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Livestock Slaughtering Survey

Methodology

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FOREWORD

The National Administrative Department of Statistics (DANE) is committed to the strengthening and consolidation of the National Statistical System (SEN), as part of the Planning and Statistical Harmonization Project. This process involves producing strategic statistics, the generation, adaptation, adoption and dissemination of standards, and the consolidation and harmonization of the statistical information. It also requires the coordination of instruments, actors, initiatives and products in order to improve the quality of the strategic statistical information, its availability, timeliness and accessibility, as a response to the increasing demand for this type of products.

With this background and conscious of the need and obligation to provide the best possible products to its users, DANE has developed standard guidelines for the submission of methodologies that contribute to the visualization and clear understanding of the statistical process. These guidelines have been used for the elaboration of the methodological documents of its operations and statistical research. DANE makes them available both to the specialized users and to the public in general. These methodologies are presented in standard manner; they are complete and easy to read. The main technical characteristics of the processes of each research are presented in order to facilitate its analysis, control, replicability and evaluation.

This series of documents intends to favor the transparency, confidence and credibility in the technical quality of the institution and should contribute to a better understanding of the statistical information, produced following the principles of coherence, comparability, integrity and quality.

This document follows the standard adopted by DANE to present the set of methods and procedures through which the Survey of Livestock Slaughtering is constructed (ESAG), offering to the users a coherent and clear document.

INTRODUCTION

Slaughtering is the process of adequately killing an animal, avoiding suffering practices, in proper sanitary conditions, with the aim of obtaining its meat and parts for human consumption and other uses. This process is a fundamental part of the meat chain, which is made up of the phases of production (breeding, upbringing and fattening), transport, slaughtering and commercialization.

DANE is conscious of the importance of providing basic information on the trends of the cattle sector and of the production of meat for the planning of these activities. This is the reason behind the implementation of ESAG (Survey of Slaughtering), whose origins go back to the decade of the fifties. The statistics obtained from this survey constitute one of the traditional pieces of the statistical activities.

Its main objective is to provide information on the number of heads, the live-weight and the carcass-weight, obtained both from slaughtering cattle (bovine and buffaloes) and small livestock (pigs, sheep and goats). Figures are produced for the country as a whole and for different breakdown levels, in a timely manner and within the required levels of confidence.

The primary sources of information of ESAG are the slaughter houses and the meat packing plants, as well as the municipal administrations and local tax offices, environmental sanitation agencies or any other place where slaughtering is reported. This statistical research has a national coverage and every month gets data from approximately 270 facilities, registered according with the regulations. They are authorized to slaughter bovine and smaller cattle, and operate in 247 municipalities. Their results are published monthly and quarterly.

The data obtained enriches the knowledge of the evolution of the cattle farming subsector. Some of the main uses of this information are the calculation of this subsector in the GDP and the determination of specific indicators of productivity and of the extraction rates.

The dynamics of the cattle farming sector requires a permanent renewal of this statistical operation, so as to offer better information at national and regional level, by means of the extension of the geographic and thematic coverage, besides the adoption of electronic media for collecting the information. The last update was realized in 2008.

This methodological document describes the steps and procedures followed to structure and develop the ESAG; it defines the purpose of the research and how it articulates with other elements of the economic environment, as well as the theoretical and practical elements used and the expected results.

The text is divided into three chapters: the first one summarizes the backgrounds of the survey, its origin and historical evolution emphasizing on the more relevant changes that have been introduced overtime to improve the supply of information to the users; the second chapter presents the elements that constitute the design of the statistical operation, including the thematic, statistical, operational and systems designs; the third chapter gives a brief description of the different documents that support the statistical operation.

1.BACKGROUND

The ESAG was organized in 1915 by the General Comptroller Office. This was the organization in charge of providing the information until 1951. As of 1952, DANE is in charge of the operation, within his program of Fiscal Statistics and publishes the information of cattle slaughtering (DANE, 1998: 7).

Initially it was considered a fiscal statistic because it provided information on the income of the municipalities due to the collection of the tax on this activity.

The research covered all the national territory until 1970, when it was decided to implement a probabilistic sample simultaneously with the Census of Slaughterhouses and Meat Packing Plants, in order to produce timely data on a monthly basis. In 1979 a progress report including 42 cities was produced. These cities were selected because of their high share in cattle slaughtering country-wise, according to data collected in 1977 and 1978. These cities altogether represented 52% of national cattle slaughtering. This approach made it possible to improve the publishing delays of cattle and swine slaughtering statistics for these 42 cities.

In 1991 the probabilistic sample was redesigned to correct the bias in its expansion; nevertheless, this method was suspended definitively as of 1994, because the results were not totally satisfactory. It was convened to replace the sample with a preliminary report of the census of the slaughtering activity, as a new form of well-timed production of reliable data. The report provided results at national, departmental and capital of department levels, based on the figures obtained from the census of cattle slaughtering (DANE, 1998).

Until 1997 the registered information refers to cattle (bovine and buffaloes) and small livestock (swine, sheep, goats) slaughtering and was published with three different populations: preliminary report for 67 municipalities, preliminary census report and census. In this same year a non probabilistic sample for 67 municipalities was defined. Those municipalities represented at that time 68.6% of the total slaughtering of the country.

In 1998 the National Institute of Food and Drug Monitoring (INVIMA) made a census of slaughterhouses and packing plants, whose results were not widely known. Due to the closing of several plants the reporting municipalities were reduced to 61 (the original 67 excluding the municipalities of Cajicá, Cúcuta, Itagüí, Jamundí, Sincelejo and Yumbo, whose plants had been closed). For 2002, 63 municipalities were reporting.

In 2007, nine municipalities were added and the historical information was reconstructed from 2004, obtaining a total of 72 municipalities. In addition, the research was

complemented with the incorporation of a redesigned probabilistic sample implemented beginning in the last quarter of 2008. This change allowed several improvements by generating information on cattle slaughtering at national level and by regions, according to the Territorial Units Classification (NUTE)¹. At the same time began the use of the **origin**, a variable that makes possible to identify the departments that supply the cattle slaughtered in the different plants or receiving centers. These improvements included also the inclusion of information about other species (buffaloes, goats and sheep), as well as the adoption of electronic media for collecting the information.

¹Nomenclatura de Unidades Estadísticas Territoriales; Territorial Statistical Units Classification, Andean Community (see GLOSSARY for details)

2. DESIGN OF THE STATISTICAL OPERATION

2.1. METHODOLOGICAL / THEMATIC DESIGN

2.1.1 Needs of information

The slaughterhouses and packing plants carry out two main activities: they provide the cattle slaughtering service and sometimes they buy live animals and wholesale the meat. This is the reason to consider them a fundamental link of the meat chain, as it is in this phase that meat for consumption and other products derived from the slaughtering for other uses are obtained. Nevertheless many of the slaughterhouses and packing plants of the country do not meet all the technical requirements established by law.

The number of this type of facilities in the country varies considerably; this situation was more noticeable when the Decree 1500 (May 4, 2007) was issued. This legal instrument established a set of technical rules and sanitary requirements that the slaughterhouses are due to fulfill in the primary production, processing, quartering and other activities related to the cattle slaughtering to guarantee the production of innocuous meat and by-products. This brought about many temporary or permanent closings of establishments that did not satisfy the requirements because they did not have the technical and technological resources to establish modern systems of handling and the implementation of good practices that allow sustaining the innocuity of the meat; not to mention that due to the publication of the decree the phenomenon of clandestine slaughtering was probably increased.

On the other hand, in spite of the preference for the consumption of bovine meat in the country, it is of interest to identify how the consumption of new species appears and evolves and to know the origin of the cattle and the location of the slaughterhouses.

For these reasons, it was necessary to implement the estimates based on a process of continuous update of the framework of establishments providing livestock slaughtering services, to detect new ones, or new characteristics of the already known ones, and to include them within the estimations. This research delivers also volume indicators, type and location, to obtain a complete picture of livestock slaughtering with timely produced figures for the planning of the cattle farming sector.

DANE responds to these needs by reinforcing its efforts for keeping the lists of establishments updated, as the basic instrument of a sampling framework that allows generating statistics that reasonably indicate the country's cattle and small cattle

slaughtering. DANE also provides historical statistics of cattle slaughtering by species and by sex, with a geographic breakdown by region. This is possible through collecting information from all the sources (slaughter houses and packing plants, municipal administrations, environmental sanitation agencies or other institutions where the cattle slaughtering is reported). The specific service establishments must be registered and fulfill all the requirements established by law.

Additionally, cattle slaughtering is one of the components of information to calculate the cattle farming GDP. This indicator is calculated quarterly and annually by the Direction of Synthesis and National Accounts of DANE, as a part of the macroeconomic indicators of the country.

Other important uses of the ESAG are: to offer tools for the analysis of the cattle farming sector through the indicators of the number of slaughtered heads, the live and carcass weights, the proportion of meat adequate for human consumption, determinants of the cattle production and the supplying regions, providing a baseline for the public and private sectors, for the researchers as well as for international comparisons.

2.1.2 Objectives

General objective

To provide information on the number of heads, the live-weight and the carcass-weight, obtained both from bovine animals (cattle and buffaloes) and small livestock (swine, sheep and goats) slaughtering. Figures are produced for the country as a whole with different breakdown levels, in a timely way and within the required levels of confidence. This information should support the analysis and planning of the cattle farming sector.

Specific objectives

- To quantify the volume of cattle slaughtered: in number of heads, live and carcass weights for the five species already mentioned, both country-wise and by region (NUTE)
- To establish the change overtime of cattle slaughtering according to species, calculation of the variations from year to year or for fractions of the year, for the total number of heads, and the live- and carcass- weights.
- To estimate the cattle and swine slaughtering by: category, domestic consumption and export; destination of the meat for domestic consumption (marketplaces, butcheries, supermarkets and institutional markets), slaughtering by region NUTE and origin of the cattle slaughtered, also by region NUTE.
- To provide information of the monthly activity of adult cattle slaughtering in 72 municipalities (coverage from 2005 to 2008) and monthly movement in 61 municipalities (coverage until 2004).

2.1.3 Scope

This statistical operation estimates the behavior of cattle slaughtering of five different species using several variables (number of heads, live- and carcass- weights, sex) using

a probabilistic sample of establishments that realize (slaughterhouses and packing plants) or report these activities (municipal administrations, environmental and sanitary agencies, etc.).

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

- **Breakdown by age and sex of cattle:** These variables provide specific information for calculation of indices as the rate of extraction differentiating between males and females.
- **Live-weight and carcass-weight of the cattle slaughtered, by species and sex:** these variables allow evaluating the change overtime of the productivity of the cattle for external and domestic consumption.
- **Destination of the meat in carcass (or in quarters) for domestic consumption:** this breakdown allows identifying the marketing channels and the share of the different destinations as supermarkets, large retailers and institutional markets.
- **Origin of the slaughtered cattle:** this variable defines the department where the slaughtered cattle comes from, and makes possible the construction of the cattle farming map. It is also possible to have an idea of the area of influence of some slaughterhouses and plants and to identify which are the regions that induce the largest movements of cattle to be slaughtered in places other than their place of origin.

The ESAG has a national coverage and obtains data of a sample of 267 legally established slaughtering facilities for cattle and small cattle spread all over the country on a monthly basis.

2.1.4 Reference framework

a.Theoretical framework

Cattle slaughtering is related to important social and economic elements. From the social point of view it has particular relevance because it is associated to the food safety concept, which exists when “all the people at all times have access (physical and economic) to sufficient, safe and nutritious food (that meets people dietary needs as well as their food preferences) to maintain a healthy active life.” (FAO, 2011: 1).

According to FAO: “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.”

(FAO, 2012). In such sense, a suitable nutrition keeps people away from poverty conditions that are harmful to their food safety.

From an economic point of view, cattle slaughtering is associated to concepts such as the meat chain and the rate of extraction from the cattle herd, one of the basic indicators for the analysis of the evolution of the subsector. It is defined as the percentage ratio of the slaughtered animals to the total volume of the cattle herd.

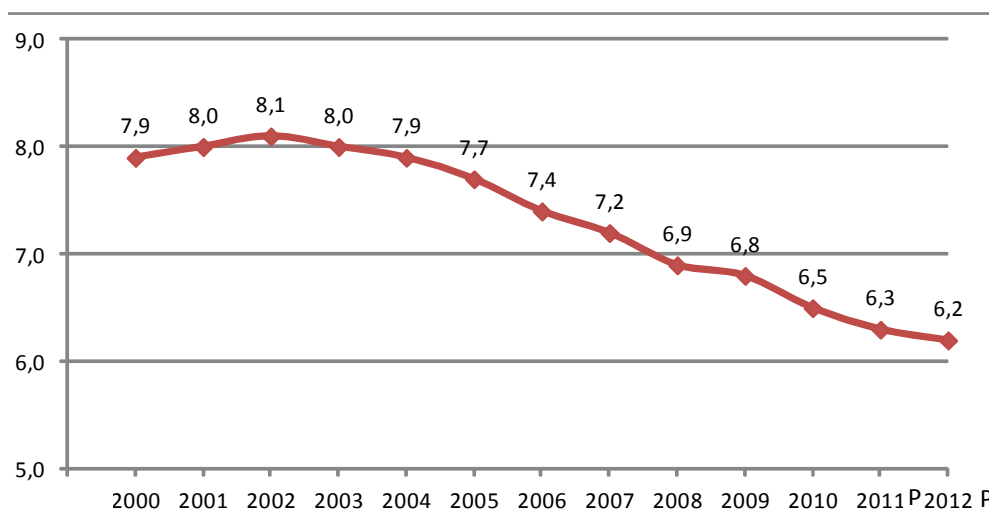
One of the main subjects associated to the cattle slaughtering is the innocuity of the meat. Many documents make reference to the sanitary requirements that the slaughterhouses have to meet to be in line with adequate procedures for human consumption of their products.

The research and publications of FAO, the European Union and the Colombian Federation of Cattle Breeders (FEDEGAN), among others, are well known. The theoretical framework on cattle slaughtering, is provided in great part by the legislation of each country that in most cases presents the studies and recommendations proposed by the institutions and organizations related to the cattle farming sector.

These concepts underline the importance of studying the subsector and the need to develop stimulus in order for to maintain its share within the national economy. A decrease of its relative importance in the domestic production has been observed.

The cattle farming (or animal production) subsector belongs to the agriculture, forestry and fishing activity. In spite of its important share in the economy given its interrelationships and contributions to value added, in the last 13 years its share in Gross Domestic Product has decreased from 8.0% in the 2000-2005 period, to 6.5% in the last five years.

Graph 1
Agriculture, forestry and fishing share of GDP (%), 2000-2012



Source: DSCN-DANE

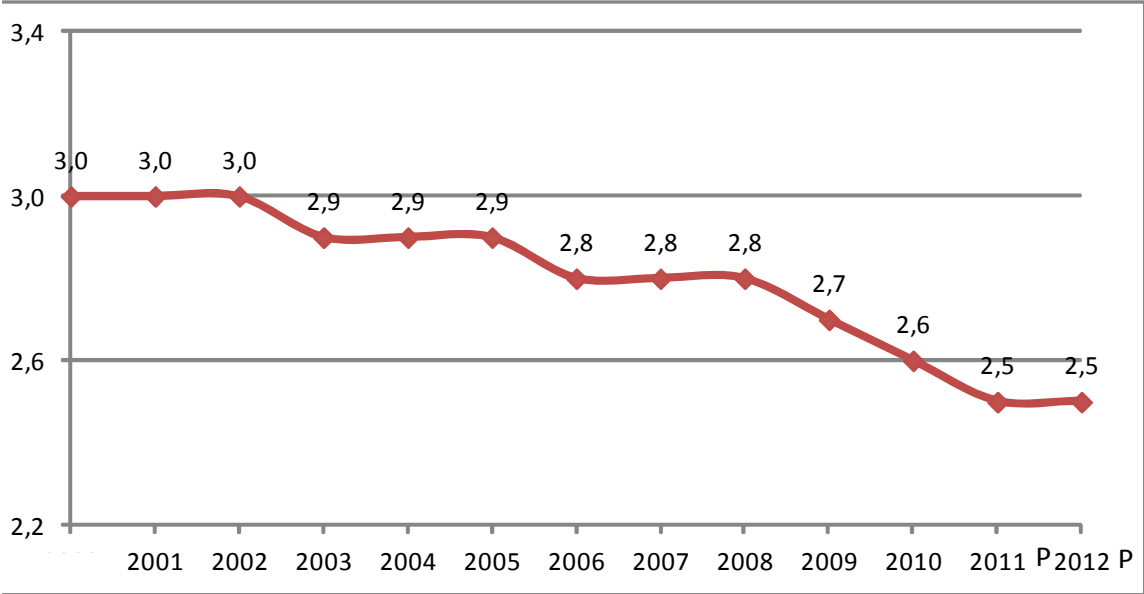
P : Provisional

Dec. 19, 2013

The animal production subsector (one of the four subsectors of agriculture) presents also a decreasing trend in its to GDP, but it is less noticeable than in the case of agriculture as

a whole. In the last 13 years the share of the subsector has fluctuated between 3.0 and 2.5% of GDP and an average of 2.6% during the last five years.

Graph 2
Livestock and hunting share of GDP (%), 2000-2012



Source: DSCN-DANE

P : Provisional

Dec. 19, 2013

The annual growth rates of the value added of the animal production and hunting subsector shows noticeable fluctuations. The period of greater growth is observed during 2004-2008, being 2004, the year with the greater growth rate (5.4%). In contrast, 2009 and 2010 exhibit negative values. During both last years of the series, 2011 and 2012, the subsector shows an important recovery with an average growth rate of 4.0%, after two years of a noticeable contraction. The cyclical behavior of this activity, its important dynamics, its interrelationships with other industries, and the need to complement the studies and follow-up of the animal production subsector make necessary the design, the implementation and the continuity of ESAG, as a strategic statistic.

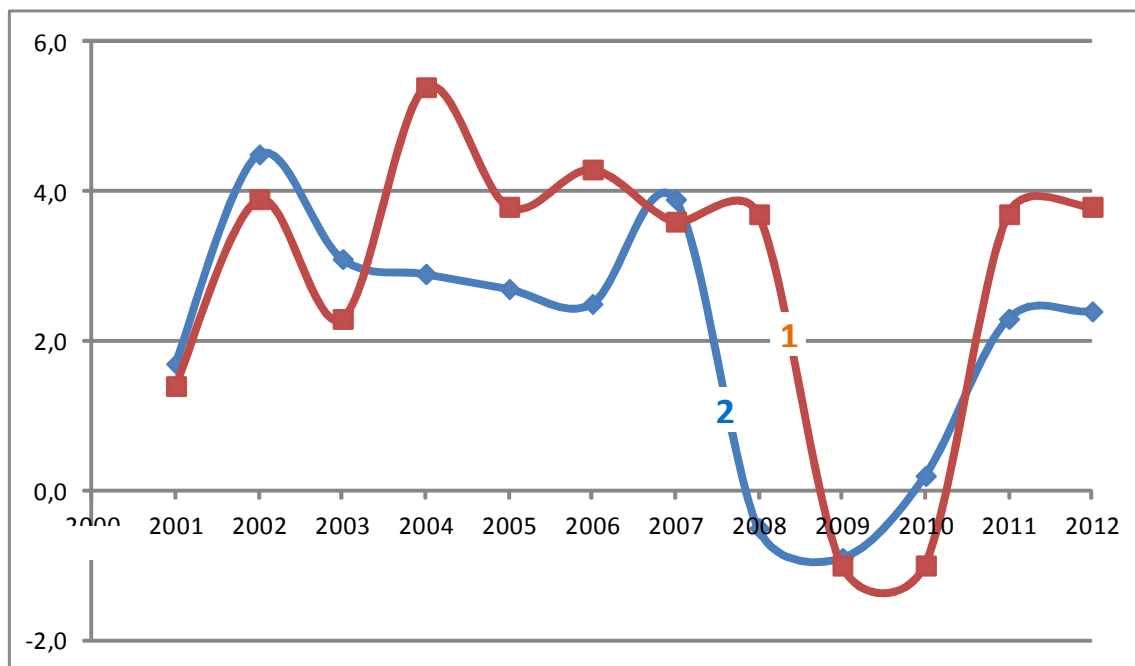
In most countries, the generalized practice for obtaining information on cattle slaughtering consists in the use of administrative records, but the need of more detailed information and the requirement of updated directories of establishments associated to this activity, made necessary the implementation of establishments surveys. In Colombia, these establishments are the slaughterhouses and packing plants, municipal administrations and agencies of environmental sanitation.

Graph3

Value added annual rate of growth (%) 2001-2012

1.- Agriculture, forestry, hunting and fishing

2.- Animal production and hunting (totally included in 1)



Source: DSCN-DANE

P : Provisional

Dec. 19, 2013

Traditionally this research provides the number of heads slaughtered and the weights (live and carcass) as an indicator of cattle production (expressed in kilograms or tons). These variables provide a baseline for analysis, follow-up and international comparisons.

b. Some definitions

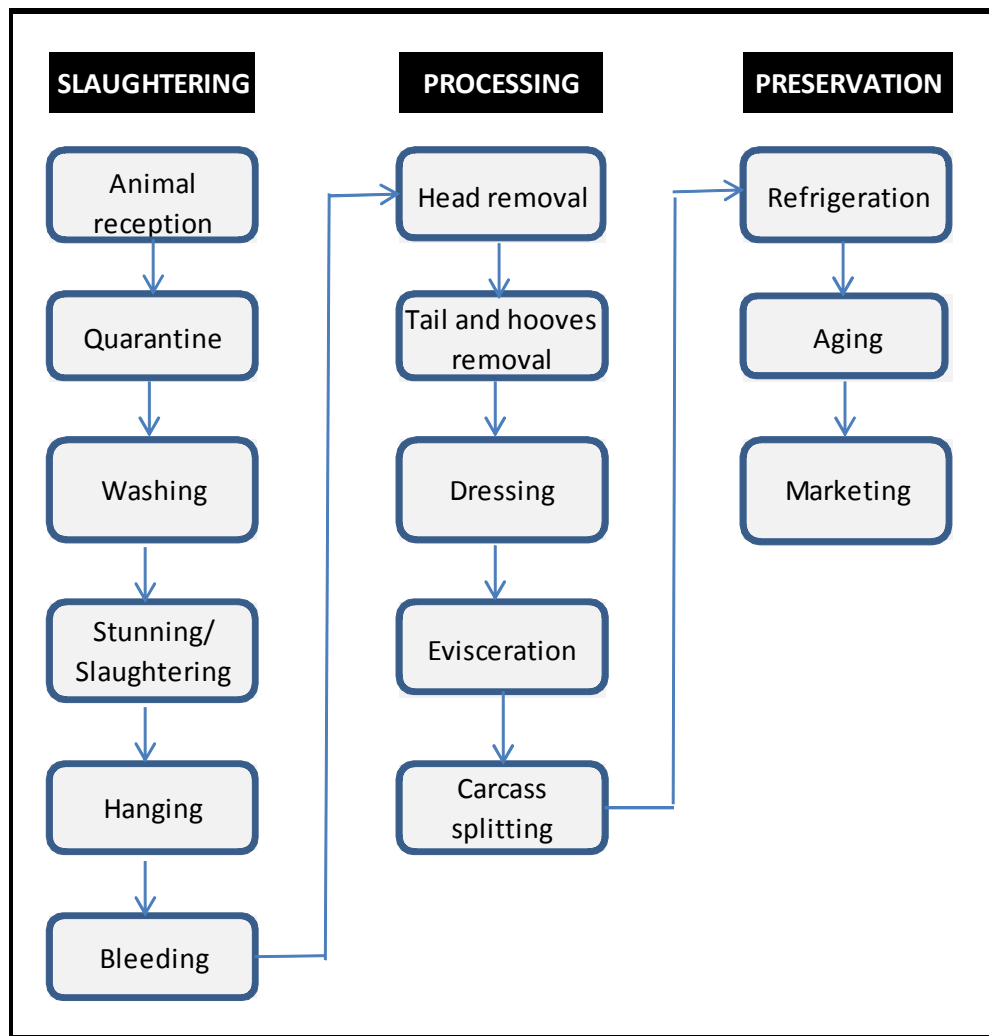
Carcass: "The body of a slaughtered animal after separation of the head, skinning and evisceration. It consists only of the bone structure and the meat adhered to it without extremities" (Ministry of the Social Protection, 2007: 5).

Destination of the meat (in carcass): It refers to the type of markets to which the product goes; within this research the destinations are: marketplaces, butcheries, supermarkets and institutional markets.

Process: "Procedure of progressive separation of the body of an animal in carcass and other edible and non-edible parts" (Ministry of the Social Protection, 2007: 7).

Bovine or bovine cattle: Particular species of the bovid family. Bulls, oxen, and cows belong to this animal species which are produced to obtain its milk or its meat. These products may be oriented toward domestic consumption or for exports. These animals are in some cases designated as large cattle; the adults have an average live weight of 400 kg.

Figure 1
Flow diagram of slaughtering, processing and preservation processes



Buffaloes: The buffalo is a ruminant mammal, of the bovid family (as the bovines). It has a great body, robust and more elevated towards the head, with small and separated horns, beard and the forehead and the neck covered by long hair. They are also designated as large cattle.

Goats: They are domestic ruminant mammals of short hair and hollow horns. They live generally in mountainous regions. Goats are bred for their milk, frequently used in cheese production, and also for their meat, skin and hair. They are considered small cattle.

Sheep: Sheep are ungulate ruminant mammals; the male of this species is called ram or breeding ram. Their meat and milk are very well appreciated for human consumption. Cheese and other derivatives may be obtained from the milk. Clothing and other products are made with their wool. The leather is another widely used by-product. They are also considered small cattle.

Swine: The pigs are even-toed ungulate mammals of the Suidae family that can be found in wild or domestic state. They have a stout body with thick skin, a short neck, short tail and a movable snout, especially the domesticated pig. The scientific name of the domestic species is *Sus scrofa domestica*. They are grown up for their meat and other products for domestic consumption or for exports. They are considered small cattle and when slaughtered have an average live-weight of 100 kg.

Slaughterhouse: “Establishment where the animal species declared appropriate for human consumption are slaughtered. It must be registered and authorized for that purpose”. (Ministry of the Social Protection, 2007: 8)

Carcass weight: weight, expressed in kilograms, registered after slaughtering, bleeding, skinning and evisceration of the animal, but before refrigeration. The carcass weight is related to the live-weight of the animal, as an index of productivity and quality.

Live- weight: Expressed in kilograms, is the weight of an animal before slaughtering.

Origin of the cattle: variable to determine the place where the cattle come from. For the case of the ESAG this information is given by department, and makes possible to construct the cattle farming map.

NUTE Region: Region classified according to the Statistical Territorial Units Code (NUTE). See Glossary for details

Cattle slaughtering: The national legislation defines it as the procedure of killing an animal to obtain elements for human consumption. It covers several stages, from desensitizing and bleeding, by sectioning the great blood vessels (Ministry of the Social Protection, 2007: 9).

FAO underlines that “it is an obligation to slaughter the animals providing food and useful by-products by humanitarian procedures. Afterwards, it is a requirement to handle the carcasses efficiently and hygienically” (FAO, 2001: CAP. 7).

c. Legal framework

Decree 2278 of 1982, was one of the basic elements of the legal framework. It was repealed by Decree 1500, 2007.

In 2005 the commitment to regulate the slaughtering, the processing and the marketing of meat was fulfilled through CONPES 3375 and CONPES 3376 (September 2005).

Decree 1500 was issued in 2007. It defines the technical regulations creating the Official System of Inspection, Monitoring and Control for meat, meat foods and derivatives for human consumption and settles down the sanitary requirements for innocuity in their primary production, cutting, processing, storage, transport, commercialization, import or export. The decree also stipulates a term of five years for the transition and implementation (Ministry of Public Health and Social Protection, 2007).

Later, given the difficulty to fulfill the new standardization, Decree 2270 of 2012, besides other regulations, extended the term for the complete implementation of Decree 1500 by three and a half years. (Ministry of Public Health and Social Protection, 2012).

Three additional Resolutions complement the standardization:

Resolution 240 of January of 2013 on sanitary requirements for the operation of slaughterhouses for bovines, buffaloes and swine, their processes and storage,

commercialization, transport, import and export of meat and meat foods² (Ministry of Health and Social Protection, 2013).

Resolution 241 of January of 2013 that establishes the sanitary requirements that must fulfill the poultry slaughter plants. (Ministry of Health and Social Protection, 2013).

Resolution 242 of January of 2013 establishes the sanitary requirements for the operation of the poultry slaughter plants, their processes and storage, commercialization, transport, import and export of meat and meat foods (Ministry of Health and Social Protection, 2013).

An important summary of these and other regulatory elements on the meat chain is presented by FEDEGAN, which can be consulted in their webpage (www.fedegan.org.co), for instance Resolution 072 and Resolution 18119, both issued in 2007.

d. International references

-**FAO** document "Guidelines for Humane Handling, Transport and Slaughter of Livestock" (FAO, 2001).

-**European Parliament and the Council of the European Union** have issued **Regulation (CE) no. 1165/2008** (19 of November of 2008) regarding cattle statistics and production of meat, which establishes the coverage of the corresponding statistics, the frequency and period of reference and the limit dates for releasing them. This document constitutes a good reference (European Parliament and Council of the European Union, 2008).

e. National references

The main national references are those listed in the legal framework (paragraph c. above) Some professional and business organizations are well known by the quality of their studies and they participate to the ESAG technical committees: FEDEGAN, Colombian Association of Swine Breeders (Asoporcicultores) and the Ovine-Goat National Productive Chain. They are important discussants and the information they produce serve as guidance, and bring the information in context for the analysis of this subsector.

2.1.5 Design of indicators.

a. Number of heads of slaughtered livestock: it is the result of adding the number of slaughtered males and females. For the case of bovine cattle also calves and animals younger than 1 year are taken into account, so as to provide total slaughter in the reference period.

² Resolutions 2905 (August 2007), 4282 and 4287 (November 2007), served as background to Decree 1500. They contain the basic regulations for cattle, swine and poultry respectively and refer to all the elements of production, slaughtering and marketing.

Total cattle slaughtered:

$$\text{Total heads slaughtered} = \text{Male heads slaughtered} + \text{Female heads slaughtered}$$

- b. Life-weight of the cattle:** the total life-weight of the slaughtered cattle is treated in the same way: it is the result of the sum of the life-weight in kilograms of the male animals slaughtered plus the life-weight of weight the female animals slaughtered. In this case also the calves and animals younger than 1 year are taken into account, to figure out the total life-weight in the period of reference.

$$\text{Total cattle life-weight (Kg)} = \text{Total life-weight of males} + \text{Total life-weight of females}$$

- c. Carcass-weight of the cattle:** it is the result of adding the carcass-weight in kilograms of the male animals slaughtered and the carcass-weight of the female animals slaughtered. In this case also the calves and animals younger than 1 year are taken into account, to figure out the total carcass-weight in the period of reference.

$$\text{Total cattle carcass-weight (Kg)} = \text{Total carcass-weight of males} + \text{Total carcass-weight of females}$$

2.1.6 Publication of results

After collecting, consolidating and assuring the consistency of the information, the corresponding estimates for the variables under study (number of heads, life-weight and carcass-weight) are calculated following the sample design. This processing is made with SAS software both for the monthly estimations published in the website, and for the quarterly figures published in the survey bulletin together with the accumulated results for the current year.

The bulletin also analyzes the following variations:

Annual variation: percentage variation calculated between the quarter of the year in reference (q, y) and the same quarter of the immediately previous year (q, y-1).

Accumulated variation in the current year: calculated percentage variation in the accumulated results from January to the month of reference in the current year (January to m, y), and the accumulated results in the same period of the immediately previous year (January to m, y-1).

2.1.6.1. Design of output tables

The results of the estimates are presented by the Statistical Methodology and Production Division of DANE (in charge of the statistical calculations), to the Thematic office responsible for the planning and conduction of the Survey, to be published in Excel, including the estimate of the coefficients of variation (cve) and the corresponding confidence intervals.

The results are reviewed thematically to analyze their quality, in an internal control procedure and also with context information so as to identify tendencies and behaviors. Then the edition and publication of monthly tables and of the bulletin with quarterly results is made.

Monthly tables published in the webpage.

Total national and regional cattle slaughtering - bovine, swine and other species.

The results are detailed in three groups: bovine, swine and other species.

- *Bovine*: it contains information of region (NUTE), period, general total, total domestic consumption broken down into males, females, calves and the information of the carcasses for exports. For each subgroup the following variables are provided: Number of heads, live-weight (kg) and carcass-weight (kg), each with its coefficient of variation estimated and the 95% confidence interval.
- *Swine*: it contains information of region (NUTE), period, general total, total domestic consumption broken down into males and females. For each subgroup the following variables are provided: Number of heads, live-weight (kg) and carcass-weight (kg), each with its coefficient of variation estimated and the 95% confidence interval.
- *Other species*: it contains information for the species: ovine, goats and buffaloes, including period, general total, total domestic consumption broken down into males and females. For each subgroup the following variables are provided: Number of heads, live-weight (kg) and carcass-weight (kg), each with its coefficient of variation estimated and the 95% confidence interval.

Tables included in the quarterly bulletin. This publication provides a set of tables with the data of the quarter of reference. The information presented is:

- Evolution of the variables, comparison of the period of reference of the present year versus the previous one
- Comparison of the data by species, geographic and thematic breakdown.
- Information presented in absolute values and percentage.
- Coefficients of variation.

The thematic contents show the interest variables and the specific data for each species as follows:

1. Slaughtering of bovine and small cattle:

1.1. General results (quarterly)

1.2. Accumulated results for the current year

2. Bovine slaughtering

2.1. General results (quarterly) and destination of the bovine meat for domestic consumption

2.2. Accumulated results for the current year

3. Swine slaughtering

3.1. General results (quarterly) and destination of de swine meat for domestic consumption

3.2. Accumulated results for the current year

4. Other species slaughtering

4.1. General results (quarterly)

4.2. Accumulated results for the current year

Annex 1. Maps of origin of bovine and swine

Annex 2. Criteria for handling the obtained estimates

Annex 3. Price changes for bovine cattle, by quarter and year.

Annex 4. Slaughtering of adult cattle in 72 and 61 municipalities

Annex 5. Results by region (NUTE)

The details of the tables may be consulted in the document: Output tables, ESAG, in Intranet:

http://danenet/sistema_documental/files/dimpe/esag/Documentacion%20Basica/Metodologias/Diseno%20Tematico/TA-ESAG-CSA-01.pdf.

2.1.7 Design of the questionnaire

- a. **Physical questionnaire.** In this case, two questionnaires are used; one for large cattle (bovine and buffaloes) and another one for small cattle (swine, ovine and goat). These questionnaires are consistent with the electronic version and include the same variables.

The physical questionnaire is an alternative to the electronic form. It is used to report the information when, for some reason, the source cannot access Internet. It is still used in a few circumstances and is structured as follows:

Chapter I. - Data Identification³. In this part all the data referring to the identification of the source must be included as well as the date of reference for the report.

³ The questionnaire for small livestock A-110 includes the same variables as the A-100, used for large cattle.



LARGE CATTLE SLAUGHTERING SURVEY

Confidential: The data requested by DANE in this questionnaire are strictly confidential. They can not be used for fiscal or legal purposes. Results are published in aggregated way. Decree 663/60, Art. 76; Law 79/93, Art. 5.

This research is intended to provide statistical information about large cattle slaughtering (bovine and buffalos) for internal consumption or for exports. It includes volume of slaughtering, carcass-weights, destination of carcasses and cattle origin. This information will help the planning activities both of the cattle sector and the meat chains. We thank your cooperation.

BEFORE COMPLETING THE QUESTIONNAIRE, PLEASE READ THE INSTRUCTIONS IN THE BACK

I- IDENTIFICATION

Regional Direction	_____		
1. Department	_____	<input type="text"/>	<input type="text"/>
3. Enterprise name	_____	2. Municipality	<input type="text"/>
5. Address of the slaughtering facility	_____	4. Order number	<input type="text"/>
6. Phone number (s)	_____	7. Fax	_____
8. Web page	_____	9. e-mail	_____
10. Reporting month	_____	11. Year	<input type="text"/>

Chapter II. – Slaughtering by species. The information takes into account the data of cattle slaughtered for domestic consumption for each species, including, in the case of bovine, the data concerning animals for exports. It also contains the geographical origin of the cattle.

Finally there is a space for any relevant comments.

Chapter III. – Control data. This section contains the identification data corresponding to the identification of the reporting person, the date in which the questionnaire was answered, the name of DANE's supervisor and the data of the territorial DANE office corresponding to the source.

b. Electronic questionnaire via Web. This form contains each variable of study by species, as follows:

- Identification data
- Corroboration of cattle slaughtering activities

II- SLAUGHTERING BY SPECIES

PART 1. BOVINES

Characteristics	Total (A1+A5)	For domestic consumption			For exports
		A1=A2+A3+A4	A2. Males	A3.Females	A4. Calves
1) Total heads slaughtered					
2) Total live-weight (kg)					
3) Total carcass-weight (fresh)					

Code new element

A6.

4. Destination of the meat. Only for internal consumption

Please, indicate the percentages of meat (carcass) from slaughtered animals, for internal consumption, according to the following destinations (use percentages add up to 100%).

Characteristic	%
A7. Local and nearby markets, marketplaces and butcheries in town or close to it	
A8. Chain supermarkets, wholesale, centers of direct distribution	
A9. Institutional markets, hotels, restaurants, hospital, schools, among others	

100%

5. Origin of the cattle.

Please register the department of origin of the cattle, as per the ICA bill of transportation. Please indicate the total number of heads, both for domestic consumption and for exports. If the animals come from the same department where the slaughterhouse is located, please fill in that piece of information.

Code (A10.)	Department of origin	A11. Number of heads received	A12. Percentage

Code (A10.)	Department of origin	A11. Number of heads received	A12. Percentage

- Information concerning large cattle
 - Bovine
 - Buffaloes

- Information concerning small livestock
 - Swine
 - Ovine
 - Goats

The following variables are taken into consideration:

- Classification variables:
 - Sex, destination of the meat (exports and domestic consumption)

II- SLAUGHTERING BY SPECIES (end)

PART 2. BUFFALOES.- Take into account slaughtered animals for domestic consumption and exports

Characteristics	Total (A1+A5)	For domestic consumption			For exports
		A1=A2+A3+A4	A2. Males	A3.Females	A4. Calves
1) Total heads slaughtered					
2) Total live-weight (kg)					
3) Total carcass-weight (fresh)					

Code new element

A6.

4. Destination of the meat. Only for internal consumption

Please, indicate the percentages of meat (carcass) from slaughtered animals, for internal consumption, according to the following destinations (use percentages add up to 100%).

Characteristic	%
A7. Local and nearby markets, marketplaces and butcheries in town or close to it	
A8. Chain supermarkets, wholesale, centers of direct distribution	
A9. Institutional markets, hotels, restaurants, hospital, schools, among others	

100%

5. Origin of the cattle.

Please register the department of origin of the cattle, as per the ICA bill of transportation. Please indicate the total number of heads, both for domestic consumption and for exports. If the animals come from the same department where the slaughterhouse is located, please fill in that piece of information.

Code (A10.)	Department of origin	A11. Number of heads received	A12. Percentage

Code (A10.)	Department of origin	A11. Number of heads received	A12. Percentage

- Variables of analysis:
 - Number of slaughtered heads
 - Live-weight (kg).
 - Carcass-weight (kg).
 - Destination of the meat (in carcass) for domestic consumption
 - Origin of the slaughtered animals

The information is given monthly by each of the sources included in the study, using an electronic form via internet. By accessing DANE's webpage, the establishments (with username and password) provide the information of the monthly slaughtering, which is loaded to the system in real time.

With this tool, the processes of editing, codification and validation of the information are optimized. However, the success of this instrument is directly related with the interaction and management that each staff in DANE develops with the sources.

COMMENTS

CONTROL DATA

Please indicate the full name and position of the person providing the information. Do not forget signing and stamp the seal of the slaughterhouse or administration.

Full name	Signature and seal								
Position	Completion date								
Name of DANE collector	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 20px; height: 20px;">D</td> <td style="width: 20px; height: 20px;">D</td> <td style="width: 20px; height: 20px;">M</td> <td style="width: 20px; height: 20px;">M</td> <td style="width: 20px; height: 20px;">Y</td> <td style="width: 20px; height: 20px;">Y</td> </tr> </table> <table style="display: inline-table; vertical-align: middle; margin-left: 10px;"> <tr> <td style="width: 20px; height: 20px;"> </td> <td style="width: 20px; height: 20px;"> </td> </tr> </table>	D	D	M	M	Y	Y		
D	D	M	M	Y	Y				

PLEASE CONTACT US

DANE REGIONAL _____ TELEPHONE _____

2.1.8 Standards, specifications, rules of validation, consistency and imputation

The thematic, statistical, logistic and systems groups of the Statistical Methodology and Production Division of DANE, jointly verify that the final development of the questionnaire in the web, complies with the standards of validation and consistency established in the design of the survey. This process is carried out by means tests before initiating the collection of the information, with the purpose of verifying the correct development of the program.

In ESAG, the sources answer the questionnaire with the information of the month of reference without interference. The electronic process provides validations procedures to realize this process efficiently.

The electronic questionnaire is divided in identifiable parts corresponding to the type of information and includes also the validation process.

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

- b. Corroboration of slaughtering.** It explores the activity of a source in a certain period and finds out the species slaughtered. If any of the five species studied is not slaughtered a menu of reasons is offered to the respondent. In the case of an inactive facility this event has to be registered together with the explicative reasons.
- c. Data registration.** If the source presents activity in the month of reference, the survey will be activated in the sequence corresponding to each of the included species.
- d. Monthly variations.** The application calculates the variations presented in the current report with respect to the previous month. If these variations show an absolute value greater than 20%, an explanation should be selected from a menu of options.
- Specific changes in bovine live-weight.- When this variable presents fluctuations that do not correspond to commercial standards the source is required to document them.
 - Live-weight and in carcass-weight standards: There are basic ranges of fluctuation for the weights associated with each species that is used to determine the consistency of the information. These data are based on commercial trends and practices.

Table 1

Guide of weight ranges for live-weight and carcass-weight

Species	Sex	Live-weight (Kg)				Carcass-weight : Live-weight ratio (%)
		Domestic consumption		Exports		
		Min	Max	Min	Max	
Bovine-adult	Male	170	700	400	720	48% to 58%
Bovine-adult	Female	170	700	400	720	48% to 58%
Bovine-calves		20	200			50% to 62%
Buffaloes	Male	400	750	450	800	46% to 55%
Buffaloes	Female	400	750	450	800	46% to 55%
Buffalos< 1 year						46% to 55%
Swine	Male	40	160	60	180	65% to 85%
Swine	Female	40	160	60	180	65% to 85%
Goats	Male	10	50	10	60	40% to 52%
Goats	Female	10	50	10	60	40% to 52%
Sheep	Male	10	50	10	60	40% to 52%
Sheep	Female	10	50	10	60	40% to 52%

1 The carcass-weight is given as a percentage of the live-weight

When the information is qualified as *Does not apply*, and there is no numeric datum, the rest of the information is not considered. The application has rules to establish when the information is included depending on the species.

2.1.9 Nomenclatures and classifications

- a. **Nomenclature Territorial NUTE** (see GLOSSARY)
- b. **Political Administrative Division codes.** Each survey is codified using the DIVIPOLA (DANE) code that identifies the municipality and department where the facility is located.

2.2 STATISTICAL DESIGN

2.2.1 Basic components of the statistical design

Universe: it is made of the slaughtering facilities (slaughterhouses and packing plants), municipal administrations, environmental sanitation agencies or any other place where the slaughtering of cattle in the country is reported.

Objective population: it is made up of the slaughtering facilities (slaughterhouses and packing plants), municipal administrations, environmental sanitation agencies or any other place where the slaughtering of cattle in the country is reported.

Sampling framework: for year 2008 it is a list of 811 establishments, located in the national territory that were registered and in operation.

The constructed framework was elaborated from a directory of establishments where cattle slaughtering takes place or is reported. It included 1,142 establishments in the country; it was compiled consulting the directories of FEDEGAN, Asoporcicultores, and the National Institute for Food and Drug Monitoring (INVIMA). The closed or duplicated establishments were excluded. Each regional directions of DANE validated the information in the municipalities of their territory. DANE headquarters made a telephone verification to determine if the establishments were in operation or not.

The framework has the identification and location variables of the different sources and some auxiliary or complementary variables.

Main variables of identification and location: department and its code, municipality and its code, name of the source, name of the person who can provide the information, address, telephone.

Main auxiliary variables: Commercial name, legal status, number of heads slaughtered (bovine and swine).

Main variables (see Glossary): Slaughtered animals (or heads), live-weight, carcass weight, category, destination of the meat, origin.

Source of data: Questionnaire, self completed via web, by each establishment included in the sample.

Coverage: national

Geographic breakdown: the breakdown of the results is realized by region NUTE. Bogota is added to the South Andean region, for protecting the statistical reserve of the sources.

Thematic breakdown: number of heads slaughtered, live-weight in tons, carcass-weight in tons, by sex of the animal according to each species. For bovine and swine, destination (marketwise) of the meat (in carcass) in tons by origin.

2.2.2 Statistical units

- a. **Unit of observation:** the slaughtering facilities (slaughterhouses and packing plants), municipal administrations, environmental sanitation agencies or any other place in the country where the slaughtering of cattle is reported.
- b. **Unit of analysis:** the slaughtering facilities (slaughterhouses and packing plants), municipal administrations, environmental sanitation agencies or any other place in the country where the slaughtering of cattle is reported.
- c. **Unit of sampling:** the slaughtering facilities (slaughterhouses and packing plants), municipal administrations, environmental sanitation agencies or any other place in the country where the slaughtering of cattle is reported.

2.2.3 Collection and Reference Periods

- a. **Period of reference.** Calendar month previous to the data collection procedure.
- b. **Period of collection.** Data are collected in the first ten working days of the month following the period of reference.

2.2.4 Sample Design

Type of sampling: the design used is a Probabilistic Stratified Simple Random Sampling (Stratified SRS).

The design is probabilistic because all the sampling units have a known and non-zero probability of being selected.

Table 2
ESAG sample distribution by NUTE region

ZONE	Stratum	Number of plants	Sample size
Bogota	Large	2	2
Atlantica	Small	66	4
	Medium	47	7
	Large	35	35
Pacifica	Small	60	4
	Medium	38	5
	Large	25	25
Amazonia	Small	7	4
	Medium	10	3
	Large	15	15
Andina Norte	Small	99	4
	Medium	50	8
	Large	29	29
Andina Sur	Small	132	7
	Medium	84	17
	Large	77	77
Orinoquia	Small	19	3
	Medium	18	4
	Large	14	14
TOTAL		827	267

The stratification is done as follows: The first criterion of stratification is geographical and corresponds to the seven NUTE regions. Within each region three strata are created to classify the units according to the number of heads slaughtered: large units, where all the units are forcefully included in the sample, and the medium and small units, selected by simple random sampling.

Sample size definition: The total sample size is 267 units. This size corresponds to the sum of the calculated sizes of sample in each region and strata.

In order to determine the sample size within each NUTE zone, the generalization of the algorithm Lavallée - Hidioglou is applied. It delimits the strata using as guide a continuous variable that usually presents a skew distribution (in this case the number of

heads slaughtered in the facility). This method stratifies and optimizes the necessary sample size in each stratum maintaining the expected levels of confidence and precision (Louis, 2002).

Expansion factors: they are a value by which the elements selected in the sample are multiplied in order to obtain the estimation of the parameter in the universe; the selection method defines how to structure and calculate this factor.

In ESAG a SRS design is applied to each stratum, thus the factor of expansion for the establishments selected within each stratum corresponds to the following mathematical expression:

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

Where

N_h = Total number of units in stratum h .

n_h = Total number of units selected in stratum h .

Estimation procedure.

Estimator of Totals: Once the expansion factors have been calculated, the estimator of the total of a variable Y under study is defined in the universe, based on the values observed in the sample, using the estimator proposed by Horvitz-Thompson (1952) in a SRS, as follows:

$$\hat{t}_Y = \sum_h \sum_{\alpha=1}^{n_h} \frac{N_h}{n_h} y_{h\alpha}$$

Where $y_{h\alpha}$ = Value of the variable Y of the unit α in the stratum h .

Variance of the Estimator: An unbiased estimator for the variance of the estimator is given by:

$$\hat{V}(\hat{t}_Y) = \sum_{h=1}^6 \frac{N_h^2 (1 - \frac{n_h}{N_h})}{n_h} s_{ys h}^2$$

$$S_{ysh}^2 = \frac{1}{n_h - 1} \sum_{s h} (y_k - \bar{y}_{sh})^2$$

Calculation of the accuracy of the results

Coefficient of variation: one of the main criteria to determine the quality of the estimation of a parameter is the variability of the possible results of this estimation, which depends on factors as the design and sample size, the parameter to estimate, and the breakdown levels, among others.

Estimated coefficient of variation (ecv): it is a measurement that summarizes this variability in percentage terms. It is obtained from the information of the sample and indicates the precision degree with which a result is being reported. The smaller the ecv, the lower the uncertainty of the estimation. Its formula is as follows:

$$ecv = \frac{\hat{V}(\hat{t}_y)}{\hat{t}_y} \times 100$$

The use of the ecv depends directly on the conditions of the study. There are no universal rules; nevertheless the following criteria concerning the coefficient of variation are proposed:

- Excellent, if the ecv is *smaller* of 3%
- Good quality, between 3% and 5%;
- Acceptable, between 5% and 15%;
- Of restricted use, if it is greater of 15%; these estimations must be used with caution.

Confidence intervals: once the ecv is known it is possible to calculate the confidence interval. It gives the range within which the variable under study is expected to fall with a certain probability. An interval with 95% of trustworthiness is given by:

$$\hat{t} [1 - 1.96 \text{ecv}(\hat{t}); 1 + 1.96 \text{ecv}(\hat{t})]$$

Where \hat{t} represents the value of the parameter under study.

Example:

Estimate for total head slaughtered :	22.587
ecv (%) :	1,79%
ecv (total heads slaughtered) :	22.587 x 1.79% = 404
IC (95% confidence) :	404 x 1.96 = ± 792

Therefore the interval is (22,587 +/- 792). It may be said that with 95% of confidence the total of heads slaughtered, during the period of reference, is in the range 21,796 — 23,378 heads.

2.2.5 Adjustments for coverage

In ESAG three cases are possible:

- The source does not give the slaughtering information.
- The slaughter facility presents a temporary closing.
- The facility is permanently closed.

In the first case, the information of the source is imputed. In the second case as the source is closed, the value of the variables is zero slaughtered heads. In the last case, the sample size and framework in the corresponding strata must be modified and, the expansion factors are adjusted since the facility is retired both from the sample and from the framework.

The lack of answer is in general low (less than 1% of the sources) and corresponds to establishments with low levels of activity. In these cases the nature of the source is analyzed and imputation is made only in the case of facilities devoted to the slaughtering of bovine or swine since these species are the most relevant ones.

The imputation method depends on the available information:

- For those cases with historical information for several years, the total of slaughtered heads, live-weight and carcass-weight is imputed by sex, using a time-series analysis. For destination and origin the historical trend of the establishment is applied.
- For establishments where there it is no historical information for more than two years, imputation by donors is done; an establishment with similar characteristics is selected and the slaughtering figures are taken from this source. For the destination and origin, the past trend shown by the establishment without reporting is applied.

2.3. OPERATIONAL DESIGN

DANE distributes his missionary activity in a network of processes in which participate different areas, all of them coordinated using the Integrated System of Institutional Management. Each of the areas specializes in the specific development of the activities

that comprise a given research. The process initiates in the Methodology and Statistical Production Division (DIMPE) that is in charge, among others, of the following activities:

- To design and to execute the statistical operations.
- To realize the activities of design, collection, processing and publication of the results.
- To make the technical, methodological and operative design of the researches.
- To encourage the application of national and international methodologies likely to guarantee the veracity, impartiality and opportunity of the information.
- To be technically responsible for the execution of the activities of production, collecting, editing, processing and quality control of the researches of economic and social character.
- To certify the statistical information, involving generated, validated and approved results.
- To promote inter-institutional spaces allowing the evaluation and the identification of the needs for statistical information for government and private users. To develop joint activities with them that will bring about a common benefit for the organizations involved.

On the other hand, the main responsibilities of the SYSTEMS area, are as follows:

- To coordinate the adoption and use of systems information and communications, technologies, for the processes of collecting and, to some extent the editing and the quality control of the survey.
- To technically design, to develop, to manage and to advise in the processes of creation, maintenance and update the electronic questionnaire.
- To manage and to implement computer science and technological processes bringing support to the survey.

The Logistic Area of DIMPE altogether with the regional office of DANE carries out the following activities:

- To control and to supervise the collection of the information.
- To monitor the coverage and quality of the information

- To verify atypical information with the sources of information of ESAG
- To advise the sources of information on answering with the electronic questionnaire until the basic files of the period of reference are duly constituted.
- Once the verifications of the files are ready they can be incorporated in the corresponding software by the thematic area.

The Thematic Area of DIMPE is in charge of:

- Coordinating the development and planning of the ESAG
- Analyzing the information
- Producing bulletins and other publications.

The Direction of Dissemination, Marketing and Statistical Culture is in charge of:

- Elaborating and implementing the strategic Plan of Marketing, Means, Edition, Dissemination and Communications of DANE researches and among them ESAG.
- To coordinate the dissemination of the results in agreement with the norms of the statistical reserve.

2.3.1 Training system

Training is realized by videoconference, with the support of the documentary system of the research, this system maintains documents (manuals, methodologies, etc.) on how the different stages of ESAG are implemented.

The videoconference is directed to the operative staff, responsible for the collection of the data. It is prepared and executed by the staff of DANE Headquarters, from thematic and logistic offices (at least a representative of each office). In case of changes or improvements in the system, the systems engineer in charge of the electronic questionnaire will also have to attend.

Before the videoconference, the staff must read the documents and the logistic office of DANE Headquarters must send the topics and the file with the presentation on which the meeting will be supported. The videoconference must be attended by the staff in charge of the data collection in the regional offices as well as the coordinators and other persons in charge.

A review of the main methodological and operative aspects takes place in the video conference. The staff is given a specific training on the updates or changes introduced in the survey. At the end a discussion on the questions and suggestions that arise in the meeting is organized.

This training must be realized at least once a year.

The structure of the survey and the processes that comprise it are documented and placed in the DANE Intranet for permanent consultation, by the members of the team in charge of the survey in all the areas of production, analysis and dissemination of the information.

2.3.2 Preparatory activities

Motivation: this activity is permanent, even if the informant has been associated with the study for several years. It consists of making contact monthly to remind the dates in which the informant is due to process the questionnaire and to reiterate the importance of the study and in particular his participation. This is done by direct communication with each of the persons involved in the process at operative, managerial and institutional level.

When a new entity is included, a formal contact with the heads of the establishment is made, to inform them of the importance of the research and its selection to participate in this survey. This approach is realized at the territorial level and with the respective DANE collector.

With the sensitization process, the objective is essentially, to instruct and to stimulate the process of self-reporting of the information via Web, stimulating the statistical culture of all those involved in the process.

When changes or updates in the electronic form occur, new instructions are sent to all the sources using a folding leaflet.

Selection of the staff: the staff responsible for the survey in its great majority corresponds to public servants belonging to DANE's permanent staff; additionally, in the territorial directions of Barranquilla, Bogota, Bucaramanga, Cali, Manizales and Medellín, there is a designated support person to assist them for monitoring the sources and collecting the information.

The selection of staff is performed following the policies and processes established by the organization in each fiscal period, which are disseminated by the office responsible in every hiring period.

2.3.3 Design of instruments

In the following a description is made of the instruments used in addition to the electronic and physical forms and their content:

- a. **Form for the Control and follow-up of the system of information capture:** it is used in DANE's regional offices to report the coverage of the sources and how they provided the information.



This format collects: the code of the source, the form used by the source (options: Web, physical form, fax, e-mail, telephone, other), the name of the source, the municipality and department where the establishment is located, the territorial unit to which the collection, control and monitoring correspond; it includes a space for reporting any relevant observations.

- b. **Manuals and documents of permanent consultation.**

- **Operative manual.** This document contains the operative guidelines of the survey, directed mainly to the regional directions and offices. The following subjects are treated: organizational structure of the research; geographical coverage; description of the collection instruments and frequency of the survey.

It also presents aspects of interest for the operative staff: professional profiles and honoraria; activities that must be developed by the operative staff; hiring and training, staff selection; some budgetary aspects (travel expenses; recommendations for the visits; explanation of the resources programmed in the TAYRONA server; forms for tasks

controlling in the regional directions; operative schedule, control form for following-up the system of data collection and a guide for its completion.

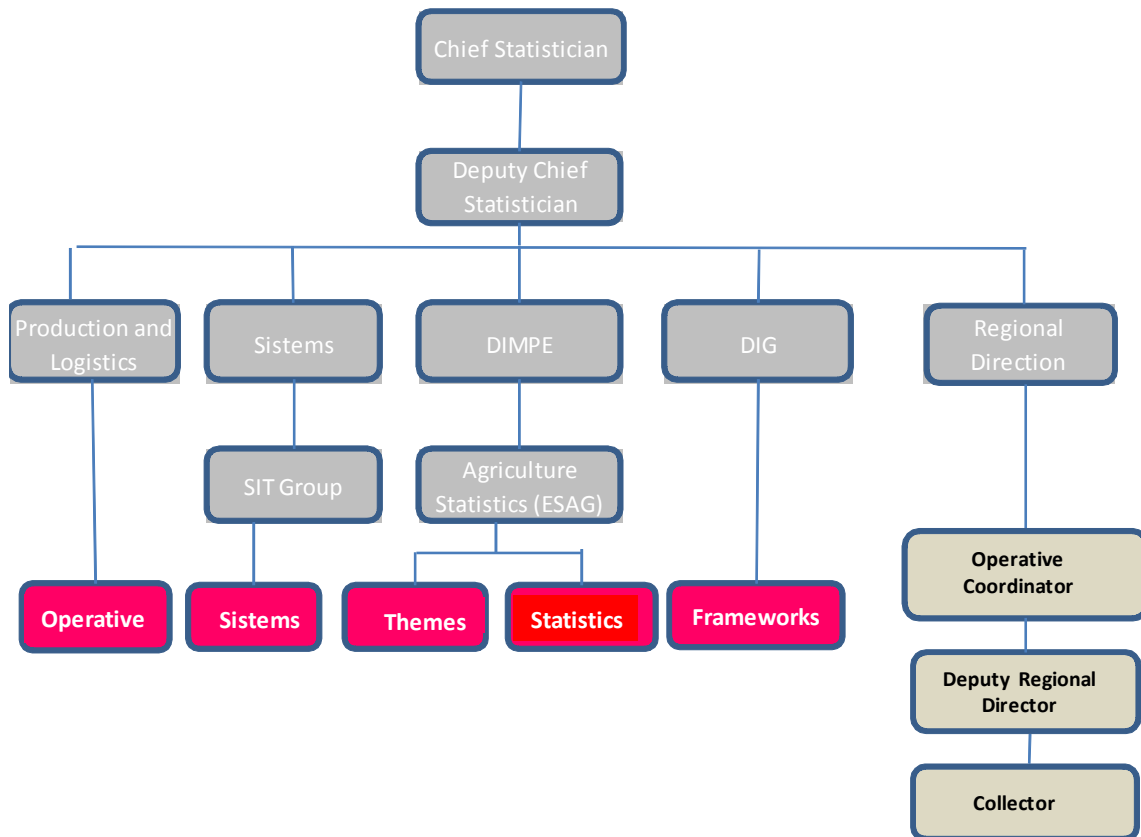
- **Data collection manual.** It contains the main aspects and instructions for this activity, such as: description of the collecting instruments (electronic form via Web, physical form, control and follow-up of the system), instructions for closing the monthly process, recommendations for the visits (field data collection), delivery of data to the central level and communications with DANE Headquarters.
- **Completion of forms manuals.** There is a document both for the physical form as for the electronic form, which contains the completion instructions for each of the variables and livestock species.
- **Editing and transcription manual.** The objective of this manual is to support the editing process in the cases in which the information arrives on the physical form and it is necessary to review it before its transcription into the electronic media. It underlines that editing is a stage of the statistical process that aims at detecting inconsistencies, analyzing and correcting wrong or missing data until its satisfactory cleansing. The treated subjects are: functionality of the physical form, editing objectives, general training for editing (required materials, general process, new features and events and corrections to modify the data).
- **System manual.** It defines the design of the electronic form, its validation, its coverage and the production of information of the ESAG. It contains: objectives of the document; description of the process; specifications of the hardware and software requirements; documents for accessing the process; identifications of activities (loading information on the sources, transfer to DANE Headquarters, uploading to the database, control and follow-up); controls (monthly reports, report of traditional sources and backup); loading ESAG data; frequent problems and recommendations, and a glossary.
- **Manager user manual.** The objective of this document is to present the manual of new features and reports for any DANE staff (irrespective of the sample and assigned zone) to be able to follow-up, monitor and even introduce information of the ESAG, given the implementation of the electronic form via Web. The manual presents: the objectives of the document, how to access the software (access to include the information of a source and access as an administrator of the system); administration menu and functions (consultations, monthly reports, state of the operation under the administrator responsibility; coverage reports; traditional reports; requests; support and session closing), follow-up and monitoring at the central level.

2.3.4. Collecting information

Operational scheme. ESAG information is collected via an electronic form and a self completion process, through DANE's website.

This operation is realized following DANE's administrative scheme. It divides the country into six regional directions, each responsible for a well-defined geographical area. Following the number and location of the sources assigned to the regional directions some local offices participate in the collection stage.

Diagram 1
Operative Organization chart



Collection methods and procedures. The collection is carried out using two reporting procedure. The first one consists in the direct self-completion of the electronic form with permanent support of a member of DANE staff.

The system of each regional direction includes a directory of the assigned sources, according to its area of influence. During the first ten days of the month, the direction gets in touch with the persons in charge of providing the information in the establishments,

informs them about the dates in which the data of the previous month are to be completed, in the corresponding DANE's webpage.

DANE's staff controls the coverage and consistency of the information and follows up with the sources that have not provided the information.

DANE's staff performs a strict follow-up of the data provided and the activity that the sources report. Although the software intrinsically includes editing, codification and validation procedures, only who knows the source is able to make the relevant decisions concerning the errors introduced in the completion of the survey or about inconsistencies that require verification or correction.

In these cases the informant is consulted so as to establish the procedure to be followed and to provide the corresponding support, until the doubts are clarified or the corrections are realized.

The second procedure is by self-completion of the physical form. It that may be collected by DANE, or the sources may send it to DANE, by fax or e-mail, (the physical forms may be collected when the sources are visited). This form follows the traditional procedures of editing and verification of the reported information, as well as the respective follow-up and the registration of all the new features. Once this process is concluded, the responsible must load the information in the electronic form of the webpage.

2.4. SYSTEMS DESIGN

Two teams are involved in the construction of the electronic form for collecting ESAG information: DIMPE's systems team, comprising a coordinator and an engineer, and the ESAG thematic team.

The individuals and organizations that may use of the electronic form are: processing plants (slaughterhouses and packing plants), municipal administrations, environmental sanitation agencies or any other where cattle slaughtering is reported, and obviously DANE.

The technology used for the development of the information system for the data collection of the survey is the capture through electronic form, supported through DANE's website. This component has been adjusted following the design and construction specifications of electronic forms established by DANE's Systems Division.

User and system manuals have been elaborated so as to facilitate the operation, administration and maintenance of the information system.

The components of the computer software facilitate the data collection, adding to, modifying and eliminating registries from the database, the consultation and production of

coverage reports, and the use of information by the manager of the database and the administrator of the software.

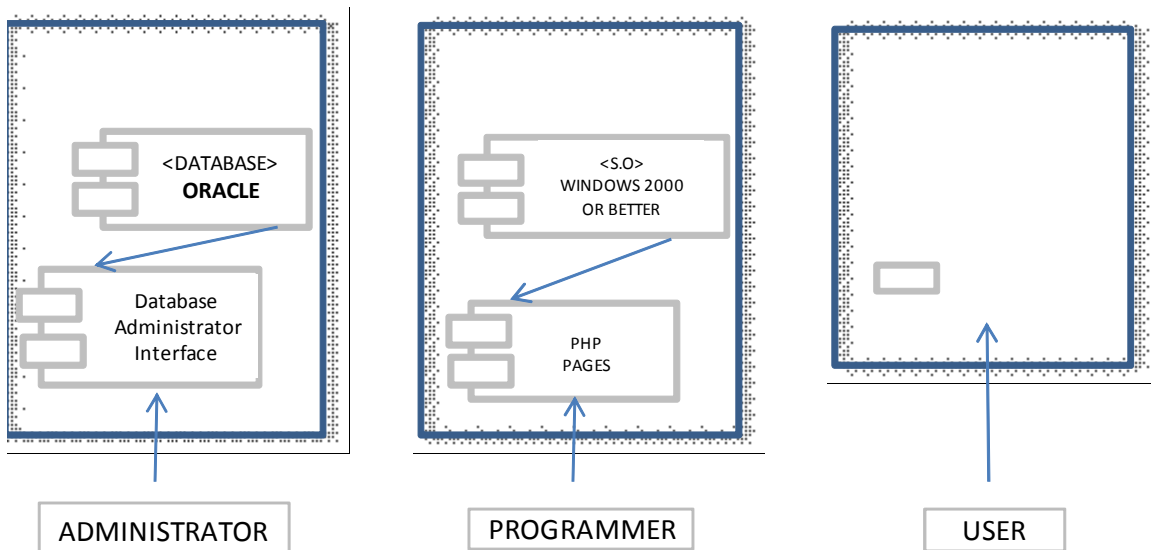
2.4.1. Definition of the architecture of the system

This activity includes the definition of the levels of architecture of the system; the identification of design and construction requirements; the technological environment of the system and the procedures for the operation, management, security and control of the system.

DANE has the technological infrastructure necessary to support the developments of electronic forms to be disclosed via Web, which include Oracle database servers and the web server, where the institutional webpage is located. It supports PHP, the language used in the development of the form.

Diagram 2

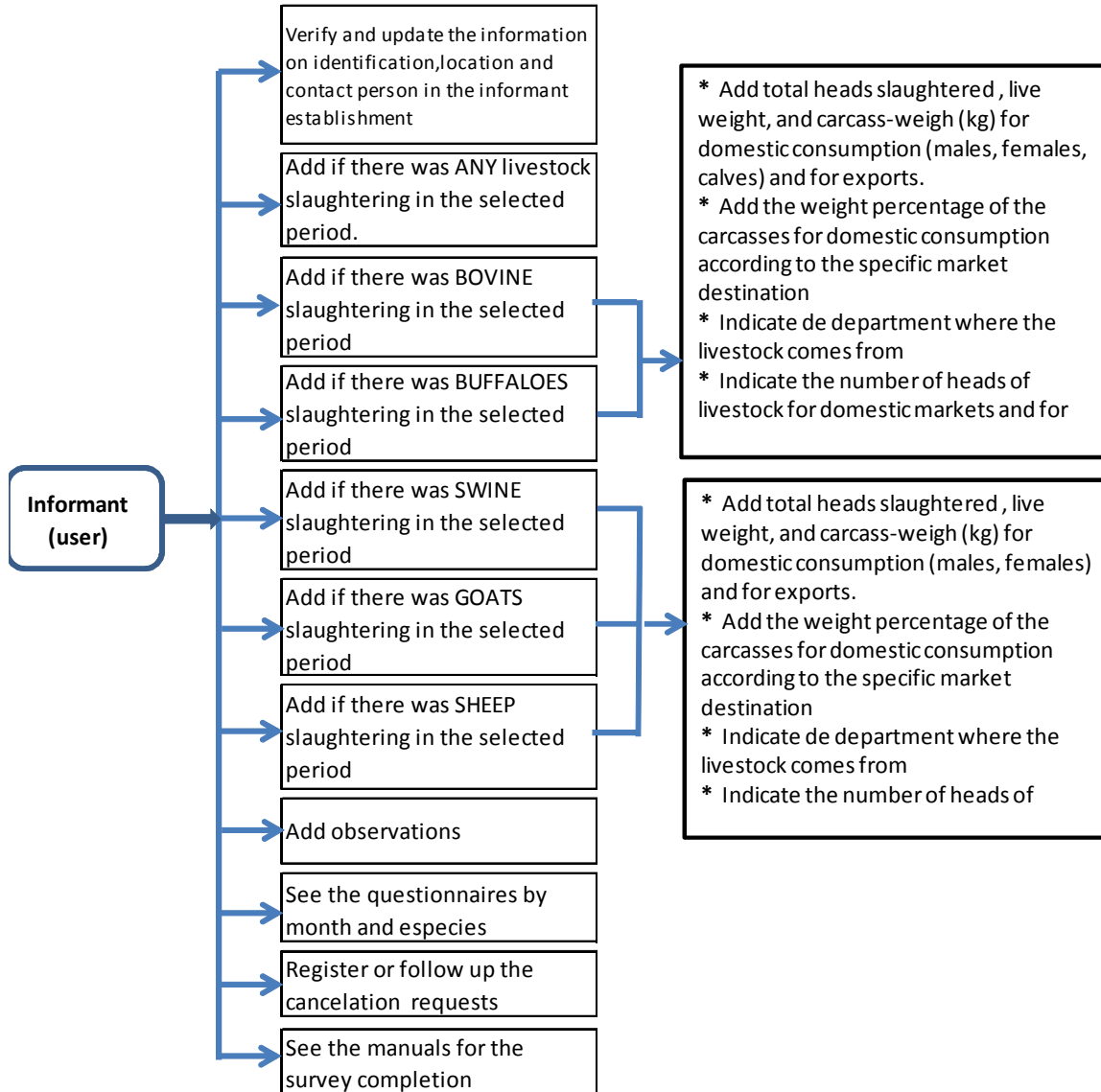
Architecture of the system: levels definition

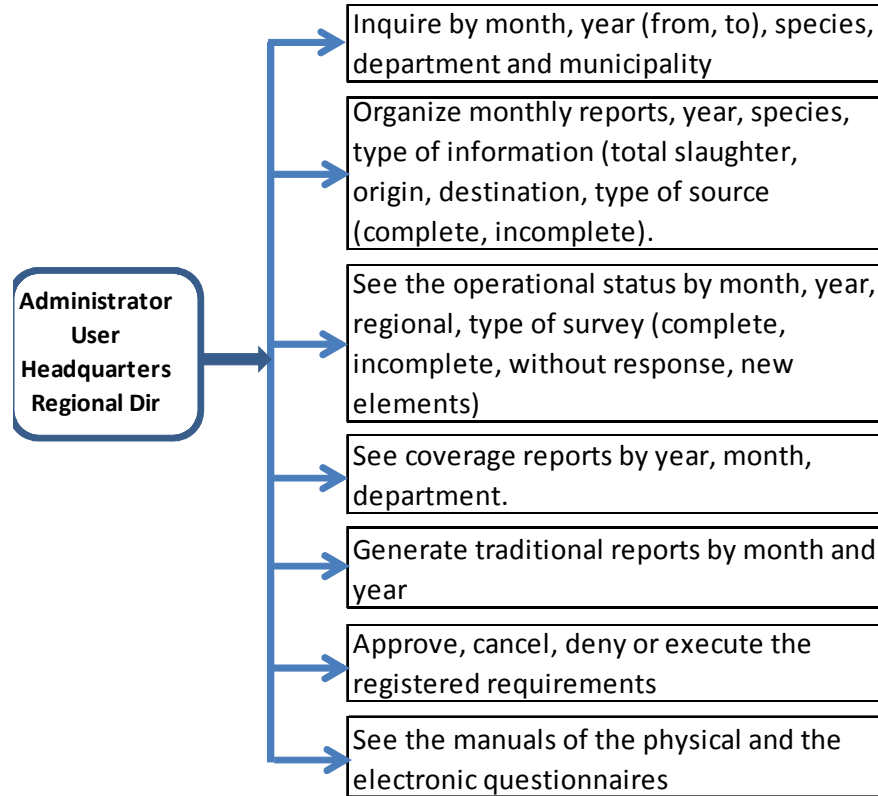


In development, the Oracle database server ("TESTS") is used, where the preliminary development of the questionnaire is made in order to define possible changes or requirements of the end users. Once the development ends, tests are done in order to

identify and correct errors; then the source code is transferred to another Oracle database server ("SURVEY"), where the information from the sources is collected.

Logical architecture. The actions that the user will be able to realize are the following:

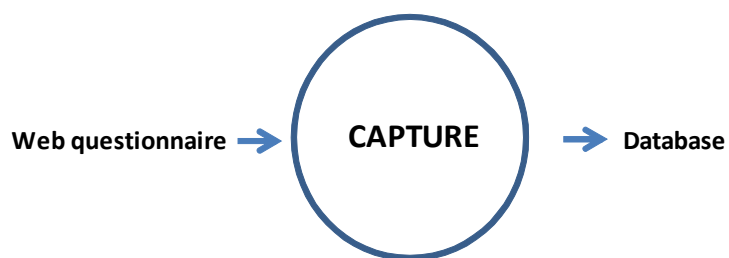




2.4.2. Description of the process

The **data capture** process integrates the files of the information collected using the electronic form.

Graph 4
Capture Process



The electronic form makes it possible for the sources to send the information corresponding to large cattle (bovine and the buffalos) and small cattle (swine, sheep, and goats).

As mentioned before three general sections exist: the **first** refers to the identity data: name, contact person and geographical location of the establishment among others.

The **second** specifically details the slaughtering of each of the species mentioned according to the following variables:

- Number of heads slaughtered by sex, and market (domestic consumption and exports).
- Live-weight of the animals (kg).
- Approximated weight of the meat (fresh carcass weight)
- Destination of the meat in channel for domestic consumption.
- Department of origin of the slaughtered animals.

Most of the information required in the electronic form can be taken from the monthly registries kept by the establishment or by the municipality for the payment of taxes and parafiscal charges; for the live-weight and the approximated carcass-weight, the trends observed by zone and species may be taken into account.

As for the destination of the meat in carcass, the source can consider that the establishment gives priority to the local or nearby market, or to the supply of more specialized units as supermarkets or wholesale centers. Finally, for the origin of the cattle, the Bill of Internal Transportation, issued by ICA may be used as it indicates the department of origin and number of heads that arrive for slaughtering in a given vehicle.

The sources must consider that all positive or negative variation of the number of slaughtered heads greater than 20% must be justified, by selecting an option on a pre-coded menu or writing the relevant explanations (observations).

The **third** section is a module that allows the source to ask for the total or partial elimination of the registered data, in order to introduce corrections.

Table 3
Process specification (Informant)

IDP	NAME	FUNCTION	INPUT	OUTPUT
P01	Entrance to the system	Allows the user entrance to the system	User and password	Permits or denies access to the system
P02	Period registration	Allows defining to which period corresponds the information to register	Month and year	Form with identification data
P03	My profile	Allows reviewing or updating the identification, name and location of the source	Enterprise name, address, phone number, fax, webpage, e-mail	Form to register the data of the person responsible for answering
P04	Survey completion	It makes possible to acquire ESAG information	To establish if there was any slaughtering activity	Form to complete the survey data according to given criteria
P05	Comments	It makes possible to write remarks and comments on the survey	Remarks or comments	Filed information
P06	Questionnaires	Displays tables to report slaughtering information	Month and species	Tables with the information reported
P07	Requests	It provides the way to register, verify or cancel requests made	Month, year, species and transaction	Request registered
P08	Help	Displays the system manuals	Creates the link with physical and electronic forms	Requested manual
P09	Session closing	Ends the process and closes the session	Close session	Session ended

Table 4
Process specification (Administrator)

IDP	NAME	FUNCTION	INPUT	OUTPUT
P10	Entrance to the system	Allows the user entrance to the system	Password	Permits or denies access to the system
P11	Inquiries	Shows the total heads slaughtered by species	Month and year (from,to), species, department, municipality	Report with the requested data according to criteria
P12	Monthly report	Production of monthly reports	Year, species, kind of information,kind of source	Report with the requested data according to criteria
P13	State of my operation	Shows the state of the surveys	Month,year, location, type of survey	Report with the requested data according to criteria
P14	Coverage Reports	Shows a report with the coverage of the survey	Month, year, department	Report with the requested data according to criteria
P15	Regular Reports	Generation of regular reports	Month, year	Report with the requested data according to criteria
P16	Requests	Approves, cancels, denies or executes the requests made	Remarks, action	Manages the requests made
P17	Help	Displays the system manuals	Creates the link with physical, electronic and administrator forms	Requested manual
P18	Session closing	Ends the process and closes the session	Close session	Session ended

2.4.3. Specifications of the requirements

a. Hardware. It is the physical component in the construction of the information system including aspects as the memory of the equipment, hard disks and processors.

It is necessary to distinguish between hardware for the data capture from the sources, and the hardware of the application servers and of the database that facilitate the construction of the information system and afterwards the management of the data. Therefore, the equipment for data capture must have the following minimum characteristics:

- Processor Pentium IV of 2 GHz or more.
- Ram memory of 512 MHz or more.
- Hard disk of 80 Gigabytes or more.
- SVGA Monitor SVGA.
- Network Card of 10/100 base-T or more.
- CD Unit.
- USB port.

b. Software. It is the logical and intangible part in the construction of the information system and includes key aspects as the data base, the programming languages and the operating system.

The software characteristics to support the equipments used as server for the database and the applications are:

- Web Navigator: Internet Explorer 5.0 or superior
- Windows 2000 or subsequent.
- Dreamweaver MX 2004 – Webpage Publisher.
- Oracle 10g - Native database.
- Apache version 2.0 – Web applications server.

The equipment for the servers of the database and applications equipment follow the policies of computer security defined by the DANE's Systems Division for this type of data collection.

The users in the establishments that complete the ESAG questionnaire are requested to have access to Internet and a navigator as Microsoft Internet Explorer ver. 5.5 or better.

2.4.4. Design of the database

At this stage the storage strategy is brought into consideration, as well as the recovery and consultation of the data collected in the survey. It is developed in three clearly defined phases: the conceptual design, the logical design and the physical design of databases.

Regarding the conceptual design, an information scheme is designed in order to satisfy the requirements of the thematic group. It helps the database designer to communicate to the users what he has understood about the information that is handled in the survey. Throughout the process of development of the conceptual scheme, it is tested and validated with the requirements of the users (thematic group).

In the logical design the information scheme is based on a specific model of database. The conceptual scheme is transformed into a logical scheme. It is constructed using the

structures of the basic model of database on which the Generating System of Databases is founded (SGBD) (in the case of the ESAG the system is Oracle 10g, with large storage capacity and fast answer to consultations). An E-R model (entity-relationship) is proposed: this is a universally used tool for designing databases; as the logical scheme advances, it is tested and validated with the requirements of the users.

Finally the database for ESAG was implanted in DANE's Oracle server.

2.4.5. Loading the database

This module allows the automatic loading of the information provided by the sources in the previously designed database. The loading module is divided into the following modules:

- a. **Inconsistencies Module:** its function is to verify that the information loaded to the data base is free from erroneous data or duplicated records.
- b. **Coverage control module:** its function is to generate reports to follow-up the information that has been loaded in it databases.

- b. **Editing module:** it allows the elimination of information loaded erroneously and the introduction of the corresponding adjustments.

2.4.6. Validation of data and generation of thematic and coverage reports

Once the information in the database is consolidated, the procedures of validation and generation of inconsistencies reports are executed (following the validation and consistency specifications), with the purpose of guaranteeing the quality of the information collected in the survey. When inconsistencies are identified using an user interface, the required adjustments to the affected records of the data base are made.

Finally, coverage reports (that help the administrators to control the data collection) and specific reports (to facilitate the analysis of the variables by the thematic group) are generated.

2.4.7. Data capture using the electronic form

DANE has the technological infrastructure necessary to support the developments of electronic forms to be used via web: the Oracle database server and the web server where the institutional page that supports PHP is already installed -PHP is a language for developing dynamic websites-. The Oracle database server is installed in two servers working in cluster in which the data collected from the electronic forms is kept.

The data capture with electronic forms via web, comprises four sub-processes:

- Design of the database.
- Creation of the web software.
- Publication of the application in the web server and link in the institutional webpage.

- Collection of information.

Each sub-process includes a series of activities, functions, resources and controls, which are described next.

2.4.8. Entity relationship model of the system

Once the information actually used by ESAG has been observed in the paper versions of the questionnaires, the database is structured (tables, fields, data types and size). Then, the database is standardized in order to eliminate redundancy in the stored information. The structure of the data base is shown in Diagram 3.

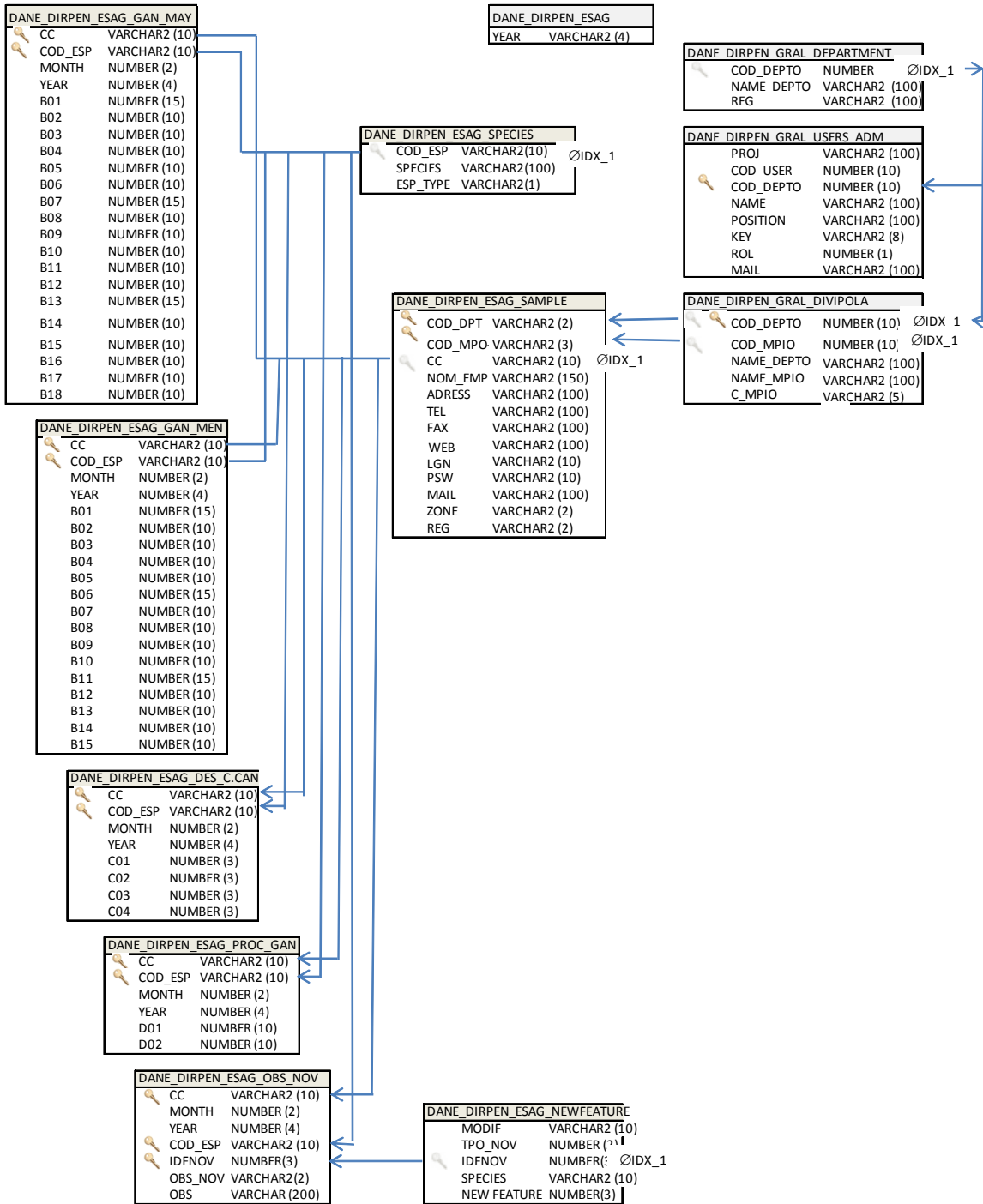
2.4.9. Creation of the web software

The development of the electronic questionnaire uses DANE's methodology of documentary system, as well as a methodology denominated XP (Extreme Programming), that consists in developing the software by modules and with the participation of the thematic user. When a module is developed, it is tested and put immediately into production, so that the product evolves gradually.

In the design of the survey's electronic questionnaire, different techniques and principles are applied. This design requires the definition of its contents with sufficient details for its physical completion, implementing all the explicit requirements contained in the model of analysis and adjusting them to the implicit requirements of the end user. In addition, this design is used as a guide for those who might have to perform changes in the coding, tests or maintenance of the form.

During the development stage of the electronic form, the validations necessary to guarantee that the user does not commit errors at the time of completing the form are implemented. Then a procedure is developed to assign a user name and password to each source. The resulting file with the identification of each user is sent to the operative coordinator of the survey, who is in charge to send communication to the users with the corresponding identification. This process is completely rooted in DANE's application web server.

Diagram 3.- ESAG Entity Relation Model



Publication of the application in the web server and link in the institutional webpage.

At this stage, a request is made to the Systems Division for the allocation of sufficient disc space and the tools necessary to install the application developed in DANE’s web server.

Later, the Press Office, that manages the institutional webpage, authorizes the creation of a link allowing the sources the access in order to complete the survey.

Collection of information. The process of capturing information from the sources, through the web, is done under the direction of the operative coordinator of the research. This coordinator is in charge of authorizing the access and fixing the schedule each of the participant establishments or organizations to provide their answers. This process was implanted in shared mode in DANE's database servers and web applications.

Control and follow-up. This activity make use of the work in line carried out by the sources at national level, in order to introduce new features, or produce coverage reports and follow-up elements. These tools help to continuously motivate the sources and to verify the fulfillment of the assigned coverage.

2.4.10. Testing plan specification

This plan describes the tests of units, of integration and of the system that is applied to the electronic form. The objective is to test all the pre-defined requirements and the model of cases of use.

Specification of the test environment: the objective of this task is to define the environment for performing the tests of the system. The following concepts of specification of environment are treated:

- Technological environment: hardware, software and communications.
- Operational Requirements of operation and security of the tests environment.
- Testing Tools for the extraction of sets of test, analysis of results, utilities for management of the environment, etc.
- Emergency procedures and recovery.
- Planning the system's capacities.

Technical specifications of the test levels: the objective of this task is the detailed description of the different levels of the tests: unit tests, test of integration, test of the system, implantation and acceptance.

- **Unitary tests.** The unit tests include the verifications associated to each component of the information system. It aims at verifying the functionality and the structures of each individual component. They are performed during the development or construction process of each subsystems of the information system.
- **Tests of implantation:** They include the verifications required to assure that the system works correctly in the operational environment, and respond satisfactorily to requirements of efficiency, security, operation and coexistence with the rest of the information systems. It is also submitted for acceptance to the operational user. These tests are realized during the process of implantation and acceptance of the information system.

- **Tests of the System:** They are tests of integration of the complete information system. They allow proving the system as a whole and its integration with other related systems. They verify that the functional and technical specifications are fulfilled. As in the previous ones, the tests are to be performed during the construction of the information system.

- **Tests of Integration:** They include verifications associated with groups of components as PHP forms that normally appear in the definition of the construction subsystems or in the integration plan of the information system. Their purpose is to verify the correct combination of the different components and modules that constitute the information system. They must be implemented at the time of construction of the information system.

- **Acceptance tests:** They verify that the system fulfills the requirements of expected operation and as a consequence obtains the final acceptance of the system from the user (thematic equipment of the research).

In this phase the thematic and logistics staffs (DANE Headquarters) test the functionality of the system, the validations integrated to it, the flows and the processes that are performed.

The system is then put at the disposal of the regional directions so that they realize tests both as user-administrator, as well as with the users-source and report comments, tests results and suggestions to be analyzed.

For these tests, the Systems Area facilitates the access for users-source so that all the tests and iterations required might be performed. This guarantees that the system can be offered to the public.

2.5. QUALITY CONTROL METHODS AND MECHANISMS

a. **Quality Control and monitoring, supervision processes.** The survey staff, at the central and regional levels, may generate reports, using the electronic form, to carry out the control of the geographical coverage of all the sources included in the operation.

In the system, the report called “*Situation of my operation*” provides the required information for establishing the behavior of the sources in a given area of influence, to access their responses and to visualize the registered information.

b. **Visits and field data collection.** Additionally every year visits to sources that face difficulties are programmed. This allows confirming the real situation of their activity and to validate with them some of the processes.

The objective is to realize an actual follow-up and monitoring of the survey, and to verify some variables. A permanent contact with the sources stimulate the statistical culture. These visits have the following characteristics:

- Visits programmed and confirmed in advance. Contact should be established with all the levels of the establishment, (operative, managerial, etc.).
 - Any difficulties with the monthly self-completion of the questionnaire should be reported.
 - If required, assistance in the completion of the form via web should be given.
 - The validity of the following variables is verified: live-weight still (kg) and carcass-weight (kg) of the slaughtered animals.
 - It is important to confirm the activity of the establishment concerning the species slaughtered.
 - Some physical forms are left with the responsible of the establishment. This is an alternative to use when there are problems with the electronic procedure.
 - The objective is always to stimulate the use of the form via Web.
- Also, at the end of every month, the regional directions send the *Control and follow-up format of the capture system* to DANE Headquarters, that presents the follow-up of the tool used by the sources. This report is also used to monitor the regional directions.

c. Indicators regarding the quality control of the processes

Coverage indicator: this indicator measures the effectiveness in the collection process in terms of the coverage of the sources providing information.

$$\frac{\text{Number of sources collected in the month of reference}}{\text{Number of sources}} \times 100$$

Reference level: 95%

Source: Electronic questionnaire in the web

Frequency: Monthly

Timeliness Indicator for monthly results: this indicator measures if the ESAG results are published on due time.

Real date of publication – Date of publication as per the schedule (days)

Reference level: Timeliness Indicator ≤ 0 days

Source: ESAG schedule

Frequency: Monthly

Timeliness Indicator for press bulletin: this indicator measures if the publication of the press bulletin of ESAG is done on due time.

Real date of publication – Planned date of publication

Reference level: ≤ 1: timely publication

> 1: it is necessary to generate a remedial action.

Source: ESAG schedule

Frequency: Quarterly

Quality Indicator: this indicator measures the effectiveness of the motivation and training of the sources in the completion of the form, which affects the quality of the information. It may also be used as an early warning to identify and correct possible errors or inconsistencies.

$$\frac{\text{Number of inconsistent questionnaires}}{\text{Total number of completed questionnaires}} \times 100$$

Reference level 5%

Source: Electronic form Web

Frequency: Monthly

Finally the coefficients of variation, published in the output tables, may provide an indicator of quality of the information. During the last five years the estimated coefficients of variation associated with the total number of heads slaughtered by species are shown in the following table.

Table 5. Coefficient of variation: livestock heads slaughtered (%)

Year	Bovine	Swine	Buffaloes (1)	Goats (2)	Sheep (2)
2009	3.1	2.0	0.0	2.1	4.0
2010	3.1	1.8	0.0	2.9	2.6
2011	3.2	1.2	0.0	2.7	2.0
2012	4.1	1.9	0.0	1.0	2.3
2013	4.1	2.1	0.0	0.0	0.0

(1) The coefficient of variation for buffaloes is 0%, because they are slaughtered in establishments always included in the sample.

(2) In the case of goats and sheep, as of year 2013 it is of 0% since all the sources that report slaughtering of these species are systematically included given the criteria of the sample design.

2.6. DESIGN OF PILOT TESTS

During the fourth quarter of 2008, a pilot test directed towards the extension of ESAG, in order to generate results at national level with a breakdown by zone NUTE was implemented. The results were satisfactory as all the sources reported the information on time. This was an important issue for the development and update of the survey, so that from this quarter, the publication of the results generated with the information collected via Web was initiated.

At present, any change or improvement in the collection instrument is discussed by all the staff. Proposals are structured and presented to the external committee so as to obtain comments and suggestions that may improve the proposal.

The changes in the electronic form are then implemented along the lines stated in the Testing plan specifications (paragraph 2.4.10), before sending them for its final use by the informants and by the DANE staff, in the Headquarters and in the regional directions.

2.7. DESIGN OF THE ANALYSIS OF RESULTS

2.7.1. Statistical analysis

The inference analysis makes possible to estimate some characteristics of a population from the study of a sample drawn from it.

The calculated sampling error for the national total of slaughtered heads of bovine and swine oscillate between 1% and 3%. The exports total slaughtering has a calculated sampling error of 0% since all the sources authorized for this activity are included in the sample.

The same situation arises for buffaloes, goats and sheep. The total slaughtering of these species has a 0% sampling error since all the establishments that slaughter these species are included in the sample.

Given the type of operation the errors associated with coverage, processing and no-answer are low (around 2%).

Occasionally there are some delays of the establishments in delivering the information (one or two months), attributed to a great extent to the lack of stability of the staff in charge of the completion of the survey, that brings about a change in the imputation rate.

Once the results are obtained, they are compared with previous ones to evaluate their trend with respect to those already exhibited by this type of activity.

2.7.2. Analysis of context

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

In the analysis of the slaughtering trend, the data reported by producers associations and by government institutions are taken into account.

The cattle activities are traditional in the country, and several professional associations have been organized. Some of them collect parafiscal resources for the development of this subsector.

The collected information must give a ratio between number of heads and its corresponding weight (kg), according to established parameters and trends by source and period of the year. If the ratio considerably differs, there must be a formal explanation to be discussed with the sources.

For each quarter of the year the behavior of the livestock slaughtering by species is compared with the corresponding quarter of the previous year.

2.7.3. Experts Committees

The thematic staff of DANE presents the results (in output tables and graphs) to the internal and external committees of this statistical operation prior to the publication of the press release.

- a. Internal committee: The Thematic and Logistic staff of the operation and other interested persons from National Accounts, the Deputy Director Office, and DIMPE, attend this committee. The output tables are initially presented to the organization experts for analyzing and validating the results with them before going to the external committee.
- b. External committee: This Committee is attended by the Ministry of Agriculture (Sheep and Goat Productive Chain); the Colombian Cattle Federation (FEDEGAN) and the Colombian Association of Swine Raisers (ASOPORCICULTORES) and most of the participants of the internal committee. The output tables are presented to the participants, with the aim of contextualizing and analyzing the results and of stimulating a feedback for the survey at the time of its dissemination.

2.8. DISSEMINATION DESIGN

The medium selected for the dissemination of the information generated by the ESAG is the webpage, where the statistical Annexes and the press bulletin are published. The information must fulfill all the principles of the national code of good practices for official statistics.

2.8.1. Administration the data repository

DANE disseminates the results of this operation through the www.dane.gov.co webpage, link: Farming, Statistics of Livestock slaughtering/ (ESAG) <https://www.dane.gov.co/index.php/agropecuario-alias/estadisticas-de-sacrificio-de-ganado-esag>.

2.8.2. Products and dissemination instruments

- A link to the electronic form for cattle slaughtering.
- Documents containing the background of the operation: Methodological summary and Methodology.
- Quarterly information: Press release, Press Bulletin and its presentation.
- Historical information of bulletins and press releases of the last 4 years.
- Information of historical series of slaughtering national and regional totals for bovine, swine and other species (October 2008- December of 2013)
- Guide for the interpretation of the error sample in terms of the coefficient of variation and the estimated confidence interval.

- Series of bovine and swine slaughtering in 72 municipalities. (2004 – 2008).
- Series of bovine and swine slaughtering in 63 municipalities. (2002 – 2007).
- Series of bovine and swine slaughtering in 63 municipalities. (2000 – 2004).

2.9. EVALUATION DESIGN

The operation is evaluated monthly. If there are new features they are communicated to the DANE's Logistics office, with the purpose of obtaining precise instructions. The suggestions of staff are received and evaluated. This is a source of different points of views and experiences that may enrich the statistical operation.

In the meetings of the internal and external committee, besides presenting the quarterly results, the comments and suggestions of the experts and associations are received. They serve as feedback and may provide improvements to the methods and the procedures of the statistical operation.

Additionally, the system of institutional management of DANE verifies that the processes fulfill the quality standards, and realizes continuous follow-up through the System of Planning and Institutional Management (SPGI) which periodically provides the corresponding qualification.

Along these lines, DIRPEN evaluates DANE's statistical operations through a commission of independent experts that gives an evaluation report and decides with the staff an action plan in order to adopt recommendations, changes, adjustments or redesigns.

Finally, the thematic office evaluates permanently the subsector, to answer to its dynamics, and maintain the survey up-to-date.

3. RELATED DOCUMENTATION

Output tables: Present the structure, the contents and the aspects to take into account for the presentation of the ESAG results.

Data dictionary: It contains the description of the tables, denomination and description of the variables of the files in which resides the survey software.

Design of system: Presents the design of the system for collecting and processing the information of ESAG collected through the electronic form via web. It defines the scope and architecture of the system; it identifies the technological environment of the processes of data capture with electronic forms; it describes the processes of data capture and explains the plan of tests that accompanies the development and setting into operation of the information system.

Sample design: It presents in a detailed way the sample design and includes aspects as the sampling framework, the stratification applied, the selection of sample with the corresponding size and finally the equations that allow estimating the variables of interest with their respective sampling errors.

Specifications of indicators: it presents the indicators that guarantee the quality and timeliness of the results, detailing aspects related to the calculation formula, purpose, reference level, responsibility of calculation, information sources, frequency and criteria to make decisions in cases in which the level of an indicator becomes critical.

Specifications of validation and consistency: this document gives the rules of validation and consistency depending on the characteristics of the livestock slaughtered. They make possible an efficient editing process and try to maintain the quality of the information collected through the electronic form.

Methodological summary: it presents the summary of the methodological aspects of the survey.

Glossary: it contains the definitions or explanations of the terms and abbreviations used in the statistical operation. This instrument improves the understanding of the content of ESAG.

Reviewing guide: Guide for reviewing and generating coherent results. It describes the processes of analysis and generation of results within the standards of quality and timeliness required.

Guide for interpreting the sample errors in terms of the coefficient of variation and estimate of the confidence interval: presents the criteria that must be taken into account when handling the obtained estimations, in particular referred to the confidence interval and the coefficient of variation.

Processes design: it identifies and generates the documents for all the processes involved in developing the survey and achieving results. It serves as a reference for the staff in the implementation of activities through awritten and graphical description of the processes involved.

Editing, coding and capturing manual: Gives the rules to follow when data are collected in physical questionnaires. Afterwards they will be transferred to the electronic form.

Physical questionnaires completion manual: it is a support for the persons who provide the information using a physical questionnaire.

Web questionnaires completion manual: describes in a clear and simple manner the steps that must follow the establishments that provide information by self-completion on the web questionnaire.

Collection manual: describes the processes for collecting the information, using the electronic form. It is a reference for motivating, following-up and monitoring the establishments that provide information via web.

User manual (Manager): It presents the new features and reports with which some members of the staff, depending on the zone and the sample of establishments, may follow-up, control, and even capture the information, using the electronic questionnaire.

Manual of the system: it defines the design of the electronic format of capture, validation, control of coverage and production of the information of the ESAG.

Operative manual: it presents the guidelines to be followed to achieve the objectives proposed in the collection process. General and budgetary aspects are described as well as the control formats for the activities realized in the regional directions.

Statistical Design Methodology: it contains the basic components of the statistical design implemented in ESAG.

Functional model: it contains the graphical representation of all the process of the operation.

Control Plan: it contains the list of documents, requirements, specifications, verification frequency, person in charge of the verification and registry of the processes and activities to successfully implement the statistical operation.

Procedure analysis and generation of results: it describes the steps for the analysis and generation of results within the standards of quality, timeliness and confidence that the statistical information of the Survey requires.

No-compliance procedure: it describes the actions to be followed when there is non-compliance in the processes or activities to carry out the statistical operation.

GLOSSARY

Carcass.- The carcass, as defined by Decree 1500, is the body of a slaughtered animal, that has been bled, skinned, eviscerated, and its extremities cut, therefore where only the bone structure and the meat adhered to it remains (Ministry of the Social Protection, 2007).

Destination of the carcasses for domestic consumption.- Describes the type of domestic markets where the product goes; in this particular case : local markets and butcheries, supermarkets and institutional markets.

Category: Variable used to identify if the production is oriented toward the domestic markets or to exports.

Livestock exports.- It corresponds to the legal flow out of the national customs territory to other countries. In the framework of this research reference is only made to meat in carcasses exported by the establishments that do participate in the network of informants of the survey.

Bovine or bovine cattle: Particular species of the bovid family. Bulls, oxen, and cows belong to this animal species which are produced to obtain its milk or its meat. These products may be oriented toward domestic consumption or for exports. These animals are in some cases designated as large cattle; the adults have an average live-weight of 400 kg. (adults) and around 150 kg (calves/ veal).

Swine: The pigs are even-toed ungulate mammals, of the Suidae family that can be found in wild or domestic state. They have a stout body with thick skin, a short neck, short tail and a movable snout, especially the domesticated pig. The scientific name of the domestic species is *Sus scrofa domestica*. They are grown up for their meat and other products for domestic consumption or for exports. They are considered small cattle and when slaughtered have an average live-weight of 100 kg.

Goats: They are domestic ruminant mammals of short hair and hollow horns. They live generally in mountainous regions. Goats are bred for their milk, frequently used in cheese production, and also for their meat, skin and hair. They are considered small cattle.

Sheep: Sheep are ruminant mammals ungulate; the male of this species is called ram or breeding ram. Their meat and milk are very well appreciated for human consumption. Cheese and other derivatives may be obtained from the milk. Clothing and other products are made with their wool. The leather is another by-product widely used. They are also considered small cattle.

Buffaloes: The buffalo is a ruminant mammal, of the bovid family (as the bovines). It has a great body, robust and more elevated towards the head, with small and separated horns, beard and the forehead and the neck covered by long hair. They are also designated as large cattle.

Inventory of cattle. It corresponds to the total number of existing animals, distributed by sex and groups of age. There are inventories of cattle for each species.

Region NUTE: Region classified according to the Statistical Territorial Units Code (NUTE). This identifier is used by the Member States of the Andean Community, and assigned to each statistical territorial unit. It consists of three digits representing six regions of the country (Andean Community, 2002). Colombian NUTE Regions are formed as follows:

Atlantic region: The departments of Atlantic, Bolivar, Cesar, Cordoba, Guajira, Magdalena, Sucre and the San Andres archipelago.

Pacific region: The departments of the Cauca, Chocó, Nariño and Cauca Valley

Region Amazonia: The departments of Amazon, Caquetá, Guaviare, Putumayo, Guainía and Vaupés.

Andean North: The departments of Antioquia, Santander and Norte de Santander

Andean South: Bogotá and the departments of Boyacá, Caldas, Cundinamarca, Huila, Quindío, Risaralda and Tolima.

Orinoquia region: The departments of Arauca, Casanare, Meta and Vichada.

New features. When an establishment faces a particular situation that prevents the normal development of the regular slaughtering activity, the survey registers it by assigning a code from a set of possibilities..

Origin of the cattle. Variable that determines the origin of the cattle that is being slaughtered. In the case of the present research, it concerns the department of origin, with the aim of providing the cattle map.

Carcass weight: weight, expressed in kilograms, registered after slaughtering, bleeding, skinning and evisceration of the animal, but before refrigeration. The carcass weight is related to the live-weight of the animal, as an index of productivity and quality.

Live- weight: Expressed in kilograms, is the weight of an animal before slaughtering.

Cattle slaughtering: The national legislation defines it as the procedure of killing an animal to obtain elements for human consumption. It covers several stages, from desensitizing and bleeding, by sectioning the great blood vessels (Ministry of the Social Protection, 2007: 9).

FAO underlines that “it is an obligation to slaughter the animals providing food and useful by-products by humanitarian procedures. Afterwards, it is a requirement to handle the carcasses efficiently and hygienically” (FAO, 2001: CAP. 7)

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