are part of the small livestock.

Pig cattle. Set of pigs bred for their exploitation. Pigs or hogs are very docile mammals, with an average lifespan of about 15 years. The practice of domestication and use of these animals is done almost everywhere in the world.

The pig adapts itself in almost any ecosystem, but is associated more with corn growing regions. It provides meat, fat, bone, bristles, skin, in addition to which it can generate a series of products in various manufacturing industry segments such as the manufacturing of brushes and paintbrushes; also in the manufacturing of glue and gelatins obtained from the hooves of this animal (Santaella, 2014). They are part of the small livestock.

Abattoir. «Any establishment where the species of animals that have been declared suitable for human consumption are slaughtered and which have been registered and approved for this purpose» (Ministry of Social Protection, 2007: 8).

Carcass weight. Weight recorded by the scale, post-slaughter, bleeding, evisceration and depilation of the animal, expressed in kilograms (kg). The carcass is directly related to the liveweight of the animal and corresponds to a percentage thereof. In the case of this survey, the hot carcass weight is required (Ministry of Social Protection is sought, 2007).

Live weight. Total kilograms (kg) that an animal has before it is slaughtered.

Origin of livestock. Variable that seeks to determine the origin of livestock that is slaughtered. In the case of this survey, this information is provided at the department level, with the aim of providing the livestock map.

Livestock slaughter. National legislation defines it as «the procedure that is performed to an animal intended for human consumption, in order to kill it, which ranges from its desensitization to bleeding through the sectioning of the large vessels» (Ministry of Social protection, 2007: 9).

FAO states «it is an obligation to humanely slaughter animals intended to the supply of food products and useful sub-products. Then, the carcass should be processed hygienically and efficiently».

c. Legal framework

Decree 2278 of 1982 was the legal framework for the meat chain including the slaughter of livestock; it was repealed by Article 98 of National Decree 1500 of 2007.

In 2005, the commitment was established to regulate the slaughter, processing and marketing of meat through the CONPES documents 3375 and 3376. In May 2007, Decree 1500 was issued, which establishes the technical regulation including the official system of inspection, surveillance and control of meat, edible meat products and derived meat products intended for human consumption as well as the sanitary and safety requirements that need to be met in their primary production, processing, deboning, carving, storage, transport, commercialization, sale, import or export and a transition period of five years is established for implementation (Ministry of Social Protection, 2007) is established.

Subsequently, given the difficulty of meeting the new regulations, the deadline was extended by three and a half years through Decree 2270 of 2012, in addition to issuing other provisions (Ministry of Social Protection, 2012).

There are also three resolutions that complement the regulations. These are Resolution 240 of January 2013, whereby the sanitary requirements for the operation of animal slaughtering plants of the bovine, buffalo and swine species, deboning plants and storage facilities, commercialization, sale, transport, import or export of meat and edible meat products (Ministry of Health and Social Protection, 2013).

Resolution 241 of January 2013 which establishes the sanitary requirements that special processing plants for poultry need to meet; and Resolution 242 of January 2013 which establishes the sanitary requirements for the operation of the processing

plants of poultry, carving and storage, commercialization, sale, transport, import or export of meat and edible meat products4.

An important regulatory framework on the meat chain that is applicable to this statistical operation is presented by FEDEGAN, which is available on its website.

Decree 1500 of 2007
Which establishes the official system of inspection, surveillance and control of meat, edible meat products and derived meat products intended for human consumption.

Resolution 072 of 2007
Which establishes the manual of good practices for the production and procurement of the skin of bovine and buffalo livestock.

Resolution 2905 of 2007
Which establishes the technical regulations pertaining to the sanitary requirements and safety of meat and edible meat products of bovine and buffalo intended for human consumption.

Resolution 18119 of 2007
Which regulates the requirements of the Gradual Compliance Plan for the processing and deboning plants of bovine and buffalo livestock.

Decree 2278 of 1982
Which partially regulates Chapter V of Law 09 of 1979 with respect to the slaughter of animals of public supply or for human consumption and the processing, transport and commercialization of meat (Fedegan).

[4] The background of the current resolutions are those that accompanied the Decree 2278 of 1982: Resolution 2905 of August 2007, which establishes the technical regulations on the sanitary requirements and safety of meat and edible meat products of the bovine and buffalo species intended for human consumption and the provisions for their processing, boning, storage, commercialization, sale, transport, import or export; Resolution 4282 of November 2007, which establishes the technical regulations on the sanitary requirements and safety of meat and edible meat products of the pig species intended for human consumption and the provisions for their processing, boning, storage, commercialization, sale, transport, import or export; and Resolution 4287 of 2007, which establishes the technical regulations on the sanitary requirements and safety of meat and edible poultry meat products intended for human consumption and the provisions for their processing, boning, storage, transport, commercialization, sale, import or export.

d. International benchmarks

In its document Guidelines for humane handling, transport and slaughter of livestock, FAO states the recommended practices for the handling and welfare of animals for slaughter (FAO, 2001).

Also, the European Parliament and the Council of the European Union have the Regulation (EC) no. 1165/2008 of the European Parliament and of the Council of November 19, 2008 concerning statistics pertaining to livestock and meat production, which establishes the coverage that statistics should have, the frequency, reference period and transmission deadlines, which constitutes a good benchmark (European Parliament and Council of the European Union, 2008).

e. National benchmarks

The main national benchmarks in the legal framework related in Paragraph C of this section, in addition to some guilds and government sector organizations that stand out for their work of situation analysis in addition to their institutional activities. These entities and associations attend the External Committee of the ESAG and are the Colombian Federation of Cattle Farmers (Fedegan), the Colombian Association of Pig Farmers (Asoporcicultores), the National Sheep-Goat Production Chain and the Ministry of Agriculture and Rural Development, which serve as contrast and background information for the analysis of this subsector.

2.1.5. Design of indicators

Analysis and study variables. Number of slaughtered animals, liveweight and carcass weight.

a. **Number of animals slaughtered.** It is the result of adding the number of males and females slaughtered. In the case of cattle, calves or animals under one year are also taken into account in order to provide the total slaughter in the reference period.

$$Sacrificio\ total\ de\ ganado = Machos\ sacrificados + Hembras\ sacrificadas$$

b. Liveweight in kilograms (kg). It receives equal treatment in kg with respect to the total cattle slaughtered, which is the result of the sum of liveweight in kilograms (kg) of male animals slaughtered plus the liveweight of females slaughtered. In the case of cattle, calves or animals under one year are also taken into account in order to provide the total liveweight in the reference period.

$$Peso\ en\ pie\ kg\ del\ ganado = peso\ en\ pie\ kg\ de\ los\ machos + peso\ en\ pie\ kg\ de\ las\ hembras$$

c. Carcass weight (hot) (kg) cattle. It is the result of the sum of carcass weight in kilograms (kg) of male animals slaughtered plus the carcass weight of slaughtered females. In the case of cattle, the weight of calves or animals under one year is also taken into account in order to provide the total carcass weight in the reference period

The carcass weight requested in the ESAG, is the hot carcass weight.

$$Peso\ en\ canal\ kg\ del\ ganado = peso\ en\ canal\ kg\ machos + peso\ en\ canal\ kg\ hembras$$

2.1.6. Plan of results

After collecting, consolidating and ensuring the consistency of information, the respective estimates for the study variables (animals, liveweight and carcass weight) are calculated according to the sample design. This processing is performed by developing programs or routines in the «SAS» statistical pack for estimates that are published on the website monthly. The survey's bulletin presenting the quarterly and accumulated year to date results and their respective changes is done on a quarterly basis.

The bulletin also analyzes the following changes:

Annual change. Percentage change calculated between the quarter of the reference year (i, t) and the same quarter of the immediately previous year (i, t-1).

Accumulated change year-to-date. Percentage change calculated between what has elapsed from January to the month of the reference year (January to i, t), and what has elapsed in the same period of the immediately previous year (January to i, t-1).

2.1.6.1. Design of output tables or result tables

The results of estimates are delivered by the Statistical Methodology division of DANE, which is responsible for making the statistical calculation, to the thematic division, responsible for planning and directing the survey to be edited in Excel. The calculation of sampling errors measured by the Estimated Coefficient of Variation (CVE) and its corresponding confidence intervals (IC 95 % +/-) were also performed.

The results are thematically reviewed in order to analyze their quality, in an internal comparison and also with context information, in order to identify the trends and behaviors. Consequently the editing and publishing in monthly tables and the quarterly results bulletin is performed.

Tables for monthly publication on the website. The published file is distributed with the content and seven sheets with information, which contain:

Livestock slaughter, liveweight and carcass weight by categories. Total national. These tables contain information for all the species under study: cattle, buffalo, pig, sheep and goats, which provide the following details: period, grand total, males and females. For these sections the following variables are related: animals, with its coefficient of variation cve and confidence interval IC 95 % ±, liveweight in kg with its cve and IC 95 % ±, Carcass weight in kg with its cve and IC 95 % ± and liveweight in kg with its cve and IC 95 % ±.

In the case of cattle, the categories of the domestic consumption, calves and export, that apply only to this species, are also included, for which the same information is included with respect to the animals, liveweight and carcass weight with the corresponding cve and confidence intervals IC 95 % ±.

Livestock slaughter, liveweight and carcass weight by categories, according to departments. These tables with departmental breakdown are presented for cattle and pigs species and contain information with respect to the animals, with its coefficient of variation cve and confidence interval IC 95 % ±, liveweight in kg with its cve and IC 95 % ±, carcass weight in kg with its cve and IC ± 95 % and liveweight in kg with cve and IC 95 % ±.

In the case of cattle, the categories of the domestic consumption, calves and export, that apply only to this species, are also included, for which the same information is included of animals, liveweight and carcass weight with the corresponding cve and confidence intervals IC 95 % ±.

The above information is compiled for each of the departments except for the following cases.

- To preserve the statistical reserve, the departments of Amazonas, Guainía and Chocó are grouped in the presentation of results.

- The departments of Vaupés, San Andrés, Providencia and Santa Catalina did not register slaughter plants in the latest update of the sampling framework of the survey, conducted in 2013.

Tables included in the publication in the quarterly bulletin. This publication contains a set of tables that aim to present the data concerning the reference quarter and the cumulative year-to-date period. The information presented is as follows:

- Evolution of data, comparison of the reference period of the current year vs. year immediately previous.

- Comparison of the data by species, geographical and thematic breakdown.

- Information presented in absolute and percentage values.

The thematic content shows the variables of interest and then the specific data pertaining to each species are developed and tables are made for the following topics:

I. QUARTERLY RESULTS OF LIVESTOCK SLAUGHTER, FOR BIG AND SMALL LIVESTOCK

1. ANIMALS SLAUGHTERED

1.1. Total national

Table 1. Livestock slaughter by categories according to species, year, quarter

Table 2. Annual change and participation of livestock slaughter by category, according to species, quarter, year

1.2. Departmental results

Table 3. Participation, change and contributions of cattle livestock slaughter, according to department, quarter, year

Table 4. Participation, change and contributions of pig livestock slaughter, according to department, quarter, year

2. LIVEWEIGHT

2.1. Total national

Table 5. Liveweight, according to species, quarter, year

2.2. Departmental results

Table 6. Liveweight of cattle livestock, according to departments, quarter, year

Table 7. Liveweight of pigs livestock, according to departments, quarter, year

3. CARCASS WEIGHT

3.1. Total national

Table 8. Carcass weight according to species, quarter, year

Table 9. Destination of carcasses, according to species, quarter, year

Graph 1. Participation of domestic consumption of meat in carcass by destination, according to species, quarter, year

Table 10. Carcass weight and yield of cattle livestock carcass, according to departments, quarter, year

Table 11. Carcass weight and yield of pigs livestock carcass, according to departments, quarter, year

4. ORIGIN OF LIVESTOCK

4.1 Cattle livestock. Origin and slaughter by department (map)

4.2. Pigs livestock. Origin and slaughter by department (map)

II. YEAR-TO-DATE RESULTS

1. SLAUGHTERED ANIMALS

Table 12. Livestock slaughter by categories according to species. Accumulated month-month, year

Table 13. Annual change and participation of slaughtered livestock, by category, according to species. Accumulated month-month, year

Graph 2. Slaughter of cattle and pigs livestock, monthly evolution (last 5 years)

Graph 3. Slaughter of buffalo, goats and sheep livestock, monthly evolution (last 5 years)

2. LIVEWEIGHT

Table 14. Liveweight by species. Accumulated month-month, year

3. CARCASS WEIGHT

Table 15. Carcass weight by species. Accumulated month-month, year

The details of the tables can be found in document: «Output tables Livestock Slaughter Survey» located on the DANE intranet.

2.1.7. Design of the questionnaire

a. Hard-copy form. In this case, two questionnaires are used; one for big livestock (bovine and buffalo) and one for small livestock (pigs, sheep and goats). This form IS consistent with the electronic form and takes the same variables.

The physical form acts as an alternative to the electronic form that is made available online to provide information when the source cannot access the Internet for different reasons. It is still used by a small percentage and is composed as follows:

Chapter I Identification Data[5]. All the data identifying the source and flows throughout the survey as well as the compliance with certain numerical syntax rules or that the possible values6 are valid for each of the questions.

DANE

TODOS POR UN NUEVO PAÍS
PAZ EQUIDAD EDUCACIÓN

ENCUESTA DE SACRIFICIO DE GANADO MAYOR (ESAG)

CONFIDENCIAL: los datos que el DANE solicita en este formulario son estrictamente confidenciales y en ningún caso tienen fines fiscales ni pueden utilizarse como prueba judicial. Los resultados se publican en forma agregada. Ley 79/93, Art. 5.°.

Esta encuesta tiene por objetivo proporcionar información estadística sobre el número de cabezas, peso en pie y peso en canal, obtenido del sacrificio del ganado mayor (vacuno y bufalino) para el total nacional y distintos niveles de desagregación, con la oportunidad y confiabilidad requeridas, para facilitar el análisis y la planeación del subsector ganadero del país.

ANTES DE DILIGENCIAR EL FORMULARIO, LEA LAS INSTRUCCIONES AL RESPALDO.

I - IDENTIFICACIÓN

Oficina territorial _____

1. Departamento _____ 2. Municipio _____

3.Nombre del establecimiento o entidad _____ 4. Número de orden _____

5. Dirección de establecimiento o entidad _____

6. Teléfono(s) _____ 7. Fax _____

8. Página web _____ 9. Correo electrónico _____

10. Mes de la información _____ 11. Año _____

Chapter II. Slaughter of species. The information takes into account the livestock slaughtered for domestic consumption for each of the slaughtered species, and in the case of the bovine species, the slaughtered livestock intended for export. It also enquires the origin of livestock.

[5] The form of the Small Livestock Slaughter Survey A-110, contains the same variables than the form pertaining to big livestock A-100.

[6] Corresponding to the data validation concept, harmonized by DANE.
http://www.dane.gov.co/index.php/es/normas-y-estandares/sistemas-de-consulta

II • SACRIFICIO DE ESPECIES

NUMERAL 1. VACUNOS

Características	Totales (A1+A5)	Para consumo interno				Para exportación
		A1. Totales (A2+A3+A4)	A2. Machos	A3. Hembras	A4. Terneros	A5. Total cabezas
1) Total cabezas sacrificadas						
2) Total peso en pie (kg)						
3) Total peso de la carne en canal CALIENTE (kg)						

4. Destino de la carne. Sólo para consumo interno

Por favor indique el porcentaje de carne en canal del ganado sacrificado para consumo interno, según los siguientes destinos (emplee porcentajes, siempre completando el 100%)

Característica	Porcentaje
A7. Mercado local y cercano: plazas y famas del municipio o de municipios cercanos	
A8. Supermercados de cadena, mayoristas, centros de distribución directa	
A9. Mercado institucional: hoteles, colegios, restaurantes y hospitales entre otros	
	100%

5. Procedencia del ganado

Registre el departamento de origen del ganado según la Guía Sanitaria de Movilización Interna (GSMI), indicando el número de cabezas tanto para consumo interno como para exportación. Si el ganado procede del mismo departamento donde se ubica la planta de sacrificio, igualmente diligencie la información.

Departamento de origen del ganado vacuno	A11. Cantidad de cabezas que llegaron	Departamento de origen del ganado vacuno	A11. Cantidad de cabezas que llegaron

Forma DANE A - 100 - 2016

Impreso en la Dirección de Difusión, Mercadeo y Cultura Estadística del DANE

II - SACRIFICIO DE ESPECIES (conclusión)

NUMERAL 2. BUFALINOS

Tome en cuenta el total de las cabezas sacrificadas tanto para consumo interno, como para exportación

Características	Totales (A1+A5)	Para consumo interno				Para exportación
		A1. Totales (A2+A3+A4)	A2. Machos	A3. Hembras	A4. Animales menores de un año	A5. Total cabezas
1) Total cabezas sacrificadas						
2) Total peso en pie (kg)						
3) Total peso de la carne en canal CALIENTE (kg)						

6. Destino de la carne. Sólo para consumo interno

Por favor indique el porcentaje de carne en canal del ganado sacrificado para consumo interno, según los siguientes destinos (emplee porcentajes, siempre completando el 100%).

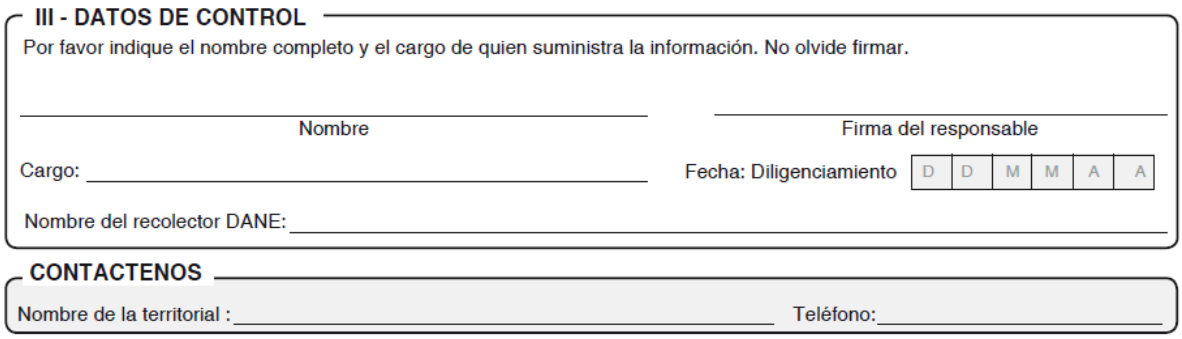
Característica	Porcentaje
A7. Mercado local y cercano: plazas y ferias del municipio o de municipios cercanos	
A8. Supermercados de cadena, mayoristas, centros de distribución directa	
A9. Mercado institucional: hoteles, colegios, restaurantes y hospitales entre otros	
	100%

7. Procedencia del ganado

Registre el departamento de origen del ganado según la Guía Sanitaria de Movilización Interna (GSMI), indicando el número de cabezas tanto para consumo interno como para exportación. Si el ganado procede del mismo departamento donde se ubica la planta de sacrificio, igualmente diligencie la información.

Departamento de origen del ganado bufalino	A11. Cantidad de cabezas que llegaron	Departamento de origen del ganado bufalino	A11. Cantidad de cabezas que llegaron

OBSERVACIONES


III - DATOS DE CONTROL

Por favor indique el nombre completo y el cargo de quien suministra la información. No olvide firmar.

Nombre

Firma del responsable

Cargo:

Fecha: Diligenciamiento D D M M A A

Nombre del recolector DANE:

CONTACTENOS

Nombre de la territorial :

Teléfono:

b. Electronic form via online. This form contains every one of the study variables by species and:

- Identification data
- Verification of livestock slaughter
- Information pertaining to all species

    - Bovines
    - Buffalo
    - Pigs
    - Ovine
    - Goats

The following variables are taken:

- Classification variables

    - By sex and destination of meat (export and domestic consumption)

- Analysis variables

    - Number of animals slaughtered
    - Liveweight in kg
    - Hot carcass weight in kg
    - Destination of the carcass meat for domestic consumption
    - Origin of slaughtered livestock

The information is completed on a monthly basis by each of the sources included in the study, through the electronic form via the web. Accessing the

DANE website, by assigning a user name and password, the establishments provide information with respect to the monthly slaughter, which is loaded into the system in real time.

With the use of this tool, critique, coding and validation of information processes are optimized. However, the success of this instrument is directly related to the management that every DANE official performs with the sources and their interaction with them.

It is important to note that each source can consult the form that they just completed and the historical forms completed for the period that the source selects under the menu *REPORTS,* on the link: See Form.

2.1.8. Validation, consistency and imputation standards, specifications or rules

The thematic, statistical, logistical and IT teams of the Methodology and Statistical Production of DANE teams jointly verify that the final development of the online form meets the validation and consistency rules established in the design of the survey. This process is achieved by making tests before the start of the collection of information, in order to ensure the correct development of the program.

In the ESAG the sources self-complete the form with the information of the reference month. The electronic form via online contains validations online, that allow this process to be carried out efficiently.

The electronic form is divided into identifiable parts according to the type of information and the corresponding validation:

a. **Identification**. It includes all the identification data of the source and the application contains a directory table, which is permanently updated.

b. **Verification of species slaughter**. It enquires as to the activity of a source in a given period and the species that it slaughtered. The form asks the source if it slaughtered one of the five species under study beginning with the big species to small species asking for the five species and if the source did not slaughter any of the species; it shall give the reason through a menu of options. Similarly, in the event that the establishment is not active it shall indicate what is the novelty explaining this reason.

c. **Record of data**. If the source has activity in the reference month, the survey will be specifically developed starting the completion in order for each of the species.

For the processing of the liveweight and carcass weight, for each of the species, the application has a reference table containing the ranges of average liveweight per animal, taking into account the species and sex. In the case of carcass weight, the table contains the average carcass yield per animal, taking into account the species and sex for validation.

At the moment of completing the data, the application performs the operation of calculating the average weights and comparing them with the reference table; in the event that the data is outside the established ranges, it is asked to review the data; if the data corresponds, then a justification is requested by the source to allow the capture of data.

Validation acts as a filter to detect typing errors and allows entering values out of range, to capture the diversity presented in the departments or regions of the country, with justified data.

In order to establish the weight ranges for the survey that serve as a filter, the existing literature on the topic and the concept of industry experts were enquired (see Table 1).

Table 1. Average liveweight and carcass yield, by species, according to sex

Species	Sex	Liveweight Kg[1]		Carcass yield[2]	
		Minimum	Maximum	Minimum	Maximum
Bovine	Males	175	600	48 %	58 %
Bovine	Females	175	550	48 %	58 %
Bovine	Calves	60	200	40 %	52 %
Bovine	Export	400	600	50 %	62 %
Buffalo	Males	400	600	46 %	55 %
Buffalo	Females	400	550	46 %	55 %
Buffalo	Under one year	60	300	46 %	55 %
Buffalo	Export	400	550	46 %	55 %
Pigs	Males	50	130	65 %	85 %
Pigs	Females	45	120	65 %	85 %
Pigs	Export	50	130	65 %	85 %
Goats	Males	20	40	40 %	52 %
Goats	Females	20	40	40 %	52 %
Goats	Export	20	40	40 %	52 %
Sheep	Males	22	60	40 %	52 %
Sheep	Females	22	60	40 %	52 %
Sheep	Export	22	60	40 %	62 %

Source: ESAG.

[1] It corresponds to the calculated weight of the total liveweight divided by the total number of slaughtered animals, obtaining an average weight per animal.

[2] Carcass yield is the percentage of use of the animal's flesh given by the ratio: carcass yield = (Carcass weight / liveweight) x 100. The carcass weight requested in the ESAG is the hot carcass weight.

Note: The only species that is currently being exported in Colombia is the bovine; however, the filters were established for other species in the application.

d. Monthly changes. The application calculates the changes presented in the form of the reference month with respect to the previous month for each of the sources. If the data is higher or lower than 20 % compared with those reported in the previous month, an explanation is requested that can be selected from a menu of options; the establishment also has the option to record in a text box an explanation that is not covered in the form.

The novelties referred to in this statistical operation can be consulted in the Critique Manual of the Livestock Slaughter Survey (ESAG).

e. Consistency and validation in the data collection process. For the critique and quality control of the information collected through the web, the electronic form has a Changes Module which has four reports:

Change of animals slaughtered
Change of livestock exports
Change of weights out of range
Change of novelties by source

These reports allow filtering of the forms that present inconsistencies, cases to be verified directly with the sources or potential errors; to know these reports in detail please refer to the Critique Manual of the Livestock Slaughter Survey (ESAG).

In the event that any correction is required to be made to the information that the establishment or entity provides, the information will always be verified directly with the source.

Once the collection is completed each month as scheduled, the Form of Control and Monitoring to the Capture System should be completed. The purpose of this form is to evaluate the effectiveness of the electronic form and its acceptance by the source.

f. Complementary consistency and validation. In addition to the Changes Module, the thematic area performs the review of the monthly file and generates reports with records that require direct verification with the sources.

The information is received by the logistics area and is distributed to the territorial branches for the respective management to be carried out.

The territorial branches in turn consolidate and send the responses to DANE Central for the debugging of the information.

g. Imputation. For each case, the nature of the source and availability of information is analyzed in order to perform the imputation.

The sources that have historical information for several years, the total of slaughtered animals is imputed by sex, liveweight and carcass weight, by means of time series and for the variables of destination and origin the historical trend of the source is applied.

For the sources with historical data of less than two years, imputation is performed by donors. For this effect, a source with similar characteristics is selected and its data pertaining to slaughter are taken. For the variables of destination and origin, the trend of the source is applied.

2.1.9. Nomenclatures and classifications used

Political-Administrative Division of Colombia (DIVIPOLA). To establish the geographic location of each of the establishments surveyed assigning them complete identification data including the DIVIPOLA code corresponding to the municipality where it is located.

2.2. STATISTICAL DESIGN

2.2.1. Basic components of the statistical design

Universe. It consists of the slaughter plants (abattoirs and refrigerator facilities), mayor's offices, municipal treasuries or where the livestock slaughter is reported in the country.

Target population It consists of the slaughter plants (abattoirs and refrigerator facilities), mayor's offices, and municipal treasuries or where the livestock slaughter registered in the country is reported.

Statistical framework It is a list framework, consisting of slaughterhouses or processing plants and refrigerator facilities, which are registered and located in the national territory.

The initial framework for the probabilistic sample conducted in 2008 was built between 2007 and 2008, from the directory of livestock slaughter plants, enquiring directories of establishments of the Colombian Federation of Cattle Farmers (Fedegan), the Colombian Association of Pig Farmers (Asoporcicultores) and the National Institute for Medicine and Food Surveillance (Invima).

For the extension of the sample conducted in 2013, whose purpose was to deliver departmental results, a review of the framework was made again and 646 active sources of information were found. In 2014 a source was included that was established in that year, bringing the current total framework to 647 sources.

For this extension, each of the territorial branches of DANE conducted a verification with the mayor's offices of the municipalities within their jurisdiction, in order to determine whether they were or were not in operation. From 2013, each time the emergence of a new slaughter plant or information source is detected; it is automatically incorporated to the sampling frame and begins to provide information in the survey.

This framework has identification and location variables with respect to the different slaughter establishments and also with auxiliary variables that complement it.

The main identification and location variables are department, department code, municipality code, data source, name, address and telephone number.

The main auxiliary variables are the status of the establishment (active or inactive), type of name, importance of the source given by the number of animals slaughtered of the bovine and pig species.

Definition of variables

- **Animals slaughtered.** Number of animals processed with respect to each of the species slaughtered.
- **Liveweight**. Total kilograms that an animal weighs before slaughter.
- **Carcass weight.** Weight recorded by the scale, expressed in kilograms (kg) and is recorded subsequently to the slaughter, bleeding, evisceration and depilation of the animal.
- **Destination of meat**. Types of market where the product is taken for domestic consumption. In the ESAG destinations are: market places and local butcher's shops, supermarkets and institutional market.
- **Category.** This variable refers to whether the slaughtered animals will be reserved for domestic consumption or export.
- **Origin of livestock.** Variable that seeks to determine the origin of livestock that is slaughtered; for the study, this information is provided at the department level, with the purpose of providing the livestock map. The department of origin of livestock should be recorded.
- **Data source.** Auto-completion survey via web by each of the establishments that make up the sample.

Coverage. National

Geographical breakdown. The disaggregation of the results for the bovine and pig species is done by departments; for sheep, buffalo and goats the results are presented for the national total.

Thematic breakdown. Number of animals slaughtered, liveweight, carcass weight, sex of the animal, destination of carcass meat and origin, according to each species.

2.2.2. Statistical units

a. **Observation unit**. Slaughter plants (abattoirs and refrigerator facilities), mayor's offices, municipal treasuries or where the livestock slaughter is registered.

b. **Analysis unit**. The livestock (bovine, buffalo, pigs, sheep and goats) slaughtered.

c. **Sampling unit**. Slaughter plants (abattoirs and refrigerator facilities), mayor's offices, municipal treasuries or where the livestock slaughter is registered in the country.

2.2.3. Reference and collection period

a. **Reference period**. It refers to the calendar month immediately preceding the one of the data collection.

b. **Collection Period**. The data are collected the first nine business days of the month following the one to which the information relates.

2.2.4. Sample design

The improvement of the ESAG consisted of passing from a sample of 267 establishments located in 247 municipalities, to a sample of 460 sources. In departments with less than 30 establishments for the livestock slaughter, it was determined to conduct a census; and the establishments that report the slaughter of buffalo, goats and sheep are of forced inclusion.

Maintenance of the sample. For the maintenance of the sample, a continuous monitoring is performed with respect to the universe of study, by reviewing other sources of information, such as the records of the Colombian Federation of Cattle Farmers (Fedegan) and the Colombian Association of Pig Farmers (Asoporcicultores) among others, to include new establishments that may arise.

The status of establishments is updated on a monthly basis through the novelties reported by the sources (temporary or permanent closures).

In the process of reviewing results, the inclusion of 54 sources was analyzed, which were entered in the sample as follows: the inclusion of 53 new sources in the estimation of the results from 2013 and an additional source in 2014. Thus, the sample passes from 406 sources to 460 sources of which information was available, as they belonged to the sample selected in 2008 but had not been selected in the sample of 2013, although the information was collected to perform the comparison during 2013 and 2014.

After several exercises and analyses, it was decided to include them in the estimation process since they improved the accuracy of the results, therefore the figures published for the period January 2013 to December 2015 were reprocessed; this reprocessing with 54 new sources was presented along with the results of the IV quarter of 2015. With this, a sample of 460 establishments is established for the estimates of the national total with departmental breakdown.

Sampling type. The design used for this statistical operation is a probabilistic stratified sampling and within the strata, the selection method is a Simple Random Sampling (ESTMAS).

It is probabilistic because all sampling units have known probability of selection and greater than zero.

It is stratified as follows: the first stratification criterion of the framework is of a geographical nature and it corresponds to the departments. Within each of them, two strata are created.

A strata of forced inclusion with the following inclusion criteria:

- Large plants established by the number of animals slaughtered.
- Establishments carrying out the slaughter of the buffalo, sheep or goats, because very few establishments process these species.
- In the departments where the total number of establishments is less than or equal to 30, all sources are of forced inclusion.

The second strata corresponds to the probabilistic inclusion (small plants) of which a sample is selected by Simple Random Sampling (MAS).

Definition of the sample size. The size of the sample is 460 sources of information. This size corresponds to the sum of the sample sizes calculated in each stratum in each of the departments.

In order to determine the sample size, as mentioned above, all the sources of information which reported the slaughter of buffalo, sheep and goats, in departments with less than 30 establishments in the framework were of forced inclusion.

In the remaining departments (with more than 30 sources), the sample size was determined within each one by applying the generalization of the «Lavallée-Hidiroglou» algorithm, which from an auxiliary variable highly correlated with the study variables (in this case it was the average number of animals slaughtered in 2012), allows defining the strata.

A desired level of accuracy was also established for the total departmental estimate, expressed in terms of Coefficient of Variation (CVE) which was 5 %, and a number of strata given (for this design two strata were established by department). The algorithm provides: the boundary between the two strata and the sample size required in each.

In addition to stratifying, this method optimizes the sample size required in each stratum maintaining levels of confidence and precision established (Rivest, 2002).

Table 2 shows the sample size for each stratum in each department, according to the criteria described above.

Table 2. ESAG sample distribution by department

Department		Stratum	Number of establishments	
			Framework	Sample
05	Antioquia	Probabilistic	45	5
		Forced	21	21
15	Boyacá	Probabilistic	31	4
		Forced	29	29
25	Cundinamarca	Probabilistic	22	4
		Forced	32	32
52	Nariño	Probabilistic	22	3
		Forced	8	8
54	Norte de Santander	Probabilistic	22	4
		Forced	11	11
68	Santander	Probabilistic	44	4
		Forced	20	20
73	Tolima	Probabilistic	18	3
		Forced	20	20
76	Valle del Cauca	Probabilistic	13	3
		Forced	17	17
08	Atlántico	Census	11	11
11	Bogotá	Census	4	4
13	Bolívar	Census	23	23
17	Caldas	Census	26	26
18	Caquetá	Census	12	12
19	Cauca	Census	24	24
20	Cesar	Census	21	21
23	Córdoba	Census	7	7

Department		Stratum	Number of establishments	
			Framework	Sample
27	Chocó	Census	3	3
41	Huila	Census	26	26
44	La Guajira	Census	10	10
47	Magdalena	Census	14	14
50	Meta	Census	22	22
63	Quindío	Census	5	5
66	Risaralda	Census	11	11
70	Sucre	Census	12	12
81	Arauca	Census	6	6
85	Casanare	Census	14	14
86	Putumayo	Census	11	11
91	Amazonas	Census	1	1
94	Guainía	Census	1	1
95	Guaviare	Census	4	4
99	Vichada	Census	4	4
Total general		**Probabilistic forced or**	**217**	**30**
		Forced or census	**430**	**430**
		Total	**647**	**460**

Source: DANE.

Expansion factors. They are a value that multiplies each of the elements selected in the sample in order to obtain the estimate of the parameter in the universe; this factor depends and is constructed from the sample design and the selection method used.

In the ESAG, a Simple Random Sampling (MAS) design is applied to each stratum; therefore the expansion factor for the establishment selected within each stratum corresponds to the following mathematical expression:

$$\text{fexp} = \frac{N_h}{n_h}$$

Where,

N_h = Total number of establishments in the stratum h.

n_h = Number of establishments selected in the stratum h.

Estimation procedure

Estimator of Totals: From the expansion factors, the estimator of the total (ty) of a study variable Y in the universe, depending on the values observed in the sample, is defined by using the estimator proposed by Horvitz-Thompson (1952) for a MAS, as follows (Thompson, 1952):

$$\hat{t}_y = \sum_h \sum_{a=1}^{n_h} \frac{N_h}{n_h} y_{ha}$$

Where:

y_{ah} = Value of the study variable y for the establishment a in the stratum h.

Estimator of variance: an unbiased estimator for the variance of the estimator is expressed as:

$$\hat{V}(\hat{t}_y) = \sum_{h=1}^{6} \frac{N_h^2 \left(1 - \frac{n_h}{N_h}\right)}{n_h} s_{ys_h}^2$$

Where:

$$S_{ys_h}^2 = \frac{1}{n_h - 1} \sum_{s_h} (y_k - \bar{y}_{s_h})^2$$

Calculation of the precision of results

Coefficient of variation: One of the main criteria for determining the quality of the estimation of a parameter is the variability that the potential results of this estimate have, which depends on factors such as the design and sample size, the parameter that is intended to be estimated, the variability of the phenomenon being measured and the levels of disaggregation, among others.

Estimated coefficient of variation (CVE) is a measure that summarizes such variability in percentage terms, which is obtained from the information of the sample and indicates the degree of precision with which the result is being reported. So that, the smaller the c.v.e., the less uncertainty there is with respect to the estimate and the latter is more accurate; the formula for its calculation is as follows:

$$c.v.e. = \frac{\sqrt{\hat{V}(\hat{t}_y)}}{\hat{t}_y} \times 100$$

The use of the c.v.e. as a criterion to define the usefulness of the estimation that is being analyzed depends directly on the conditions of the study (type of decisions that will be made, prevalence of the phenomenon, risks that are assumed), therefore there are no universal rules; however, it is proposed to take the following criteria into account to use the estimate coefficient of variation:

- The accuracy of the estimation is excellent, if its c.v.e is less than 3 %
- The accuracy of the estimation is of good quality, between 3% and 5 %
- The accuracy of the estimation is acceptable, between 5 % and 15 %
- The accuracy of the estimation is of limited use if it is greater than 15 %; these estimations should be used with caution.

Confidence Intervals: from the c.v.e. a confidence interval is estimated that provides the boundaries among which, within a given probability, the value of the parameter of interest is found, an interval with 95 % confidence is given by:

$$\hat{t} * (1 - 1{,}96\ cve(\hat{t}); 1 + 1{,}96\ cve(\hat{t}))$$

Where $\hat{t}$ represents the estimated value of the parameter of interest. For example:

	Total animals slaughtered	IC 95 % +/-
Estimation	22.587	791
cve (%)	1,79	

In this case the value 791 corresponds to the average length of the confidence interval $1{,}96\ cve(\hat{t}) * \hat{t}$ and therefore the interval is (22.587 +/- 791), hence, with a 95 % confidence it can be stated that the total of animals slaughtered, during the reference period, ranges between 21.796 and 23.378.

2.2.5. Coverage adjustments

Since it is a continuous survey (i.e. of a monthly collection), the sample loss is fairly controlled, so that when a source does not provide information for a given month, the imputation is performed for the non-response cases, as described in sub-section g) of section 2.1.8. Validation, consistency and imputation standards, specifications or rules of this document.

Furthermore, coverage is permanently being compared. Before publishing the results, each quarter, Fedegan and Asoporcicultores records are requested, in order to detect new sources, which are directly included in the sample, therefore no additional adjustment processes are required for coverage.

2.3. EXECUTION DESIGN

DANE distributes its mission activity in a network of processes in which different areas are involved, all coordinated through the Corporate Management Integrated System (SIGI for its acronym in Spanish). Thus each of the areas specializes in the specific development of activities that make up an investigation. The process of obtaining data starts at the Methodology and Statistical Production Division (DIMPE); the activities of the IT, Logistics, Thematic and Dissemination Divisions are listed in detail below:

The IT area, is responsible for:

- Designing the applications and select the systems, information and communications technologies, for the collection processes and part of the critique and quality control of the survey.
- Designing, developing, managing and technically advising the process of creating, maintaining and updating the electronic form.
- Managing and performing the computer and technological support processes needed for the survey

Thus, territorial branches have sufficient information to replicate the training to monitors, supervisors and coordinators; for the management of the operation in each, according to the staff assigned to each branch or sub-branch.

The logistics area in conjunction with the territorial branches and sub-branches of DANE performs the following specific activities:

- To design the operational process for the collection of information.
- To perform the control and supervision of the collection of information.
- To monitor the coverage and quality of information.

- To verify atypical information with the sources of information of the ESAG.
- To advise the sources of information in the completion of the electronic form. All of the above until forming the base files of the reference periods.
- To perform the verifications for the files to be further taken from the application of the survey by the thematic area.

The thematic area is responsible for:

- Developing the technical, methodological and operational design of the statistical operation.
- Aiming at the implementation of national and international methodologies that are designed to ensure the accuracy, impartiality and timeliness of information.
- Coordinating the efforts of all areas to technically ensure the execution of the processes of production, collection, critique, processing and quality control of the ESAG.
- Promoting inter-institutional scenarios that allow assessing and identifying the statistical information needs of government and private users and developing joint projects that result in common benefit of the entities.
- Addressing the development and planning of the ESAG.
- Performing the analysis of information.
- Developing newsletters and publications.

The Dissemination, Marketing and Statistical Culture Division is responsible for:

- Developing and implementing the strategic marketing, media, editing, dissemination and communications plans of DANE studies, including the ESAG.

2.3.1. Training system

From the moment of recruitment in the territorial branches and sub-branches, training is given to candidates, performed by the technical assistants or staff responsible for the ESAG for one day to the participating staff is made; the next day, DANE Central refers the selection test to be conducted.

Once the team is complete, training is carried out through videoconferencing and the documentary system of the study which records how the different stages of the ESAG are made is left in each of the manuals, methodologies and other documents composing.

The videoconference is addressed to the operational staff, which is responsible for the data collection. It is prepared and executed by staff of DANE Central, thematic and logistics division (at least one representative from each office); in the event there are changes or improvements in the system, the engineer in charge of the electronic form of ESAG should attend those training sessions.

Prior to the carrying out of the videoconference, staff should perform a thorough reading of the documentation and the logistics division of DANE Central office should send the topics and the file with the presentation, which will be the support for the training at the meeting. The staff in the territorial branches and sub-branches responsible for the data collection as well as the supervisors or persons in charge should attend the videoconference.

At the videoconference, an overview is made of the main methodological and operational aspects of the survey: a review of the main concepts, the criteria and tools for operational monitoring, the handling of tools for the operational monitoring, control and quality of information, in addition to training the staff about the updates or changes that have arisen; in the end the questions and suggestions arising at the meeting are discussed.

This training should be performed at least once per year and when changes occur or special activities arise that require support from regional offices and sub-branches.

The structure of the survey, processes and sub-processes that compose it, are documented and made available on the DANE intranet for permanent enquiry by each and every one of the members that make up the survey team in all areas of production, analysis and dissemination of information

2.3.2. Preparatory activities

Awareness raising. This activity is permanent, regardless of whether the source has been linked to the study for several years. It aims to establish contact on a monthly basis in order to remind those involved of the dates in which the form needs to be completed and to communicate to the source the importance of the study and its participation in it. This is done by means of direct communication with each of those involved in the process at the operational, managerial and institutional level.

When a new source is incorporated, a formal contact is made with the directives of the establishment, informing them of the importance of the study and that they have been selected to participate in this survey. This approach is carried out at the regional level and with the respective collector of DANE.

Should any change or innovation arise in the survey or the electronic form, communications are sent or instructions are included in the electronic form with all the relevant information to guide the sources of information.

The awareness raising primarily intends to instruct and encourage the process of self-completing the information via web, motivating a statistical culture among all the parties involved in the process.

Furthermore, we seek to show the guilds and entities with whom we have contact in the external committee and through communications, the work performed by DANE in the development of the survey in order to get them involved and have their active participation, opinions and concepts as experts in the sector.

Selection of staff. The staff responsible for the survey is mostly composed of DANE professionals, who have a person supporting them on the monitoring process with respect to the sources and collection of data in the territorial branches of Barranquilla, Bogotá, Bucaramanga, Cali, Manizales and Medellín.

The selection of staff is performed in accordance with the policies and procedures established by the entity in each term, which are disseminated by the responsible office in each registration period.

Currently, the recruitment is performed by means of a direct invitation, the territorial branches or sub-branches give training to the participating personnel and conduct a test sent by Central DANE. The person who gets the best score on the test will be chosen to be hired.

2.3.3. Design of instruments

The instruments that the ESAG has other than the electronic and hard-copy forms are described below:

a. **Control and monitoring form for the system to capture information.** The purpose of this form is to evaluate the effectiveness of the electronic form and the acceptance thereof by the source. In it, the regional offices of DANE report the coverage of sources and the manner in which they completed the information.

   This form contains the following information: the code of the source, the manner in which the source provided the information (options: web, hard-copy form, fax, e-mail, telephone, other), the name of the source, the municipality and department where the establishment is located, the regional office to which it corresponds, the status (options: provided, debt, temporary closure and final closure); and finally, a space for comments deemed relevant and that can provide elements of analysis of the behavior of each source in each period.

N°	ID FUENTE	RECEPCIÓN DE LA INFORMACIÓN	NOMBRE FUENTE	MUNICIPIO	DEPARTAMENTO	TERRITORIAL	ESTADO	OBSERVACION
			#N/A	#N/A	#N/A	#N/A	-	
			#N/A	#N/A	#N/A	#N/A		
			#N/A	#N/A	#N/A	#N/A		
			#N/A	#N/A	#N/A	#N/A		
			#N/A	#N/A	#N/A	#N/A		
			#N/A	#N/A	#N/A	#N/A		
			#N/A	#N/A	#N/A	#N/A		

b. Application's reports module. Two of the main objectives of this module are to provide tools for the monitoring and control of the collection and to facilitate the enquiry of historical data. For this purpose it has, among others, the following reports: enquiry, operational status, coverage and control cards, which should be continuously monitored.

c. Application's changes module. It was already referred to in this document; its main purpose is to identify records with possible errors, to guide the actions of the territorial branches and sub-branches and provide information of higher quality. The persons in charge in each regional office should monitor these reports continuously.

d. Manuals and documents to be continuously reviewed

- Operational Manual. It is a document that contains the operational guidelines of the survey; it is primarily intended for the territorial branches and sub-branches. It contains the following topics: organizational structure of the study; geographic coverage; description of the data collection instruments and the frequency of the survey.

- It also refers the following aspects for the operational staff of the survey: profiles and fees; activities that the operational staff should perform; the manner in which the recruitment, training and staff selection is done; the recommendations for the conduct of visits; forms of control relating to the work of the territorial branches; the operational schedule; and a guide for the completion of the Form of Control and Monitoring with respect to the Capture System among others.

- Collection manual. It contains the main aspects and directions for this work, such as: the description of the collection instruments (electronic form via the web, hard-copy form, and the Form of Control and Monitoring to the Capture System), instructions for closing the monthly process, recommendations for conducting visits (field collection), and communications with DANE Central.

- Completion manuals. There is a document for both the hard-copy form and the electronic form, which contains the instructions for the completion of each of the variables and classes of livestock.

- Critique manual. The purpose of this manual is to describe the process that aims to detect inconsistencies, and the analysis and correction of erroneous data to its total debugging. The topics covered are: the role of the hard-copy form, the objective of the critique, and the general instructions for the critique (materials needed to start the critique work, the general process, novelties and events as well as corrections to the information

- System Manual. It defines the design of the electronic form of capture, validation, control of coverage and production of the information of the survey and it contains the following topics: it describes the process of capturing information through the electronic form; it defines the modules in which the application is divided so as to control the coverage and inconsistencies of information and refers to the types of evidence that apply to the application among others.

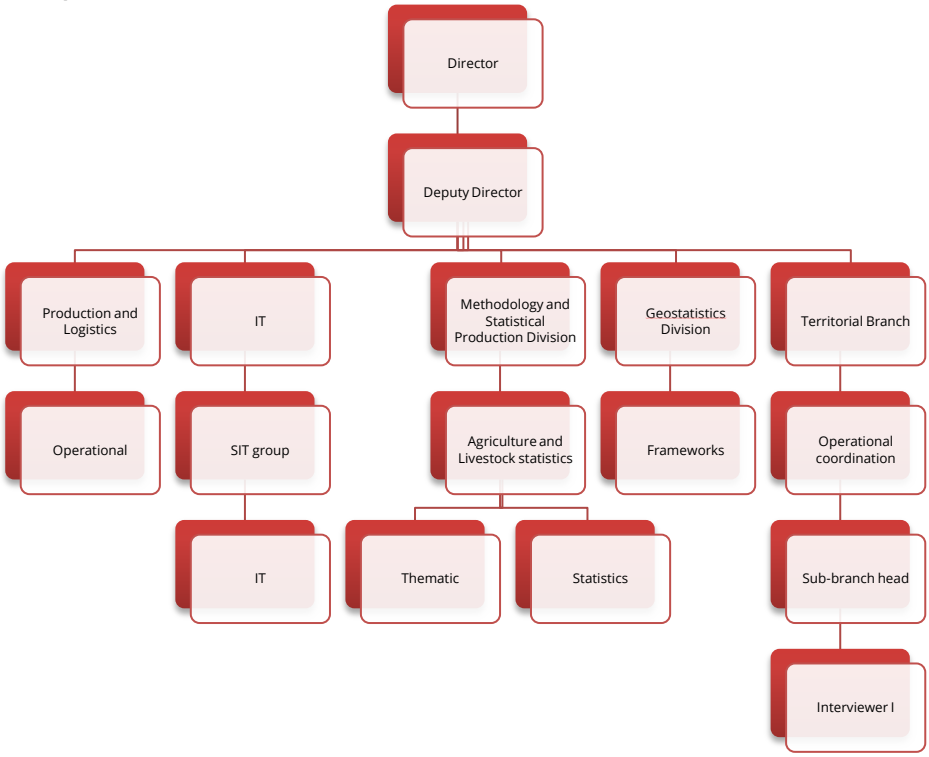
- Administrator User Manual. The purpose of this document is to present the novelties and reports with which the DANE official in the regional offices, according to the area of influence that corresponds to his or her office, can perform the follow-up, monitor and even capture information from the assigned sources under tools offered by the electronic form of the statistical operation.

2.3.4. Data collection

Operating scheme. The ESAG is conducted through an electronic form with assisted self-completion, which is accessed through the DANE website.

The work is performed under the administrative scheme of DANE, which divides the country into six territorial branches and their sub-sub-branches, which correspond to a specific geographical area, thus the establishments located in the area of influence of a territorial branch of DANE, will be assigned to it, distributing the workload for the execution of the collection phase.

Diagram 1. Operational chart



Source: DANE.

Methods and procedures for the collection. The collection process is performed by applying two reporting means. The first is by direct self-completion of the electronic form with permanent assistance from DANE's official.

Each territorial branch has available in the application of the ESAG the directory of sources that corresponds to it, according to its area of influence and during the first nine days of every month, it establishes communication with the managers or officials in charge of completing the information in the establishments with the purpose of reminding them the dates in which the data from the month prior to that of the calendar need to be completed on the DANE website.

Each DANE official performs the control and monitoring of the coverage of information, verifies its consistency and proceeds to monitor and request the information from the sources that have not loaded it.

The responsible DANE official performs a thorough monitoring of the data provided and the activity reported by the sources. Although the electronic form carries intrinsic critique elements, coding and validation, only the official as such, knows the source and makes the relevant decisions regarding inconsistencies or completion errors that require verification or correction.

In these cases the instruction is to enquire with the source in order to establish the procedure and provide the appropriate assistance until the questions are clarified or the corrections are made.

The second means of reporting is by self-completion of a hard-copy form, which eventually can be collected by a DANE official, or be sent by the sources to DANE, either by fax or e-mail, (occasionally the collection of the hard-copy forms is performed when the sources are visited). This form follows the traditional procedure of critique, verification of reported information, the respective monitoring of the sources and the registration of all the novelties.

Once this process is complete, the officer should enter the information in the electronic form made available on the website.

2.4. IT DESIGN

Two teams are involved in the construction of the electronic form for the collection of information corresponding to the ESAG: the IT team in DIMPE, consisting of a coordinator and an engineer and the thematic team of the ESAG.

End users, individuals and / or entities who use the electronic form are: In DANE the Logistics and Thematic areas and of course the sources of the survey (slaughter plants (abattoirs and refrigerator facilities), mayor's offices, municipal treasuries or where the livestock slaughter is reported).

The technology used for the development of the information system for the collection of data pertaining to the survey is the capture of it from an electronic form, assisted through the DANE website. The web component of the information system conforms to the DANE website after taking into account the specifications of design and construction of the electronic forms established by the DANE IT division.

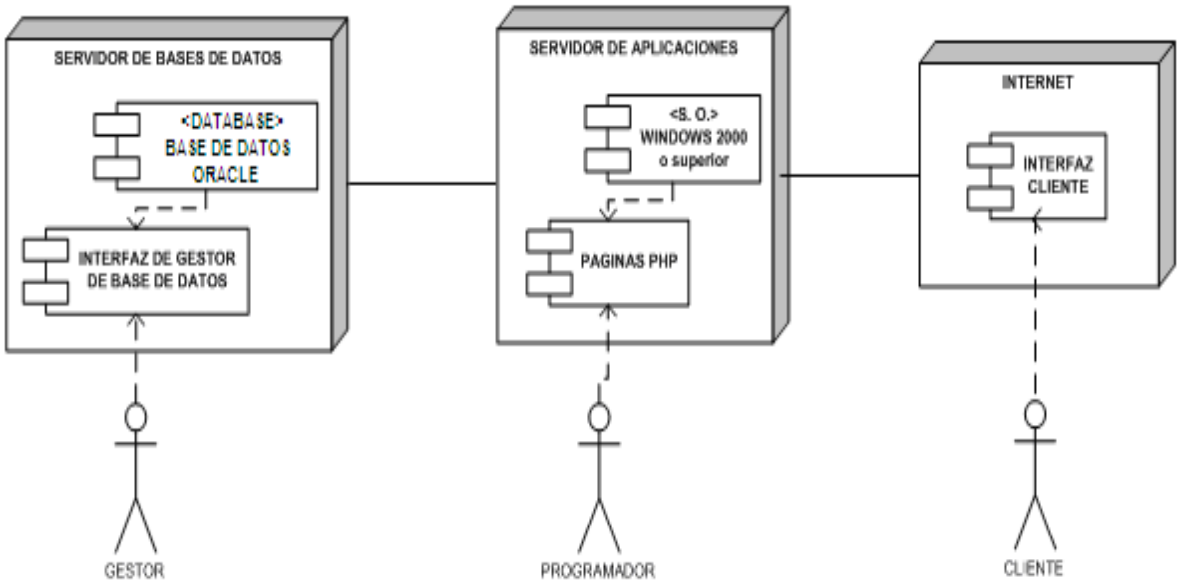
In order to facilitate the operation, management and maintenance of the information system, there are user and system manuals.

The components of the computer tool are intended to facilitate the capture, update (add, modify and delete records from the database), the query and the production of coverage reports and the management of the information contained in the administrator system of the system applications.

2.4.1. Definition of the system architecture

The system architecture considers tasks such as: the definition of the system's architecture levels; identification of design and construction requirements; the technological environment of the system and operational, management, security procedures and control of the system.

Diagram 2. Definition of the system's architecture levels



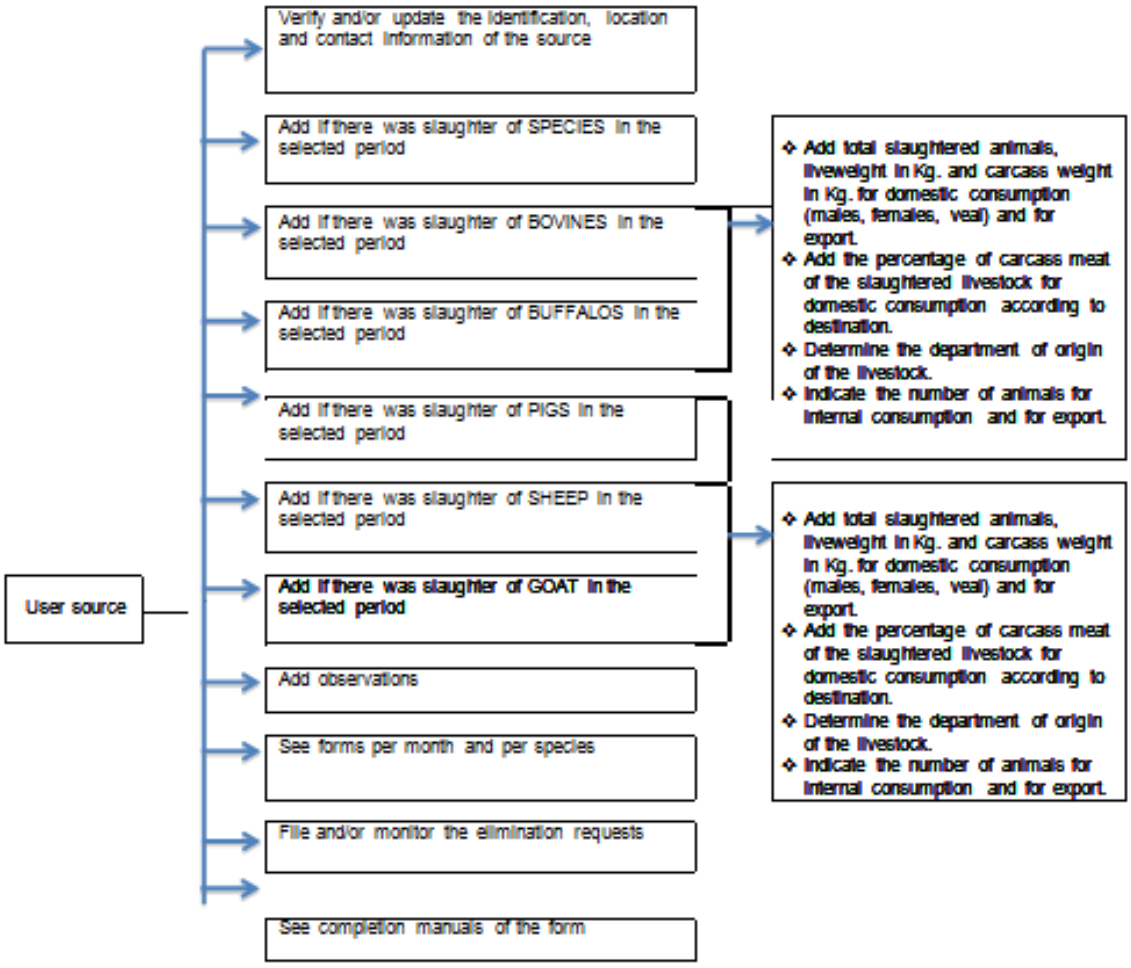
Source: DANE.

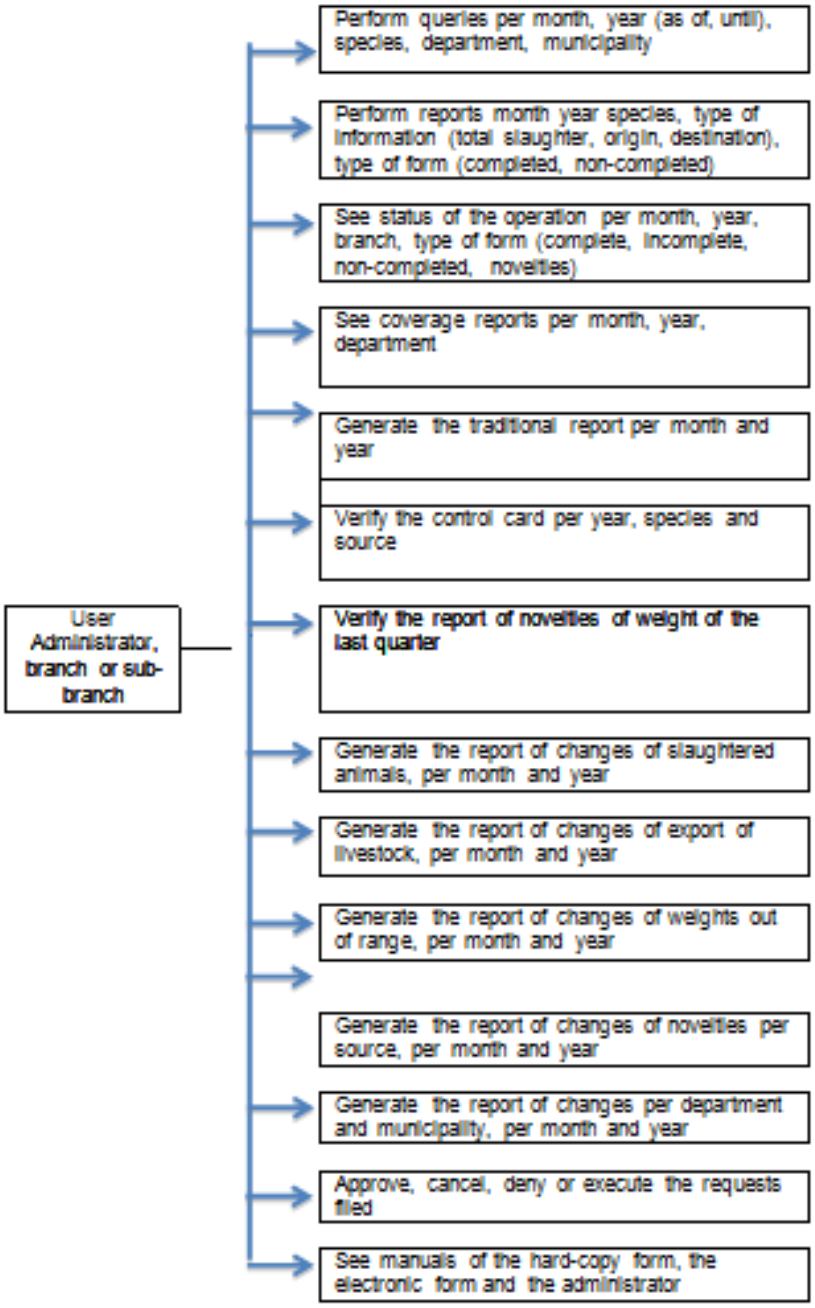
DANE has the necessary technological infrastructure to support the development of electronic forms to be disseminated via the web, consisting of Oracle database servers and web servers, where the institutional website is currently mounted and that supports PHP, the language with which this form is developed.

In order to develop the form, an Oracle database server (TESTS) is used, where the preliminary development of the questionnaire is made so as to determine on it, the possible changes or requirements of the end users. After completing development, performing the tests and correcting errors, the entire source code (development) is relocated to another Oracle database server (SURVEY, from which the information is received from the sources.

The actions that the user may perform are as follows:

Figure 3. Logical architecture



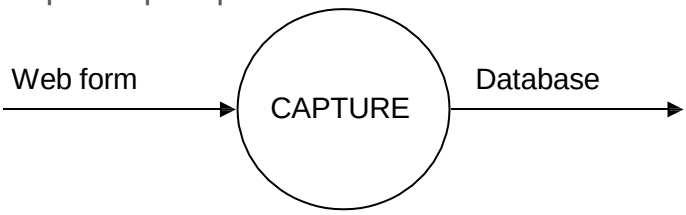

User Administrator, branch or sub-branch
Perform queries per month, year (as of, until), species, department, municipality
Perform reports month year species, type of information (total slaughter, origin, destination), type of form (completed, non-completed)
See status of the operation per month, year, branch, type of form (complete, incomplete, non-completed, novelties)
See coverage reports per month, year, department
Generate the traditional report per month and year
Verify the control card per year, species and source
Verify the report of novelties of weight of the last quarter
Generate the report of changes of slaughtered animals, per month and year
Generate the report of changes of export of livestock, per month and year
Generate the report of changes of weights out of range, per month and year
Generate the report of changes of novelties per source, per month and year
Generate the report of changes per department and municipality, per month and year
Approve, cancel, deny or execute the requests filed
See manuals of the hard-copy form, the electronic form and the administrator

Source: DANE.

2.4.2. Definition of the system architecture

The capture process integrates the files of the information collected by the ESAG by means of the electronic form.

Graph 4. Capture process



Source: DANE.

The electronic form allows the sources to send information corresponding to big livestock (bovine and buffalo) and small livestock (pigs, sheep and goats).

There are three general sections: the first one refers to the identification data that contains the name, contact and geographic location of the establishment among others.

The second provides specific details with respect to the slaughter of each of the species listed under the following variables:

- Number of slaughtered animals by sex, for domestic consumption and export
- Livestock liveweight in kg
- Approximate weight of carcass meat (hot)
- Destination of the carcass meat for domestic consumption
- Departmental origin of the slaughtered livestock

Most of the information required in electronic form can be taken from the monthly records kept by the establishment or the municipality for the payment of payroll taxes, also, the trends in the area and the type of livestock can be considered for the liveweight of livestock and the approximate weight of the carcass meat,

In the case of the destination of the carcass meat, the source can consider the likelihood of the plant to supply either the local or nearby consumption, or if it involves the supply of meat for more specialized markets such as supermarkets or wholesale centers. Finally, for the origin of livestock, the source can consult the Sanitary Guide of Internal Mobilization of the ICA[7,] which indicates the department and number of animals that arrive to be slaughtered.

The sources should be aware that any positive or negative change in the number of animals slaughtered exceeding 20 % should be justified by selecting an option or making the relevant clarifications (observations).

The third section is a module that allows the source to request the partial or total removal of the information filed, this in order to make the respective corrections.

Table 3. Specification of processes (Source)

IDP	Name	FUNCTION	INPUT	OUTPUT
P01	Log into the system	It allows the user to log into the system	User and password	Allow or deny access to the system
P02	Period to input	It allows determining the period about which the information will be inputted	Year and month	Form with identification data
P03	My profile	It allows reviewing and / or updating the identification, contact and location data of the source	Company name, address, phone, fax, website, e-mail	Form to complete the data of the person completing the survey
P04	Complete the survey	It allows completing the information for the ESAG	Determine whether there was the slaughter of any big or small species	Form to complete the survey information according to the criteria given
P05	Observations	It allows writing comments and observations with respect to the survey	Comments and / or observations	Stored information
P06	Forms	It displays a form with the information of the slaughter	Month, year, species, operation	Form with the information requested
P07	Requests	It allows filing, verifying or cancelling removal requests as required	Month, year, species, operation	Request filed

[7] Colombian Institute of Agriculture and Livestock, for its acronym in Spanish.

P08	Aids	It displays the system manuals	Links to hard-copy form and electronic form	Manual requested
P09	Log out	It finishes the process and logs out	Log out	Session finished

Source: DANE.

Table 4. Specification of processes (Administrator)

IDP	Name	FUNCTION	INPUT	OUTPUT
P10	Log into the system	It allows the user to log into the system	Password	Allow or deny access to the system
P11	Queries	It shows the totals of the slaughter by species	Month and year (as of, until), species, department and municipality	Report with data requested according to criteria
P12	Monthly reports	Make monthly reports	Year, species, type of information, type of source	Report with data requested according to criteria
P13	Status of my operation	It displays the status of the surveys	Month, year, branch, type of survey	Report with data requested according to criteria
P14	Coverage reports	It displays the coverage report of the survey	Month, year, department	Report with data requested according to criteria
P15	Traditional report	Generate a slaughter report for 61 and 72 municipalities	Month, year	Report with data requested according to criteria
P16	Control card	It shows the slaughter conducted by a source with respect to a species for one year	Year, species, territorial branch, department, municipality, source	Report with data requested according to criteria
P17	Novelty of weights	it displays the report of weights that were out of range with respect to the last quarter	Current month	Report with data requested according to criteria
P18	Changes of animals slaughtered	It shows the report of the positive or negative change exceeding 20% in animals slaughtered	Year, month	Report with data requested according to criteria
P19	Changes of export of livestock	It displays the report of sources who registered the export of livestock	Year, month	Report with data requested according to criteria

P20	Changes of weights out of range	It displays the report of sources that filed weights outside of the range established	Year, month	Report with data requested according to criteria
P21	Changes of novelties by source	It displays the report of sources that have a novelty for the specific month	Year, month	Report with data requested according to criteria
P22	Changes by department and municipality	It displays the report by department and municipality of the animals slaughtered, monthly change and annual change	Year, month	Report with data requested according to criteria
P23	Execute request	Approve, cancel, deny or run the requests filed	Observations, action	It allows the management of requests
P24	Aids	It shows the manuals associated with the system	Links to the completion manuals of the hard-copy form and the electronic form and Administrator User Manual	Manual requested
P25	Log out	It finishes the process and logs out	Log out	Session finished

Source: DANE

2.4.3. Requirements specifications

a. Hardware type. Differentiation should be made between the hardware for the actual capture of information from the sources, and the hardware relating to the application servers and the database that facilitates the construction of the information system and the subsequent data management.

According to the above, the equipment for the capture should have at least the following minimum characteristics:

- Processor: Pentium IV 1.6 GHz or higher
- Ram Memory: 256 MHZ

- Hard Drive: 100 MB
- Screen resolution 800*600
- USB ports
- SD Reader Port
- Supported Operating Systems: Windows XP

  Windows Vista Windows 2000

  Windows 2003 Server

  Windows7 Ultimate, Enterprise, Professional, Home Premium (32 and 64 bits) Microsoft Access 2003

For the equipment that act as servers (computers with a robust configuration) for databases and applications, the following specifications were established in terms of hardware or physical components:

- Pentium IV 2.8 processor or higher
- RAM memory 512 MHz or higher
- Hard Drive: 80 Gigabytes or higher
- SVGA Monitor
- Network Card 10/100 Base-T or above
- CD unit
- Broadband Internet connection
- Windows - Linux

b. Software type. This concept encompasses key aspects, such as the database, programming languages and operating system. The logical component of the electronic form to be used in the ESAG is detailed below.

The equipment serving as application servers and that of the database should support the following software characteristics.

- Internet Explorer web browser 5.0 or higher
- Windows 2000 onwards
- Antivirus
- Dreamweaver MX 2004 - Web pages Editor
- Oracle 10g - Native database
- Apache version 2.0 - Web Applications Server

The equipment acting as servers for the applications and database have all the computer security procedures that the IT division of DANE provides for this type of data collection.

The users in the establishments who complete the form of the FASE, as requirements to answer the survey, are requested to have Internet access and use an Internet browser such as Microsoft Internet Explorer version 5.5 or higher.

2.4.4. Design of the database

The strategy with respect to storage, retrieval and query of the data collected in the survey is developed in three phases clearly defined: conceptual design, logical design and physical design of databases.

In the conceptual design, a scheme of the information was constructed from the specification of the requirements of the thematic team and helps the database designer to convey to its users what he or she has understood with respect to the information used in the survey. Throughout the entire process of development of the conceptual scheme, tests and validations are made with user requirements (thematic team).

In the logical design, the scheme for information was constructed based on a specific database model; at this stage, the conceptual schema is transformed into a logical scheme, which uses data structures of the database model upon which the Database Generator System (SGBD) is based (in the case of ESAG it is Oracle 10g). To this end, a relational model or entity-relationship of universal use in the design of databases is proposed; as the logical scheme is being developed, it undergoes testing and validation with user requirements.

For the physical design or the physical implementation of the logical scheme obtained in the previous phase, Oracle 10g is used, which is a system with large storage capacity and rapid response to queries, since the physical scheme adapts to it. In particular the database where the information collected in the survey is stored is created in the physical design.

The server of the database is backed by computer security procedures, which the IT Division provides for this type of information collection and in general, for proper treatment of the information generated in each of the divisions and studies of DANE.

2.4.5. Loading of the database

This module allows the automatic loading of the information provided by the sources in the database designed for the ESAG, which was developed in Oracle. The loading module is divided into the following modules:

a. **Inconsistencies module**: Its function is to verify that the information loaded into the database does not have erroneous data or duplicate records.

b. **Coverage control module:** Its function is to generate reports that allow performing a follow-up to the information that has been loaded into the databases.

c. **Correction module:** It allows performing the elimination of erroneously loaded information in order to make the respective adjustments.

2.4.6. Data validation as well and the generation of both coverage and thematic reports

With the information consolidated in the database, procedures are executed with respect to validation and reports of inconsistency (according to the validation and consistency specifications) in order to ensure the quality of the information collected in the operation. Once inconsistencies have been identified through a user interface, adjustments are made to the records of the database affected if appropriate or needed to justify the inconsistency.

Finally, coverage reports are generated that facilitate for the administrators the control of the data collection and the generation of reports that provides the thematic team of the study with tools for the analysis of the variables of the survey form.

2.4.7. Capture process by means of the electronic form

The Oracle database installed on two servers that work in cluster where the data collected from electronic forms are stored.

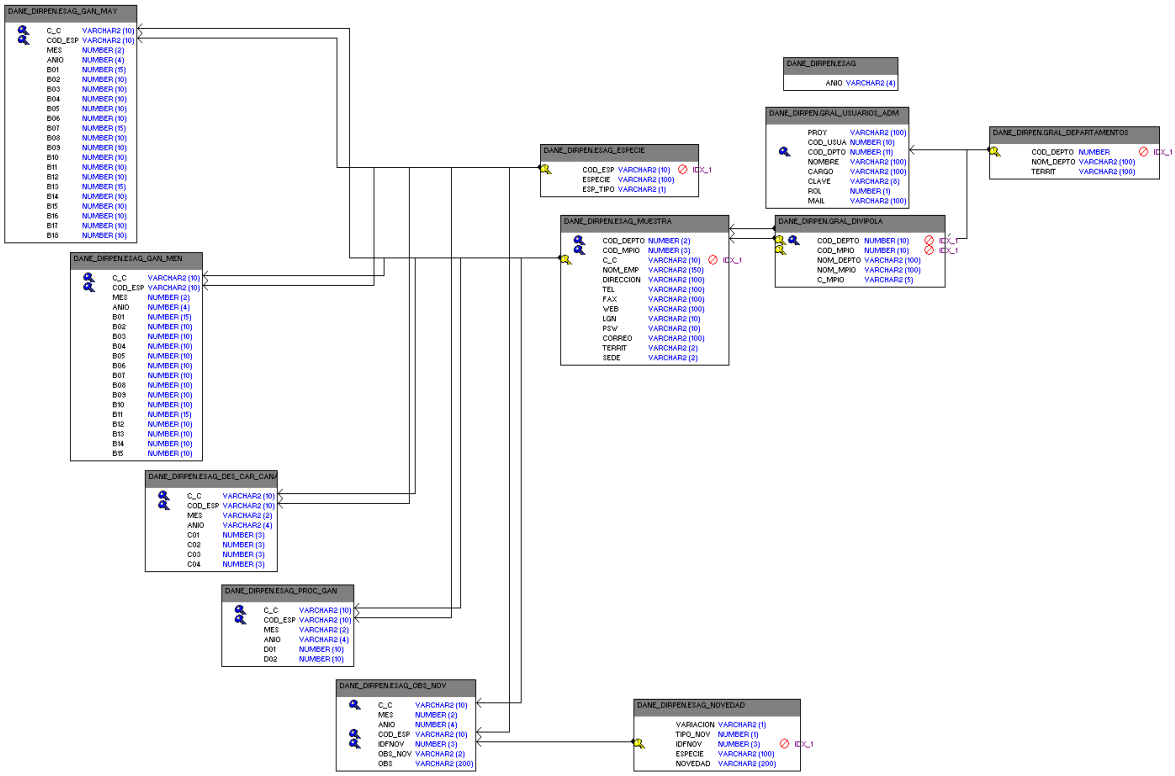
The capture process with electronic forms via the web is composed of four sub-processes: design of the database; creation of the web software; publication of the application on the DANE web server and a link on the institutional website and data collection.

Each of these sub-processes in turn contains a number of activities, functions, resources and controls, which are described below.

2.4.8. Entity-relationship model of the system

Based on the hard-copy forms where the type of information used by the ESAG is observed, the structure of the database (tables, fields, data types and size) is then formed, in order to then achieve the normalization thereof, so that there is no redundancy in the stored information. The structure of the database is as follows:

Diagram 3. Entity-relationship model of the ESAG



Source: DANE

2.4.9. Creation of the web software

For the development of the electronic form, the methodology that is in the documentary system of DANE was used, along with a methodology known as XP (Extreme Programming), which consists of developing the software in conjunction with the thematic user and dividing the development into modules where each module being developed is tested and put immediately into production, thus an incremental development of the product is achieved.

In the design of the questionnaire for the collection of information in the electronic form of the survey, all the explicit requirements contained in the analysis model are applied, adapting them to the needs of the end user.

During the development phase, the module for the capture of information is developed, implementing the necessary validations in order to ensure that the user does not make mistakes when completing the form.

Subsequently, a procedure is developed that allows assigning a username and password to each of the sources. Once created, they are sent to the operational coordinator of the survey, who is responsible for addressing communications to each source to provide them with their respective identification.

This process is fully implemented on the web applications server of DANE.

Publication of the application via the DANE web server and a link on the institutional website. At this stage, the IT Division of DANE is required to provide sufficient disk space and the tools necessary to install the developed application on the DANE web server.

Subsequently, the Press Office that is responsible for managing the institutional website, is requested to give the authorization to create a link that allows the sources to log in so that they can complete the survey. This process is fully implemented on the web applications server of DANE.

Collection of information. In this process access is granted and the response times with respect to the survey for each of the establishments who complete the ESAG is determined. It was implemented on a shared basis in the database servers and web applications servers of DANE.

Control and follow up. By means of the online work performed by the sources at the national level, the following processes are performed: registration of new products, coverage reports and follow-up of the operation, so that the operational managers have the necessary tools to continuously raise awareness of the sources and verify the assigned coverage.

2.4.10. Specifications of the tests plan

This plan describes the testing of unit, integration and the system that is applied to the electronic form. The objective is to test all the requirements defined in the specifications and in the use cases model.

Specification of the test environment. The objective of this task is the definition of the environment necessary for the carrying out of system tests. The following concepts of specification of the environment will be considered:

- Technological environment: hardware, software and communications
- Operation and safety requirements of the test environment
- Test Tools related to the extraction of sets of tests, results analysis, utilities of the environment management, etc.
- Emergency and recovery procedures
- System capacity planning

Technical specifications of the test levels. The objective of this task is the detailed description of the different levels of testing, such as unit, integration, system implementation and acceptance testing.

- **Unit tests.** They include the verifications associated with each component of the information system; when they are conducted, the functionality and structure of each individual component is verified. They are carried out in the process of development or construction associated with each of the subsystems that make up the information system.
- **Implementation tests.** They consist of performing the necessary verifications to ensure that the system works properly in the operational environment, satisfactorily meeting the requirements of performance, safety, operation and coexistence with the other information systems, and that it receives the acceptance by the users of the operation. These are made in the process of implementation and acceptance of the information system.

- **System Tests:** They are integration tests of the information system in full. They allow testing the system as a whole and its integration with other systems with which it is related in order to verify that the functional and technical specifications are met.

  As in the previous test levels, at this level tests should be performed during the construction of the information system.

- **Integration Test:** They include verifications associated with sets of components such as PHP classes or forms, generally reflected in the definition of the construction subsystems or the integration plan of the information system. They aim to verify the correct assembly between the diverse components and modules that make up the information system.

  These tests should be performed at the time of the construction of the information system.

- **Acceptance tests:** They are designed to validate that the developed system meets the expected performance requirements and are needed to obtain the final acceptance of the system on behalf of the user (the thematic team of the study).

  At this stage, the thematic and logistics teams of DANE Central tests all the functionality of the system, the validations that are integrated to it, as well as the flows and processes that it performs.

  It is then made available to the territorial branches and sub-branches so that tests are performed both as an administrator user and as source users, and the comments and suggestions that may arise in the process are received in order to be analyzed by the team.

  As preparation for the test, the IT Division source users for all the necessary tests and iterations to be performed in order to ensure that it can be made available to all the levels of users of the application.

2.5. DESIGN OF METHODS AND MECHANISMS FOR QUALITY CONTROL

a. **Control and monitoring of the quality, supervision processes.** Both at the central and at the regional levels, the staff of the survey, by means of the electronic form is able to generate online reports in order to monitor and perform the geographical coverage control of all the sources included.

   In the system, the Status of my Operation report provides specific information with respect to the development of the operation, which allows determining the level of achievement with respect to the sources of their area of influence, as well as accessing the surveys and displaying the information recorded.

b. **Visits and collection in the field.** Furthermore, visits are scheduled every year to some sources that present issues relating to the validation of certain processes and confirm their activity.

   The goal is to perform an effective follow-up and monitoring of the survey, the verification of certain variables and, when maintaining a permanent contact with the sources, to encourage the statistical culture through the institutional presence. These visits have the following characteristics:

   - They are scheduled in advance and confirmed; in those visits, contact is made with all the levels of the establishment (operational, managerial and institutional).
   - It is enquired as to whether there is any problem with the self-completion of the monthly information.
   - If necessary, assistance or advise is provided with respect to the self-completion via the web.
   - The validity of the variables is verified: liveweight in kg and carcass weight in kg of the slaughtered livestock.
   - It is important to validate the activity of the plant according to the species that it slaughters.

- Some hard-copy forms need to be provided as an alternative when the source has problems with the self-completion via the web.
- The goal is always to encourage the source to complete the form via web.

Also, at the end of each month the territorial branches of DANE send the Form of Control and Monitoring to the Capture System to DANE central, where monitoring is performed with the tool used by the sources to provide information to DANE, It also serves to monitor the territorial branches and sub-branches.

Finally, there is the module of changes that also allows monitoring the quality of the data in real-time.

c. Indicators for quality control with respect to the processes of the study

Coverage Indicator: this indicator allows measuring the efficiency of the collection process in terms of total coverage of the sources that provide information.

$$ICO = \frac{Number\ of\ sources\ collected\ in\ the\ reference\ month}{Total\ number\ of\ sources\ of\ information} * 100$$

Baseline: 95 %
Source: Electronic web form
Frequency: Monthly

Indicator of monthly timeliness: it allows measuring the timeliness of the publication of the tables pertaining to the monthly results of the ESAG.

$$IOM = Actual\ day\ of\ delivery\ of\ results - Day\ scheduled\ for\ the\ delivery\ of\ results$$

Baseline: Timeliness indicator ≤ 0 days
Source: Schedule of the ESAG
Frequency: Monthly

Indicator of quarterly timeliness: it allows measuring the timeliness of the publication of the ESAG Technical Bulletin.

$$IOT = \frac{\text{Actual day of delivery of the Technical Bulletin}}{\text{Day planned for the delivery of the Technical Bulletin}}$$

Baseline: Less than or equal to 1: timely delivery; Greater than 1: It is necessary to generate the corrective action.
Source: Schedule of the ESAG
Frequency: Monthly

Quality indicator: it allows measuring the effectiveness in the activities of awareness raising and training of the sources in the completion of the form, which has an impact on the quality of the information, as well as timely establishing and correcting any errors or inconsistencies.

$$IC = \frac{\text{Number of forms with inconsistencies}}{\text{Total number of forms inputted}} \times 100$$

Baseline: 5 %
Source: Electronic web form
Frequency: Monthly

Finally, the coefficients of variation; each of the estimates published in the ESAG are accompanied by their corresponding Estimated Coefficient of Variation c.v.e. that corresponds to a measure of accuracy with respect to the estimate, becoming part of the quality indicators of the information of the ESAG.

The c.v.e are presented in the output tables published as annexes on the DANE website.

2.6. PILOT TESTS DESIGN

The entire team discusses any change or improvement in the collection instrument; a proposal is structured and submitted to the external committee, in order to collect the comments and contributions that can improve the proposal.

Subsequently, the changes are implemented in the electronic form and the protocol established in sub-section 2.4.10 Specifications of the tests plan should be met before making the tool available to all the sources of information and users, both from DANE Central and the territorial branches and sub-branches.

2.7. DESIGN OF ANALYSIS OF RESULTS

2.7.1. Statistical analysis

It is an inferential analysis that includes the methods and procedures to deduct properties (making inferences) of a population from a sample.

Sampling errors calculated for the national total of the bovine and pig species range between 1 % and 3 %. For the slaughter intended for export, errors are of 0 % because all the sources that are authorized for this purpose are included in the sample.

In the case of the buffalo, goat and sheep species it is 0 % because all sources that present slaughter of these species are of forced inclusion.

By the nature of the study, coverage or response rate errors are controlled by imputation and continuous comparison with external sources, as mentioned above.

Occasionally, timeliness issues arise in the delivery of information from the sources, with delays of one or two months, mainly due to high turnover of the staff in charge and responsible for completing the survey in each establishment, which affects the imputation rate.

Once the results have been generated, a comparison is made thereof with respect to the trends that are specific to the activity.

2.7.2. Context analysis

The analysis of results on the behavior of livestock slaughter is based on a descriptive analysis, of changes, historical trends and seasonal behaviors, according to established standards and the structure identified in the subsector.

In the analysis of the information, the slaughter trend informed by the guilds involved in the activity and other state institutions is taken into account.

Livestock activities in the country have a long tradition, which has led to the formation of specialized guilds, which in some cases are also the entities collecting the payroll taxes of the activity.

The information recorded should meet the correlation between the number of slaughtered animals and their corresponding liveweight in kg, according to the established parameters and the trend by source as well as the time of year. If there is no such correlation, it should have its respective formal explanation of growth or decline of slaughter or no slaughter that is enquired with the sources.

For each year in each of the four quarters, the behavior of the livestock slaughter of the analyzed species is described in relation to the immediately previous year.

2.7.3. Committees of experts

The thematic team of DANE presents the results to be published in the press release in output tables and graphs to the internal and external committee of the statistical operation.

a. Internal committee. It involves the Thematic, Logistics and Methodology teams of the study, and delegate staff interested in the sector from the divisions: Director's office, Deputy director's office, National Accounts Division, Methodology and Statistical Production. Output tables are presented to the internal experts of the entity with the aim to analyze and validate the subsequent results that are further presented to the external committee.

b. External committee. This committee involves the Ministry of Agriculture and Rural Development (MADR) involved, the Sheep-Goat Chain; the Colombian Federation of Cattle Farmers (Fedegan) and the Colombian Association of Pig Farmers (Asoporcicultores). Staff of the internal committee also attend these meetings. Output tables are presented to the guilds and associations of the livestock sector interested in the information, in order to contextualize and analyze the results as well as generate feedback for the survey for its further dissemination

2.8. DESIGN OF DISSEMINATION

The means provided for the dissemination of information generated by the ESAG is the website, where the statistical annexes, technical bulletin, press release and the presentation made to the External Committee are published. The information should comply with all the principles of the national code of good practice for official statistics.

2.8.1. Data repository management

DANE achieves the function of disseminating the results of the information through its website www.dane.gov.co, link: Statistics by topic, Agriculture and Livestock, Livestock Slaughter Survey (ESAG) http://www.dane.gov.co/index.php/agropecuario-alias/estadisticas-de-sacrificio-de-ganado-esag

2.8.2. Dissemination products and tools

- A link to the livestock slaughter electronic form.
- Documents containing the background of the study: Methodological datasheet and Methodology.
- Quarterly information, consisting of the Press Release, Technical Bulletin and the presentation.
- Historical information of the bulletins and press releases of the last 4 years.

- Information or historic series of national and regional livestock slaughter national total and regional - bovine, pigs and other species - as of October 2008 up to December 2013.
- Information or historic series of livestock slaughter, national total and departmental - bovine, pigs and other species - as of January 2013 to date.
- A guide for the interpretation of the sampling error in terms of the estimated coefficient of variation and confidence interval.
- Series of bovine and pig livestock slaughter in 72 municipalities. For the 2004-2008 period.
- Series of bovine and pig livestock slaughter in 63 municipalities. Movement from 2002 to 2007.
- Series of bovine and pig livestock slaughter in 63 municipalities. Movement from 2000 to 2004.

2.9. DE EVALUATION DESIGN

On a monthly basis, the exercise performed in the collection is evaluated. In the case where there are novelties, they are reported to the Logistics Division of DANE, in order to obtain precise instructions. Also, suggestions from staff are received and evaluated, in order to include the different views and experience that are relevant so as to enrich the statistical operation.

Similarly, in the meetings of internal and external committees, in addition to presenting quarterly results, comments and suggestions are also received from experts and guilds, which provide feedback and the methods and procedures of the statistical operation, among other aspects can be improved.

Furthermore, the institutional management system of DANE ensures that the processes meet quality standards, and performs continuous monitoring to fulfillment of the work through the Institutional Planning and Management System (SPGI) which is graded regularly.

In this line, the Regulation, Planning, Normalization and Standardization Division (DIRPEN) evaluates the statistical operations of DANE through a commission of independent experts that delivers an evaluation report and agrees with the team upon an action plan to implement the recommendations, changes, improvements, adjustments or redesigns that are deemed relevant according to the evaluation.

Finally, the thematic division permanently evaluates the subsector so as to keep the survey updated and responds to the dynamics thereof.

3. RELATED MATERIALS

Output tables. It presents the structure, content and aspects to consider for the presentation of the results of the ESAG.

Data Dictionary. It contains the description of the tables, name and descriptions with respect to the variables of the file stored by the study's application.

IT design. It presents the IT design for the collection and processing of information obtained from the ESAG in an electronic form via the web. It defines the scope and architecture of the system; it identifies the technological environment of the capture processes by means of electronic forms; it describes the capture processes from electronic forms via the web and it explains the test plan that accompanies the development and the starting of the operation of the information system.

Sample design. It contains in a detailed fashion, the sample design of the ESAG and it includes aspects such as the sampling framework, the stratification applied thereto, the design for the selection of samples with their respective size and finally the equations that allow performing estimates with respect to the variables of interest with their respective sampling errors.

Indicator specifications. It presents the indicators of the ESAG, which guarantee the quality and timeliness of results, detailing aspects of their calculation formula, objective, reference level, calculation responsibility, source, frequency and criteria to make decisions in the event that the indicator level becomes critical.

Validation and consistency specifications. This document establishes the validation and consistency rules based on the characteristics of livestock slaughter, which allow performing an efficient process and that seek to assure the quality of the information that is collected through the electronic form.

Methodological datasheet. It exposes the study's methodological summary.

Glossary of terms. It contains the definitions or explanations of terms and acronyms used in the statistical operation for the purpose of improving the understanding with respect to the content of the ESAG.

Review guide for the consolidation, analysis and generation of results. It describes the processes of analysis and the generation of results within the standards of quality and timeliness required by the statistical operation.

Guide for the interpretation of sampling error in terms of the coefficient of variation and confidence interval estimates. It presents the criteria to be taken into account for the management of the estimates obtained, specifically with respect to the coefficient of variation and confidence intervals.

Collection of processes. It identifies and documents all the processes and sub-processes necessary for the development of the study and the obtaining of results. It also guides the staff involved in the process of obtaining, processing and analysis of the ESAG for the implementation of activities through the written and graphical description thereof.

Critique, coding and capture. It establishes the rules and procedures performed for the control of the information collected in hard-copy forms. The purpose of this manual is to explain the review and critique process for the subsequent input into the electronic form, when hard-copy forms are received.

Completion manual for hard-copy forms. It provides guidance to sources of information for the completion of the hard-copy form.

Completion manual for the web. It establishes in a clear and simple way the steps to be followed by establishments that are information sources for the survey in order to self-complete the information via the web.

Collection manual. It describes the processes for the collection of information by means of the electronic form. It refers aspects of awareness raising, monitoring and follow-up to the sources in order to obtain the information completed via web within the established schedule.

Administrator user manual. It contains the novelties and reports with which the DANE official, according to the sample of establishments and the assigned area, is able to perform the follow-up, monitoring and even the capture of information from the ESAG, under the implementation of the electronic form via web.

System Manual. It defines the design of the electronic form for the capture, validation, production coverage control and production with respect to the information of the ESAG.

Operating Manual. It presents the guidelines that need to be followed in order to achieve the objectives proposed in the collection process of the ESAG. It consists of an overview of the study as well as the budgetary aspects and it describes ways to control the work done in the territorial branches and sub-branches.

Statistical design methodology. It contains the basic components of the statistical design that were implemented in the ESAG.

Functional model. It contains the graphical representation of all the processes and sub-processes of the study.

Control Plan. It contains the list of documents, requirements, specifications, frequency of verification, the person responsible for the verification and a record of processes and activities in order to perform the statistical operation.

Analysis and generation of results procedure. It describes the steps to analyze and generate results within the standards of quality, timeliness and confidence that the statistical information of the survey requires.

Treatment of non-compliant processes or activities. It lists the actions to be taken in the event that nonconformities occur in the processes and activities to carry out in the statistical operation.

4. GLOSSARY

Abattoir. «Any establishment where the species of animals that have been declared suitable for human consumption are slaughtered and which have been registered and approved for this purpose» (Ministry of Social Protection, 2007: 8).

Bovine and buffalo carcass. The definition of these carcasses is adopted from the Regulation (EEC) no. 1165/2008 on livestock statistics and meat production. The definitions for the bovine, pig, ovine and goat species are found there. The whole body of a slaughtered animal as presented after having been bled, eviscerated and skinned, headless (separated from the carcass at the altoid-occipital joint); without the feet (severed at the carpal-metacarpal or tarsal-metatarsal joints); without the organs contained in the thoracic and abdominal cavities with or without the kidneys, the kidney fat and the pelvic fat, without the genitalia and the attached muscles and without the udder or the mammary fat (European Parliament and Council of the European Union, 2008: 10).

Bovine cattle. Set of cows, oxen and bulls that are domesticated by humans for their use and production, and to meet certain needs, whether food or economic. Various elements can be obtained from them, such as meat, skin or milk; furthermore, its derivatives are used for the making of other products for human use.

The bovine is a large ruminant mammal with a robust body; in the beginning they were primarily used for the production of milk and meat along with the treatment of land, subsequently it was the use of its derivatives and its horns; its excrement as a kind of fertilizer or fuel; and its skin for the production of clothing. These are part of the big livestock.

Buffalo cattle. Set of buffalo for their exploitation. The buffalo is a ruminant mammal bovid, with a robust body, long and thick horns placed far back on the skull, bulging forehead and little fur (www.definicionesde.com, 2011).

The two main buffalo species are the African buffalo and Asian buffalo. It is part of the big race.

Carcass. The carcass is defined by Decree 1500 as «the body of an animal after being slaughtered, throat cut, skinned and gutted leaving only the bone structure and the meat attached to it limbless» (Ministry of Social Protection, 2007: 5).

Carcass weight. Weight recorded by the scale, post-slaughter, bleeding, evisceration and depilation of the animal, expressed in kilograms (kg). The carcass is directly related to the liveweight of the animal and corresponds to a percentage thereof. In the case of this survey, the hot carcass weight is required (Ministry of Social Protection is sought, 2007).

Cattle. It is the set of animals raised for exploitation and is defined as:

Conglomerate of animals, primarily four-legged mammals, bred by man for their maximum exploitation and trade; among these, the production of meat and all its derivatives are the main purpose of feeding the human species.

The practice of cattle breeding is known as cattle farming, a work done by humans since ancient times. It is worth mentioning that these animals have provided great benefits since the beginning of man, especially food; but in addition to that, also the derivatives from cattle, such as their skin and other items which can also be used; therefor it could be said that it represents one of the most important elements of the economic activity of mankind, thus giving rise to more complex societies (Santaella, 2014).

Dairy and Livestock Development Fee. It was created through Law 89 of 1993 whereby the Dairy and Livestock Development Fee is established and the National Livestock Fund is created; It is a contribution of a payroll tax nature equivalent to 50 % of a legal daily minimum wage in effect per each livestock animal at slaughter.

The Dairy and Livestock Development Fee is to be paid by the public and private meat processing plants per each livestock animals slaughtered.

FEDEGAN through the National Livestock Fund is the entity responsible for managing the collection with the aim of supporting the livestock activity (FEDEGAN).

Destination of the carcass meat for domestic consumption. It refers to the types of market to which the product is directed; in the study, the destinations are: market places and local butcher's shops, supermarkets and institutional market.

Dressing. «Process of progressive separation of the body of an animal carcass and other edible and inedible parts» (Ministry of Social Protection, 2007: 7).

It is the hygienic process performed with the animal in order to obtain meat for human consumption; which begins with the receipt thereof to the shipment of the carcass (Páez, 2012).

Goat and ovine carcass. «The whole body of a slaughtered animal as presented after operations of bleeding, evisceration and skinning, headless (separated from the carcass at the atloid-occipital joint), the feet (severed at the carpal-metacarpal or tarsal-metatarsal joints), or tail (severed between the sixth and seventh caudal vertebrae); without the organs contained in the thoracic and abdominal cavities (except the kidneys and kidney fat), and without the udder and genitalia; the kidneys and kidney fat are part of the carcass» (European Parliament and Council of the European Union, 2008: 10).

Goat cattle. Set of goats for exploitation. The goat is a mammal of a ruminant type, it is a major producer of milk and meat, in addition to its fur, skin and manure can be used for several things. The male goat is known as «goat» or «billy-goat» whereas the young are called «goats» or «kids» (Santaella, 2014).

It has high adaptability and from its breeding the following products can be obtained: meat, milk, leather and fur. They are part of the small race.

Livestock exports. It corresponds to the legal exit of the national customs territory of cattle to other countries. In the case of this study it refers only to the production of carcass meat by establishments that make up the sources of information that report to the survey, intended for export.

Livestock slaughter. National legislation defines it as «the procedure that is performed to an animal intended for human consumption, in order to kill it, which ranges from its desensitization to bleeding through the section of the large vessels» (Ministry of Social protection, 2007: 9).

FAO states «it is an obligation of humanely slaughtering animals intended for the supply of food products and useful sub-products. Then, the carcass should be processed hygienically and efficiently» (FAO ch.7).

Liveweight. Total kilograms (kg) that an animal has before it is slaughtered.

Novelties. It consists of assigning a code or standard in order to record any inconvenience that the establishment has that prevents it from slaughtering.

Origin of livestock. A variable that seeks to determine the origin of livestock that is slaughtered. In the case of this survey, this information is provided at the department level, with the aim of providing a livestock map.

Ovine cattle. Set of sheep bred for exploitation; they are major producers of milk, meat and wool for making cloth. Sheep are herbivore mammals.

It is one of the species with greater exploitation in arid and dry areas, ecosystems that are unsuitable for other livestock such as cattle.

The females are known as sheep, the male it is called ram; and the young are called lambs (Santaella, 2014). They are part of the small race.

Pig carcass. «Animal's body of the pig domestic race after slaughter, bleeding, evisceration and shaved, stripped of tongue, hooves, genitalia, kidneys and pelvic fat, with or without head. Even though Regulation (EEC) 3220/84 does include the kidneys and the diaphragm» (Sánchez Rodríguez, s.f.).

Pig cattle. Set of pigs bred for their exploitation. Pigs or hogs are very docile mammals, with an average lifespan of about 15 years. The practice of domestication and use of these animals is done almost everywhere in the world.

The pig adapts itself to almost any ecosystem, but is associated more with corn growing regions. It provides meat, fat, bone, bristles, skin, in addition to which it can generate a series of products in various manufacturing industry segments such as the manufacturing of brushes and paintbrushes; also in the manufacturing of glue and gelatins obtained from the hooves of this animal (Santaella, 2014). They are part of the small livestock.

Pig farming development fee. «It is a payroll tax contribution created by Law 272 of 1996 and amended by Law 623 of 2000 and 1500 of 2011, which consists of the payment equal to 32% of a legal daily minimum wage in effect per each pig at slaughter».

Its payment is mandatory by the establishments carrying out the slaughter of this species. (Article 3 Decree 1522 of 1996). The destination of these resources is aimed at strengthening the activity of pig farmers and pork industry in the country (Colombian Association of Pork Farmers).

Tax on slaughter. «Since the enactment of Law 8 of 1909 it is an tax of the exclusive property of the departments as well as that coming from the slaughter of small livestock and corresponds to the municipalities».

In 1945 Law 31 was issued, whose purpose was to promote livestock farming and the convenience of the consumer, providing that «when the owner of big or small livestock declare in the respective collection, that it will slaughter a certain amount of animals in order to transport the meat to a place other than that in which livestock is slaughtered, the tax shall be paid at the place where the meat is consumed».

In the codification of constitutional and legal provisions pertaining to the organization and operation of the departmental administration (Decree 1222 of 1986), issued by the National Government based on the extraordinary powers conferred by Article 35 of Law 3 of 1986 that expressly provided for the repeal of all the regulations on the matter, which had not been codified (ibid, Article 339), a statement which the Court subsequently deemed to be adjusted to the Constitution, in accordance with ruling of November of 13 the same year.

Neither under the title dedicated to departmental revenues, nor more specifically in the chapter dedicated to Tax on slaughter of big cattle, did the legislator include Article 30 of Law 31 of 1945. However, Articles 90 and 40 taken from laws 56 of 1918 and 34 of 1925, respectively, a chapter was formed under the name «tax on the slaughter of big livestock», which only contains the following two rules:

Article 161. The departments are free to set the quota of the tax on slaughter of big livestock.

Article 162. «Income on slaughter may not be leased» (Venecia, 2007).

Thus the legislator let the departments freely fix the tax rates, and therefore the regulations from one department to another varies greatly.

Currently the tax is due at the place where the livestock is slaughtered, allowing better control of the obligation.

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