European Commission
Directorate General for Health and Consumers

Study on the introduction of electronic identification (EID) as official method to identify bovine animals within the European Union

Framework Contract for evaluation
and evaluation related services - Lot 3: Food Chain
(awarded through tender n^{o} 2004/S 243-208899)

Final Report

Submitted by:

Food Chain Evaluation Consortium (FCEC)

Civic Consulting - Agra CEAS Consulting -

Van Dijk Management Consultants - Arcadia International

Project Leader: Arcadia International

European Commission
DG SANCO
Rue de la Loi 200
1049 Brussels

25.04.2009

Contact for this assignment:

Mr. Daniel Traon, Managing Partner
Arcadia International E.E.I.G.
Avenue des Princes Brabançons, 35
B-1170 Brussels
Belgium
Telephone: +32 (0)56 48 50 18
Fax: +32 (0)2 675 87 32
Email: daniel.traon@arcadia-international.net

Study on the introduction of electronic identification (EID) as official method to identify bovine animals within the European Union

Final Report

Prepared by the Food Chain Evaluation Consortium (FCEC)
Civic Consulting – Agra CEAS Consulting –
Van Dijk Management Consultants – Arcadia International

Project Leader: Arcadia International

Food Chain Evaluation Consortium

c/o Civic Consulting
Potsdamer Strasse 150
D-10783 Berlin-Germany
Telephone: +49-30-2196-2297
Fax: +49-30-2196-2298
E-mail: alleweldt@civic-consulting.de

Expert Team

Arcadia International:

Mr D. Traon
Mr Pieter Hogewerf
Dr Bill Vandaele
Dr. Rodolphe de Borchgrave

Van Dijk Management Consultants:

Ms Tine Debusschere
Mr Dominique Spaey
Ms Laurence van Nieuwenhuyse
Mr Anastasio Sofias
Ms Sylvie Barel

fcec

Food Chain Evaluation Consortium
Civic Consulting – Agra CEAS Consulting
Van Dijk Management Consultants – Arcadia International

CONTENTS

List of Graphs

List of Tables

Acronyms

BSE	BOVINE SPONGIFORM ENCEPHALOPATHY
CA	COMPETENT AUTHORITY
CAP	COMMON AGRICULTURAL POLICY
COPA-COGECA	THE UNITED VOICE OF FARMERS AND THEIR CO-OPERATIVES IN THE EUROPEAN UNION
EID	ELECTRONIC IDENTIFICATION
EU	EUROPEAN UNION
FDX	FULL DUPLEX
FCEC	FOOD CHAIN EVALUATION CONSORTIUM
FMD	FOOD AND MOUTH DISEASE
FVO	FOOD AND VETERINARY OFFICE
GHz	GIGAHERTZ
HDX	HALF DUPLEX
ICAR	INTERNATIONAL COMMITTEE FOR ANIMAL RECORDING
IDEA	IDENTIFICATION ELECTRONIQUE DES ANIMAUX
IC	INTEGRATED CIRCUIT
ID	IDENTIFIER
ISO	INTERNATIONAL ORGANISATION FOR STANDARDISATION
LF	LOW FREQUENCY
LSU	LIFE STOCK UNIT
JRC	JOINT RESEARCH CENTER
MS	MEMBER STATE
OTP	ONE TIME PROGRAMMING
RA	REGISTRATION AUTHORITY
RF	RADIO FREQUENCY
RFID	RADIO FREQUENCY IDENTIFICATION
SG	STEERING GROUP
UECBV	UNION EUROPEENNE DU COMMERCE DU BETAIL ET DE LA VIANDE -EUROPEAN LIVESTOCK AND MEAT TRADING UNION
UHF	ULTRA HIGH FREQUENCY

ACKNOWLEDGMENTS

The evaluation team would like to thank all participants (Competent Authorities, Stakeholders and Experts) that responded to our survey and those interviewed at EU and Member State levels, for their contributions to this evaluation. We would also like to thank the DG SANCO & JRC staff involved with this evaluation for their highly valuable assistance and support throughout this exercise.

KEY MESSAGES

1) The obligations of the current Regulation (EC) No 1760/2000 that establishes a system for the identification and registration of bovine animals are considered as being efficient in fulfilling the objectives of individual traceability by a large majority of the stakeholders and by the CAs, but that improvements could be made in order to use a broader spectrum of identifiers than only two classical ear tags and to reduce reading time, errors and administrative burden via automatic reading.

2) The technical feasibility study demonstrates that technical solutions exist and are suitable for the bovine sector even if a certain level of customisation is required to secure optimal usage of EID technology e.g. installation of stationary readers. Both E-ear tags and boluses can be used as transponders. International standards for electronic animal identification (ISO 11784 and ISO 11785) have already been included in the EU legal framework on animal identification for several species and are also appropriate for the bovine sector. The WYSIWYG approach (What You See Is What You Get) consisting of having one unique identification code written on both the visible ear tag and on the electronic identifier (E-ear tag or bolus) is the preferred one by a majority of stakeholders. However, its implementation may lead to significant costs in a couple of MSs where a modification of the currently used numbering system will be necessary.

3) EID is associated with higher costs for identifiers and reading equipment compared to conventional identification. Savings of labour costs due to automatic reading only partly compensate the higher costs for EID equipment when only "regulatory readings" to record animal movements within the framework of Regulation (EC) No 1760/2000 are taken into account. However, this study demonstrates that when additional readings are performed (e.g. within the framework of eradication programmes, medical treatment or the production control) then EID would bring benefits in specific business cases.

4) Direct costs and benefits are not balanced all along the production chain. Costs are mainly supported by the animal keepers (farmers) in the holding of birth while most of the EID benefits affect the downstream actors (markets, slaughterhouses).

5) Additional benefits would occur when the electronic device is also used for management purposes such as in dairy and fattening farms where automation is in place for controlling production records like milk yield, fertility, weights and/or feed consumption.

6) Official's controls activities could, also, benefit from EID.

7) This unbalanced distribution of costs and benefits may be considered as an obstacle for the compulsory introduction of the EID technology in the bovine sector.

8) Comparing different options for the introduction of EID, the two extreme scenarios do not seem to be appropriate. The status quo option would lead to a possible disturbance of the internal market and the mandatory option is rejected by most of the interviewees.

9) The study concludes that the voluntary introduction of EID in the bovine sector on the basis of harmonised standards would be the preferred option. However, individual MS should have the possibility to opt for an obligatory (or compulsory) regime at national level for the following reasons:

- Each MS could decide to introduce EID by law at a convenient time and not under a push scenario;
- This policy option would allow a case by case approach and therefore an optimal buy-in by all actors in the chain - from the breeders to the slaughterhouses;
- It would set incentives to obtain public and private financial investments to further evaluate costs and benefits of EID under specific production and trading conditions.

EXECUTIVE SUMMARY

Regulation (EC) No 1760/2000 of the European Parliament and of the Council of 17 July 2000 establishes a system for the identification and registration of bovine animals and labelling of beef and beef products and includes the elements "double ear tag", "holding register", "cattle passport" and "national computerised database".

According to the aforementioned Regulation, the Commission was required to study the feasibility of using electronic means as an official method of identification within the EU by taking into consideration the latest technological development in the field of Radio Frequency Identification (RFID) and also based on the fact that Electronic IDentification (EID) is already part of the official identification system for many species.

The **purpose of the study is to analyse the technical feasibility** of the introduction of EID for bovine animals **and to concentrate on the economic impacts** of the three different options (e.g. obligatory, voluntary and "do nothing") as defined as follows:

- **OPTION 1: OBLIGATORY (or "compulsory") regime:** Each bovine animal is to be identified by one conventional visible ear tag AND one electronic identifier;

- **OPTION 2: VOLUNTARY regime;** segmented in the following sub-options:
  - **OPTION 2A:** Electronic identification is voluntary at EU level, and **individual Member State has the possibility to opt for the obligatory (or "compulsory") regime.** In case the Member State opts for the *obligatory regime*, the same obligation as under OPTION 1 is applicable in that Member State. In case the Member State opts for the *voluntary regime*, bovine animals can then be identified by two conventional ear tags or one conventional visible ear tag AND one electronic identifier (i.e. an electronic ear tag or a bolus) that has been recognised as an official mean;
  - **OPTION 2B:** Electronic identification is voluntary at EU level, and **individual Member State does not have the possibility to opt for the obligatory (or "compulsory") regime**. Under the voluntary regime, bovine animals can be identified by two conventional ear tags or one conventional visible ear tag AND one electronic identifier (i.e. an electronic ear tag or a bolus) that has been recognised as an official mean.

  It is considered that under OPTION 2, the introduction of EID is at least voluntary. This implies that it is not possible for a Member State to opt for the "Do Nothing" scenario under the voluntary regime.

- **OPTION 3: "DO NOTHING"** (or Status Quo) regime. No change to the actual provisions implies that each bovine animal is to be identified by two conventional visible ear tags. If keepers want to use electronic identifiers, this is in addition to the two official ones. This option is considered as the baseline.

Finally **the study has listed the advantages and disadvantages of a voluntary or obligatory introduction of EID** within the existing legal framework of Regulation (EC) No 1760/2000 and Directive 64/432/EEC[1].

The study has been carried out by the Food Chain Evaluation Consortium (FCEC) from October 2008 to April 2009 and was based on a series of interviews at EU and MS levels with competent authorities representatives and many stakeholders.

The Standard Cost Model (SCM) approach has been considered and an additional cost model has been developed to compare the costs and benefits of the different options. The cost model allows modifying parameters such as labour costs, costs of equipment and investment as well as the frequencies per regulatory action to adapt to different and more specific farm types and farming conditions. It has to be mentioned that **the cost analysis has been based on the assumption that only Article 4 of Regulation (EC) No 1760/2000 is subject to modifications** to consider EID as an official method of identification of bovine animals.

Referring to the regulatory obligations in the existing legislation on bovine identification, it could be concluded that **all compliance costs are administrative costs** as there are no other obligations than legal obligations related to the provision of information on the livestock.

From the start of the study, **a large majority of the stakeholders and the CAs have mentioned that the actual system is considered as being efficient in fulfilling objectives of the Policy, but that improvements could be made** in order to mainly reduce identification errors and to reduce time for e.g. notification, update of the national database leading to a real-time system necessary to manage disease outbreak crises when occur.

Several actors have started to use electronic identification in specific cases e.g. buffalos sector in Italy, cattle industry in Denmark therefore it is important to set-up Community rules in relation to technologies and standards to be used for harmonisation reasons. The technical study highlights **that both E-ear tags and boluses can be used as transponders**. **ISO standards 11784 and 11785 have to be applied** and devices have to be tested according to the same guidelines as for sheep and goats. In addition the **majority of interviewees are in favour of having one unique number (WYSIWYG) written on the visible ear tag and on the second identifier (E-ear tag or bolus)** even if it has to be recognized that this approach may lead to significant costs for a couple of MSs to adapt the currently used numbering system e.g. UK mentioned during the interviews that it cost Defra about 3 million £ to modify their identifier allocation system for sheep and goats.

Costs have been calculated using 2 scenarios. In the first scenario, it is considered that operators are not considering any benefit from the e-reading and therefore continue to act as today even if one of the identifier is an electronic one. On the other hand, the second scenario considers that both reading and transfer of data is fully done electronically and that actors are fully considering benefits of EID in relation to the regulatory obligations. Other possible benefits of e-reading and e-transfer of data that are related to non-regulatory actions such as

[1] Council Directive 64/432/EEC of 26 June 1964 on animal health problems affecting intra-Community trade in bovine animals and swine

e.g. farm management optimisation are considered in a more general and qualitative way. After all, these benefits do not fall within the scope of the (regulatory) cost model.

The results as shown in the following table compare the total costs (in 1,000 €) of EID for OPTION 1 and OPTION 3. As under the POLICY OPTION 2A and POLICY OPTION 2B it is not possible to predict in a reliable manner what Member States and/or what holdings would introduce EID on a compulsory or voluntary basis, it was decided not to make specific calculations for these two sub-options in the cost model but to limit the calculation based on a set of assumptions defined by FCEC. In any case costs of this option would be in between the two extreme options presented here.

	Big breeders	Small Breeders	Market & assembly centers	Slaughter-houses	Competent Authorities	TOTAL
SCENARIO 1 : EID BUT NO e-reading AND NO e-transfer						
Option 1: E-ear tag	294.497	106.018	50.310	35.838	20.397	**507.060**
Option 1: Bolus	358.064	115.603	50.310	47.241	20.397	**591.615**
Option 3: Do Nothing	203.163	27.176	49.377	34.209	20.283	**334.208**
Difference for E-ear tag	91.333,7	78.841,9	932,7	1.629,9	113,7	**172.852**
%	*44,96%*	*290,12%*	*1,89%*	*4,76%*	*0,56%*	***51,72%***
Difference for Bolus	154.900,5	88.427,4	932,7	13.032,7	113,7	**257.407**
%	*76,24%*	*325,39%*	*1,89%*	*38,10%*	*0,56%*	***77,02%***
SCENARIO 2: EID AND e-reading AND e-transfer						
Option 1: E-ear tag	652.424	106.018	13.748	33.041	114	**805.344**
Option 1: Bolus	716.821	115.603	13.912	44.525	114	**890.975**
Option 3: Do Nothing	203.163	27.176	49.377	34.209	20.283	**334.208**
Difference for E-ear tag	449.260,6	78.841,9	-35.629,1	-1.167,9	-20.169,6	**471.136**
%	*221,13%*	*290,12%*	*-72,16%*	*-3,41%*	*-99,44%*	***140,97%***
Difference for Bolus	513.657,6	88.427,4	-35.464,5	10.316,4	-20.169,6	**556.767**
%	*252,83%*	*325,39%*	*-71,82%*	*30,16%*	*-99,44%*	***166,59%***

This table shows that **direct costs and benefits are not balanced all along the chain**. **Costs,** which are preparatory, equipment (transponders and readers) costs, **are mainly supported by the farmers when benefits**, in case of full valorisation of the electronic device (early e-reading at farm gate's level), **are for downstream actors** e.g. markets & assembly centers and slaughterhouses. Additionally, CAs profit from the fact that all data can be automatically computerised, reducing labour costs.

The study has been able to demonstrate that **additional benefits would occur when the electronic device is also used for management purposes such as in dairy and fattening farms** where automation is in place for controlling milk production or/and feed consumption.

Official's controls activities could, also, benefit from EID in case inspectors are equipped with readers.

This **unbalanced distribution of costs and benefits may be considered as an obstacle for the development of the EID technology**. Only a couple of MSs and/or sectors have invested

in pilot studies and field trials to further evaluate EID in specific conditions and to approach this mentioned difficulty.

Most of the interviewees consider that **"OPTION 1: Obligatory" is not the correct approach** as the actual identification system is considered as efficient and that the sectors are economically suffering.

The **"OPTION 3: Status Quo" may be considered but** as standards are not defined in the actual legislation, **considering this option may lead** to having different MSs and/or different sectors with different standards leading **to harmonisation and intra-community trade issues**.

The **"OPTION 2B: Voluntary at EU level and voluntary at MS level"** is not considered as a valuable option by most of the interviewees as it may result in the establishment of 2 different systems, and ultimately 2 different markets **leading to confusions at the market place with possible impacts on the efficiency of the actual traceability system**.

The change in the identification system can be best introduced on a voluntary basis (OPTION 2A) at European level. At MS level, it is up to the single Member State to decide, if it wants to introduce the change (mandatory EID after a transitional period) by law or not. This option encourages substantial public and private financial investment as there are both public and private benefits and responsibilities associated with EID. EU Member States have very different farming practices and sector organisations and for these reasons, we recommend that it is up to each Member State to work collaboratively with all chain actors to identify added values of EID and to secure its acceptation.

In conclusion, even if electronic identification is still associated with higher costs compared to conventional identification, it has been demonstrated that benefits occur in specific business cases. It is only when considering regulatory and business benefits together that EID has a chance to be accepted by the actors.

INTRODUCTION

Regulation (EC) No 1760/2000 of the European Parliament and of the Council of 17 July 2000 establishes harmonised rules for the identification and registration of bovine animals and labelling of beef and beef products and repealing Council Regulation (EC) No 820/97. Council Regulation (EC) No 911/2004 of 29 April 2004 implementing Regulation (EC) No 1760/2000 of the European Parliament and the Council addresses implementation as regards to ear tags, passports and holding registers.

Existing legislation on bovine identification includes the elements "double ear tags", "holding register", "cattle-passport" and "computerised database" but does not take into consideration the latest technological development in the field of RFID. Animal keepers who want to use RFID can do so; however this would not be part of the official system of identification and registration.

Electronic identification is already part of the identification systems for ovine and caprine animals (Regulation (EC) No 21/2004), *equidae* (Regulation (EC) No 504/2008) and pet animals (Regulation (EC) No 998/2003).

Numerous research projects, including the Commission large scale IDEA project, have demonstrated that in principle, the use of electronic identifiers can deliver a substantial improvement in animal identification systems[2] and therefore, the European Commission wishes, now, to carry out an analysis on the introduction of electronic identification (EID) as official method to identify bovine animals (from birth to slaughter) within the entire EU.

For this purpose DG SANCO has commissioned the Food Chain Evaluation Consortium (FCEC) to carry out this analysis in the context of the ongoing Evaluation Framework Contract for Lot 3 (Food Chain). The study was conducted on behalf of the FCEC by Arcadia International with the support of Van Dijk Management Consultants.

1. OBJECTIVES

The general purpose of the study is to analyse the technical feasibility and the associated costs of the introduction of EID for bovine animals within the legal framework of regulation (EC) No 1760/2000. The analysis takes into consideration the objectives set in the EU legislation and the strategic aims and objectives set out in the Commission Communication on a new Animal Health Strategy for the EU in relation to animal traceability.

The analysis of the technical feasibility (cf. SECTION 2) describes the recent technological developments in the field of RFID and compares possible available technical solutions by listing advantages and disadvantages of each of them. This section takes also into account existing standards used for other species (ISO) and analyses their accuracy to the bovine

[2] Report to the Council and the European Parliament on the possibility of introduction of electronic identification for bovine animals (COM(2005)9)

sector. It analyses to what extend a specific RFID technology should be favoured or excluded, to what extend it is necessary to harmonise technical criteria at EU level, how EID would influence existing identification systems, and if there are elements of multi-purpose use that need to be considered.

The cost analysis focuses on the necessary investments (identifiers, applicators, reading equipment, local IT systems, etc…) and the impact on labour costs (working time, reading accuracy, etc…). The study evaluates advantages and disadvantages, and presents costs and benefits for the all different actors in the production chain from birth to slaughter e.g. small breeders (< 20 heads), big breeders (> 20 heads), markets & assembly centers and slaughterhouses as well as the competent authorities and for each of the 3 main options as defined below:

OPTION 1: OBLIGATORY (or "compulsory") regime

Each bovine animal is to be identified by one conventional visible ear tag AND one electronic identifier;

OPTION 2: VOLUNTARY regime; segmented in the following sub-options

OPTION 2A: Electronic identification is voluntary at EU level, and **individual Member State has the possibility to opt for the obligatory (or "compulsory") regime**

- In case the Member State opts for the *obligatory regime*, the same obligation as under OPTION 1 is applicable in that Member State;
- In case the Member State opts for the *voluntary regime*, bovine animals can then be identified by:
    1. two conventional ear tags;
    2. one conventional visible ear tag AND one electronic identifier (i.e. an electronic ear tag or a bolus) that has been recognised as an official mean.

OPTION 2B: Electronic identification is voluntary at EU level, and **individual Member State does not have the possibility to opt for the obligatory (or "compulsory") regime**

Under the voluntary regime, bovine animals can be identified by:

1. two conventional ear tags;
2. one conventional visible ear tag AND one electronic identifier (i.e. an electronic ear tag or a bolus) that has been recognised as an official mean.

It is considered that under OPTION 2, the introduction of EID is at least voluntary. This implies that it is not possible for a Member State to opt for the "Do Nothing" scenario under the voluntary regime.

OPTION 3: "DO NOTHING" (OR STATUS QUO) regime

No change to the actual provisions implies that each bovine animal is to be identified by two conventional visible ear tags. If keepers want to use electronic identifiers, this is in addition to the two official ones.

The cost analysis considers, also, the distribution of costs between the parties (both private and public), and presents the impact of the introduction of EID as official method to identify bovine animals on the reduction of administrative burden.

The Commission services will use the conclusions and results of this analysis as a basis for drafting an Impact Assessment if a legislative review is deemed necessary.

2. SCOPE

The scope of the study is the bovine animals sector(s), from birth to death, including all production systems (e.g. cattle, milk production, fattening holdings, etc...). It is important that data are representative of the European market as a whole and the geographical focus has therefore been those Member States with significant markets. During the first discussion, the Steering Group mentioned that the data collection should concern the following Member States: France plus 9 other MS with at least one country from each of the following pairs: DK/NL, UK/IE, ES/IT, PL/HU, EE/LV, DE/AT. As a conclusion of the inception meeting, the following geographical coverage has been validated by the Steering Group, based on a FCEC's proposal:

Table 1: List of MS interviewed for data collection

Member State	Data Collection tool
DE	Face-to-face meeting
DK	Phone in-depth interviews
EE	Phone in-depth interviews
FR	Face-to-face meeting
IE	Face-to-face meeting
IT	Face-to-face meeting
NL	Face-to-face meeting
PL	Phone in-depth interviews
ES	Phone in-depth interviews
UK	Face-to-face meeting

It has to be noticed that the high number of interviewees highlights the interest for the study of all sectors of the production chain, competent authorities included.

3. METHODOLOGY

This section presents the global methodology that was used to collect mainly qualitative data. The methodology to assess quantitative cost and benefits is included in the presentation of the cost model developed by FCEC (Annex 3).

The methodological tools employed in this study were as follows:

- **Desk research and analysis.** This involved the identification and review of available literature and other relevant material including the base legislation, EU discussion papers, stakeholders and Member States responses, EU orientation papers, and any other relevant document (list in Annex 4). This material was supplemented by additional sources made available to us throughout the course of the project by stakeholders and Member State authorities. It should be noted that there is a fair amount of material relating to the issue;

- **European level stakeholder interviews.** In order to gain an oversight of the topic, interviews were undertaken with Commission representatives (DG SANCO and JRC) and with stakeholders through a round table organised by UECBV involving more than 10 persons from different countries and via a meeting with COPA-COGECA representatives. These interviews were also used to identify the main areas of likely impact from the introduction of EID for more detailed consideration during the interviews (see below);

- **Interviews with Competent Authorities and stakeholders.** In accordance with the Terms of Reference, and in order to present information which is representative of the European Union face to face semi-structured interviews were carried out in the UK, Ireland, France, Germany, Italy, and NL. A complete day has been dedicated to each MS, by having a group meeting involving competent authorities and national experts in the morning and a second group meeting with the stakeholders in the following. In-depth interviews have been carried out in four additional MSs (DK, ES, PL and EE) in which, through the support of the CA, stakeholders have been invited in positioning themselves via individual semi-structured interviews (phone or/and Emails). The semi-structured interview guide used was developed following the initial European level interviews and based of additional outcomes of the inception meeting. The study team developed the questionnaire as the interviews progressed to incorporate new lines of enquiry and information already gathered. New insights were thus built into the process as the interviews proceeded. The interviews were carried out and drafted using a common framework. However, the structure of the trade chain differs from one MS to another and as a result; the likely impacts of the introduction of EID also tend to differ. Differences in the emphasis between the interviews reflect this;

- **Quantitative questionnaire** sent to competent authorities in order to collect accurate statistics on bovine population (see Annex 5). Twenty one MSs did return the questionnaire filled in.

The research was carried out between October 2008 and the end of February 2009. This was a quite comfortable timescale giving time to any stakeholders to complete their input via Email after the initial interviews. It has to be noticed that an extra meeting with the Steering Group took place to present and validate the cost model developed and the assumptions taken by the FCEC.

SECTION 1. UNDERSTANDING OF THE EU CONCEPT OF ANIMAL TRACEABILITY, OF ANIMAL TRACEABILITY IN THE BOVINE SECTOR AND THE OBJECTIVES IN RELATION TO EID

Traceability means the ability to track any food, feed, food-producing animal or substance that will be used for consumption, through all stages of production, processing and distribution (from the farm to the fork). The EU's General Food Law that entered into force in 2002 made traceability compulsory for all food and feed businesses. It requires that all food and feed operators implement special traceability systems. They must be able to identify where their products have come from and where they are going (one step back and one step forward) and to promptly provide this information to the CAs on request.

Already in April 1997, in response to the BSE crisis, the Council of the European Union implemented a system of permanent identification of individual bovine animals enabling reliable traceability from birth to death. The Council Regulation (EC) No 820/97 implemented by January 1, 2000 a regime of individual identification of cattle by means of:

1) **Individual animal identification** from birth until harvest (and in some cases until purchase by end-users);
2) **Animal movement records** that trace animals as they are transported and identify both the location of origin and destination;
3) **Animal termination records** that document the location of each animal's death and the cause; and
4) **A central database** that is able to quickly trace animals, identify cohorts in the case of disease, and possibly provide valuable management tools for producers.

On August 14, 2000, subsequent Regulation (EC) No 1760/2000 of the European Parliament and of the Council did enter into force. The objectives are threefold:

1) **The localisation and tracing of animals to veterinary purposes** leading to the effective control and eradication of animal diseases, particularly BSE and FMD;
2) **The traceability of beef for public health reasons**; and
3) **To assist with the management and supervision of certain Community aid schemes** in the field of agriculture such as livestock premiums as part of the Common Agricultural Policy (CAP) subsidy schemes.

Benefits of identification and traceability are today well identified and can be summarised as follows:

- Animal health including zoonoses;
- Disease prevention and control;
- Food safety and food quality;
- Trade;
- Preventing fraud;

- Genetic improvement;
- Animal production and distribution management efficiency; and
- Crisis management (ability of national authorities to respond rapidly to disease outbreaks and food safety incidents by identifying the source of problems).

The current identification and traceability regulation is perceived as being efficient by most of the stakeholders and answers to the actual policy objectives but can be improved. The FVO Overview Report 9505/2003[3] highlights some operational deficiencies such as e.g. incorrect identification, delays in marking young animals, delays in registering the movements in the national databases, national database for registration of bovine animals not fully operational at the time of the mission, and additional weaknesses in particular in the area of recording animal movements through the markets & assembly centers involved. Finally it has to be mentioned that a lot of paperwork is still involved, sensitive to human mistake.

Experience gained by several countries via field-trials or pilot projects and the results of the large-scale research project IDEA are additional key elements in the fact that the Action Plan of the Animal Health Strategy considers electronic identification of bovine animals as a possible improvement of the existing EU legislation, even if already mentioned before (Article 4(7) of Regulation (EC) No 1760/2000). This approach is also coherent with the objective of replacing paper documents with electronic data as presented in the new Animal Health Strategy (e.g. passport).

Introduction of EID can help to reduce typing mistakes as it allows a more accurate reading than with classical ear tags, to keep holding registers up-to-date, to secure registration of movements within the 7 days period as required by the EU legislation. The main economic advantage of EID is based on the e-reading of the electronic identifier to transform physical information to electronic (digitalised) information at very early stage (when tagging) and then the full usage of these e-data for recording and transfer.

If these benefits are recognized by most of stakeholders, interviewees have expressed the difficulty of implementing EID based on the fact that it may be considered that most of benefits will profit to the downstream actors (markets & assembly centers and slaughterhouses) when additional costs are for keepers (upstream) in buying electronic identifiers and readers. These points are further presented in SECTIONS 3 to 5.

[3] DG(SANCO)/9505/2003: Overview report of a series of missions carried out in all member states during 2002 in order to evaluate the operation of controls over the traceability and labelling of beef and minced beef.

SECTION 2. TECHNICAL FEASIBILITY STUDY

All bovine animals on a holding shall be identified by two ear tags that have been approved by the competent authority based on Regulation (EC) No 1760/2000 and Regulation (EC) No 911/2004. These ear tags shall be applied to each ear within 20 days maximum after birth. An animal (that has passed veterinary tests) imported from a third country shall also receive approved tags within 20 days maximum (application of tags is not necessary if destination is a slaughterhouse and if the animal is slaughtered within 20 days). Original identification shall be linked to allocated identification in a computerised database or register.

Animals from another Member State shall retain their ear tags when imported. Ear tags may not be removed or replaced without the permission of the competent authority. The allocation, distribution and application are determined by the competent authority.

The ear tag sets shall be flexible plastic, tamper proof, not reusable, animal friendly, and have non-removable inscriptions. First tag shall be 45x55 mm with > 5 mm characters size minimum. The tag set consists of two parts: a male part and a female part. Each part of the ear tag shall contain the name/log of the competent authority, has a two letter country code and has an ID code of 12 digits maximum (optionally a bar code can be printed on the tag).

The second ear tag set can be from other material and additional information is possible. A competent authority has the possibility of allowing the use of an electronic identification in combination with the second ear tag.

2.1. RADIO FREQUENCY IDENTIFICATION

Radio Frequency Identification (RFID) is based upon passive tags (without a battery), called transponders, with an unique identification number. Transponders have an antenna, an integrated circuit (IC) with an integrated resonance capacitor and the HDX (see next paragraph) transponders have an additional capacitor for storing energy. Transponders do not have an own power source so the tags always have to be powered externally. The transponder antenna picks up energy when it is positioned in the electromagnetic field of a reader. Subsequently the transponder uses the antenna for transmitting the information programmed in the IC. The information is received by the reader. A transponder receives energy and responds, a reader (technical more correct name: transceiver) transmits energy and receives information. The unique transponder number is a link to information of the product or animal e.g. inside a database. Transponders always have an (unique) identification number, advanced transponders additionally have the possibility of storing information.

The RFID technology can be used at different frequencies. Each RFID frequency range (LF: < 135kHz, RF: 13,56 MHz, UHF: 862 – 915 MHz, Microwave: 2,45 GHz and 5,8 GHz) meets specific operational considerations of performance, tag form factors and cost. Low frequencies can penetrate almost all materials while not being absorbed. In this range, however, the achievable operating distance is limited. On the other hand microwave allows longer distances while penetration of objects is reduced.

For animal identification purposes LF technology is always used as the penetration of the signal through living tissue is an important issue. This is important for bolus and injectable transponders but it is also relevant for ear tag transponders, because there are possible situations when body parts of the animal can be in between the reader and the tag to be read. The reading range should be sufficient so that if reader and transponder are close to each other information is exchanged, but on the other hand the reading distance should be limited so that the risk of reading a transponder of another animal is eliminated.
RF and UHF are mainly used for item management. Advantages of RF and UHF are the high reading distance and the possibility of reading tag numbers when having several tags present in the field of the reader. Some publications claim that RF and UHF are also suitable for animal identification purposes.

The possibilities of using LF, RF and UHF for bovine animal identification were discussed with RFID manufacturers (supplying LF, RF and UHF products) and RFID experts were consulted.

2.1.1. RFID technologies

There are two different transponder technologies available:

- Full duplex (FDX);
- Half duplex (HDX).

The main difference between FDX and HDX is the moment of information exchange. The FDX transponder is transmitting information when the field of the reader is activated, while the (capacitors of the) HDX transponder is charged with energy during this phase. When the field of the reader is switched off the information of the HDX transponders is transmitted.

2.1.2. LF identification

LF identification is suitable for animal application because LF signals are not influenced by body tissue and the achievable reading distances meet the animal RFID requirements. The use of LF identification animal RFID is standardised at worldwide level (ISO 11784 and ISO 11785).

Official livestock schemes currently implemented with ISO 11784 and ISO 11785 compliant equipment include as for examples (not complete list):

- Australia (1998) - cattle;
- Scrapie plan UK (2002) - sheep;
- Cyprus (2004) - sheep;
- Canada (2002) - cattle;
- Botswana (1997) - cattle;
- Uruguay (2005) - cattle;
- Spain (2005) - sheep;
- Italy regional:
  - Aosta (1998) - sheep & cattle;
  - Sicily (2005) - sheep & cattle;
  - Sardinia (2005) - sheep & cattle.

Where official schemes are in place farmers have learned that the technology is an excellent tool for improving their farm management and on-farm automation. Also in countries not having official schemes farmers are, for the above reasons, voluntarily using ISO 11784 and 11785 compliant RFID equipment. Globally, over 100 million livestock animals have been identified with ISO 11784 and 11785 compliant RFID tags for either official (80%) or on farm use.

Only one ISO 11785 transponder of the same technology (FDX or HDX) can be read at the same time (e.g. if two FDX transponders are present in the field of a reader then both transponders will be activated). The signal of the transponders will interfere (collisions), resulting in a situation where none of the tags can be read. For HDX transponders the situation is the same. In the advanced transponder standards ISO 14223-1..3 an anti collisions mechanism is included (see 2.1.4).

2.1.3. RF/UHF identification

The RF/UHF technology has some advantages. But these advantages are in most cases related to a specific application and are not relevant for all other applications. The nuances related to the claimed RF/UHF technology advantages are:

Low cost
Low cost RF/UHF transponders are widely used for identifying products such as pallets. In a lot of these applications one time use low quality RF or UHF tags are used. These tags can have a low cost antenna. The non-hostile environment makes also the use of low quality packaging possible. If these tags should be made suitable for animal applications then the quality of the antenna and the connection between antenna and integrated circuit should be improved. The packaging should be improved for protecting the transponder for the hostile environment. These improvements will result in a price comparable to the price of LF animal identification products.

Higher reading distance
The higher reading distances can be achieved with an big antenna surface. Using such big antenna in animal application is expected to have a negative impact on the loss rates of the tags. The size of the antenna of the RF/UHF transponders can be reduced to e.g. 30 mm, but the reduced antenna would also reduce the reading distance that can be achieved. Under ideal circumstances it is expected that reading distances of 1 m are achievable with transponder antenna sizes of 30 mm.

Possibility of anti collision
In the situation when two or more conventional LF transponders are positioned in the field of a reader all transponders will start responding at the same time (collisions) resulting in a situation where it is possible that none of the transponders are read by the reader. In anti collision mode transponders have a number of time frames available for responding (e.g. 16). Each transponder responds in a random time frame in a way that the chance of collisions is reduced. If a reader still detects collisions there is a possibility of selecting a subset of the transponders in the field of the readers (e.g. only transponders with an even number are allowed to select a time frame). This anti collision mechanism is implemented in a standard way in the RF/UHF technology.

The main disadvantages of the RF/UHF technology are:

Moisture environment
The reading performance of the RF/UHF transponders can strongly be reduced by a humid environment, e.g. wet manure sticking to the RF/UHF ear tag transponder. The application of the transponder as an injectable or bolus is not possible because of the impact of humid body tissue.

Reflections
The UHF technology is sensitive for reflections (e.g. caused by metal gates). Due to this it can happen that a tag at some distance of the reader is identified while a bad positioned tag closer to the reader is not identified. This can lead to a mismatch between the actual cow number and the number read by a reader. Shielding the antennas can reduce this risk but this will make the equipment more expensive. A general remark is that the RF/UHF readers are more complex and so more expensive than LF readers.

Other disadvantages of the RF/UHF technology:
- There are no worldwide approved standards available for animal identification with RF/UHF technology;
- The use of RF/UHF is not harmonised worldwide. The technology can switch between frequency bands impacting negatively the reading performance;
- Readers should be synchronised when more than one reader is used within an area of 1 km^2;
- Only very limited experience with RF/UHF animal identification is available.

In conclusion, the RF/UHF transponder technology has not been proven to be suitable for animal identification. This technology, which is not standardised worldwide, is only applicable as ear tag transponder not as bolus or injectable. The environment has a strong impact on the reading performance of RF/UHF technology. The anti collision mechanism is also available in the advanced LF transponder technology. Transponder will be on almost the same price level as LF transponders. The price of the readers will be significantly higher than the readers used for LF transponders.

2.1.4. Advanced LF transponders

Advanced LF transponders are LF transponders with the following additional feature of storing information in the transponder memory and with the possibility of anti collision.
The stored information can be locked (write once, read many) and it is also possible to protect the information with a password. The advanced LF transponders have the possibility of anti-collision. That means that if there are more transponders in the field of the reader a mode can be activated by the reader where the transponders are read one by one. The anti collision mechanism is time consuming what makes this method a little less suitable for dynamic reading conditions (e.g. group of quick moving small animals).

The advanced LF transponders are compatible with non advanced LF readers, so the advanced LF transponders can be read with readers intent for reading non advanced LF transponders.

If a user wants to benefit from the advanced features of the advanced LF transponder a dedicated reader shall be used. An advanced LF transponder reader will be more costly because it is more complex than a non advanced LF transponder reader. The integrated circuit used for advanced LF transponders has the same production costs as the integrated circuit of conventional transponders. Actually most IC manufacturers will probably use the same IC for both transponder types. In case of non advanced use a number of features will be disabled. There is a small cost difference between the advanced IC and the non advanced IC, because for non advanced applications the advanced part of the IC is not tested. This will result in a small (< 5%) price difference for the transponder user.

The anti collision mode of the advanced LF transponders will only work with populations of advanced LF transponders. It will not work in a mixed population of advanced and non advanced LF transponders, because the responding of the non advanced LF transponder cannot be switched of.

Stockholders can benefit from the possibilities that come available the advanced LF transponders. The anti collision mechanism is not necessary when all animals have to be strictly separated while reading ID codes (e.g. when loading a truck). The memory makes possible to store information on the transponder (so all information is available even if there is no online connection with a database).

It is recommended to reference the advanced transponders as being obligatory. The use of the advanced transponder technology will only have very limited impact on the price of the transponders. Users that do not want to use the advanced transponder functionality can use non advanced LF readers while users that do want to use the advanced transponders functionality are able to do so to a full extent.

2.1.5. Readers

The RFID readers have to combine two functions: 1) the energy transport from the reader to the transponder and 2) the information transport from the transponder to the reader. The transponder modulates the ID code on the RFID signal. The reader demodulates the bit stream from the RFID signal.

Handheld readers
A reader of the handheld type is during the reading of the transponder positioned in close distance to the (expected) transponder position. In most cases the reader has to be activated by pushing a button. The reader remains activated during a certain period or as long as the user pushes the button. The readers have a display to display the ID code of the animal, although some readers have only a signal light that flashes when a transponder code is read. A handheld reader can have a memory function for storing the ID codes that have been read as well as sophisticated menus for adding information to an ID code. The information can be transferred offline e.g. by a serial line or USB or online with Bluetooth connection. The device is always operated by a battery.

Stationary readers
Stationary readers are installed on a fixed position e.g. in a slaughterhouse. The stationary readers have in most cases a connection with a power source and a wired connection to a

computer network. Most of stationary readers have a signal light that flashes when reading an ID code but do not have a display. The antenna of the reader has to be positioned in such a way that the transponders of the moving animals are read. Sometimes the antenna is split into two parts, with one part installed on each side of a pass way. Measures have to be taken to prevent that more than one transponder can be in the antenna field of the reader at the same time. The specific conditions in slaughterhouses (e.g. presence of high amount of metal, interfaces due to the various devices used) apparently influence the performance of this type of readers. No concrete data has been collected to validate this hypothesis.

Portable readers
A portable reader is used as a stationary reader, but the portable reader can easily be moved to another location.

2.2. ANIMAL IDENTIFICATION STANDARDISATION

In close cooperation with the manufacturers of RFID technology and RFID user group organisations ISO has developed standards for animal identification. Before being published the standards have to be approved by national standardisation organisations. The development of a standard takes in most cases several years. Each standard is systematically reviewed every 5 years based on formal procedures available for amending these standards.

The animal identification ISO 11784, ISO 11785 and ISO 14223-1..3 standards allow a worldwide trade of animals and the exchange of animal identification related information possible.

The ISO 24631-1..4 test procedures help users to select the right products for their applications by making well defined test results available to all interested parties. This will speed up further introduction of electronic devices, encourage manufacturers to improve on performance, and reduce the costs for separate tests in multiple countries. The ISO 24631-6 safeguards the risk of misinterpretation of animal identification information.

A new work item has been initiated for standardising the wired synchronisation of static readers, making the undisturbed use of several readers on one location possible.

ISO develops international standards, but does not conduct any conformance testing. Whenever required for ensuring the effective use of specific standards ISO designates a competent body to serve as a maintenance agency or registration authority. In the case of the series of standards on radio frequency identification for animals ISO has designated the Rome-based International Committee on Animal Recording (ICAR) as the registration authority (RA). The responsibilities of the RA includes the publishing of test reports on its website (www.icar.org).

The standards are applicable for all animals, so not only for livestock but also for companion animals, zoo animals, endangered species, wild life and fishes.

2.2.1. Standards for animal RFID

The following standards are available for non advanced LF animal identification:

ISO 11784: Radio frequency identification of animals - code structure
The code structure of the transponders is divided into a number of fields:

- Animal bit: indicating if the transponder is intended for animal identification purposes;
- Country code: a 3 digit number referring to the unique ISO 3166 country number (000-899). The use of country coded transponders is restricted to countries that have a competent authority responsible for the registration and granting of ID-codes. It is the responsibility of the competent authority to maintain the uniqueness of the numbers. Countries without competent authority shall not use transponders with a country code. In these countries so called manufacturer coded transponders (900-998) shall be used. The manufacturer of the transponders is in this case responsible for maintaining unique ID codes;
- Identification code: a 12 digit number that is in combination with the country/ manufacturer code unique worldwide for all animals. The idea of the ISO 11784 standard is that the number itself should not carry any information (e.g. like farm number, breeding organisation or region code), because this leads to inefficient use of numbers. Information in relation to the animal shall be stored in databases;
- Retag counter: in some cases an animal loses the tag or the tag does not function anymore. In this case the owner of the animal has the possibility of retagging the animal with the same ID code. The retagging with the same ID code shall be registered in the database and also in the transponder. When issuing a new ID code the retagging number shall be set to '0'. At every retagging the retag counter shall be incremented. The retag counter offers 7 retagging possibilities. In case of any further losses, a new number shall be granted to the animal. The use of retagging is only allowed in combination with country coded transponders. In case of a manufacturer code, the user information field should be set to '0';
- User information field: The use of the user information field is only allowed in combination with the country code. The 2 digits field shall be set to '00' in case of a manufacturer coded transponder. When used in combination with the country code the code of the user information field should be coded based on the specifications of the competent authority;
- Trailer bit: this bit shall be set in case information is written in the trailer of the transponder code, otherwise this bit shall be '0';
- RUDI-bit: this bit shall be set if a transponder is of the advanced LF transponder type, in case of a non advanced LF transponder the bit shall be '0';
- Reserved field: This field is reserved for future use, all bits in this field should be set to '0'.

ISO 11785: Radio frequency identification of animals – air interface.
The air interface allows the use of two different transponder types: full duplex (FDX) and half duplex (HDX). The main difference between FDX and HDX is the moment of information exchange (see 1.2.1). The air interface is standardised in such a way that reading possibilities for HDX and FDX transponders are balanced with a so called dual adaptive protocol. Based upon the situation the listening (reading of the ID code) period for a certain technology (FDX or HDX) can be extended based upon what has been detected by the reader.

In the ISO 11785 standard two synchronisation methods are defined. One synchronisation method for handheld readers and one method for wired synchronisation of static readers. For identification systems it is necessary to synchronise readers when two or more of them are used in physical proximity. HDX transponders convey data using two frequencies, one of which is the same frequency as the activation signal. When two readers operate independently the respective activation signals can occur during the periods when other readers are attempting to receive HDX transponder signals. Consequently readers will mutually interfere with others unless ON and OFF periods of the activation signals are synchronised. Synchronised readers transmit activation signals and receive HDX transponder signals in unison and will not interfere with each other.

2.2.2. Standards for advanced animal RFID

In some application additional transponder features are appreciated. These additional features are the possibility of storing (user) information on the transponders and the possibility of reading information while having several transponders in the field of the reader. For the user it is important that the ID codes of the advanced transponders can also be read with the installed reader base, so the advanced transponders conforming to the ISO 14223 are compatible with ISO 11784 and ISO 11785 standards. This means that when an advanced transponder is activated it will first react with the ISO 11784 ID code using the ISO 11785 air interface protocol.

The following standards for advanced animal RFID are expected to become available soon:

- ISO 14223-1: Radio frequency identification of animals – advanced transponders - part 1: air interface;
- ISO 14223-2: Radio frequency identification of animals – advanced transponders - part 2: code and command structure;
- ISO 14223-1: Radio frequency identification of animals – advanced transponders - part 3: applications.

2.2.3. Test procedures animal RFID

Different RFID equipment is available on the market. It is difficult for users of the technology to understand what equipment suits best their application, therefore standards have been developed for testing animal RFID equipment.

Two different sets of test procedures are available:

- Testing the compliance to the ISO 11784 and ISO 11785 standards of transponders and readers. The granting of the manufacturer codes (see 1.3.1) by a registration authority is described in the conformance test for transponders. The ID codes of all transponders that have been approved for their conformance can be read with the reading equipment that has been approved for its conformance. Therefore a small injectable glass transponder used for identifying e.g. a cat can be read with a big static reader that has been developed for reading cattle in a slaughterhouse;
- Testing the performance of ISO 11784 and ISO 11785 conforming products. The results of the performance procedures can be used to check if a RFID product meets the requirements of a certain application (e.g. a transponder used for identifying a bull should produce a stronger signal than a transponder that is used for identifying a cat).

The following test procedures are available:

- ISO 24631-1: Radio frequency identification of animals – test procedures – part 1 evaluation of conformance of RFID transponders with ISO 11784 and ISO 11785 (including granting and use of a manufacturer code);
- ISO 24631-2: Radio frequency identification of animals – test procedures – part 2 evaluation of conformance of RFID transceivers with ISO 11784 and ISO 11785;
- ISO 24631-3: Radio frequency identification of animals – test procedures – part 3 evaluation of performance of RFID of ISO 11784 and ISO 11785 transponders;
- ISO 24631-4: Radio frequency identification of animals – test procedures – part 4 evaluation of performance of RFID of ISO 11784 and ISO 11785 transceivers.

2.2.4. Data representation

The RFID data can be displayed by using different formats. The use of different formats might lead to misinterpretation of the information. Therefore a standard is developed for the representation of the animal identification information ISO 2631-6: Radio frequency identification of animals - Part 6: Representation of the animal identification information (visual display/data transfer).

This standard mentions how the ISO 11784 information shall be displayed on a reader display and how the ISO 11784 data shall be communicated over a data link. The displaying of country code (manufacturer code) and identification code is obligatory and optionally the retagging counter value, user information (EU: species code) and the information of the additional information fields can be displayed. The format used for the optional parameters is obligatory. The obligatory format for the information communicated over a data contains the following parameters: animal bit, retagging counter, user information, content additional information fields, country or manufacturer code, (national) identification code. Optionally a date and time stamp can be included (format is obligatory).

2.2.5. Stationary reader synchronisation

The wired synchronisation of stationary reader equipment is broadly defined in ISO 11785. The manufacturers of the stationary reading equipment found detailing of the procedure

necessary. The ISO group on animal identification is developing a detailed description of the wired synchronisation. It is expected that a standard (ISO 24631-7) on this subject will become available in 2010.

Synchronisation is needed when two or more readers are used close to each other.

2.3. METHODS OF IDENTIFYING ANIMALS AND READING ID

Ear tag, bolus and injectable are the main types of transponders that are used for animal RFID.

2.3.1. Ear tag

Electronic ear tag transponders are plastic covered transponders that have to be fixed to the ear of the animal by using a onetime use locking mechanism or that have to be attached to an ear tag in such a manner that it cannot be removed from the tag without damaging it.

Farmers already have experience with the application of visual ear tags. There is no special training necessary for the application of ear tag transponders. The loss rate of ear tag transponders (physical + functional loss) is expected to be a little lower or to be on the same level as the visual ear tags (up to ~5% a year). An advantage of the ear tag transponders is that in case of non functioning of the reader or of the transponder, the number can be visually read. The ear tags can already be applied at birth of the animal. Ear tag transponders can fraudulently be exchanged with a different ear tag transponder.

2.3.2. Bolus

Electronic ruminal bolus transponders are transponders placed into a high specific gravity container able to be orally administered to ruminants, which remain permanently in the fore stomach.

Boluses can only be applied when an animal has a certain weight/age (~ one month). New bolus types that might be applicable at a younger age (one week after birth) are being developed, but only limited experience is available with these new transponders. When applied by an unskilled person the application of a bolus may result in wounding the animal (what in some incidental cases can lead to mortality). The bolus transponder can only be read with a reader. The recovery of a bolus transponder during slaughter is more complex than the recovery of an ear tag transponder. It is possible that by mistake an animal receives two boluses, or that the presence of a magnet device to protect against the ingestion of metallic objects may result in non readable ID codes (transponders will respond simultaneously what makes the demodulation of the transponder signal impossible). Identification with bolus transponders is fraud proof because the removal of the bolus transponders is a complex medical intervention.

Finally, benefits can also be realised at the level of welfare aspects when using the bolus as it would reduce the number of ear tag to just one, which would reduce the number of ear inflammations.

2.3.3. Injectable

Injectable transponders are small sized transponders that are encapsulated in a biocompatible and non porous material, e.g. glass and which have to be injected into an animal's body. They are widely used for identifying companion animals and horses (12 mm). These transponders have a very limited reading performance. They are also available in 32 mm size with a reading performance comparable to the reading performance of electronic ear tags and boluses used for cattle identification. The application of the injectable transponders in companion animals and horses is always performed by a specifically trained person (e.g. a veterinarian). Several experiments have been conducted with injectable transponders for livestock identification, but the recovery of the injectable transponders during slaughter was in most cases a serious problem. Identification with injectable transponders is fraud proof because the removal of the injectable transponders is a complex medical intervention.
The IDEA project demonstrated that only 80% of injectable transponders were recovered and only 52% of these could be successfully read after recovery. The extraction process apparently influences the readability[4].
The post slaughter recovery of injectable transponders is problematic and as a result due to potential risk of implantable transponder entering the food chain it is not possible to recommend the injectable.

2.4. PRACTICAL ASPECTS ANIMAL RFID

2.4.1. Numbering of the transponders

As mentioned in 2.2.3. the idea of the ISO 11784 coding is to sequentially number animals with a meaningless number. In the past numbering schemes were proposed where the electronic number was giving some information.

Every country code (and manufacturer code) has the following (national) identification code available for identifying animals:
000.000.000.000 – 274.877.906.943

In 2001 a numbering scheme was proposed for the UK farm animals. This numbering scheme contained a county and a farm number. The proposed structure of the numbering system was the following:

Country code UK: 826	From	To
Other animals than farm animals:	100.000.000.000	274.877.906.943
Farm animals:	000.000.000.000	099.999.999.999
County code:	000.xxx.xxx.xxx	099.xxx.xxx.xxx
Farm code:	xxx.000.0xx.xxx	xxx.999.9xx.xxx
Animal ID:	xxx.xxx.x00.000	xxx.xxx.x99.999

[4] Report to the Commission to the Council and the European Parliament on the possibility of introduction of electronic identification for bovine animals

A big disadvantage of using numbering schemes is that quite some numbers will be left unused, e.g. in the example above a farm with less than 10 animals receives the same amount of numbers as a big farm (100.000 numbers).
Alpha numeric coding of the transponders is not possible. Countries that have a visual alpha numeric coding and that want to use the same numbering visually and electronically shall convert the alpha numeric code into a decimal code (e.g. the 11 digit visual number system of The Netherlands (NL xxx.xxx.xxx) will be translated in a 15 digit electronic numbering system (528 000.xxx.xxx.xxx)). The costs of this adaptation should be a key consideration as in an article published by G. Caja and al [5], it is mentioned that the cost of building, running, and maintaining of a national database for sheep and goats in Spain has been estimated to be the same as the "Simogan" cattle database currently in use, which corresponds to a total of 46 Mio € over a 6,5 year period.
During the interviews, UK CAs' representatives mentioned that adapting the national system for printing numbers on new e-tags has been a cost of 3 Mio £ for sheep and goats. The cost of modifying the database to allow new numbering system to be considered has not been evaluated yet.

2.4.2. Link between visual and electronic numbers

The visual numbers on the ear tags can be the same as (or related to) the electronic transponder numbers or two different numbering systems can be used independent of each other. The two independent numbers are linked to each other in a relational database. The What You See Is What You Get (WYSIWYG) option has the advantage that an animal has only one number.

If a number series is granted to a farmer both numbers have to be programmed. In the past this was a disadvantage because most transponder manufacturers at that time used pre-programmed transponders (the transponder codes were programmed by the integrated circuit manufacturer). Nowadays most manufacturers use One Time Programming (OTP) transponders. The codes of these transponders are programmed (and locked) by the distributor. There is no cost difference between the pre programmed transponders and the OTP transponders.

The use of two different numbers has the advantage that the database link between the two numbers can be used as an additional safety measure (fraud tracing). In case of two different numbers the owner of the animal will only use one of the two numbers, so if the other number is read this number always has to be converted. The visual number is expected to be the preferred one in most cases. Therefore a conversion table must be available in every reader. Readers that can only read and display the transponder code will be worthless in non WYSIWYG schemes.

A large majority of CAs and farmers representatives want to use the WYSIWYG approach, meaning having the same unique number in the electronic identifier and visible on the ear tag.

[5] C. Saa, M.J. Milan, G.Caja and J.J. Ghirardhi (2005). Cost evaluation of the use of conventional and electronic identification and registration systems for the national sheep and goat populations in Spain. J. Anim. Sci. 2005. 1215-1225

This approach would lead to a need to translate the maximum 12 digit visual ear tag numbering system into a 15 digit electronic numbering system.

2.4.3. Use of RFID transponders in dairy automation

On a high percentage of West European farms transponders are used for dairy farm process control. Cows are e.g. identified for concentrate dispensing, milk production recording or cow traffic control in relation to automatic milking. In most cases neck belt transponders are used for this purpose. The technology used can be one that is comparable with the ISO 11784 and ISO 11785 technology or can be a different technology. The neck belt transponders cannot simply be exchanged by e.g. ear tag or bolus RFID.
In most cases the electronics for reading the transponder codes have to be exchanged, for a number of reasons: the technology used for farm management is not compatible to the ISO11784 and ISO 11785 animal identification. The transponders used for farm process control have a big antenna that can produce a strong signal. The signal produced by the RFID tags will be less powerful so more sophisticated readers are necessary for having the same reader performance.

In concentrate boxes the neck belt transponder has two functions: 1) the identification of the animal and 2) the detection of the presence of the head of the animal in the feeding trough for signalling that the animal actually is eating. If an animal does not eat the complete portion that has been distributed then another animal can ‘steel’ the leftover. This can lead to in extreme situations to metabolism disorders for the animal ‘steeling’ the leftover of several animals.

An ear tag transponder can probably combine both of the functions that are mentioned in the previous paragraph, but for a bolus this will be more complex. In cases where there is a mixture of boluses and ear tags the situation will be even more complex.

In milking parlours with milk recording, when introducing RFID different scenarios are applicable for farms that use transponders for farm process control purposes:

- The systems are used next to each other. The farm process control uses the neck belt transponders and the RFID is used only for traceability. There is a small chance that the signal of the neck belt transponder is in some situations disturbed by the RFID tag (bolus or ear tag). Farmers will not have any advantage of the RFID.
- The farm process control uses RFID. The electronics of the readers for farm automation shall in most cases be updated and in some cases the equipment must be repositioned. It is expected that most applications will eventually work if ear tag transponders are used. The use of bolus transponders for farm automation systems has to be investigated, because it is expected that several problems have to be solved before it can be successfully applied. Farmers have to invest to update their readers equipment, after a few year they will benefit from using RFID transponders as they will not have to buy expensive neck belt transponders anymore.

When using ear tag transponders for dairy farm process control uniform high quality transponders are a necessity.

2.4.4. Use of RFID transponders in cattle and veal automation

Cattle and veal farmers do not have a high level of farm automation. Before animals go for slaughter the weight of each animal is recorded, but this data is generally not linked to the ID of the animal. Additional weight recording during the life of the animal is used for bulking animals based on different weight classes, and this procedure is also and in most cases not linked to the ID of the animal.
If all animals are identified with a RFID tag (bolus or ear tag) the weight information can easily be linked with the animal ID. The use of animal ID makes the composition of groups with different weight classes easier and also it is possible to link breeding information to individual animals.

The selection of animals can be automated by using selecting gates equipped with RFID. An online connection with a database will make possible the use of different sources of information for the selection process.

2.4.5. Practical aspects RFID readers

The reader manufacturers expect that both technologies (FDX and HDX) will be marketed for the bovine sector. In situations where both transponder technologies are considered readers that provide the dual adaptive protocol (ISO 11785) shall be used, because this protocol offers equal reading changes for both technologies. The possibility of wireless synchronisation (ISO 11785) of handheld readers is crucial if the handheld equipment is expected to be used in the neighbourhood of static reading equipment (< 10 m). The wired synchronisation (ISO 11785 and ISO 24631-7) is important if several stationary readers are installed within close distance to each other (< 40 m). This is especially of importance if readers of different manufacturers are expected to be used e.g. in slaughterhouses.

It is expected that only farmers that have a larger amount of animals will buy handheld reading equipment, for small farms there is no need to buy the equipment because the use of RFID will not give them any additional benefit. It is expected that only part of big farmers is interested in buying static reading equipment. Markets & assembly centers and slaughterhouses are expected to buy handheld and static equipment. Officials are expected to use handheld equipment or user equipment that is available (e.g. data from static reader that is installed in a slaughterhouse).

There is no need to prescribe the reader equipment that shall be used on farms. If a low budget reader meets the requirements of a farmer, he shall be allowed to use such a device. Requirements are needed for place (e.g. markets and slaughterhouses) were readers of different suppliers are expected to be used. Test procedures for testing the conformance to the ISO 11784 and 11785 standards of reading equipment are available (handheld equipment) or expected to become available (static equipment).

Especially in slaughterhouses there is quite some electromagnetic disturbance. Because of these disturbances special tuning of the reading equipment is necessary. The same stationary equipment can be used as e.g. on farm, but addition installation time is required.

The quality assurance of transponders (conformance to the ISO 11784 and ISO 11785 standards and performance criteria, tested conform to ISO 24631-3) are considered as being crucial for achieving good reading performance.

2.4.6. Practical aspects RFID transponders

The price of the identification devices will strongly depend on how the ordering of the tags is organised within a country. If the tags are tendered on a regional, or even better on a national level, or every independent farmer has to order his own tags has up 40% impact on the price of the tag sets.

The used numbering system does not impact the price of the transponders. OTP transponders will be used and those transponders are programmed when printing the visual ear tag labels.

2.4.7. Approval of RFID products

Approval of the transponder and reader equipment shall be organised in such a way that not every product has to be tested and approved by every EU country. It is preferred to have one registration authority responsible for the registration of the approved equipment (e.g. ISO 24631-1..4) and the results of the different test laboratory shall be accepted by every EU MS.

2.5. CONCLUSIONS

The LF RFID technology is the most suitable technology for identifying bovine animals. Ear tag transponders and bolus transponders are both applicable. The application of a bolus at an age of 20 days or younger is a problem with most of the boluses that are currently used for identifying bovine animals but new bolus types may overcome this difficulty. The use of injectable transponders has to be investigated in relation to the slaughterhouse recovery. The LF animal RFID technology, the testing of the LF RFID technology and the interpretation of the RFID information is standardised at the world level. The use of the RFID transponders for farm automation is beneficial for cattle farming, for dairy farms that already have a high degree of automation there will be no or very limited advantages in switching over to animal RFID. The advanced LF RFID technology have additional features available that can be beneficial for the bovine sector.

SECTION 3. POLICY OPTIONS AND ESTIMATION OF MAIN COST FACTORS

Regulation (EC) No 1760/2000 imposes an identification of individual animals by the mean of "*an ear tag approved by the competent authority, applied to each ear. […] Both ear tags shall bear the same unique identification code, which makes it possible to identify each animal individually together with the holding on which it was born*" (Article 4(1)).

The options considered for this study are related to the modification of the provisions of Art. 4(1) of Regulation (EC) No 1760/2000 as follows:

OPTION 1: OBLIGATORY (or "compulsory") regime

Each bovine animal is to be identified by one conventional visible ear tag AND one electronic identifier (ear tag or bolus)

OPTION 2: VOLUNTARY regime; segmented in the following sub-options

OPTION 2A: Electronic identification is voluntary at EU level, and **individual Member State has the possibility to opt for the obligatory (or "compulsory") regime**

- In case the Member State opts for the obligatory regime, the same obligation as under Option 1 is applicable in that Member State;
- In case the Member State opts for the voluntary regime, bovine animals can then be identified by:
    1. two conventional ear tags;
    2. one conventional visible ear tag and one electronic identifier (i.e. an electronic ear tag or a bolus) that has been recognised as an official mean.

OPTION 2B: Electronic identification is voluntary at EU level, and **individual Member State does not have the possibility to opt for the obligatory (or "compulsory") regime**

Under the voluntary regime, bovine animals can be identified by:

1. two conventional ear tags;
2. one conventional visible ear tag AND one electronic identifier (i.e. an electronic ear tag or a bolus) that has been recognised as an official mean.

It is considered that under OPTION 2, the introduction of EID is at least voluntary. This implies that it is not possible for a Member State to opt for the "Do Nothing" scenario under the voluntary regime.

OPTION 3: "DO NOTHING" (OR STATUS QUO) REGIME (BASELINE)

No change to the actual provisions implies that each bovine animal is to be identified by two conventional visible ear tags. If keepers want to use electronic identifiers, this is in addition to the two official ones.

Our analysis of the cost of the options is based on the scenario that no other provision than the one in Article 4 is being modified in Regulation (EC) No 1760/2000 (e.g. no obligation to e-reading the transponders or to submit information to the national database in an electronic format) or other Regulations for the implementation of Regulation (EC) No 1760/2000.

SECTION 4. ANALYSIS OF IMPACTS

The cost calculations presented in this section will first of all be dealing with the ***cost of regulation*** related to Regulation (EC) No 1760/2000 and other Regulations for the implementation of it. Furthermore, it will also be analysed what ***benefits*** could be obtained by introducing EID and to what extend these benefits are directly related to regulatory obligations or on the other hand related to non-regulatory business process optimisation opportunities. Finally, for each Policy Option, relevant ***qualitative elements*** are integrated in this analysis.

A description of how the Standard Cost Model was implemented is presented in Annex 2. Furthermore, Annex 3 provides a detailed description of all input parameters, intermediary calculations as well as the output of the Excel model that was developed in order to make the calculations presented in this section. As such, only some aggregated tables will be presented in this chapter. Additional elements (e.g. on the choice of the exact parameter values) can however easily be found in the Annexes.

As no other provision than the one in Article 4 would be changed under the policy options considered, the cost of regulation of only 3 out of the 6 required actions under Regulation (EC) No 1760/2000 (cf. Annex 2 on the Standard Cost Model) will change. After all, as the introduction of EID as official method to identify bovine animals does not oblige the actors to do electronic reading, the cost of regulation of the actions 3, 4 and 5 is strictly speaking not impacted by the change in Article 4. However, as it can be expected that stakeholders will want to benefit from possible efficiency gains from electronic identification, these will also be analysed in this section.

Table 2: Identification of the actions of which the cost of regulation will be impacted under the options considered

Types of required action	Cost of regulation impacted by change in Article 4 ?
1. Preparatory actions *- Monitoring of regulation* *- Distribution of information* *- Training*	Yes
2. Tagging (and retagging) of bovine animals	Yes
3. Reading of identifiers and registration	No
4. Transfer of information on read identifyers to the register or database	No
5. Processing of the information received from the sector	No
6. Removal and recuperation of (E)ID material	Yes

In the following paragraphs, the cost of regulation for the 3 actions (i.e. Task 1, Task 2 and Task 6) impacted by the modification in regulation will be presented. Furthermore, it will be analysed if non regulatory benefits, of which the possibility can be considered as an indirect consequence of the introduction of EID, can be identified for the remaining actions (cf. Task 3, Task 4 and Task 5) as well as for other aspects.

4.1. EXPECTED IMPACTS OF POLICY OPTION 1: OBLIGATORY/COMPULSORY

For the evaluation of the impact of choosing POLICY OPTION 1 "Obligatory/Compulsory", both the electronic identification by means of E-ear tags as well as boluses have been considered. More precisely, a cost-benefit analysis has been made for an implementation based on 100% E-ear tags or 100% boluses since it can be assumed[6] that the cost of a mixed situation will correspond to a weighted average of both situations. A distinction is made between the approach by which all bovine animals need to have an electronic identifier within the first year that the new regulation comes into effect and a transitional approach which implies that only new born animals get an electronic identifier.

4.1.1. Cost of regulation

Task 1: Preparatory phase

It is assumed that, in case of a change in the Regulation (EC) No 1760/2000, a minimum of time will be devoted by all actors in order to e.g. study information on the new provisions and provide a minimal training to all people concerned. For the holdings, it was assumed that on average 5 hours per organisation would be required, for the markets & assembly centers and slaughterhouses, this is assumed to be 10 hours. In case of the competent authorities, this is set at 300 hours.

This cost of the preparatory phase fully consists of labour costs. Therefore, it is assumed that this cost is fully taken into account in Year 1 (and thus not considered as an investment that can be depreciated afterwards).

The tables below present the total cost of the preparatory phase for each of the categories of actors. Furthermore, this cost has also been expressed in a cost per organisation.

[6] Provided especially the limited part of the costs related to the specific applicators required for boluses.

Table 3: Total cost of the preparatory phase per Member State and per group of actors

Member States	Total cost (per actor and only in Year 1)				
Task 1A - Monitoring of regulation					
	Holdings	**Markets and assembly centers**	**Slaughterhouses**	**Competent authorities**	**Total**
Total EU 27	**145.735.259 €**	**932.689 €**	**1.629.860 €**	**113.703 €**	**148.411.510 €**
AT	6.817.461 €	18.481 €	675.260 €	6.702 €	**7.517.903 €**
BE	3.136.292 €	7.053 €	13.444 €	7.014 €	**3.163.803 €**
BG	1.195.427 €	270 €	185 €	426 €	**1.196.307 €**
CZ	320.382 €	689 €	5.554 €	1.443 €	**328.067 €**
CY	15.370 €	0 €	106 €	3.075 €	**18.551 €**
DK	2.293.109 €	7.639 €	27.617 €	8.298 €	**2.336.663 €**
EE	141.722 €	153 €	2.750 €	1.308 €	**145.933 €**
FI	1.997.926 €	0 €	8.584 €	6.255 €	**2.012.765 €**
FR	22.798.854 €	270.941 €	56.178 €	6.213 €	**23.132.186 €**
DE	17.367.772 €	174.814 €	202.448 €	7.479 €	**17.752.513 €**
EL	1.304.604 €	2.232 €	11.160 €	3.666 €	**1.321.662 €**
HU	435.600 €	748 €	3.564 €	1.461 €	**441.373 €**
IE	11.437.370 €	21.800 €	45.780 €	7.491 €	**11.512.441 €**
IT	11.207.988 €	207.858 €	355.935 €	6.114 €	**11.777.894 €**
LV	814.420 €	654 €	2.752 €	1.119 €	**818.945 €**
LT	2.168.010 €	0 €	1.831 €	1.038 €	**2.170.879 €**
LU	146.742 €	1.785 €	595 €	8.340 €	**157.462 €**
MT	9.097 €	0 €	79 €	2.655 €	**11.831 €**
NL	3.635.306 €	10.516 €	48.869 €	6.582 €	**3.701.274 €**
PL	15.765.807 €	9.175 €	5.707 €	1.503 €	**15.782.192 €**
PT	1.631.669 €	1.252 €	2.191 €	2.856 €	**1.637.968 €**
RO	15.962.564 €	1.794 €	1.495 €	1.083 €	**15.966.936 €**
SI	1.492.702 €	1.608 €	1.974 €	2.922 €	**1.499.206 €**
SK	252.608 €	2.354 €	4.513 €	828 €	**260.303 €**
ES	7.980.506 €	115.189 €	56.421 €	3.867 €	**8.155.982 €**
SE	2.795.154 €	468 €	14.514 €	6.858 €	**2.816.994 €**
UK	12.610.800 €	75.218 €	80.352 €	7.107 €	**12.773.477 €**

Table 4: Total cost of the preparatory phase per Member State and per individual actor

Member States	Cost per Organisation (per actor and only in Year 1)			
Task 1A - Monitoring of regulation				
	Holdings	**Markets and assembly centers**	**Slaughterhouses**	**Competent authorities**
Average EU 27	**42,88 €**	**165,25 €**	**165,52 €**	**4.211,22 €**
AT	88,85 €	177,70 €	177,70 €	6.702,00 €
BE	110,20 €	220,40 €	220,40 €	7.014,00 €
BG	7,10 €	14,20 €	14,20 €	426,00 €
CZ	22,95 €	45,90 €	45,90 €	1.443,00 €
CY	53,00 €		106,00 €	3.075,00 €
DK	146,90 €	293,80 €	293,80 €	8.298,00 €
EE	19,10 €	38,20 €	38,20 €	1.308,00 €
FI	107,30 €		214,60 €	6.255,00 €
FR	103,65 €	207,30 €	207,30 €	6.213,00 €
DE	102,35 €	204,70 €	204,70 €	7.479,00 €
EL	55,80 €	111,60 €	111,60 €	3.666,00 €
HU	22,00 €	44,00 €	44,00 €	1.461,00 €
IE	109,00 €	218,00 €	218,00 €	7.491,00 €
IT	76,25 €	152,50 €	152,50 €	6.114,00 €
LV	17,20 €	34,40 €	34,40 €	1.119,00 €
LT	16,35 €		32,70 €	1.038,00 €
LU	99,15 €	198,30 €	198,30 €	8.340,00 €
MT	39,55 €		79,10 €	2.655,00 €
NL	103,10 €	206,20 €	206,20 €	6.582,00 €
PL	21,95 €	43,90 €	43,90 €	1.503,00 €
PT	31,30 €	62,60 €	62,60 €	2.856,00 €
RO	14,95 €	29,90 €	29,90 €	1.083,00 €
SI	36,55 €	73,10 €	73,10 €	2.922,00 €
SK	16,35 €	32,70 €	32,70 €	828,00 €
ES	58,65 €	117,30 €	117,30 €	3.867,00 €
SE	117,05 €	234,10 €	234,10 €	6.858,00 €
UK	111,60 €	223,20 €	223,20 €	7.107,00 €

Task 2: Identification (Tagging and Re-tagging)

Based on the cost model parameters as presented in Annexes 1 and 2, the following total yearly costs for the obligatory electronic identification of bovine animals were obtained:

Table 5: Total cost of identifying bovine animals (incl. retagging in case of losses) per technology and scenario

	OPTION 1 : E-Eartag and conventional identifier						OPTION 1 : Bolus and conventional identifier					
	One-off regularisation			Transitional approach			One-off regularisation			Transitional approach		
TOTAL ANNUAL COSTS (in million EUR)												
	Equipment cost	Labour cost	Total cost	Equipment cost	Labour cost	Total cost	Equipment cost	Labour cost	Total cost	Equipment cost	Labour cost	Total cost
Total EU 27	261	132	393	134	67	202	369	142	511	211	64	275
AT	5,92	3,14	**9,05**	3,12	1,66	**4,78**	8,36	3,37	**11,72**	4,86	1,59	**6,45**
BE	6,75	4,97	**11,72**	2,97	2,49	**5,46**	8,35	5,34	**13,69**	3,63	2,36	**5,99**
BG	3,66	0,08	**3,74**	2,80	0,05	**2,85**	7,61	0,09	**7,70**	6,54	0,05	**6,58**
CZ	3,40	0,52	**3,92**	1,48	0,26	**1,74**	4,19	0,56	**4,75**	1,80	0,25	**2,05**
CY	0,14	0,05	**0,19**	0,06	0,03	**0,09**	0,17	0,05	**0,22**	0,07	0,03	**0,09**
DK	4,29	4,27	**8,57**	2,05	2,32	**4,37**	5,25	4,59	**9,84**	2,45	2,24	**4,69**
EE	0,69	0,08	**0,77**	0,36	0,04	**0,40**	0,94	0,09	**1,03**	0,53	0,04	**0,57**
FI	2,46	1,69	**4,15**	1,18	0,87	**2,05**	3,20	1,81	**5,02**	1,60	0,83	**2,44**
FR	51,09	35,38	**86,47**	23,23	18,20	**41,42**	63,24	38,01	**101,24**	28,41	17,38	**45,79**
DE	33,41	22,62	**56,03**	15,28	11,57	**26,86**	41,89	24,30	**66,18**	19,22	11,04	**30,26**
EL	1,92	0,65	**2,57**	0,97	0,33	**1,30**	2,69	0,69	**3,38**	1,49	0,31	**1,80**
HU	1,97	0,27	**2,24**	0,98	0,14	**1,12**	2,67	0,29	**2,96**	1,43	0,13	**1,57**
IE	14,80	10,33	**25,13**	6,53	4,97	**11,51**	19,16	11,10	**30,27**	8,83	4,67	**13,50**
IT	15,78	7,46	**23,24**	7,00	3,48	**10,49**	21,15	8,02	**29,17**	10,18	3,24	**13,42**
LV	1,53	0,12	**1,64**	0,99	0,06	**1,06**	2,71	0,13	**2,84**	2,05	0,06	**2,11**
LT	3,63	0,24	**3,87**	2,53	0,13	**2,66**	6,86	0,25	**7,11**	5,48	0,13	**5,60**
LU	0,49	0,33	**0,81**	0,21	0,16	**0,37**	0,59	0,35	**0,94**	0,25	0,16	**0,40**
MT	0,04	0,01	**0,05**	0,02	0,00	**0,02**	0,05	0,01	**0,06**	0,02	0,00	**0,03**
NL	10,12	7,04	**17,16**	4,52	3,61	**8,13**	12,36	7,56	**19,93**	5,36	3,44	**8,80**
PL	23,52	2,30	**25,82**	14,79	1,16	**15,95**	41,57	2,47	**44,04**	30,67	1,10	**31,77**
PT	4,26	0,81	**5,07**	2,27	0,43	**2,70**	5,96	0,87	**6,82**	3,46	0,42	**3,88**
RO	20,35	0,80	**21,15**	16,40	0,45	**16,85**	44,96	0,86	**45,82**	40,03	0,44	**40,47**
SI	1,62	0,29	**1,91**	0,95	0,14	**1,10**	2,69	0,31	**3,00**	1,85	0,14	**1,99**
SK	1,37	0,14	**1,51**	0,68	0,07	**0,74**	1,89	0,15	**2,04**	1,02	0,07	**1,09**
ES	18,92	7,26	**26,18**	10,59	4,35	**14,94**	24,47	7,79	**32,26**	14,05	4,30	**18,35**
SE	3,96	3,02	**6,98**	1,75	1,48	**3,24**	5,05	3,24	**8,29**	2,29	1,40	**3,68**
UK	24,85	18,37	**43,21**	10,54	8,86	**19,40**	30,91	19,73	**50,64**	13,02	8,33	**21,35**

The costs indicated for the one-off regularisation correspond to the costs incurred in Year 1. After this first year of regularisation, the costs are equal to the ones of the transitional approach.

It can be highlighted that one-off regularisation costs 393 Mio € for E-ear tags (compared to 202 Mio € for the transitional approach) and 511 Mio € for boluses (compared to 275 Mio € for the transitional approach), which is a significant extra cost in Year 1 (about + 90%). This cost has to be balanced with the advantages of not having a transitional period where two (or three: conventional, E-ear tags and boluses) systems are in place leading to possible threats in term of efficiency of the system to the objectives of the policy. The transitional period should be considered by taking into consideration the bovine animal's lifetime that can be more than 8 years.

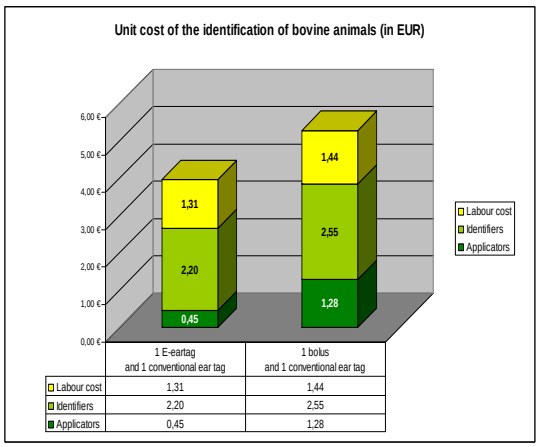
The table below presents the average costs of identifying one bovine animal under the POLICY OPTION 1 (abstraction is made of adding an additional electronic identifier to previously identified animals under the one-off regulation approach).

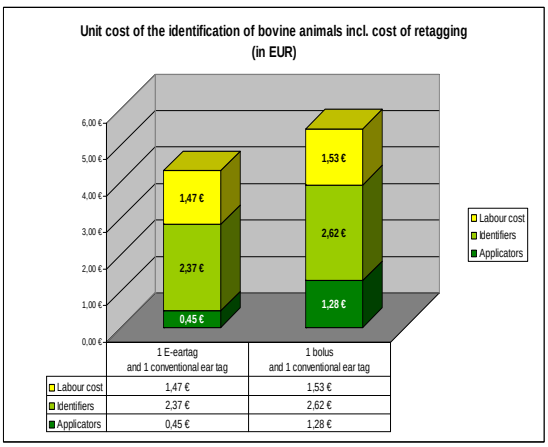
Table 6: Breakdown of the cost of identifying one bovine animal (excl. and incl. cost of re-tagging)

	1 E-ear tag and 1 conventional ear tag	1 bolus and 1 conventional ear tag
Labour cost	**1,47 €**	**1,53 €**
Cost of tagging	*1,31 €*	*1,44 €*
5% retagging of conventional ear tags	*0,09 €*	*0,09 €*
4% retagging of E ear tags	*0,07 €*	
0,30% re-ID with bolus		*0,01 €*
Applicator	**0,45 €**	**1,28 €**
Identifier	**2,37 €**	**2,62 €**
Cost of tagging	*2,20 €*	*2,55 €*
5% retagging of conventional ear tags	*0,06 €*	*0,06 €*
4% retagging of E ear tags	*0,11 €*	
0,30% re-ID with bolus		*0,02 €*
Total (excl. Re-ID)	**3,96 €**	**5,26 €**
Total (incl. Re-ID)	**4,29 €**	**5,43 €**

The high cost of the applicator for boluses has a significant impact on the total cost differences between the two types of electronic identifiers taken into account under OPTION 1.

Graph 1: Comparison of the cost of identifying one bovine animal (excl. and incl. the cost of re-tagging)





When comparing the cost of Task 2 between big and small farms, the cost of the applicator is the only cost that will vary. After all, it is assumed that the cost of the identifiers, as well as the efficient duration to apply an identifier, is not depending on the size of the farm.

The table below presents the cost-volume relationship between the size of the farm and the unit cost for the applicator for both types of identifiers considered in this study:

Table 7: Relation between the unit cost of the applicator and the size of the farm

Size of the farm (in LSU)	10	20	30	50	100	200	500
Reproduction rate	0,85	0,85	0,85	0,85	0,85	0,85	0,85
Number of new born animals to identify	9	17	26	43	85	170	425
Yearly cost of the applicator for tags	12,00 €	12,00 €	12,00 €	12,00 €	12,00 €	12,00 €	12,00 €
Yearly cost of the applicator for boluses	22,00 €	22,00 €	22,00 €	22,00 €	22,00 €	22,00 €	22,00 €
Unit cost of the applicator for tags	**1,33 €**	**0,71 €**	**0,46 €**	**0,28 €**	**0,14 €**	**0,07 €**	**0,03 €**
Unit cost of the applicator for boluses	**2,44 €**	**1,29 €**	**0,85 €**	**0,51 €**	**0,26 €**	**0,13 €**	**0,05 €**

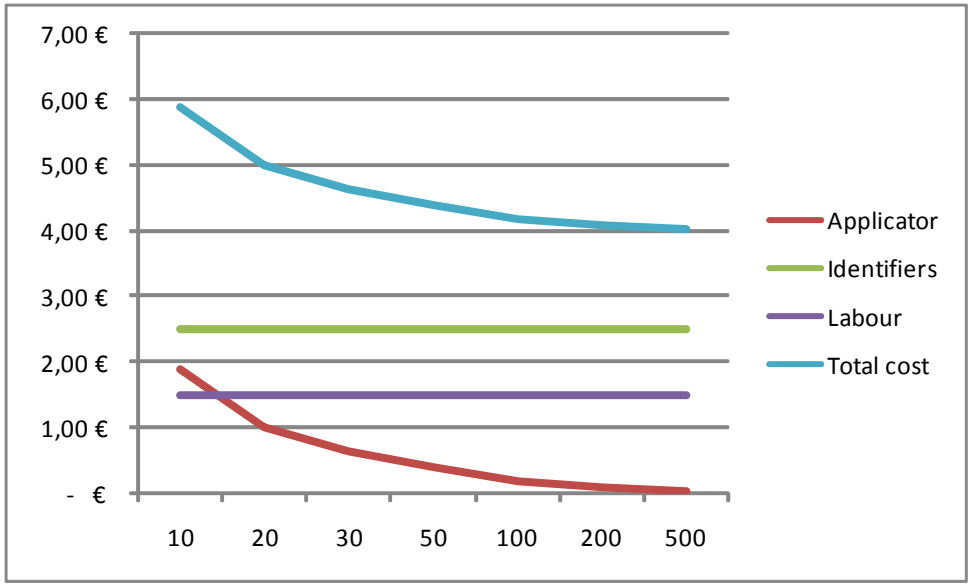
This all leads to the total unit cost of EID presented in the table below:

Table 8: Breakdown of total unit cost for EID depending on the size of the farms (in LSU)

Size of the farm (in LSU)	10	20	30	50	100	200	500
Unit cost *							
Applicator	1,89 €	1,00 €	0,65 €	0,40 €	0,20 €	0,10 €	0,04 €
Identifiers	2,49 €	2,49 €	2,49 €	2,49 €	2,49 €	2,49 €	2,49 €
Labour	1,50 €	1,50 €	1,50 €	1,50 €	1,50 €	1,50 €	1,50 €
Total cost	*5,88 €*	*4,99 €*	*4,64 €*	*4,39 €*	*4,19 €*	*4,09 €*	*4,03 €*

(*) Values presented correspond to situation with of 50% weight for E-ear tags and 50% for boluses

Graph 2: Evolution of unit cost for EID of bovine animals for different sizes of farms (in LSU) (values presented correspond to situation with of 50% weight for E-ear tags and 50% for boluses)



Finally, as it is assumed that all of the identification is performed by the farms, it is not relevant to present the cost of the identification of bovine animals per actor.

Task 6: Removal and recuperation of (E)ID material

The total cost for removal and recuperation of (E)ID material depends on the type of identifier used and is fully linear with the number of animals slaughtered. No distinction is made between the costs of a one-off regularisation and the cost of the transitional approach. After all, for the transitional approach, it is very difficult to make assumptions of what part of the new EID bovine animals will be slaughtered in the consecutive first years of the introduction of EID. Therefore, we have immediately assumed an average ongoing situation after full implementation of EID. This means that it was assumed that the slaughtered animal is always having one conventional ear-tag and one electronic identifier (E-ear tag or bolus).

For the E-ear tags, it was assumed that the same efficient duration is required as for the removal and recuperation a conventional ear tag (i.e. 0,6 minute per tag). As it is more time-consuming to find a bolus, the efficient duration for removing and recuperating a bolus was set at 2 minutes per identifier.

Finally, it was assumed that no specific equipment is required for removing the identifiers.

The regulatory cost of Task 6 is presented below:

Table 9: Total cost and cost per slaughtered animal for the removal and recuperation of the identifiers

Technology	Total cost per year (per technology) in EUR		Technology	Unit cost per slaughtered animal (per technology) in EUR	
	OPTION 1 : E-Eartag	OPTION 1 : Bolus		OPTION 1 : E-Eartag	OPTION 1 : Bolus
Removing of conventional ear tags			Removing of conventional ear tags		
Total EU 27	4.886.946	4.886.946	Total EU 27	0,17	0,17
Removing of E-Ear tags			Removing of E-Ear tags		
Total EU 27	4.886.946	0	Total EU 27	0,17	0,00
Removing of boluses			Removing of boluses		
Total EU27	0	16.289.820	Total EU27	0,00	0,58
Total cost of removing identifiers			Total cost of removing identifiers		
Total EU27	9.773.892	21.176.766	Total EU27	0,35	0,75

4.1.2. Overview of possible benefits and qualitative considerations

Whereas the paragraph 4.1.1. has presented the costs of regulation of the introduction of EID as an official method to identify bovine animals within the European Union, this paragraph will now more broadly consider other impacts we believe worth including in this study. These impacts will be evaluated for all of the 3 tasks that are not directly impacted by the POLICY OPTIONS for modifying Article 4 of the Regulation (EC) No 1760/2000, as well as for the non-regulatory part of Task 1. Other elements are also considered such as benefits for veterinarian acts, official controls. Finally, benefits of the introduction of EID as an official method on dairy and fattening farms will be presented.

Task 1: Preparatory phase – Non-regulatory costs

The costs related to the initial installation of the physical environment, enabling e.g. e-reading, were valued at 3.155 € for the markets & assembly centers and slaughterhouses. Big holdings are equipped with handset readers only and for small holdings, no electronic reading is assumed. Therefore no investment is required during the preparatory phase for these stakeholders. These initial investments are depreciated over 5 years.

They lead to the following total cost per category of actors:

Table 10: Overview of yearly cost related to the depreciation of the initial investment cost for modifying the physical environment

		Option 1: Obligatory
Installation - modification of the physical environment		
(yearly cost - in EUR)		
	Holdings (big breeders)	0,0 €
	Holdings (small breeders)	0,0 €
	Markets & assembly centers	3.561.364,0 €
	Slaughterhouses	6.213.457,0 €
Total		9.774.821,0 €

Task 3: Registration and Reading

The introduction of EID as official method to identify bovine animals does not oblige the actors to perform an electronic reading. By consequence, the costs of regulation related to the reading of IDs for the registration of animals and the movements can be considered the same under all options, i.e. based on "manual reading" (i.e. writing down the IDs on a piece of paper).

It could however be useful to verify e.g. under which circumstances the efficiency gained by electronic reading exceeds the extra costs for EID compared to the use of conventional ear tags.

For each of the actors involved in reading EID, assumptions were taken regarding the reading equipment they dispose off. Furthermore, detailed information on the number of movements and its distribution over the actors in each Member State were collected (cf. Annex 3).

For the farmers, it was assumed that only the big farmers (> 20 heads) have electronic reading equipment (2 handset readers for electronic ear tags or 2 handset readers for boluses; of which each time one is back-up equipment). Furthermore, it was assumed that the markets & assembly centers each have 1 handset reader and 1 static reader for E-ear tags or boluses; slaughterhouses have 2 handset readers and 1 static readers.

Calculations based on the above presented assumptions regarding the equipment that is required for electronic reading, combined with the number of readings required for regulatory purposes, lead to the costs presented in the table below. The number of regulatory readings has been distributed between the big and small holdings *a rato* of the estimated distribution of the livestock on these two categories. This estimation takes into account the weight of the different categories of small holdings (e.g. < 5 LSU, 5-10 LSU, …).

Table 11: Total equipment and labour cost for regulatory readings

EQUIPMENT (Total annual cost in EUR)			
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 1
	e-Reading	*e-Reading*	*Manual reading*
Big breeders			
Total EU 27	281.894.550	281.894.550	0
Small breeders			
Total EU 27	0	0	0
Markets			
Total EU 27	4.898.992	4.898.992	0
Slaughterhouses			
Total EU 27	10.235.957	10.235.957	0
Total equipment cost per year			
Total EU 27	297.029.499	297.029.499	0

LABOUR COSTS (Total annual cost in EUR)			
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 1
	e-Reading	*e-Reading*	*Manual reading*
Big breeders			
Total EU 27	4.151.249	4.981.499	33.209.990
Small breeders			
Total EU 27	2.252.855	2.252.855	2.252.855
Markets			
Total EU 27	3.061.362	3.225.952	32.917.876
Slaughterhouses			
Total EU 27	1.514.953	1.596.402	16.289.820
Total labour cost per year			
Total EU 27	10.980.419	12.056.708	84.670.541

Based on these separate calculations for the equipment and labour cost, it can be evaluated if the efficiency gains of e-reading is neutralising the additional investment in reading equipment.

Therefore, the total cost of the e-reading has been compared to the manual reading:

Table 12: Comparison of total cost of e-reading compared to manual reading

TOTAL COST (Equipment + Labour)				Delta compared to manual reading	
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 1	OPTION 1 : E-Eartag	OPTION 1 : Bolus
	e-Reading	*e-Reading*	*Manual reading*		
	(1)	*(2)*	*(3)*	*= (1) - (3)*	*= (2) - (3)*
Big breeders					
Total EU 27	286.045.799	286.876.049	33.209.990	252.835.809	253.666.058
Small breeders					
Total EU 27	2.252.855	2.252.855	2.252.855	0	0
Markets					
Total EU 27	7.960.354	8.124.944	32.917.876	-24.957.522	-24.792.932
Slaughterhouses					
Total EU 27	11.750.910	11.832.359	16.289.820	-4.538.910	-4.457.461
Total labour and equipment cost per year					
Total EU 27	308.009.918	309.086.206	84.670.541	223.339.377	224.415.665

In general for the EU 27, it can be concluded that the big breeders are investing much more than what there is to gain by optimising the regulatory readings. Markets on the other hand have a direct positive return on the investment in e-reading equipment. Finally, slaughterhouses are also investing more than there is to gain when moving to e-reading for the regulatory readings.

When we take a look at the information at the Member State level (presented in Annex 3), it becomes clear that the situation for the big breeders is the same in all Member States. The positive return for the markets can be observed in most Member States, exceptions such as in Spain, Denmark or Italy are explained by the market structure: in these countries, there are relatively few movements per market. The situation for the slaughterhouses per Member State is much more diverse. The average size of the slaughterhouses has a very strong impact on the profitability of the investments of e-reading. As a general rule, it can be concluded that for slaughterhouses in which more than 3.000 animals are slaughtered yearly, the investment in e-reading equipment is cost-efficient. Only exception to this rule is Lithuania which is however characterised by labour costs that are below the EU average.

Finally, for the big breeders, it was analysed what the number of extra non-regulatory readings per year should be in order to make the investment in e-reading equipment profitable, abstraction made of all other tasks than Task 3. Therefore, based on the EU 27 average labour cost, it was first determined what the cost of time saving per reading is:

Table 13: Time and cost saving per reading (EU average)

Time and cost saving per reading (Big breeders)		
	OPTION 1 : E-Eartag	**OPTION 1 : Bolus**
Manual reading (min)	2,00	2,00
E-reading (min)	0,25	0,30
Time saving per reading (min)	1,75	1,7
Average EU labour cost	15,67 €	15,67 €
Cost saving per reading	**0,46 €**	**0,44 €**

As the labour cost varies strongly in the EU 27, calculations were also made at the individual Member State level. The delta of the cost compared to manual reading (cf. Table 12) can now be divided by the cost saving per reading in order to obtain the number of additional non-regulatory readings that are required to come to the break-even point of the investment.

Finally, this number of additional non-regulatory readings can be compared to total livestock of the big holdings so that the feasibility of obtaining the break-even point can be evaluated.

Table 14: Number of additional non-regulatory readings required neutralising the investment in the reading equipment

	OPTION 1 : E-Eartag				OPTION 1 : Bolus			
	Value of time saved per reading (in EUR)	*Number of additional readings required to obtain break-even*	*LSU of big breeders*	*Number of additional reading per LSU of big breeders*	*Value of time saved per reading (in EUR)*	*Number of additional readings required to obtain break-even*	*LSU of big breeders*	*Number of additional reading per LSU of big breeders*
Big breeders		*= (1)*	*= (2)*	*= (1) / (2)*		*= (3)*	*= (4)*	*= (3) / (4)*
Total EU 27	**0,46**	**553.230.051**	**79.409.560,00**	**6,97**	**0,44**	**571.371.624**	**79.409.560**	**7,20**
AT	0,52	18.273.124	1.553.584,00	11,76	0,50	18.845.377	1.553.584	12,13
BE	0,64	9.619.096	2.635.400,00	3,65	0,62	9.953.052	2.635.400	3,78
BG	0,04	28.958.175	211.000,00	137,24	0,04	29.813.138	211.000	141,29
CZ	0,13	11.041.421	1.309.200,00	8,43	0,13	11.386.550	1.309.200	8,70
CY	0,31	237.734	55.246,00	4,30	0,30	245.892	55.246	4,45
DK	0,86	2.678.540	1.541.025,00	1,74	0,83	2.791.087	1.541.025	1,81
EE	0,11	3.371.950	207.679,00	16,24	0,11	3.475.172	207.679	16,73
FI	0,63	6.361.740	844.375,00	7,53	0,61	6.565.949	844.375	7,78
FR	0,60	81.931.235	19.450.625,00	4,21	0,59	84.720.818	19.450.625	4,36
DE	0,60	56.677.765	12.408.720,00	4,57	0,58	58.588.820	12.408.720	4,72
EL	0,33	9.412.515	573.250,00	16,42	0,32	9.701.370	573.250	16,92
HU	0,13	9.913.032	590.925,00	16,78	0,12	10.214.107	590.925	17,28
IE	0,64	35.586.324	5.562.650,00	6,40	0,62	36.734.241	5.562.650	6,60
IT	0,44	38.361.117	5.575.312,00	6,88	0,43	39.618.767	5.575.312	7,11
LV	0,10	9.389.374	193.150,00	48,61	0,10	9.669.900	193.150	50,06
LT	0,10	15.813.253	281.775,00	56,12	0,09	16.283.949	281.775	57,79
LU	0,58	681.456	194.532,00	3,50	0,56	704.305	194.532	3,62
MT	0,23	213.006	16.350,00	13,03	0,22	219.566	16.350	13,43
NL	0,60	12.854.240	3.930.500,00	3,27	0,58	13.332.302	3.930.500	3,39
PL	0,13	240.261.159	2.677.962,00	89,72	0,12	247.374.990	2.677.962	92,37
PT	0,18	20.194.231	1.220.975,00	16,54	0,18	20.811.957	1.220.975	17,05
RO	0,09	56.642.462	819.000,00	69,16	0,08	58.329.072	819.000	71,22
SI	0,21	7.224.536	253.625,00	28,49	0,21	7.441.718	253.625	29,34
SK	0,10	4.114.448	455.056,00	9,04	0,09	4.242.435	455.056	9,32
ES	0,34	53.084.475	5.380.969,00	9,87	0,33	54.795.899	5.380.969	10,18
SE	0,68	6.222.044	1.483.800,00	4,19	0,66	6.431.258	1.483.800	4,33
UK	0,65	39.966.423	9.982.875,00	4,00	0,63	41.314.155	9.982.875	4,14

It can be concluded that on average, 6,97 and 7,20 additional non-regulatory readings per LSU are required in order to obtain the break-even point in case of using respectively E-ear tags or boluses. Depending on the labour cost (reflected in the "Value of time saved per reading") and number of LSU of the big breeders, this number varies from less than 2 additional readings per animal (e.g. in Denmark) to over 100 of additional readings (e.g. in Bulgaria).

In specific production schemes (e.g. dairy production, fattening holdings) the number of non-regulatory or production management readings can exceed the average figures mentioned above. As an example, each milk cow is read 2 times per day. These elements are further considered later in this chapter as equipment cost savings should be considered to analyse the cost/benefits for these types of production.

Task 4: Notifications - Transfer of the read ID to register or database

Additional cost savings as result of the investment in e-reading can also be obtained after the initial reading of the ID. More particularly, when transferring the read ID to the competent authority. In case of manual reading, it is assumed that each ID needs to be re-copied to e.g. a document that can then be faxed or that it is typed into the corresponding fields on a web interface. It is assumed that it takes about 1 minute per ID to perform a manual transfer.
In case a handset or static reader is used, the information can be much easier be transferred in an electronic way. For the handset readers, it is assumed that the downloaded information is transferred once every week and that this requires the intervention of a person during 10 minutes. For the static reader, the same frequency of transferring the information is assumed, but the efficient duration is assumed to be shorter as e.g. downloads are made on a continuous basis so that the work required is limited at mainly validation tasks. Therefore, the efficient duration is set at 6 minutes.

This implies *grosso modo* that cost efficiencies caused by time savings in the transfer of read ID can be obtained when the number of readings that need to be transferred each week exceeds 6 readings (in case of a static reader) or 10 readings (in case of a handset reader). These targets seem especially realistic for the markets & assembly centers as well as slaughterhouses, but much more difficult to obtain for the holdings and especially the small ones.

Table 15: Comparison of the cost of transferring the ID to the competent authorities in case of manual or e-reading

Actor	Total cost of transferring ID in a manual way			Total cost of transferring ID that was read with a handset reader		
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3
	e-reading	e-reading	manual	e-reading	e-reading	manual
Big breeders						
Total EU 27	0	0	16.604.995	121.696.073	121.696.073	0
Small breeders						
Total EU 27	1.126.427	1.126.427	1.126.427	0	0	0
Markets						
Total EU 27	0	0	16.458.938	808.331	808.331	0
Slaughterhouses						
Total EU 27	0	0	8.144.910	2.825.090	2.825.090	0
Total cost						
Total EU 27	1.126.427	1.126.427	42.335.271	125.329.494	125.329.494	0

Actor	Total cost of transferring ID that was read with a static reader			Total cost of transferring ID		
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 1	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 1
	e-reading	e-reading	manual	e-reading	e-reading	manual
Big breeders						
Total EU 27	0	0	0	121.696.073	121.696.073	16.604.995
Small breeders						
Total EU 27	0	0	0	1.126.427	1.126.427	1.126.427
Markets						
Total EU 27	484.998	484.998	0	1.293.329	1.293.329	16.458.938
Slaughterhouses						
Total EU 27	847.527	847.527	0	3.672.617	3.672.617	8.144.910
Total cost						
Total EU 27	1.332.525	1.332.525	0	127.788.447	127.788.447	42.335.271

Based on the calculations presented above, it can be concluded that – at least for certain actors – the introduction of electronic reading can significantly reduce the manpower costs related to the transfer of ID information to the competent authorities. For the holdings however, the e-transfer is actually more expensive as the limited number of regulatory data that needs to be transferred is not making the weekly downloads of the handset readers cost-efficient.

Table 16: Cost savings in case of electronic transfer of ID compared to manual transfer

Actor	Total cost of transferring ID			Cost saving of electronic transfer compared to manual transfer		
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 1	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 1
	e-reading	e-reading	manual	e-reading	e-reading	manual
Big breeders						
Total EU 27	121.696.073	121.696.073	16.604.995	105.091.078	105.091.078	0
Small breeders						
Total EU 27	1.126.427	1.126.427	1.126.427	0	0	0
Markets						
Total EU 27	1.293.329	1.293.329	16.458.938	-15.165.609	-15.165.609	0
Slaughterhouses						
Total EU 27	3.672.617	3.672.617	8.144.910	-4.472.293	-4.472.293	0
Total cost						
Total EU 27	127.788.447	127.788.447	42.335.271	85.453.176	85.453.176	0

Finally, in Regulation (EC) No 1760/2000 Article 7.3, it is also stipulated that *'Each keeper shall supply the competent authority, upon request, with all information concerning the origin, identification and, where appropriate, destination of animals, which he has owned, kept transported, marketed or slaughtered'.*

For this study, we have assumed that these requests will not be frequently done by Member States that have a fully operational central computerised database. Furthermore, it was estimated that collecting and e.g. faxing the requested information manually would take about 30 minutes. This efficient duration was reduced to 10 minutes in case the organisation can make a query electronically and send an electronic file to the competent authorities. So also for this provision, e-treatment of the data could provide cost-savings. This specific possibility has however not been quantified in our cost model since it is not significant compared to the global possible cost savings under Task 4. If we consider that all MS will make one request/year, time saving is estimated at 140 K hours for a total cost of 2,2 Mio €.

Task 5: Processing of the information received from the sector

Finally, it has been checked what time and cost savings could be obtained at the side of the competent authorities in case all ID information would be transferred directly in an electronic format to the computerised database.

For simulation the possible savings, it was assumed that 0,85 min is needed by the competent authorities to process 1 ID manually. This time is increased by 5% in order to take into account the error margin and thus the work that needs to be repeated. For determining the cost of the manual treatment, 50% of the movements is taken into account as it is assumed that half of the information on the movements is transferred via an automated web-interface so that only the remaining 50% actually requires a manual intervention by the competent authority.
In a fully automated environment based on e-reading and e-transfer of information, it is assumed that manual intervention is no longer required as possible erroneous inputs would be detected automatically so that the person sending the information to the competent authorities can correct the information.

As presented in Annex 3 on the implementation of the cost model, the full automation of the processing of the sector information on movements, would lead to a cost saving of 20,3 Mio € for all national competent authorities together.

Other additional benefits to be considered

Several other benefits indirectly linked to the introduction of EID as an official method for cattle identification are discussed and presented here from a qualitative view. These elements have not been considered in our cost model as too limited data are available at this stage. The figures presented in the following paragraphs are based on unique data sources that may not be representative enough. Therefore, we have decided not to include them in the cost model.

Benefits for veterinarian acts:

Identification of animals is extremely important for inseminators as it is first of all important to inseminate the correct animal. Also for reproduction insemination treatments, it is crucial

to dispose of the correct ID information. A transponder will secure accuracy in 100% of cases and time may be saved if a reader is available. If the farmer is equipped with a reader this one can be used, but better than this, if the veterinarian has an e-reading equipment, he can store all information on date and conditions of insemination.

A 2009 Danish study considers that 25 seconds can be saved per female animal on a yearly basis. As the number of calves/year is evaluated at 34 Mio for the complete EU 27 MS, cost saving can be estimated at a little bit more than 4 Mio €. This figure does not include the cost of buying any reading equipment by the veterinarian.

Additional to reproduction acts, the same veterinarians can benefit from EID for treatments and medication use in term of time saving, accuracy of the data and storing data on individual animals.
The same Danish study, estimated that up to 90 seconds can be saved per year and per animal leading to an additional cost saving of about 6 Mio €. Is assumed that only 20% of the total bovine population is concerned by veterinarian acts.

These cost saving will only profit to the veterinarians and not to the keepers as individual acts are paid on a flat price regardless how much time has been spent on the given act.

Animal welfare obligations:
In an effort to increase animal welfare conditions; obligations to farmers, transporters and traders may be facilitated by electronic tagging. EID can then be considered as part of an integrated system regarding animal welfare. As for example, EID can be use for the monitoring of animals transport conditions and any other event based on obligations of Council Regulation (EC) No 1/2005. No relevant figures can be presented here.

Official's control:
According to Commission Regulation (EC) No 1082/2003 establishing the minimum level of controls to be carried out in the framework of the system for the identification and registration of bovine animals, MS have to inspect at least 5% of their holdings if the MS has a fully operational national database in place, 10% of the holdings in other cases. During the controls, CAs have to identify animals and therefore a fast accurate reading as well as automated documentation increases their efficiency.
The competent authorities in a region in Italy, where electronic identification of all bovines continued since the start of the IDEA project, estimate that the time savings in their controls at farms and slaughterhouses are around 45%[7]. A 2009 Danish study indicates that about 1 minute can be saved per controlled animal.

These two elements lead to a cost saving of about 1 Mio € yearly if 5% of the animals are controlled.

[7] JRC-IPSC (April 2007). Cost analysis for small ruminant holdings in Member States

Benefit of EID on dairy and fattening farms with existing identification equipment[8]:
As mentioned in the technical feasibility study (SECTION 2), transponders are already in use for dairy farms management and to a less extend in fattening farms in the EU.

Costs and benefits depend largely on the type of identification equipment which has to be replaced. Actually, in most cases neck belt transponders are used for this purpose.
The following points and associated figures have been collected during the interviews in the 6 MS that have been visited. Complementary information has been extracted from a German publication[9]. Benefits of EID starts with calves, in case there is an automatic teat feeder. Electronic ear tags would work with majority of the existing equipment even if it is reported that about 40% of equipment is not ISO compliant (see SECTION 2). However, certain practical elements have to be considered in order to benefit from the existing equipments. For example, one of the main questions related to which ear will be tagged with the electronic ear tag. If there is no clear rule nor guideline on how to tag in detail, calves can appear with left or right E-ear tag leading to possible problems for e.g. automatic feeding systems where the antenna is used at one side only.

If animals are electronically identified with E-ear tags, neck collars can be removed if the reading equipment is ISO compliant. In that case only a change of the antenna location may be necessary to identify "official" E-ear tags. For boluses, more investment will be necessary as the reader will have to be repositioned and a higher reading performance is required.

When trying to estimate cost savings in this area, it has to be considered that neck collars have a long time life and can be used on several animals. If we consider that a given neck collar can be used on 3 dairy cows, cost savings are estimated at about 10 €/animal.

As we do not have been able to estimate the number of neck collars actually in use in the EU, it is not possible to make a global cost saving estimation.

In the case that the existing animal detection technology is not compatible with the EID device, replacement or modification of equipment must be considered. Associated costs are difficult to estimate at this stage.

4.1.3. Summary

The table below presents the total costs of all tasks per type of actor, as well as the comparison of the total costs of introducing EID as an official method to identify bovine animals with a situation where all tasks remains manual.

[9] Heiko Georg and *al* (2008) - New aspects in Electronic Animal Identification – Part I and Part II

In the first scenario, the costs are presented for a situation in which only the electronic ***identification*** becomes obligatory. For all other tasks, it is assumed that these remain manual.

Table 17: Summary of the total costs of all tasks per actor (EID obligation)

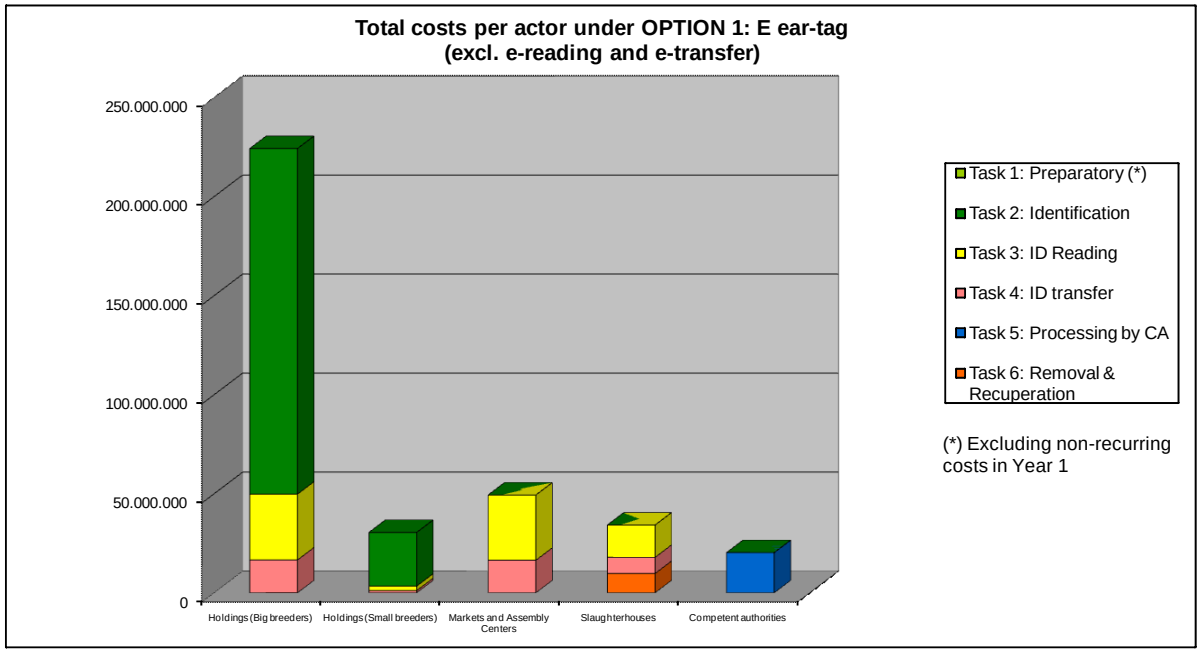
Overview OPTION 1 Cost of regulation with EID	Total		Holdings		Markets & Assembly centers	Slaughter-houses	Competent Authority
			Small	Big			
	in EUR	in %	in EUR				
E-ear tags	**507.059.711**						
Preparatory phase	148.411.510	29,3%	75.525.986	70.209.273	932.689	1.629.860	113.703
ID-tagging and retagging	201.585.199	39,8%	27.112.370	174.472.830			
Reading	84.670.541	16,7%	2.252.855	33.209.990	32.917.876	16.289.820	
Transfer of read ID	42.335.271	8,3%	1.126.427	16.604.995	16.458.938	8.144.910	
Processing information by CA	20.283.298	4,0%					20.283.298
Removal and recuperation of EID material	9.773.892	1,9%				9.773.892	
Boluses	**591.614.826**						
Preparatory phase	148.411.510	25,1%	75.525.986	70.209.273	932.689	1.629.860	113.703
ID-tagging and retagging	274.737.440	46,4%	36.697.860	238.039.580			
Reading	84.670.541	14,3%	2.252.855	33.209.990	32.917.876	16.289.820	
Transfer of read ID	42.335.271	7,2%	1.126.427	16.604.995	16.458.938	8.144.910	
Processing information by CA	20.283.298	3,4%					20.283.298
Removal and recuperation of EID material	21.176.766	3,6%				21.176.766	

Overview OPTION 1 Cost of regulation with EID	Total		Holdings		Markets & Assembly centers	Slaughter-houses	Competent Authority
			Small	Big			
	in EUR	in %	in % (per phase)				
E-ear tags	**507.059.711**						
Preparatory phase	148.411.510	29,3%	50,9%	47,3%	0,6%	1,1%	0,1%
ID-tagging and retagging	201.585.199	39,8%	13,4%	86,6%			
Reading	84.670.541	16,7%	2,7%	39,2%	38,9%	19,2%	
Transfer of read ID	42.335.271	8,3%	2,7%	39,2%	38,9%	19,2%	
Processing information by CA	20.283.298	4,0%					100,0%
Removal and recuperation of EID material	9.773.892	1,9%				100,0%	
Boluses	**591.614.826**						
Preparatory phase	148.411.510	25,1%	50,9%	47,3%	0,6%	1,1%	0,1%
ID-tagging and retagging	274.737.440	46,4%	13,4%	86,6%			
Reading	84.670.541	14,3%	2,7%	39,2%	38,9%	19,2%	
Transfer of read ID	42.335.271	7,2%	2,7%	39,2%	38,9%	19,2%	
Processing information by CA	20.283.298	3,4%					100,0%
Removal and recuperation of EID material	21.176.766	3,6%				100,0%	

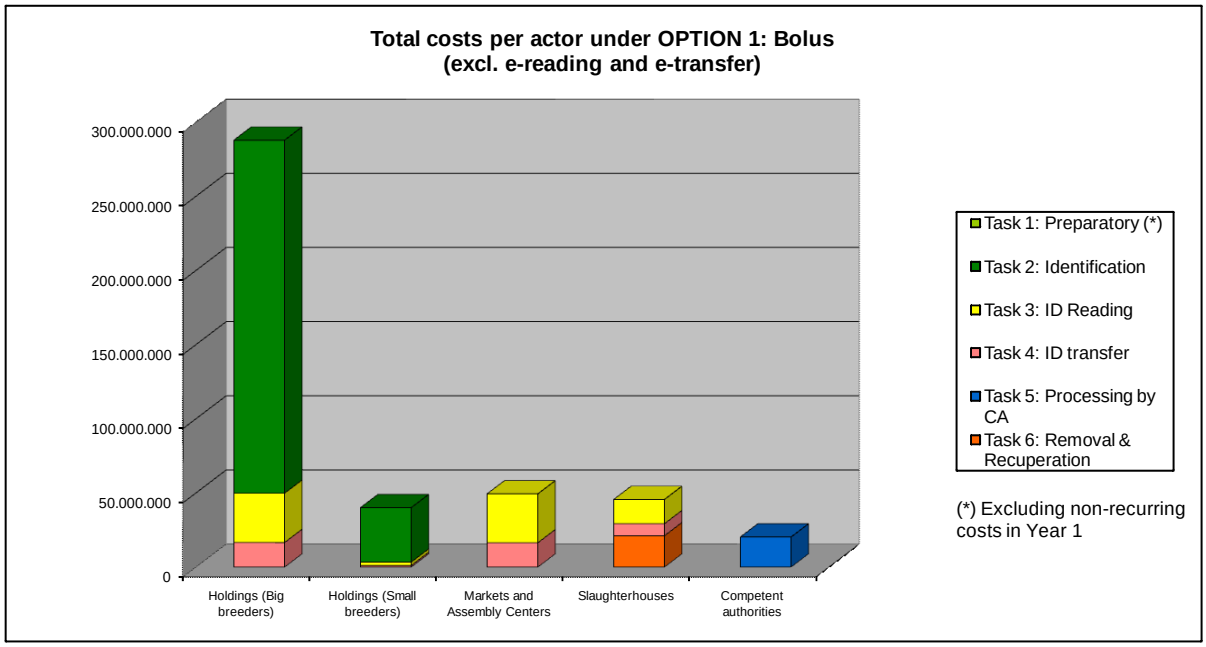
All of the costs presented above, with the exception of the costs related to the preparatory phase which are only relevant in Year 1, relate to the situation in an average year.

The graphs below present a summary of these costs, excluding the cost of the preparatory phase as this is not a recurring cost.

Graph 3: Total annual recurring cost per actor under Option 1: E-ear tag (excl. e-reading and e-transfer)



Graph 4: Total annual recurring costs per actor under Option 1: Bolus (excl. e-reading and e-transfer)



In the second scenario the costs are presented for a situation in which not only the electronic ***identification*** becomes obligatory, but also electronic ***reading*** and ***transfer*** of data is assumed (cf. calculations under 4.1.2).

Table 18: Summary of the total costs of all tasks per actor (EID obligation and e-reading and e-transfer assumption)

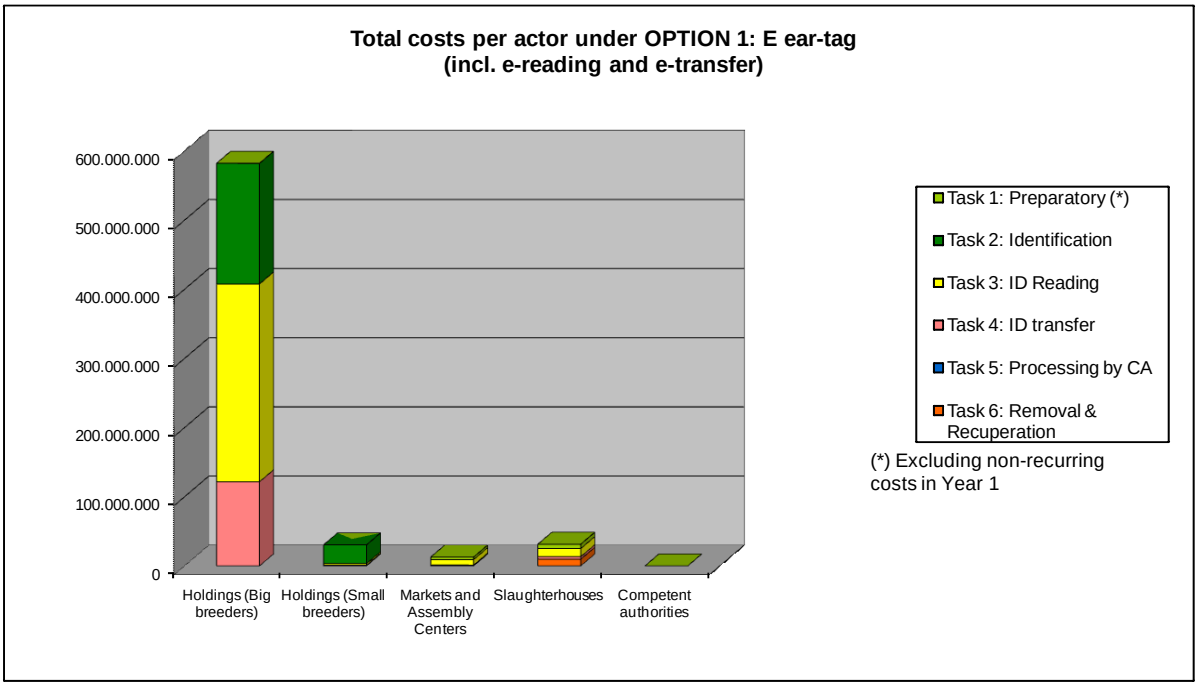
Overview OPTION 1 Cost of regulation with EID, e-reading and e-transfer of data	Total		Holdings		Markets & Assembly centers	Slaughter-houses	Competent Authority
			Small	Big			
	in EUR	in %	in EUR				
E-ear tags	**805.343.787**						
Preparatory phase	158.186.331	19,6%	75.525.986	70.209.273	4.494.053	7.843.317	113.703
ID-tagging and retagging	201.585.199	25,0%	27.112.370	174.472.830			
Reading	308.009.918	38,2%	2.252.855	286.045.799	7.960.354	11.750.910	
Transfer of read ID	127.788.447	15,9%	1.126.427	121.696.073	1.293.329	3.672.617	
Processing information by CA	0	0,0%					0
Removal and recuperation of EID material	9.773.892	1,2%				9.773.892	
Boluses	**890.975.190**						
Preparatory phase	158.186.331	17,8%	75.525.986	70.209.273	4.494.053	7.843.317	113.703
ID-tagging and retagging	274.737.440	30,8%	36.697.860	238.039.580			
Reading	309.086.206	34,7%	2.252.855	286.876.049	8.124.944	11.832.359	
Transfer of read ID	127.788.447	14,3%	1.126.427	121.696.073	1.293.329	3.672.617	
Processing information by CA	0	0,0%					0
Removal and recuperation of EID material	21.176.766	2,4%				21.176.766	

Overview OPTION 1 Cost of regulation with EID, e-reading and e-transfer of data	Total		Holdings		Markets & Assembly centers	Slaughter-houses	Competent Authority
			Small	Big			
	in EUR	in %	in % (per phase)				
E-ear tags	**805.343.787**						
Preparatory phase	158.186.331	19,6%	47,7%	44,4%	2,8%	5,0%	0,1%
ID-tagging and retagging	201.585.199	25,0%	13,4%	86,6%			
Reading	308.009.918	38,2%	0,7%	92,9%	2,6%	3,8%	
Transfer of read ID	127.788.447	15,9%	0,9%	95,2%	1,0%	2,9%	
Processing information by CA	0	0,0%					
Removal and recuperation of EID material	9.773.892	1,2%				100,0%	
Boluses	**890.975.190**						
Preparatory phase	158.186.331	17,8%	47,7%	44,4%	2,8%	5,0%	0,1%
ID-tagging and retagging	274.737.440	30,8%	13,4%	86,6%			
Reading	309.086.206	34,7%	0,7%	92,8%	2,6%	3,8%	
Transfer of read ID	127.788.447	14,3%	0,9%	95,2%	1,0%	2,9%	
Processing information by CA	0	0,0%					
Removal and recuperation of EID material	21.176.766	2,4%				100,0%	

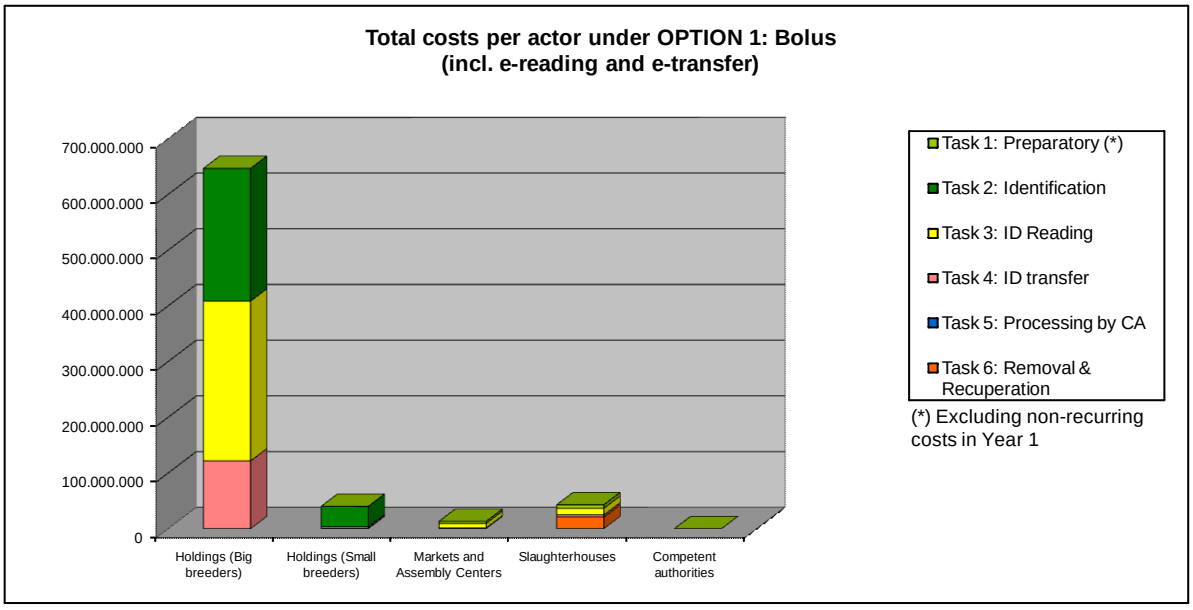
Again, all of the costs presented above, with the exception of the costs related to the preparatory phase which are for the part corresponding to the values indicated in Table 16 only relevant in Year 1, relate to the situation in an average year.

The graphs below present a summary of these costs, excluding the part of the cost of the preparatory phase that is not a recurring cost.

Graph 5: Total costs per actor under Option 1: E-ear tag (incl. e-reading and e-transfer)



Graph 6: Total costs per actor under Option 1: Bolus (incl. e-reading and e-transfer)



A more detailed table, including a breakdown per task and per MS, can be found in the Annex 3 with the description of the cost model.

As mentioned costs related to the preparation phase that only occur in Year 1 are not presented in the graphs above. It has to be added that the costs linked to the adaptation of the national databases as well as the adjustments required for enhancing the existing ear tag

allocation system to deliver bovine EID in the case the numbering system would have to be reviewed to secure compliance to ISO standards are not included here.

The main benefits of the introduction of electronic identification as an official method to identify bovine animals in term of time saving (e.g. time saving in reading identifiers and transferring information, automated reading and documentation) are highlighted by the cost comparison in SECTION 5.

Additionally, it can be mentioned that EID brings the following main advantages to those who invest in IT by purchasing appropriate RFID reading equipment, computer software and internet connections:

- Unambiguously identified animals leading to better data accuracy;
- Easy reading and less errors in notification could lead to reduced notification time and bring the national database closer to "real-time";
- Tracing back and forward can be done in hours rather than days leading to improved management in case of disease outbreak;
- Facilitate CAs controls for ID but for other control purposes as well;
- Improved traceability for consumers;
- Cost savings in other farm management areas linked to multi-purpose use of the system;
- Security of operators;
- Reduction of data transfer costs leading to less paper work for both operators and CAs;
- Trade competitive advantage relative to those that are not able to provide top level traceability assurances to customers and in managing and responding to animal disease or related outbreaks;
- EID provides incentives to share production and marketing information with upstream and downstream actors in the value chain leading to improved transfer of product liability.

4.2. EXPECTED IMPACTS OF POLICY OPTION 2: VOLUNTARY

As under the POLICY OPTION 2A and POLICY OPTION 2B it is not possible to predict in a reliable manner what Member States and/or what holdings would introduce EID on a compulsory or voluntary basis, it was decided not to make additional specific calculations for these two sub-options in the cost model.

After all, if under OPTION 2A EID would become ***obligatory*** in a specific Member State, the cost of this will be made available also under OPTION 1 and therefore figures per MS could be consulted in Annex 3.

In the other cases where the introduction of EID becomes ***voluntary***, it can be assumed that this regime will be chosen by the holdings that believe that this system will be overall more efficient. The evaluation of the efficiency of EID in combination with further efficiency gains

for e.g. farm automation systems can be performed on a case-by-case basis; full extrapolation at the Member State level or at the European Union level will however remain very arbitrary and could very quickly lead to wrong conclusions.

Nevertheless, for purely illustrative purposes, we will present below the cost of each of the six Tasks under the Option 2. In all illustrations, the scenario excl. e-reading and e-transfer of information is considered.

Task 1: Preparatory phase

As the voluntary option implies that the CA should at least indicate e.g. what technologies are compliant for EID, there will also be under the voluntary regime some kind of monitoring of the regulation, incl. training for people opting for the EID.

It can be assumed that the cost of the preparatory phase will only be 50% of the cost when obligatory introduction is imposed. This corresponds to the following upfront costs:

Table 19: Estimated one-time preparatory cost for Option 2.

Actors	Total cost (only in Year 1)
Task 1A - Monitoring of regulation	
	OPTION 2
	50%
Holdings	
Total EU 27	**72.867.629 €**
Markets and assembly centers	
Total EU 27	**466.345 €**
Slaughterhouses	
Total EU 27	**814.930 €**
Competent authorities	
Total EU 27	**56.852 €**
Total TASK 1A - All actors	
Total EU 27	**74.205.755 €**

Task 2 : Identification (Tagging and Re-tagging)

The cost of EID tagging is more expensive than the cost of conventional ID tagging. This is a general rule that applies to all MS as the higher costs for the tagging are a direct consequence of the higher equipment costs which have been assumed uniform across the EU 27.

Based on the comparison of the costs of using 100% of each of the technologies and the assumption that a quarter of the breeders would opt to introduce EID on a voluntary basis (of which half based on E-Ear tags and half based on boluses), it can be concluded that under the OPTION 2, the cost of the identification would increase with about 8% compared to the baseline scenario (i.e. OPTION 3).

Table 20: Illustration of the possible range of costs related to tagging.

OPTION 2				
Technology	**100% E-Ear tag**	**100% Boluses**	**100% Conventiona**	**25% EID**
Total annual cost (equipment + labour)	201.585.199	274.737.440	177.144.845	192.398.963
Total cost in % of conventional approach	113,80%	155,09%	100,00%	108,61%

Task 3: Registration and Reading

For Task 3, it was indicated that the cost of regulation strictly speaking does not change when EID would be introduced. Under the OPTION 1, the cost has however been determined for the scenario in which big holdings, markets & assembly centers as well as slaughterhouses would invest in electronic reading equipment. After all, it can be expected that stakeholders will try to make the investment in EID profitable.

The table below presents a sensitivity analysis of what the impact would be if not 100% of the reading could be performed electronically, but only 25%, 33% or 50%. For all simulations, it is assumed that E-ear tags and boluses are each used in half of the cases.

Table 21: Sensitivity analysis of the cost-effectiveness of e-reading in the markets & assembly centers

OPTION 2						
Is e-reading still cost effective in case 25%, 33% or 50% of the readings in Market Places is still manual, but all investments in reading equipment are made ?						
Markets	**E Eartag**	**Bolus**	**Manual**	**25% EID**	**33% EID**	**50% EID**
Equipment cost	4.898.992	4.898.992		4.898.992	4.898.992	4.898.992
Labour (100% manual reading)			32.917.876			
Labour (100% e-reading)	3.061.362	3.225.952				
Labour (25% EID with equal parts for bolus and E ear tag)				25.474.322	23.092.384	18.030.767
Total	**7.960.354**	**8.124.944**	**32.917.876**	**30.373.314**	**27.991.376**	**22.929.759**
Efficiency gain	-24.957.522	-24.792.932	0	-2.544.563	-4.926.500	-9.988.118

Task 4: Notifications – Transfer of the read ID to register and database

Under the OPTION 1, it was concluded that the electronic transfer of read IDs is very quickly cost efficient for the markets & assembly centers and slaughterhouses, but not cost-efficient for the holdings at all.

It could be assumed that under the OPTION 2, more holdings will postpone the investment in e-reading equipment in case they are not convinced about the additional business opportunities. This could lead to a lower global additional cost of e-transfer of data for all big holdings.

However, as e-reading is not a regulatory obligation, the same assumption could also be made under OPTION 1, even if the report presents the extreme scenario in which all big holdings have e-reading equipment and transfer the ID electronically.

Task 5: Processing of the information received from the sector

The baseline scenario already assumed that 50% of the information received from the sector can be processed automatically. We have not received any indication that this would significantly increase in case the option would be chosen to voluntary introduce EID. Therefore, there is no impact of the voluntary introduction of EID to be pointed out for Task 5.

Task 6: Removal and recuperation of (E)ID material

Regarding the cost of the removal and recuperation of (E)ID material it can be expected that the uncertainties concerning the identifier used will globally increase the required efficient time. It is assumed that the additional cost could amount to 20%. The weighted costs of a number of scenarios have been calculated; these are presented in the table below:

Table 22: Sensitivity analysis of the cost for the removal and recuperation of (E)ID material under the voluntary option

OPTION 2			
	E ear tag	**Bolus**	**Conventional**
Total cost	9.773.892	21.176.766	9.773.892
Total cost incl 20% mark-up	11.728.670	25.412.119	11.728.670
	25% EID	**33% EID**	**50% EID**
Total cost incl 20% mark-up	13.439.101	13.986.439	15.149.532

Overview of advantages and disadvantages

In the remainder of this paragraph, we will further present advantages and disadvantages of this option as discussed with the stakeholders and the competent authorities during the interviews.

One of the main key advantage of the voluntary approach, regardless if it is OPTION 2A or OPTION 2B, is based on the fact that actors would have time to familiarise with EID system and identify added values in specific conditions. EID system should be understood here as electronic identification and valorisation of this identification by an early e-reading.

The approach taken by several MSs should be cited as a model. In FR, DK, and in the Northern Ireland all stakeholders, from breeders to slaughterhouses, are sitting together with the CAs in order to identify and evaluate the possible benefits of the EID system. Whenever necessary, they have established pilot studies and field trials to further characterised consequences of the introduction of the EID system.

The analysis of the OPTION 1 leads to the conclusion that most of the costs are carried out by the farmers when benefits are distributed all along the chain. One main criticism collected during the interviews is that it is not the "payers" who benefit from the investment: investment is the upstream and downstream profits instead. A voluntary approach would help to further analyse this cost distribution and to find solutions on how to distribute costs based on benefits for each type of actors.

Another advantage of the voluntary option is based on the fact that not all MSs are at the same level of understanding of the costs and benefits of EID. Only a couple of them are working on developing their knowledge on the approach. Variability ranges from a MS such as DK that has already investigated on EID for a couple of years, and where about 11% of bovine animals are already e-identified to a MS that is rejecting the idea of even considering the approach. In these MSs, it is considered that the actual system is fully operational. In fact establishment of an individual bovine traceability system has required lot of time and efforts to achieve uniformity within the EU, and therefore these MSs do not want to imagine the necessary time to achieve the equivalent level of functionality of any other system.

It has finally be mentioned that the actual situation in sheep and goats is not an incentive factor for studying possible benefits of EID on bovine animals.

As most of the benefits are business ones, the voluntary option approach leaves the possibility to the private actors to organise themselves, to evaluate if it is really an improvement, and is flexible enough to allow support by the public authorities with two major objectives 1)to improve the traceability 2)to profit from all business benefits. Additionally, it would encourage substantial public and private financial investment e.g. actual French pilot study of about 1 Mio €.

Finally, the voluntary approach will help to consider regional differences as well as to have a given approach for a given type of production.

Voluntary approach may lead to negative consequences that are summarised hereafter. In several years time, EU could be faced with different MS situations leading to the point that a certain level of confusion could occur in term of identification.

In case of intra-community trade it may become rather difficult to trace which kind of official identification is being used. For example, when importing a bovine animal identified with a bolus from another MS, one may think that the animal is not well identified as it has only one conventional ear tag, even further if the importer has no reader, he will not be able to verify the compliance of the animal to identification.

Several solutions for all these issues have been reported during the interviews, but *in fine* this situation could lead to a degradation of the efficiency of the current system if not approached carefully.

Within a MS that has decided to go for a voluntary approach (OPTION 2B), voluntary would results in 2 distinctive identification methods, and according to some interviewees to 2 different markets. For markets & assembly centers and slaughterhouses, it may increase the labour costs when 2 types of identified animals would enter or the market or the slaughterhouse. Manual reading would still be possible in any case, but e-reading would not be possible for animals that have not any electronic device. This situation would not motivate actors of the production chain to invest or they may decide that only electronically identified animals would be accepted, leading to extra costs at holding levels.

This kind of situation explains why most of the interviewees consider that the voluntary OPTION 2B is not sustainable long term and that only OPTION 2A should be considered.

A pre-requisite of this option is the establishment of EU standards in order to keep intra-community trade harmonised.

4.3. EXPECTED IMPACTS OF POLICY OPTION 3: "DO NOTHING"

No change to the actual provisions implies that each bovine animal is to be identified by two conventional visible ear tags. If keepers want to use electronic identifiers, this is in addition to the two official ones.
The do nothing option, meaning no modification of the obligations, is not expected to deal with the faced problems reported by several CAs and summarised in the Commission services (FVO) auditing reports.

Most of the interviewees consider that the current traceability system is efficient and effective but can be improved. One of the limits to assess efficiency and effectiveness of the system is based on the fact that evaluation can fully happen only when a disease outbreak occurs. The remaining problems, as listed below, may demonstrate that accurate tracing of bovine animals, especially in case of emergency, may be difficult or impossible[10].

The current main issues within the existing systems that have been identified during inspection at national level and during Commission services inspections are:

- **Incorrect identification of animals** meaning animals with only one ear tag or even no ear tag;
- **Delays in marking young animals**;
- **Holding registers not up to date** with missing paper and documentation as well as non organised data and documents;
- **Delay or absence of reporting events (birth, movement, death)** to the central database;
- **Non respect of recording of animal movements** through markets & assembly centers.

Electronic identification can contribute to improve the system but with different impacts for each of the problems that are listed above.

When talking about incorrectly identified animals and delays in tagging young animals, electronic identifiers instead of conventional ones may not improve the situation, as these identifiers must also be applied correctly. As already mentioned, application of boluses can be organised at national/regional levels through technical teams moving from farms to farms to apply boluses to new born animals. In this specific case, improvements in the correct identification of animals could be recorded, even if today there is no evidence in that respect.

[10] DG (SANCO)/9505/2003 overview report of a series of missions carried out in all member states during 2002 in order to evaluate the operation of controls over the traceability and labelling of beef and minced beef.

It may be, also, considered that in case of E-ear tags, the quality of the ear tag may be higher compared to the conventional ear tags, leading to a slight reduction of the loss rate.

Holding registers not properly maintained is mentioned as one of the current key issue. Commission Regulation (EC) No 911/2004 lists detailed rules on the content of the register that shall contain up to date information on each animal: identification code, date of birth, sex, breed or colour of coat, the date of death of the animal on the holding, or in case of departure the identification code of the holding of destination and the date of departure, and in case of arrival identification code of holding of dispatch and the date of arrival. Finally, controls by the CA must be clearly identified in the register. The use of electronic identifiers may improve this situation if the holding register is kept in a computerised form leading to less paper work and less paper loss. The benefits are mainly linked to the e-reading and not directly to the electronic identification.

Additionally, even if it is reported that in certain particular cases (e.g. dairy farms, fattening holdings) farmers are using computers it has to be highlighted that small breeders still representing a large proportion of the total number of holdings in the EU 27MS (76%) are not familiar with the usage of computers for their own management. A 2007 survey in France leads to the conclusion that only about 50% of farms (147,700 out of 320,600) are using a computer for professional needs but a rapid increase is observed (+ 200% compared to 2003).

When considering delays or absences of reporting events to the national database as well as the non respect of recording of animal movements all through the chain, improvements can be obtained if e-reading is performed as early as possible in the production chain , and preferably at holding level. When holding registers are kept under electronic format, the data flow to slaughterhouses, through markets & assembly centers is facilitated and more accurate.

In conclusion, improvements to overcome the above mentioned issues related to the current situation are mainly based on the early digitalisation of data at holding level. The key improvement factor would consist of moving to computerised registers at holding level from which a fully computerised dataflow could be established. This can already happen with the current system if the farmer has acumen for computer work or an economic reason for using computers. The main benefits are not coming from electronic identification *per se* but from electronic reading, however these two elements are inter-related in the sense that electronic identification would be an incentive to move to e-reading and management of holding registers in a simple database format (e.g. excel).

Specifically looking at the evolution of the Status Quo situation, it has to be highlighted that more and more initiatives are taken at MS level to evaluate pro's and con's, costs and benefits of EID systems (electronic identification and its valorisation through electronic reading) leading to the point that more and more farmers may want to use electronic transponders in the future.

These elements explain the current position of the various stakeholders that have been consulted during the study.

The ones that are not engaged in any field trials or/and research on the subject reject the idea of mandatory introduction of EID. These actors do not see any added values by simply replacing a conventional ear tag by an electronic one, other than to allow an EID device to be an official one. However these actors are prepared to consider voluntary EID depending on what the Commission has to propose in terms of regulatory benefit.

Several ideas have been expressed as follows:

- As individual information is recorded centrally there should be no need to maintain on-farm holding registers or use movement documents (which are necessary even if passports are not required);
- Allow reporting from third parties (e.g. transporters) so that the keeper does not have to report off movement. There would be significant benefits if the off movement could be recorded at a critical control point (i.e. market or slaughterhouse);
- Consideration of having data computerised when animals are leaving holdings.

These elements are examples of ideas that need to be further evaluated. This study is based on the modification of Article 4 of Regulation (EC) No 760/2000 to allow introduction of EID as an official method of identification; by considering other changes in the regulation, users will identify quantifiable regulatory benefits, and therefore will decide for themselves to use EID.

Additionally, costs and benefits are not equally distributed through the production chain. Most of costs are carried out by breeders when downstream actors benefit from the investment done upstream leading to a reluctance to consider EID as an opportunity.

Other stakeholders are convinced by the added values of a fully integrated EID system in which electronic identification is a pre-requisite. Most of time these stakeholders have decided to set-up a feasibility and cost/benefit analysis at value chain level (e.g. FR, Northern Ireland, DK, ...). In these studies all actors are working together to identify and quantify possible business benefits all along the chain and to communicate the conclusions to the actors.

For example, in the DK, where actually 11% of total bovine population is electronically identified the Danish authorities together with all stakeholders are considering to make EID (E-ear tags) compulsory based on studies carried out for a couple of years.

It can, also, be considered that farmers will become more familiar to computers in the near future and will replace paper with files. Therefore, it can be concluded that the current problems, as listed above, will slightly reduce overtime.

The main concern linked to the consideration of this option is based on the lack of European standards. Each MS can select the standards it wants and this approach is leading to a problem of harmonisation. If technologies used in a given MS are not the ones selected in another MS electronic exchange of data would not be possible in case of export from one MS to another and all benefits of EID systems would be lost.

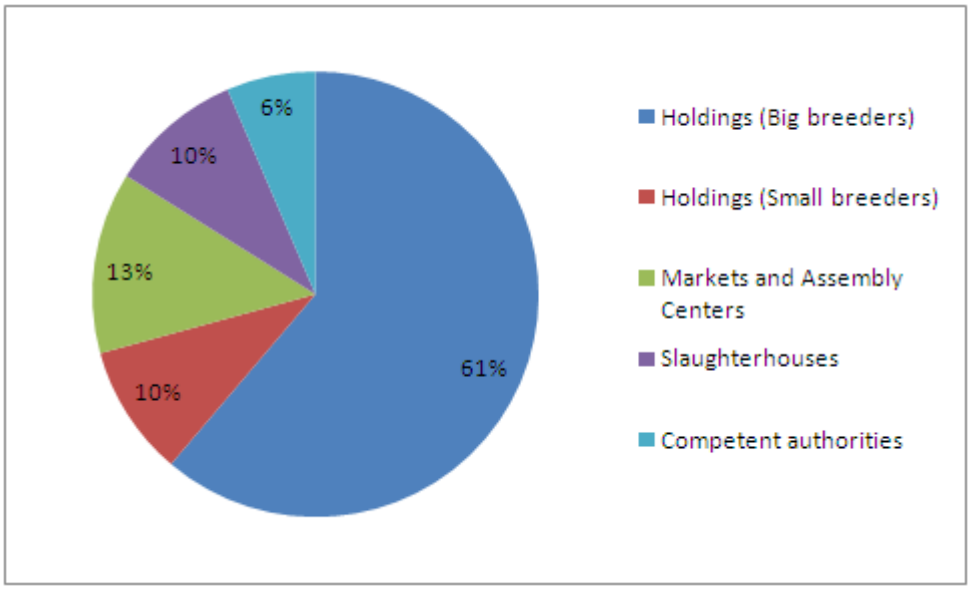
A brief summary of the costs for the option 3 is presented below, more details can be found in SECTION 5 and Annex 3.

Table 23: Cost of option 3: Do Nothing per task (1 to 6) in € and in %

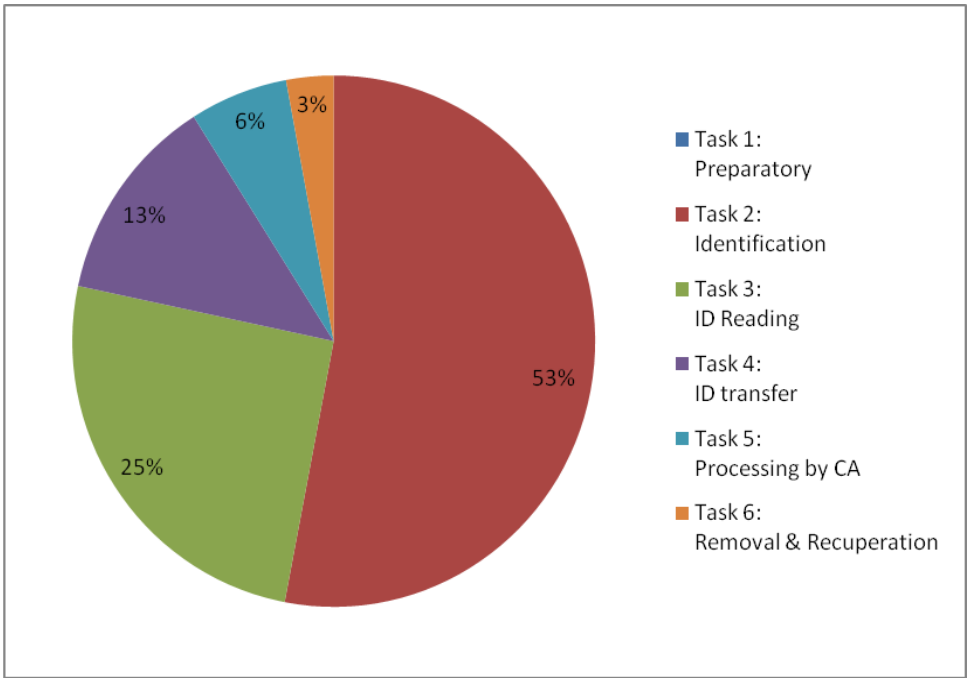
	Task 1: Preparatory		Task 2: Identification		Task 3: ID Reading	
Holdings (Big breeders)			153.348,39 €	45,9%	33.209,99 €	9,9%
Holdings (Small breeders)			23.796,45 €	7,1%	2.252,85 €	0,7%
Markets and Assembly Centers					32.917,88 €	9,8%
Slaughterhouses					16.289,82 €	4,9%
Competent authorities						
Total costs per tasks			***177.144,84 €***	***53,0%***	***84.670,54 €***	***25,3%***

	Task 4: ID transfer		Task 5: Processing by CA		Task 6: Removal	
Holdings (Big breeders)	16.605,00 €	5,0%				
Holdings (Small breeders)	1.126,43 €	0,3%				
Markets and Assembly Centers	16.458,94 €	4,9%				
Slaughterhouses	8.144,91 €	2,4%			9.773,89 €	2,9%
Competent authorities			20.283,30 €	6,1%		
Total costs per tasks	***42.335,27 €***	***12,7%***	***20.283,30 €***	***6,1%***	***9.773,89 €***	***2,9%***

Graph 7: Repartition of costs per type of actors



Graph 8: Repartition of costs per task



SECTION 5. COMPARING OF THE OPTIONS

This section summarises the cost/benefit analysis by comparing OPTION 1 (Obligatory) to OPTION 3 (Do Nothing) for each type of transponder (E-ear tag and bolus) and for each type of actor. In the current legislation there is no obligation in collecting ID numbers with an electronic reader, manual reading can continue even if animals are tagged electronically. In opposite, the actual regulation is not a limit of data computerisation as demonstrated in several MSs where data need to be entered in a web based interface solution by holdings. From that point all tasks are digitalised.

Based on these elements, this section will compare EID to conventional tagging based on 2 different scenarios:

1) EID BUT NO e-reading and NO e-transfer of data to competent authorities;
2) EID AND full e-reading AND e-transfer of data to competent authorities.

The following two tables summarise cost/benefits for each of the two scenarios.

Table 24: Cost comparison Option 1 vs Option 3 under the 2 scenarios per task (in 1,000 € and %)

	Task 1: Preparatory	Task 2: Identification	Task 3: Reading	Task 4: ID transfer	Task 5: Processing by CA	Task 6: Removal & recycling	TOTAL
SCENARIO 1 : EID BUT NO e-reading AND NO e-transfer							
Option 1: E-ear tag	148.412	201.585	84.671	42.335	20.283	9.774	**507.060**
Option 1: Bolus	148.412	274.737	84.671	42.335	20.283	21.177	**591.615**
Option 3: Do Nothing	0	177.145	84.671	42.335	20.283	9.774	**334.208**
Difference for E-ear tag	148.411,5	24.440,4	0,0	0,0	0,0	0,0	**172.852**
%		*13,80%*	*0,00%*	*0,00%*	*0,00%*	*0,00%*	***51,72%***
Difference for Bolus	148.411,5	97.592,6	0,0	0,0	0,0	11.402,9	**257.407**
%		*55,09%*	*0,00%*	*0,00%*	*0,00%*	*116,67%*	***77,02%***
SCENARIO 2: EID AND e-reading AND e-transfer							
Option 1: E-ear tag	158.186	201.585	308.010	127.788	0	9.774	**805.344**
Option 1: Bolus	158.186	274.737	309.086	127.788	0	21.177	**890.975**
Option 3: Do Nothing	0	177.145	84.671	42.335	20.283	9.774	**334.208**
Difference for E-ear tag	158.186,3	24.440,4	223.339,4	85.453,2	-20.283,3	0,0	**471.136**
%		*13,80%*	*263,77%*	*201,85%*	*-100,00%*	*0,00%*	***140,97%***
Difference for Bolus	158.186,3	97.592,6	224.415,7	85.453,2	-20.283,3	11.402,9	**556.767**
%		*55,09%*	*265,05%*	*201,85%*	*-100,00%*	*116,67%*	***166,59%***

Table 25: Cost comparison Option 1 vs Option 3 under the 2 scenarios for each type of actor (in 1,000 € and %)

	Big breeders	Small Breeders	Market & assembly centers	Slaughter-houses	Competent Authorities	TOTAL
SCENARIO 1 : EID BUT NO e-reading AND NO e-transfer						
Option 1: E-ear tag	294.497	106.018	50.310	35.838	20.397	**507.060**
Option 1: Bolus	358.064	115.603	50.310	47.241	20.397	**591.615**
Option 3: Do Nothing	203.163	27.176	49.377	34.209	20.283	**334.208**
Difference for E-ear tag	91.333,7	78.841,9	932,7	1.629,9	113,7	**172.852**
%	*44,96%*	*290,12%*	*1,89%*	*4,76%*	*0,56%*	***51,72%***
Difference for Bolus	154.900,5	88.427,4	932,7	13.032,7	113,7	**257.407**
%	*76,24%*	*325,39%*	*1,89%*	*38,10%*	*0,56%*	***77,02%***
SCENARIO 2: EID AND e-reading AND e-transfer						
Option 1: E-ear tag	652.424	106.018	13.748	33.041	114	**805.344**
Option 1: Bolus	716.821	115.603	13.912	44.525	114	**890.975**
Option 3: Do Nothing	203.163	27.176	49.377	34.209	20.283	**334.208**
Difference for E-ear tag	449.260,6	78.841,9	-35.629,1	-1.167,9	-20.169,6	**471.136**
%	*221,13%*	*290,12%*	*-72,16%*	*-3,41%*	*-99,44%*	***140,97%***
Difference for Bolus	513.657,6	88.427,4	-35.464,5	10.316,4	-20.169,6	**556.767**
%	*252,83%*	*325,39%*	*-71,82%*	*30,16%*	*-99,44%*	***166,59%***

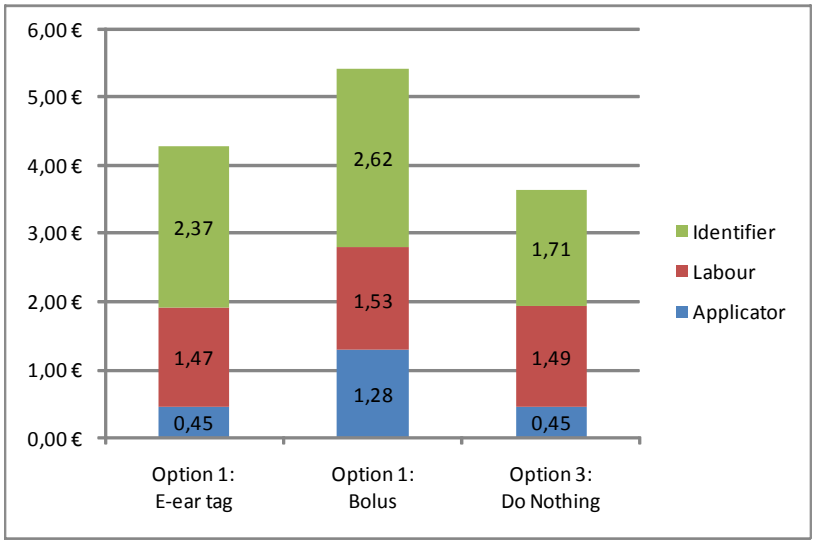
The preparatory phase represents a significant proportion of the total costs of introducing EID (>25%). These costs are based on 1)monitoring of the legislation and training and 2) installation of the e-reading equipment at markets & assembly centers, and slaughterhouses.

Average costs per bovine animal for identification per type of transponder and per option would occur as shown in the following table and graph. Costs are equivalent for the two scenarios.

Table 26: Identification costs per identified bovine animal per Option and type of transponder (in €)

	Option 1: Obligatory		Option 3:
	E-ear tag	Bolus	Do Nothing
Applicator	0,45	1,28	0,45
Labour	1,47	1,53	1,49
Identifier	2,37	2,62	1,71
Total	*4,29*	*5,43*	*3,65*

Graph 9 : Repartition of costs per identified bovine animal per Option and type of transponder



Tagging a bovine animal with an E-ear tag costs 0,64 € more than tagging with conventional devices (+ 17%), and costs 1,78 € (+48%) more when using a bolus. The price of the applicator plays a significant role in the cost difference to OPTION 3 when using a bolus. For E-ear tag the cost increase is due to the price of the identifier.

From reading to processing of data to the national database, EID reduces the costs for reading of the identifiers due to time saving. As more an electronic device is read, as more advantages occur as shown by the comparison of scenario 1 and scenario 2. Benefits are highly significant for markets & assembly centers and slaughterhouses. These actors can further profit from the EID for management purposes (e.g. sorting animals to form homogeneous lots).

Competent authorities profit also from EID as all manual tasks related to entering data in the national databases are transferred to the holdings. Costs for CAs are therefore limited to preparatory costs.

Holdings will only benefit from EID when considering business opportunities as the investment costs are largely higher than time savings. It can be concluded that on average, 6,97 and 7,20 additional non-regulatory readings per LSU are required in order to obtain the break-even point in case of using respectively E-ear tags or boluses. Current regulation requires, on average per bovine animal and based on our estimation, less than 2 readings a year.

This analysis limited to compare costs and benefits for the 6 tasks linked to the usage of EID for traceability purposes should not hide the potential multi-purposes benefits that have been qualitatively assessed and presented in this report. Electronic identification brings additional benefits for both the business (e.g. multi-purpose use) and the regulator (e.g. official's controls) even if it is not always possible to quantify them.

ANNEX 1: TERMS OF REFERENCE OF THE STUDY

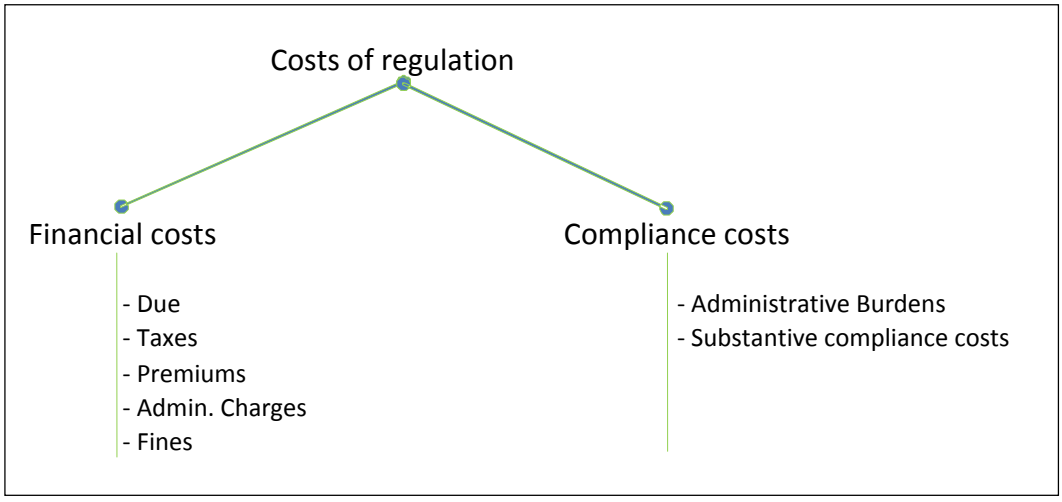
Terms of Reference

ANNEX 2: STANDARD COST MODEL

INTRODUCTION

In general, the cost of regulation can be categorised as follows:

Overview of regulatory costs



Source: "The Standard Cost Model" – A framework for defining and quantifying administrative burdens for businesses – August 2004.

Referring to the regulatory obligations in the existing legislation on bovine identification, ***no financial costs of regulation could be identified*** related to the introduction of electronic identification (EID) as official method to identify bovine animals within the European Union.

Furthermore, referring to the definition of administrative costs in the Annex 10 of the Impact Assessment Guidelines[11], it could be concluded that ***all compliance costs are administrative costs*** as there are no other obligations than legal obligations related to the provision of information on the livestock.

By consequence, the cost modelling approach for this study will follow the step by step guide for the application of the Standard Cost Model.

[11] Annex 10. Assessing administrative costs imposed by legislation to the Impact Assessment Guidelines", the European Commission defines the administrative costs as *'the costs incurred by enterprises, the voluntary sector, public authorities and citizens in meeting legal obligations to provide information on their action or production, either to public authorities or to private parties. Information is to be construed in a broad sense, i.e. including costs of labelling reporting, monitoring and assessment needed to provide the information and registration'*. (http://ec.europa.eu/governance/impact/docs/key_docs/sec_2005_0791_anx_en.pdf)

Overall, three phases are distinguished.

- **Phase 1: Preparatory analysis**
    - *Step 1: Identification and classification of the information obligations;*
    - *Step 2: Identification of the required action;*
    - *Step 3: Classification by regulation;*
    - *Step 4: Identification of target group(s), also called segmentation;*
    - *Step 5: Identification of the frequency of the required actions;*
    - *Step 6: Identification of the relevant cost parameters;*
    - *Step 7: Choice of the data sources.*

- **Phase 2: Data capture and standardisation**
    - *Step 8: Assessment of the number of entities concerned;*
    - *Step 9: Assessment of the performance of a "normal efficient entity" in each target group, taking into account cost parameters in step 6.*

- **Phase 3: Calculation and reporting**
    - *Step 10: Extrapolation of validated data to EU level;*
    - *Step 11: Reporting and transfer to database.*

The implementation of these phases and steps in evaluating the cost of regulation related to Regulation (EC) No 1760/2000 and other Regulations for the implementation of it, for all of the three options under consideration for the introduction of electronic identification (EID) as official method to identify bovine animals are presented in this annex.

PHASE 1: PREPARATORY ANALYSIS

The preparatory analysis for the standard cost model includes the identification and classification of the information obligations and the identification of the required actions including a classification by regulatory origin, the identification of target group(s), the frequency of required actions, the identification of relevant cost parameters as well as the choice of data sources and, where necessary, development of data capture tool(s).

Step 1: Identification and classification of the information obligations

Referring to the list of ***types of obligations*** presented in the Annex 10[12], the following inventory of relevant obligations can be identified:

[12] Cf. Box 12 on page 38 of the Annexes to the Impact Assessment Guidelines

Overview of relevant information obligations

Type of obligation	Source for the regulation
1. Identification of bovine animals ("Tagging") with ear tags	Regulation 1760/2000 Article 4
2. Keep an up-to-date register	Regulation 1760/2000 Article 7.1
3. Report to the competent authority all movements to and from the holding and all births and deaths of animals on the holding	Regulation 1760/2000 Article 7.2
4. Supply the competent authority, upon request, with all information concerning the origin, identification and, where appropriate, destination of animals, which he has owned, kept, transported, marketed or slaughtered	Regulation 1760/2000 Article 7.3
5. Set-up a computerised database (competent authority)	Regulation 1760/2000 Article 5
6. Communicate to other Members States and to the Commission information on the identifiers used	Regulation 911/2004 Article 10
7. Removal and recuperation of (E)ID material	Regulation 911/2004 Article 2 c

Step 2 and 3: Identification of the required action and classification by regulation

The table below lists the required ***actions*** relevant for determining the cost of the regulation. Also, it is indicated what action will be performed by what actor (cf. also Step 4).

For the cost calculations per Member State, it is assumed that no Member State requires actions that go beyond what is needed to meet the obligations imposed by the regulation (i.e. no 'gold plating' is assumed).

Overview of required actions per actor involved

Types of required action	Major actors concerned
1. Preparatory actions *- Monitoring of regulation* *- Distribution of information* *- Training*	All actors
2. Tagging (and retagging) of bovine animals	Holdings
3. Reading of identifiers and registration	Holdings, markets & assembly centers and slaughterhouses
4. Transfer of information on read identifiers to the register or database	Holdings, markets & assembly centers and slaughterhouses
5. Processing of the information received from the sector	Competent authorities
6. Removal and recuperation of (E)ID material	Slaughterhouses

As stated before (cf. Table 2 on page 23), the only actions/tasks that will be affected by the introduction of electronic identification (EID) will be the first, second and sixth one: *'Preparatory actions'*, *'Tagging (and retagging) of bovine animals'*, and *'Removal and recuperation of the (E)ID material'*. After all, since under the policy options considered for the introduction of electronic identification, there is no obligation to change the way in which the other actions such as the reading or transfer of data are performed today, there is – strictly speaking – no reason to consider the cost of such possible changes in the calculations of the cost of regulation. However, provided the importance of possible optimisation of business efficiency through electronic reading and electronic transfer of data, the detailed cost model attached to the Standard Cost Model will also include a scenario that takes into account the impact of a further automation on actions three, four and five: *'Reading of identifiers and registration'*, *'Transfer of information on read identifiers to the register or database'*, and *'Processing of the information received from the sector'*.

Step 4: Identification of target group(s), also called segmentation

The target groups are distinguished based on their type and size. A distinction is made between:

- Holdings (Farmers);
- Markets & Assembly Centers;
- Slaughterhouses;
- Competent Authorities (CA).

For the farmers, the model makes a distinction between big farmers (> 20 livestock units) and small farmers (≤ 20 livestock units). However, for the detailed calculations of the cost of regulation, no distinction was made between different types of farmers (e.g. breeding farms, milking farm, fattening farms,..). After all, differences will only be observed when determining the possible business opportunities related to e-reading. Preliminary figures for specific sectors are presented in the analysis of the OPTION 1.

The organisation of the bovine sector, and more precisely in terms of the consecutive steps in trading bovine or in transporting bovine from the farm to the slaughterhouse, differs a lot from Member State to Member State. Therefore, it was decided to group all intermediary actors between the farmers and the slaughterhouses (excl. transporters) in one global category of actors called *'Markets & Assembly Centers'*.
MSs specificities in trade organisation can be reflected by the number of movements (in and out). For example, in the UK and DE for a bovine population of about 10 million, the number of movements for markets & assembly centers is reported of about 9 and 19 million, respectively. In comparison, when looking at FR, with a bovine population of 19 million, only 3,8 million movements are recorded.

Step 5: Identification of the frequency of the required actions

The standard cost model methodology indicates that the frequency of the required actions will be expressed in a number of times per year. A distinction will however be made between recurring and non-recurring costs in order to correctly reflect the impact of one-off costs in assessing the evolution of the cumulative burden. Furthermore, the required actions will be grouped per type of actor which is responsible for executing these actions.

The Standard Cost Model that is accompanying this report explicitly calculates the frequency of each required action under the different policy options. The table below indicates the distinction between the non-recurring and recurring actions and provides a general indication of what determines the frequency of the recurring actions.

Overview of relevant information obligations

Types of required action	Frequence of the actions
1. Preparatory actions *- Monitoring of regulation* *- Distribution of information* *- Training*	Non-recurring actions
2. Tagging (and retagging) of bovine animals	Recurring action depending on the option and scenario
3. Reading of identifiers and registration	Recurring action depending on the number of births and movements of bovine animals
4. Transfer of information on read identifyers to the register or database	Recurring action every 3 to 7 days and upon request of the competent authority
5. Processing of the information received from the sector	Recurring action on a daily basis
6. Removal and recuperation of (E)ID material	Recurring action depending on the number of animals slaughtered

Step 6 and 7: Identification of the relevant cost parameters and choice of the data sources

The cost of regulation for the Regulation (EC) No 1760/2000 mainly consists of costs for the administrative action carried by the actors (or 'targeted entities') themselves (i.e. valued based on an 'internal tariff') and for the internal equipment and supplies acquired by the targeted entity to comply with the information obligation.

A detailed list of all relevant cost parameters as well as the data sources used to quantify the value of each parameter is presented in Annex 3. Most of the data collection methods indicated by the Commission in its Impact Assessment Guidelines Annexes have been used for this study. These include focus groups, consultations of stakeholders, field trials, consultancy studies and experts assessments. The model provides a more detailed indication of what data collection method was used for what parameters.

PHASE 2: DATA CAPTURE AND STANDARDISATION

Step 8: Assessment of the number of entities concerned

For the assessment of the number of entities concerned, data were collected on the number of entities of each of the actors identified in Steps 3 and 4. The overview of the number of entities per actors as well as the data sources used for collecting this information are again presented in Annex 3.

Consistent with the Standard Cost Model guidelines, the assessment of the administrative cost will be determined on the basis of an assumption of full compliance by all entities concerned. Also, the assessment will be based on 'ideal types' (e.g. a typical breeding farm).

Step 9: Assessment of the performance of a "normal efficient entity" in each target group, taking into account cost parameters in step 6.

The assessment is based on 'ideal types' (e.g. a typical breeding farm). For each of the actions that have been identified, normal efficient durations were determined. As the objective of the cost calculations for the study on the introduction of electronic identification (EID) as official method to identify bovine animals within the European Union is also to compare costs between different policy options and scenarios, different durations were determined depending on the way in which an action would be performed (e.g. efficient duration of the application of an E-ear tag compared to the efficient duration of the application of a bolus).

The results of the outcome of the assessment of the performance of a normal efficient entity for each action are presented in detail in Annex 3.

PHASE 3: CALCULATION AND REPORTING (COMPARISON OF THE THREE OPTIONS)

Steps 10 and 11 will be performed while executing the "Task 3: Comparison of the three options" of the mission (see SECTION 5).

Step 10: Extrapolation of validated data to EU level

It was evaluated to what extent specific estimates are necessary for each Member State and to what extent EU costs could be estimated by extrapolating data at national or EU level. The selection of MS specific parameters (e.g. frequency of actions for the reading of EID; i.e. "number of movements of bovine animals") or EU averages parameters (e.g. cost of the tags and boluses) is motivated in Annex 3. No specific country distributions presented in other Standard Cost Models could be used for this costing exercise.

Step 11: Report

Finally, the total costs of regulation will be presented in a standardised manner that allows for the comparison and addition of the estimates made. The common report sheet used is to be considered as a summary of the more detailed analysis that has been made and of which the outcome is presented in Annex 3.

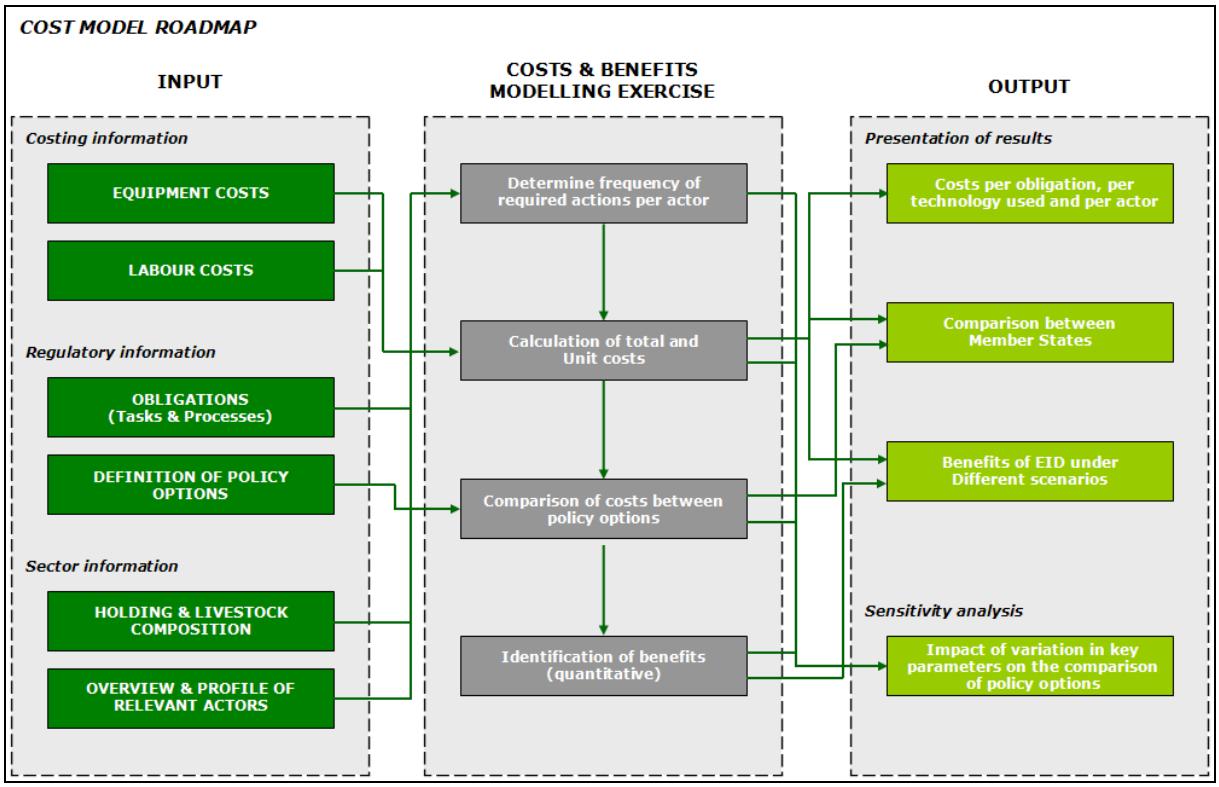
ANNEX 3: IMPLEMENTATION OF THE COST MODEL

INTRODUCTION

The cost model is constructed in a modular way, enabling the grouping of cost elements in a number of ways (per obligation or action, per MS, per actor, per technology …) while making a clear distinction between input parameters, calculations and model output.

This approach should enable easy understanding of the scope and functioning of the cost model and allows for any user to feel comfortable when making additional simulations in the model.

The main structure of the cost model is presented in the illustration below:



INPUT PARAMETERS

For the input parameters, a distinction is made between:

- The holding and livestock composition;
- Equipment costs;
- Labour costs;
- Assumptions regarding the obligations and actions (or 'tasks').

HOLDING & LIVESTOCK COMPOSITION

Bovine livestock

Information on the **total livestock** (cattle or bovine) per Member State is taken from the EUROSTAT report *'EU Cattle population in December 2007 and production forecast for 2008'* (figures for 2007). Whenever possible, this information has been further updated with information received from the national competent authorities (CA) based on a questionnaire that has been sent to them (see Annex 5).

For the Member States for which no more detailed information could be obtained, it was assumed that annual reproduction rate amounts to **85%** (i.e. 85 annually born calves per 100 cows). Then the annual number of calves has been estimated by multiplying the total number of cows[13] (i.e. dairy and other cows) by 0,85.

Abstraction was made of the **imported livestock** as this amounts only to approximately 4.000 heads per year at the EU 27 level[14].

Regarding the number of **slaughtered animals** per year, information was found in the above mentioned EUROSTAT report on the tonnes of calves, heifers, cows, bullocks and bulls slaughtered in each individual Member State (figures for 2007). From these figures and based on the average carcass weight per bovine category, the number of slaughtered animals per category and in total were determined for each Member State. Again, whenever possible, this information has been further updated with information provided directly from the competent authorities in answer to a specific questionnaire for this study (Annex 5).

FCEC has tried to collect statistics regarding mortality of animals before 20 days after birth. After all these statistics, when available, could have been interesting when comparing costs of tagging between E-ear tags and boluses, as boluses cannot be applied just after birth. Therefore, animals that died young are not tagged with a bolus when, possibly, tagged with an E-ear tag.

[13] Number of dairy cows and other cows are also based on the EUROSTAT report *'EU Cattle population in December 2007 and production forecast for 2008'* (figures for 2007).
[14] Cf. http://www.fas.usda.gov/gainfiles/200808/146295593.pdf).

Overview of the bovine livestock per MS

Caracteristics on the livestock and its reproduction							
Number of calves/cows				**0,85**			
		Bovine (2007)	Total slaughtered	Dairy cows (2007)	Other cows	Total cows	Total calves to be identified per year
		in 1000	*in 1000*	*in 1000*	*in 1000*	*in 1000*	*in 1000*
Information at EU 27 level		90.474	28.074	24.154	12.314	36.468	34.279
In % of Bovine (extrapolation assumption)							
Information per MS							
	AT	**1.997**	**706**	**525**	**271**	796	**816**
	BE	**2.700**	**824**	**524**	**510**	1.035	**954**
	BG	**611**	22	**335,9**	**14**	350	298
	CZ	**1.367**	247	**407**	**152**	559	476
	CY	**56**	**18**	**24**	**0**	24	**21**
	DK	**1.600**	**492**	**551**	**105**	656	**700**
	EE	**237**	**56**	**104**	**9**	113	**100**
	FI	**915**	**280**	**296**	**45**	341	**350**
	FR	**19.900**	5.663	**3.759**	**4.163**	7.921	**7.550**
	DE	**12.951**	**3.813**	**4.064**	**725**	4.789	**4.848**
	EL	**682**	235	**150**	**145**	295	251
	HU	**705**	111	**266**	**57**	323	275
	IE	**5.902**	1.778	**1.088**	**1.117**	2.205	1.875
	IT	**6.268**	**3.112**	**1.839**	**441**	2.280	**1.834**
	LV	**380**	**134**	**180**	**15**	196	**159**
	LT	**788**	179	**405**	**10**	415	353
	LU	**196**	**26**	**40**	**33**	73	**70**
	MT	**17**	**6**	**8**	**0**	8	**5**
	NL	**4.000**	**1.960**	**1.490**	**89**	1.579	**1.500**
	PL	**6.232**	**1.500**	**2.677**	**61**	2.739	**2.244**
	PT	**1.426**	330	**305**	**418**	722	614
	RO	**2.819**	1.054	**1572,9**	**30,6**	1.604	1.363
	SI	**475**	**132**	**117**	**60**	178	**167**
	SK	**498**	**82**	**180**	**36**	216	**178**
	ES	**5.954**	**2.165**	**903**	**1.959**	2.862	**3.482**
	SE	**1.578**	**421**	**366**	**183**	548	**527**
	UK	**10.221**	**2.727**	**1.978**	**1.665**	3.643	**3.269**

Bovine holdings (farms)

Information for the 27 individual Member States is taken into account. The number of **holdings with cattle livestock** was taken from the EUROSTAT databases[15]. Moreover, a distinction is made between holdings with up to 20 LSU (Life Stock Units) and holdings with more than 20 LSU.

[15] Cf. Category j02_08

Overview of the total number of livestock holding with cattle per MS

		Livestock holdings (cattle) (2007)	Holdings <= 20 bovines	Holdings > 20 bovines
Information at EU 27 level		3.398.490	2.576.640	821.850
		100%	76%	24%
Information per MS				
	AT	**76.730**	**47.330**	29.400
	BE	**28.460**	**7.180**	21.280
	BG	**168.370**	**164.860**	3.510
	CZ	**13.960**	**9.380**	4.580
	CY	**290**	**40**	250
	DK	**15.610**	**6.050**	9.560
	EE	**7.420**	**6.280**	1.140
	FI	**18.620**	**5.950**	12.670
	FR	**219.960**	**52.770**	167.190
	DE	**169.690**	**56.590**	113.100
	EL	**23.380**	**14.060**	9.320
	HU	**19.800**	**15.970**	3.830
	IE	**104.930**	**32.580**	72.350
	IT	**146.990**	**91.540**	55.450
	LV	**47.350**	**44.560**	2.790
	LT	**132.600**	**128.150**	4.450
	LU	**1.480**	**170**	1.310
	MT	**230**	**80**	150
	NL	**35.260**	**6.760**	28.500
	PL	**718.260**	**627.970**	90.290
	PT	**52.130**	**40.950**	11.180
	RO	**1.067.730**	**1.053.150**	14.580
	SI	**40.840**	**36.250**	4.590
	SK	**15.450**	**14.240**	1.210
	ES	**136.070**	**78.030**	58.040
	SE	**23.880**	**9.720**	14.160
	UK	**113.000**	**26.030**	86.970

Other actors (excl. competent authorities)

Data on the total number of markets & assembly centers as well as slaughterhouses, was first of all found on the websites of competent authorities at the European and Member State level:

Information on the assembly centers:

http://circa.europa.eu/irc/sanco/vets/info/data/assembly/assembly.html

Information on the slaughterhouses:

http://ec.europa.eu/food/food/biosafety/establishments/list_en.html

Furthermore, this information was updated and completed with information provided by the national competent authorities in reply to a specific questionnaire for this study (cf. Annex 5). Finally, further estimations were needed for a few Member States as no specific data could be collected.

Overview of the total number per type of actor in the bovine sector (excl. competent authorities)

		Markets & Assembly centers	Slaughterhouses	Data source
Information at EU 27 level		5.644	9.847	
Information per MS				
	AT	104	**3.800**	Competent Authority
	BE	32	**61**	Competent Authority
	BG	19	**13**	Websites
	CZ	15	**121**	Websites
	CY	0	**1**	Competent Authority
	DK	26	**94**	Competent Authority
	EE	4	**72**	Competent Authority
	FI	0	**40**	Competent Authority
	FR	1307	**271**	Competent Authority
	DE	854	**989**	Competent Authority
	EL	20	**100**	Estimate by FCEC
	HU	17	**81**	Websites
	IE	100	**210**	Websites and estimate FCEC
	IT	1363	**2.334**	Competent Authority
	LV	19	**80**	Competent Authority
	LT	0	**56**	Websites
	LU	9	**3**	Competent Authority
	MT	0	**1**	Competent Authority
	NL	51	**237**	Competent Authority
	PL	209	**130**	Competent Authority
	PT	20	**35**	Websites and estimate FCEC
	RO	60	**50**	Websites and estimate FCEC
	SI	22	**27**	Competent Authority
	SK	72	**138**	Competent Authority
	ES	982	**481**	Competent Authority
	SE	2	**62**	Competent Authority
	UK	337	**360**	Competent Authority

EQUIPMENT COSTS

For the equipment costs, a distinction is made between the cost of the approved conventional and electronic identifiers, the device applicators as well as the reading equipment.

Approved conventional and electronic identifiers

For the approved conventional and electronic identifiers the unit costs are based on average prices obtained from manufacturers and suppliers as well as from the interviews that have been carried out during the study.

It has to be mentioned that prices are quite different based on what purchasing system is used. If a central approach is taken through large calls, the price can be reduced by 30 to 40% in comparison to the approach of having suppliers dealing directly with individual farms or farmers' group. As an example, prices for convention ear tag unit are from the range of 0,40 € to 2,40 €.

Price figures presented for retagging have to be considered carefully when talking about e-identifiers as these are not in practice yet. Prices provided by suppliers may be considered as underestimated as no practical experiences exist.

Additionally, from the experience in the IDEA project and from Member States using already EID the retagging rate for ruminal boluses is around 0,3% per year (lost or not functioning), whereas for conventional and electronic ear tags the loss rate varies considerably (between 1 and 25 % per year). In the cost model the average retagging rate for conventional ear tags is set to 5 % per year. Based on stakeholders positions collected during the interviews, it is assumed that for retagging, an identifier with the same code is used.

In the calculations with ruminal boluses, training for the bolus application is shown separately as one time occurring costs.

Overview of the costing parameters related to the identifiers

Description		Unit of measure	Source for quantifying the parameters
Equipment (prices excl. VAT)			
Approved conventional and electronic identifiers (transponders)			Data source
Conventional ear tag			
Price	0,80	€/Unit	Interviews with equipment providers
Mark-up for material cost in case of retagging	40%		Interviews with equipment providers
Price for Re-ID	1,12	€/Unit	Interviews with equipment providers
Expected loss rate (physical)	5	%	Interview with stakeholders & experts
E-ear tag			
Price	1,40	€/Unit	Interviews with equipment providers
Mark-up for material cost in case of retagging	40%		Interviews with equipment providers
Price for Re-ID	2,80	€/Unit	Interviews with equipment providers
Expected loss rate (physical and functionnal)	4	%	Interview with stakeholders & experts
Bolus			
Price per unit	1,75	€/Unit	Interviews with equipment providers
Price for Re-ID	5,00	€/Unit	Interviews with equipment providers
Expected loss rate (physical and functionnal)	0,30	%	Interview with stakeholders & experts

Device applicators

For the device applicators the costs are based on average prices obtained from manufacturers and suppliers as well as from interviews. The current applicator for ear tags can be used for E-ear tag and there is no need for a new investment for farmers in case of using E-ear tags.

Experts consulted during the study indicated that the applicators should be changed after tagging of around 1.000 animals. The parameter "Maximum capacity" for the applicator for conventional or electronic ear tags has not been included in the calculations. After all, when dividing the total number of new born animals by the number of farms, multiplied by the depreciation period of the equipment, this gives results that are far below the maximum capacity that has been assumed when considering that each holding has 2 applicators.

For both boluses and E-ear tags, it is assumed that holdings will buy 2 applicators for security reasons (back-up solution in case of technical problem or loss).

For boluses, it has to be highlighted that applying a bolus requires expertise and that in certain cases, tagging with a bolus is done by experienced technical teams circulating from farm to farm (e.g. Spain).

Overview of the costing parameters related to the device applicators

Description			Unit of measure	Source for quantifying the parameters
Equipment (prices excl. VAT)				
Device applicators				Data source
	Price of applicator for conventional or electronic ear tag	30,00	€/Unit	Interviews with equipment providers
	Depreciation period	5	Years	Interviews with equipment providers
	Maximum capacity	1.000		Interviews with equipment providers
	Number of applicators			
	For a small holding	2		Interview with stakeholders & experts
	For a big holding	2		Interview with stakeholders & experts
	Price for bolus applicator	55,00	€/Unit	Interviews with equipment providers
	Depreciation period	5	Years	
	Number of applicators			
	For a small holding	2		Interview with stakeholders & experts
	For a big holding	2		Interview with stakeholders & experts

Reading equipment

This part includes reading equipment requirements for all type of actors and for both E-ear tags and boluses.
An average cost of maintenance and training for usage of 15% has been considered for all types of equipment and a depreciation period of 5 years.
Small holdings are not buying any reading equipment (< 20 heads) when big holdings (> 20 heads) are equipped with 2 handset readers (of which one serves as a back-up reader) but do not invest in static readers.
Markets & assembly centers buy one handset reader and one stationary reader when slaughterhouses are equipped with 2 handheld and one static readers.
These assumptions have been based on discussions with equipment providers and validated during the interviews.

Overview of the costing parameters related to the reading equipment, incl. assumptions on the volume of equipment per type or actor

Description		Unit of measure	Source for quantifying the parameters
Reading equipment			Data source
E-Eartag reading equipment			
Handset reader (hand held)	490,00	€/Unit	Interviews with equipment providers
Cost of maintenance and training for usage	15%		
Depreciation period	5	Years	Interviews with equipment providers
Number of readers for big holding (> 20 heads)	2	Unit	
Number of readers for markets and assembly centers	1	Unit	
Number of readers for slaughterhouses	2	Unit	
Static reader (stationary)	1.990,00	€/Unit	Interviews with equipment providers
Cost of maintenance and training for usage	15%		
Depreciation period	5	Years	
Number of readers for big holding (> 20 heads)	0	Unit	
Number of readers for markets and assembly centers	1	Unit	
Number of readers for slaughterhouses	1	Unit	
Bolus reading equipment			
Handset reader (hand held)	490,00	€/Unit	Interviews with equipment providers
Cost of maintenance and training for usage	15%		
Depreciation period	5	Years	Interviews with equipment providers
Number of readers for big holding (> 20 heads)	2	Unit	
Number of readers for markets and assembly centers	1	Unit	
Number of readers for slaughterhouses	2	Unit	
Static reader (stationary)	1.990,00	€/Unit	Interviews with equipment providers
Cost of maintenance and training for usage	15%		
Depreciation period	5	Years	Interviews with stakeholders
Number of readers for big holding (> 20 heads)	0	Unit	Interviews with stakeholders
Number of readers for markets and assembly centers	1	Unit	
Number of readers for slaughterhouses	1	Unit	

Further handling equipment

Additional equipment is required to process read identifiers irrespectively of the type of reader used. Data have to be downloaded to a "file" and therefore an IT system (PC + connection pack to the reader) is necessary. Costs of data collection and transmission equipment mean the purchase costs of equipment used in the upload/download, management and transmission of electronic data. Among the minimum requirements, one should mention buying a laptop, a modem and softwares. Most of those interviewed stated that a computer quite rudimentary was sufficient to deal with the type and volume of data in the system. A link to the internet is required to transfer the data to the central database. This data entry system already exists in many Member States where actors can type-in data to be transferred. There are no specific costs to transferring data for the operator, to the exception of the internet subscription, the interface costs are borne by the competent authority in charge of setting up the database and costs are included in the overall costs of management of the database. These costs have not been considered in the Cost Model.

Another point of discussion during the study has been the cost linked to the modification of the national database when introducing EID. In an article published by G. Caja and *al* [16], it is mentioned that the cost of building, running, and maintaining of a national database for sheep and goats in Spain has been estimated to be the same as the "Simogan" cattle database currently in use, which corresponds to a total of 46 Mio € over a 6,5 year period.
During the interviews, UK CAs' representatives mentioned that adapting the national system for printing numbers on new E-tags has been a cost of 3 Mio £. The cost of modifying the database to allow new numbering system to be considered has not been evaluated yet. In the other hand, some interviewed considered these costs as non significant.
In the cost model, these costs have not been included as no consistent cost figure was collected.

[16] C. Saa, M.J. Milan, G.Caja and J.J. Ghirardhi (2005). Cost evaluation of the use of conventional and electronic identification and registration systems for the national sheep and goat populations in Spain. J. Anim. Sci. 2005. 1215-1225

LABOUR COSTS

The labour cost for each individual Member State was taken for the table "*Tariffs used in the Action Programme Reducing Administrative Burdens in Europe*". More precisely, for the actors of the bovine sector, the hourly manpower cost of the *'8. Manual workers (agricultural and fisheries)'* was used. The manpower cost of category *'4. Clerks'* has been taken into account for the actions performed by the competent authorities.

No European average could be found in the above mentioned table. By consequence, it has been determined by calculating a weighted average, with a weight corresponding to the population per Member State.

Overview of the hourly manpower cost per MS and EU 27 averages

Hourly labour cost				
		Reducing the Administrative Burden Action Plan		Population
		8. Manual workers (agricultural and fisheries)	4. Clercks	
Information at EU 27 level		**15,67**	**17,64**	
Information per MS				
	AT	17,77	22,34	8.340.924
	BE	22,04	23,38	10.666.866
	BG	1,42	1,42	7.640.238
	CZ	4,59	4,81	778.700
	CY	10,60	10,25	10.403.100
	DK	29,38	27,66	5.511.451
	EE	3,82	4,36	1.340.935
	FI	21,46	20,85	5.312.415
	FR	20,73	20,71	64.473.140
	DE	20,47	24,93	82.218.000
	EL	11,16	12,22	11.125.179
	HU	4,40	4,87	10.036.000
	IE	21,80	24,97	4.501.000
	IT	15,25	20,38	59.619.290
	LV	3,44	3,73	2.266.000
	LT	3,27	3,46	3.357.873
	LU	19,83	27,80	483.800
	MT	7,91	8,85	407.810
	NL	20,62	21,94	16.471.968
	PL	4,39	5,01	38.115.641
	PT	6,26	9,52	10.599.095
	RO	2,99	3,61	21.538.000
	SI	7,31	9,74	5.400.998
	SK	3,27	2,76	2.025.866
	ES	11,73	12,89	46.063.511
	SE	23,41	22,86	9.253.675
	UK	22,32	23,69	61.003.875

OBLIGATIONS (TASKS & PROCESSES)

Preparatory phase

Introduction of EID leads to modification of the current regulation as well as communicating changes to users and concerned actors who, also, have to spend time understanding the new regulation and associated required actions. The implementation of an electronic animal identification requires training on the use of new equipment and technologies. The three main categories of training focus on labelling in animals, reading of labels and data management.
This preparatory phase concerns all actors. For holdings, markets & assembly centers and slaughterhouses this task is quite limited and is estimated to 5 hours on average for the holdings and 10 hours on average for the markets & assembly centers and slaughterhouses. As CAs are responsible to provide education and technological support during the development and implementation stage, efforts are more substantial and are estimated at 300 hours.

Overview of the efficient durations determined for the actions in the preparatory phase

Description	Value	Unit of measure
Task 1: Preparatory phase		
Actors for which this task is or can be relevant		
Holdings (or Farms)	**1**	(Yes = 1; No = 0)
Markets	**1**	(Yes = 1; No = 0)
Slaughterhouses	**1**	(Yes = 1; No = 0)
Competent authorities	**1**	(Yes = 1; No = 0)
Detailed task description		
Monitoring of regulation, distribution of information, training		
Holdings (or Farms)	**5**	Hour
Markets	**10**	Hour
Slaughterhouses	**10**	Hour
Competent authorities	**300**	Hour

Furthermore, all interviewees have highlighted the fact that readers are not '*plug and play*' systems and that modifications of the physical environment (corridors, stables, etc...) are required to secure an optimal use of the reading equipment. The costs presented in the following table are based on discussions with experts in this area and conclusions of field trials and pilot projects that have been completed to date. These costs designate materials and labour required in the construction and physical renovation of the market place or slaughterhouse in order to implement the RFID static reading equipment. This may be the expansion or modification of the storage facilities, the construction of data collection centers, modification of existing enclosures for livestock. The scale of conversion facilities varies greatly depending on the size and condition of a given place at the time of the adoption of RFID system.

Overview of the fixed costs of the non-recurring action related to the initial installation of e-reading equipment

Description	Value	Unit of measure
Task 1: Preparatory phase		
For the calculation of possible business opportunities related to e-reading		
Installation: Modification of the physical environment (corridors, weight scale) in order to enable e.g. electronic readings		
Big breeders	**0**	EUR (fixed upfront cost)
Markets	**3.155**	EUR (fixed upfront cost)
Slaughterhouses	**3.155**	EUR (fixed upfront cost)
Depreciation of upfront investments	**5**	years

Identification – Tagging (& Retagging)

Figures presented in the following table are based on experience gained in field work and collected during the interviews. These figures are averages, and it has to be mentioned that interviewees views were quite different from one MS to another due to the flock management and the type of production (e.g. intensive vs extensive). What is important to consider are the difference between different devices rather than the figures *per se*. Application of a bolus is considered as being a little bit more expensive than for ear tags as it may require to have 2 persons for the application.

Overview of the efficient duration of the actions related to the identification of the bovine animals

Description	Value	Unit of measure
Task 2: Identification - Tagging (& Retagging)		
Actors for which this task is or can be relevant		
Holdings (or Farms)	**1**	(Yes = 1; No = 0)
Markets	**0**	(Yes = 1; No = 0)
Slaughterhouses	**0**	(Yes = 1; No = 0)
Competent authorities	**0**	(Yes = 1; No = 0)
Detailed task description		
Application of 1 conventional ear tag	**2,50**	Minutes per ID
Re-application of lost conventional ear tag (incl. additional administrative cost)	**7,00**	Minutes per ID
Application of 1 E-ear tag	**2,50**	Minutes per ID
Re-application of lost E-ear tag (incl. additional administrative cost)	**7,00**	Minutes per ID
Application of 1 bolus	**3,00**	Minutes per ID
Re-application of lost bolus (incl. additional administrative cost)	**7,00**	Minutes per ID

Registration & Reading

With a static reader, based on discussions with suppliers and experts, time for e-reading an animal is estimated at 0,17 minutes for both E-ear tags and boluses. Reading E-ear tags with an handheld reader is longer (0,25 min) as the transponder is visible, and even slightly longer for boluses (0,30 min) as it may take some time to locate the bolus.

Overview of the efficient duration and indication of the frequency of the actions related to the registration of the bovine animals as well as the readings in case of movements

Description	Value	Unit of measure
Task 3: Registration - Reading		
Actors for which this task is or can be relevant		
Holdings (or Farms)	1	(Yes = 1; No = 0)
Big breeders	*1*	*(Yes = 1; No = 0)*
Small breeders	*1*	*(Yes = 1; No = 0)*
Milking farms	*1*	*(Yes = 1; No = 0)*
Fattening farms	*1*	*(Yes = 1; No = 0)*
Markets	1	(Yes = 1; No = 0)
Slaughterhouses	1	(Yes = 1; No = 0)
Competent authorities	0	(Yes = 1; No = 0)
Detailed task description		
Reading - conventional eartag (writing)	2,00	Minutes per ID
Reading - automated process based on E-Eartag (handheld reader)	0,25	Minutes per ID
Reading - automated process based on E-Eartag (static reader)	0,17	Minutes per ID
Reading - automated process based on Bolus (handheld reader)	0,30	Minutes per ID
Reading - automated process based on Bolus (static reader)	0,17	Minutes per ID
Percentage of readings with static reader in markets and assembly centers	80	Percentage
Percentage of readings with static reader in slaughterhouses	80	Percentage
Regulatory obligations (= "add to register")		
Readings related to birth	1	Reading per birth
Reading related to movements	1	Reading per movement in OR out

Estimation of the total number of readings

As the organisation of the sector can vary strongly from one Member State to another and provided this has a direct impact of the number of movements of animals, it was decided to request information on the number of movements per year from the competent authorities instead of making overall assumptions for these volumes.

For the majority of the Member States, information on the total number of movements was obtained. This information was further used to determine an estimated number of movements per actor since a split of the cost of regulation per action should be determined in the end.

The following rules were applied for determining the number of readings per actor per year:

- The number of regulatory readings for the farms are equal to the number of births plus the number of slaughtered animals;
- The number of regulatory readings for the slaughterhouses is equal to the number of slaughtered animals;
- In those member states with markets and or assembly centers, the number of readings is equal to the total number of movements reduced with the number of slaughtered animals times 2.

This has lead to the following results:

		Overview of regulatory readings					
		Registration of birth	Total number of movements (in OR out)	Total regulatory readings	Number of readings compared to number of births per year	Number of readings per LSU	Data source
		in 1000	*in 1000*	*in 1000*			
Information at EU 27 level		34.279	111.418	145.697	4,3	1,6	
Information per MS							
	AT	816	**4.300**	5.116	6,3	2,6	Based on input from questionnaire
	BE	954	**2.957**	3.911	4,1	1,4	Based on input from questionnaire
	BG	298	**150**	448	1,5	0,7	Best possible estimate by FCEC
	CZ	476	**1.500**	1.976	4,2	1,4	Best possible estimate by FCEC
	CY	21	**22**	44	2,0	0,8	Based on input from questionnaire
	DK	700	**1.000**	1.700	2,4	1,1	Based on input from questionnaire
	EE	100	**123**	223	2,2	0,9	Based on input from questionnaire
	FI	350	**590**	940	2,7	1,0	Based on input from questionnaire
	FR	7.550	**15.176**	22.726	3,0	1,1	Based on input from questionnaire
	DE	4.848	**27.319**	32.166	6,6	2,5	Based on input from questionnaire
	EL	251	**800**	1.051	4,2	1,5	Best possible estimate by FCEC
	HU	275	**800**	1.075	3,9	1,5	Best possible estimate by FCEC
	IE	1.875	**8.000**	9.875	5,3	1,7	Best possible estimate by FCEC
	IT	1.834	**8.384**	10.218	5,6	1,6	Based on input from questionnaire
	LV	159	**359**	518	3,3	1,4	Based on input from questionnaire
	LT	353	**1.000**	1.353	3,8	1,7	Best possible estimate by FCEC
	LU	70	**212**	282	4,0	1,4	Based on input from questionnaire
	MT	5	**15**	20	4,1	1,2	Best possible estimate by FCEC
	NL	1.500	**4.200**	5.700	3,8	1,4	Based on input from questionnaire
	PL	2.244	**6.661**	8.905	4,0	1,4	Based on input from questionnaire
	PT	614	**1.500**	2.114	3,4	1,5	Best possible estimate by FCEC
	RO	1.363	**2.500**	3.863	2,8	1,4	Best possible estimate by FCEC
	SI	167	**800**	967	5,8	2,0	Based on input from questionnaire
	SK	178	**840**	1.017	5,7	2,0	Based on input from questionnaire
	ES	3.482	**5.673**	9.155	2,6	1,5	Based on input from questionnaire
	SE	527	**1.654**	2.181	4,1	1,4	Based on input from questionnaire
	UK	3.269	**14.883**	18.152	5,6	1,8	Based on input from questionnaire

	Distribution of regulatory readings				
		Holdings	Markets & Assembly centers	Slaughterhouses	Total
		in 1000	*in 1000*	*in 1000*	*in 1000*
Information at EU 27 level		63.013	54.609	28.074	145.697
Information per MS					
	AT	1.521	2.889	706	5.116
	BE	1.778	1.310	824	3.911
	BG	320	106	22	448
	CZ	723	1.005	247	1.976
	CY	25	0	18	44
	DK	1.192	16	492	1.700
	EE	157	10	56	223
	FI	660	0	280	940
	FR	13.213	3.850	5.663	22.726
	DE	8.661	19.692	3.813	32.166
	EL	486	330	235	1.051
	HU	386	578	111	1.075
	IE	3.653	4.444	1.778	9.875
	IT	4.946	2.160	3.112	10.218
	LV	292	92	134	518
	LT	1.174	0	179	1.353
	LU	96	159	26	282
	MT	14	0	6	20
	NL	3.460	280	1.960	5.700
	PL	3.744	3.661	1.500	8.905
	PT	944	839	330	2.114
	RO	2.417	391	1.054	3.863
	SI	299	536	132	967
	SK	260	676	82	1.017
	ES	5.647	1.343	2.165	9.155
	SE	948	812	421	2.181
	UK	5.996	9.429	2.727	18.152

Notifications - Transfer of the read ID to register or database

This task concerns the transmission of data entered on the reader to the national database. It should be noted that there are already several methods of data transfer. In some Member States data is written into the passport paper, and copies are faxed or mailed to the competent authorities in charge of data collection. Other Member States have set up an internet system that lets operators enter data manually on-line, but also load ASCII files.
The following costs are based on discussions carried out during the interviews. The assumed number of transfer of handset read required per year has been estimated at once a week.

Overview of the efficient duration and indication of the frequency of the actions related to the registration of the bovine animals as well as the readings in case of movements

Description	Value	Unit of measure
Task 4 : Notifications - Transfer of the read ID to register or database		
Actors for which this task is or can be relevant		
Holdings (or Farms)	**1**	(Yes = 1; No = 0)
Big breeders	***1***	*(Yes = 1; No = 0)*
Small breeders	***1***	*(Yes = 1; No = 0)*
Milking farms	***1***	*(Yes = 1; No = 0)*
Fattening farms	***1***	*(Yes = 1; No = 0)*
Markets	**1**	(Yes = 1; No = 0)
Slaughterhouses	**1**	(Yes = 1; No = 0)
Competent authorities	**0**	(Yes = 1; No = 0)
Detailed task description		
Creation of movement document or report on birth or death		
Transfer to centralised database - manual process	**1**	Minutes per ID
Transfer to centralised database - automated process - handset reader	**10**	Minutes per transfer
Assumed number of transfers of electronically read information required per year	**52**	Units (once a week on average)
Transfer to centralised database - automated process - static reader	**6**	Minutes per transfer
Supply upon request of all info on bovine owned (min 3 years)		
Supply all info manually (manual form of register)	**30**	Minutes per transfer
Supply all info in computerised form	**10**	Minutes per transfer

Processing of the information received from the sector

Overview of the efficient duration of the actions related to the processing of the information received from the sector by the CAs

Description	Value	Unit of measure
Task 5: Processing of the information received from the sector		
Actors for which this task is or can be relevant		
Holdings (or Farms)	**0**	(Yes = 1; No = 0)
Markets	**0**	(Yes = 1; No = 0)
Slaughterhouses	**0**	(Yes = 1; No = 0)
Competent authorities	**1**	(Yes = 1; No = 0)
Detailed task description		
Processing of manually received information	**0,85**	Minutes per ID
Percentage of errors in case of a manual process	**5**	%
Processing of information received via automated process	**0**	Minutes per batch

Removal and recuperation of the ID material

It is essential to recover identifiers, conventional or electronic ones, for 2 major reasons. Firstly, to secure that these material are not entering the food chain and are not present in the environment, secondly to prevent from any fraudulent usage. Removal of conventional and electronic ear tags is a well known practice and do not introduce any additional burden. Disposal of these tags may need to be organised in 2 different circuits inducing some additional costs. However these costs have been estimated as being non significant and therefore not included in the cost model.

Recovery of boluses at slaughter doesn't create any significant issues. The bolus is present in the reticulum and is easily detected by palpating the reticulum. Various unforeseen events including accidental dislodgment and cutting techniques prevents from a 100% recovery.

Overview of the efficient duration of the actions related to the removal and recuperation of ID material

Description	Value	Unit of measure
Task 6: Removal and recuperation of ID material		
Actors for which this task is or can be relevant		
Holdings (or Farms)	**0**	(Yes = 1; No = 0)
Markets	**0**	(Yes = 1; No = 0)
Slaughterhouses	**1**	(Yes = 1; No = 0)
Competent authorities	**0**	(Yes = 1; No = 0)
Detailed task description		
Removal and recuperation of EID material		
Removal and recuperation of conventional eartag	**0,6**	Minutes per ID
Removal and recuperation of electronic eartag	**0,6**	Minutes per ID
Removal and recuperation of bolus	**2**	Minutes per ID
Transfer of ID to carcas for further traceability (for the estimation of benefits)		
Transfer by means of manuel reading of the ID	**0,5**	Minutes per ID
Transfer by means of automated EID	**0**	Minutes per ID

CALCULATIONS

The intermediary results of the calculations in the cost model are presented in this part. First of all, calculations for each individual and separate task are presented. Whenever useful, distinct detailed calculations have been made for each of the considered Policy Options. For POLICY OPTION 3 'Do Nothing', calculations are based on the assumption of ongoing business. For POLICY OPTIONS 1, 2A and 2B, the impact of costs linked to the change in the regulation will explicitly be dealt with.

TASK 1: PREPARATORY PHASE

Frequency of the actions

The monitoring of new regulation, distribution of information and training is assumed to be a non recurring action that will once take place in case of modifying the regulation. By consequence, the frequency of the action is equal to 1 and the total number of actions will depend on the number of market players per category.

Total cost and unit costs

The costs related to the preparatory phase will only occur in Year 1. As these costs are exclusively labour costs, they are not depreciated. The total costs can first of all be determined by actor:

Total cost of the preparatory phase per actor

Actors	Total cost (only in Year 1)	
Task 1A - Monitoring of regulation		
	OPTION 1	**OPTION 3**
Holdings		
Total EU 27	**145.735.259 €**	**0 €**
Markets and assembly centers		
Total EU 27	**932.689 €**	**0 €**
Slaughterhouses		
Total EU 27	**1.629.860 €**	**0 €**
Competent authorities		
Total EU 27	**113.703 €**	**0 €**
Total TASK 1A - All actors		
Total EU 27	**148.411.510 €**	**0 €**

It is composed of the costs per actor per Member State. These are presented below:

Total cost of the preparatory phase per actor and per Member State

Member States	Total cost (per actor and only in Year 1)				
Task 1A - Monitoring of regulation					
	Holdings	**Markets and assembly centers**	**Slaughterhouses**	**Competent authorities**	**Total**
Total EU 27	**145.735.259 €**	**932.689 €**	**1.629.860 €**	**113.703 €**	**148.411.510 €**
AT	6.817.461 €	18.481 €	675.260 €	6.702 €	**7.517.903 €**
BE	3.136.292 €	7.053 €	13.444 €	7.014 €	**3.163.803 €**
BG	1.195.427 €	270 €	185 €	426 €	**1.196.307 €**
CZ	320.382 €	689 €	5.554 €	1.443 €	**328.067 €**
CY	15.370 €	0 €	106 €	3.075 €	**18.551 €**
DK	2.293.109 €	7.639 €	27.617 €	8.298 €	**2.336.663 €**
EE	141.722 €	153 €	2.750 €	1.308 €	**145.933 €**
FI	1.997.926 €	0 €	8.584 €	6.255 €	**2.012.765 €**
FR	22.798.854 €	270.941 €	56.178 €	6.213 €	**23.132.186 €**
DE	17.367.772 €	174.814 €	202.448 €	7.479 €	**17.752.513 €**
EL	1.304.604 €	2.232 €	11.160 €	3.666 €	**1.321.662 €**
HU	435.600 €	748 €	3.564 €	1.461 €	**441.373 €**
IE	11.437.370 €	21.800 €	45.780 €	7.491 €	**11.512.441 €**
IT	11.207.988 €	207.858 €	355.935 €	6.114 €	**11.777.894 €**
LV	814.420 €	654 €	2.752 €	1.119 €	**818.945 €**
LT	2.168.010 €	0 €	1.831 €	1.038 €	**2.170.879 €**
LU	146.742 €	1.785 €	595 €	8.340 €	**157.462 €**
MT	9.097 €	0 €	79 €	2.655 €	**11.831 €**
NL	3.635.306 €	10.516 €	48.869 €	6.582 €	**3.701.274 €**
PL	15.765.807 €	9.175 €	5.707 €	1.503 €	**15.782.192 €**
PT	1.631.669 €	1.252 €	2.191 €	2.856 €	**1.637.968 €**
RO	15.962.564 €	1.794 €	1.495 €	1.083 €	**15.966.936 €**
SI	1.492.702 €	1.608 €	1.974 €	2.922 €	**1.499.206 €**
SK	252.608 €	2.354 €	4.513 €	828 €	**260.303 €**
ES	7.980.506 €	115.189 €	56.421 €	3.867 €	**8.155.982 €**
SE	2.795.154 €	468 €	14.514 €	6.858 €	**2.816.994 €**
UK	12.610.800 €	75.218 €	80.352 €	7.107 €	**12.773.477 €**

When dividing the total costs presented above by the number of livestock units per Member State, the following unit costs per actor are obtained:

Cost per Livestock Unit (LSU) of the preparatory phase per actor and per Member State

Member States	Cost per Livestock Unit (per actor and only in Year 1)				
Task 1A - Monitoring of regulation					
	Holdings	**Markets and assembly centers**	**Slaughterhouses**	**Competent authorities**	**Total**
Average EU 27	**1,61 €**	**0,03 €**	**0,07 €**	**0,01 €**	**1,72 €**
AT	3,41 €	0,01 €	0,34 €	0,00 €	**3,76 €**
BE	1,16 €	0,00 €	0,00 €	0,00 €	**1,17 €**
BG	1,96 €	0,00 €	0,00 €	0,00 €	**1,96 €**
CZ	0,23 €	0,00 €	0,00 €	0,00 €	**0,24 €**
CY	0,28 €	0,00 €	0,00 €	0,06 €	**0,33 €**
DK	1,43 €	0,00 €	0,02 €	0,01 €	**1,46 €**
EE	0,60 €	0,00 €	0,01 €	0,01 €	**0,62 €**
FI	2,18 €	0,00 €	0,01 €	0,01 €	**2,20 €**
FR	1,15 €	0,01 €	0,00 €	0,00 €	**1,16 €**
DE	1,34 €	0,01 €	0,02 €	0,00 €	**1,37 €**
EL	1,91 €	0,00 €	0,02 €	0,01 €	**1,94 €**
HU	0,62 €	0,00 €	0,01 €	0,00 €	**0,63 €**
IE	1,94 €	0,00 €	0,01 €	0,00 €	**1,95 €**
IT	1,79 €	0,03 €	0,06 €	0,00 €	**1,88 €**
LV	2,14 €	0,00 €	0,01 €	0,00 €	**2,16 €**
LT	2,75 €	0,00 €	0,00 €	0,00 €	**2,76 €**
LU	0,75 €	0,01 €	0,00 €	0,04 €	**0,80 €**
MT	0,54 €	0,00 €	0,00 €	0,16 €	**0,70 €**
NL	0,91 €	0,00 €	0,01 €	0,00 €	**0,93 €**
PL	2,53 €	0,00 €	0,00 €	0,00 €	**2,53 €**
PT	1,14 €	0,00 €	0,00 €	0,00 €	**1,15 €**
RO	5,66 €	0,00 €	0,00 €	0,00 €	**5,66 €**
SI	3,14 €	0,00 €	0,00 €	0,01 €	**3,16 €**
SK	0,51 €	0,00 €	0,01 €	0,00 €	**0,52 €**
ES	1,34 €	0,02 €	0,01 €	0,00 €	**1,37 €**
SE	1,77 €	0,00 €	0,01 €	0,00 €	**1,79 €**
UK	1,23 €	0,01 €	0,01 €	0,00 €	**1,25 €**

Comparison between options

It is assumed that the preparatory phase is only required in case the existing regulation would be modified. The only option for which there are no costs for the preparatory phase is thus OPTION 3. Moreover, it is assumed that a change towards a compulsory or voluntary system would cause the same costs in terms of monitoring of the changes in the regulation.

Identification of benefits

There were no direct benefits identified that are linked to the monitoring of the changes in the regulation, the distribution of information and training related to the introduction of EID as official method to identify bovine animals.

On the other hand, in case e-reading would be considered, it is assumed that initial installation and modifications to the physical environment would be required. The costs for these are valued as follows:

Total yearly cost and unit cost per head for the initial modification of the physical environment for e-reading

Task 1B - Installation - Modification of physical environment				
	Total yearly cost		Unit costs per head	
	OPTION 1	OPTION 3	OPTION 1	OPTION 3
Holdings (big breeders)				
Total EU 27	0 €	0 €	0,00 €	0,00 €
Markets and assembly centers				
Total EU 27	3.561.364 €	0 €	0,04 €	0,00 €
Slaughterhouses				
Total EU 27	6.213.457 €	0	0,07 €	0,00 €
Total TASK 1B - All actors				
Total EU 27	9.774.821 €	0 €	0,11 €	0,00 €

For each of the values presented in the above tables, values at the Member State level are available in the Excel cost model accompanying this report.

TASK 2: IDENTIFICATION: TAGGING AND RETAGGING

For the ***obligatory*** introduction of electronic identification (EID) as official method to identify bovine animals within the European Union, a distinction is made between the costs of two possible scenarios:

- **One-off regularisation**: the identification of the whole livestock needs to be regularised during the first year after the new regulation comes into effect. After the first year, the identification is the same as under the transitional approach;
- **Transitional approach**: the identification as required by the new regulation is applied to the new born animals only.

After all, if under OPTION 2A, EID would become obligatory in a specific Member State, the cost of this will be made available also under OPTION 1. In the other cases where the introduction of EID becomes voluntary, it can be assumed that this regime will be chosen by the holdings that believe that this system will be overall more efficient. The evaluation of the efficiency of EID in combination with further efficiency gains for e.g. farm automation systems can be performed on a case-by-case basis; full extrapolation at the Member State level or at the European Union level will however remain very arbitrary and could lead to the wrong conclusions.

Frequency of the actions

For POLICY OPTION 1 and 3, the frequency of the actions is determined per Member State, per type of identifier and for both the case of identifying and re-identifying if the identifier is lost. The following rules were applied:

- Under OPTION 1:

- All new born animals receive a conventional ear tag as well as an electronic identifier (E-Ear tag or bolus);
- For determining the number of cases in which re-identification is required, loss percentages per type of identifier are applied on the whole bovine livestock including half of the new born animals as a uniform spread of the births is assumed. Whereas this approach is fully representative for the one-off regularisation, it includes an additional assumption for the re-identification with electronic identifiers under the transitional approach. After all, the loss rates that are specific for the electronic identifiers are applied to whole livestock whereas in reality, these rates should be a weighted average of the loss rate for the conventional and the new electronic identifier. Also, it is implicitly assumed that the loss of the second conventional ear tag implies re-identification with an electronic identifier. In this respect, the calculation of the transitional approach is to be considered as an average situation after the first few years of introducing EID.

- Under OPTION 3:

  - All new born animals receive two conventional ear tags;
  - Lost ear tags are determined by applying the loss percentage for conventional ear tags on the whole bovine livestock including half of the new born animals as a uniform spread of the births is assumed.

Overview of the number of identifiers per technology that is required under POLICY OPTION 1 and POLICY OPTION 3

Technology	Frequency of required actions				
	OPTION 1 : E-Eartag		OPTION 1 : Bolus		OPTION 3
	One-off regularisation	Transitional approach	One-off regularisation	Transitional approach	
Number of conventional ID					
Total EU 27	34.278.628	34.278.628	34.278.628	34.278.628	68.557.256
Number of conventional ID (Re-ID)					
Total EU 27	5.380.682	5.380.682	5.380.682	5.380.682	10.761.365
Number of E-Eartag					
Total EU27	124.752.963	34.278.628	0	0	0
Number of E-Eartag (Re-ID)					
Total EU27	4.304.546	4.304.546	0	0	0
Number of Bolus					
Total EU27	0	0	124.752.963	34.278.628	0
Number of Bolus (Re-ID)					
Total EU27	0	0	322.841	322.841	0

Total cost and unit costs

It is assumed that the farmers are the only actors that are applying identifiers. Therefore, the tables below do not present costs per actor. A split of the total costs is however made between the labour cost and the cost of the equipment (applicators as well as identifiers). As stated above, the cost calculated for the one-off regularisation under OPTION 1 corresponds to the cost that would be incurred in Year 1. The costs presented under the transitional approach for OPTION 1 and under OPTION 3 correspond to the costs of an average year.

Overview of the total labour and equipment cost for the identification of bovine animals

Technology	Overview of total costs per year				
	OPTION 1 : E-Eartag		OPTION 1 : Bolus		OPTION 3
	One-off regularisation	Transitional approach	One-off regularisation	Transitional approach	
	Costs of Year 1	Average year	Costs of Year 1	Average year	Average year
Total labour cost					
Total EU27	132.227.631	67.311.244	142.037.374	64.137.710	69.464.431
Total cost of the applicators					
Total EU27	40.781.880	40.781.880	115.548.660	115.548.660	40.781.880
Total cost of the identifiers					
Total EU27	220.156.144	93.492.075	253.381.157	95.051.070	66.898.533
Total cost of Task 2	393.165.655	201.585.199	510.967.191	274.737.440	177.144.845

Based on the total cost in the previous table, the following unit costs per head can be calculated:

Overview of the unit cost for labour and equipment for the identification of bovine animals

Technology	Overview of the cost per livestock unit per year				
	OPTION 1 : E-Eartag		OPTION 1 : Bolus		OPTION 3
	One-off regularisation	Transitional approach	One-off regularisation	Transitional approach	
	Costs of Year 1	Average year	Costs of Year 1	Average year	Average year
Total labour cost					
Total EU27	1,46	0,74	1,57	0,71	0,77
Total cost of the applicators					
Total EU27	0,45	0,45	1,28	1,28	0,45
Total cost of the identifiers					
Total EU27	2,43	1,03	2,80	1,05	0,74
Total unit cost of Task 2	4,35	2,23	5,65	3,04	1,96

Comparison between options

The higher equipment costs for EID, combined with higher efficient durations for the application of EID in case of the boluses, leads to a higher total and unit cost for EID compared to conventional identification.

Identification of benefits

No quantitative benefits that are directly related to the introduction of EID could be identified. Indirect benefits related to e-reading and e-transfer of data are however discussed further down.

TASK 3: REGISTRATION AND READING

Frequency of the actions

The frequency of the actions is directly related to the number of births and movements. It was assumed that these also include the number of animals that dies on the farms instead of being slaughtered in a slaughterhouse. The frequency of the readings is independent of the technology for the identification and reading used.

The distribution of the number of readings of the holding over the big breeders and small breeders is based on an estimation of the distribution of the livestock over these two types of holdings. This estimation takes into account the weight of the different categories of small holdings (e.g. < 5 LSU, 5-10 LSU, …).

Overview of the breakdown of the readings over the actors

Description	Frequency of the actions per actor
Holdings (Big breeders)	
Total EU 27	54.874.374
Holdings (Small breeders)	
Total EU 27	8.138.993
Markets and Assembly Centers	
Total EU 27	54.608.910
Slaughterhouses	
Total EU 27	28.074.388
Total number of readings (regulatory)	
Total EU 27	145.696.665

Total cost and unit costs and Comparison between options

Overview of the total equipment and labour cost of e-reading compared to manual reading

EQUIPMENT (Total annual cost in EUR)			
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 1
	e-Reading	*e-Reading*	*Manual reading*
Big breeders			
Total EU 27	281.894.550	281.894.550	0
Small breeders			
Total EU 27	0	0	0
Markets			
Total EU 27	4.898.992	4.898.992	0
Slaughterhouses			
Total EU 27	10.235.957	10.235.957	0
Total equipment cost per year			
Total EU 27	297.029.499	297.029.499	0

LABOUR COSTS (Total annual cost in EUR)			
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 1
	e-Reading	*e-Reading*	*Manual reading*
Big breeders			
Total EU 27	4.151.249	4.981.499	33.209.990
Small breeders			
Total EU 27	2.252.855	2.252.855	2.252.855
Markets			
Total EU 27	3.061.362	3.225.952	32.917.876
Slaughterhouses			
Total EU 27	1.514.953	1.596.402	16.289.820
Total labour cost per year			
Total EU 27	10.980.419	12.056.708	84.670.541

Based on the comparison of the cost related to reading equipment and the valorisation of the time savings in case of e-reading, it can now be determined what the benefits of e-reading are for each category of actors.

Comparison of the cost of e-reading with manual reading per actor

TOTAL COST (Equipment + Labour)					Delta compared to manual reading	
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 1		OPTION 1 : E-Eartag	OPTION 1 : Bolus
	e-Reading	*e-Reading*	*Manual reading*			
	(1)	*(2)*	*(3)*		*= (1) - (3)*	*= (2) - (3)*
Big breeders						
Total EU 27	286.045.799	286.876.049	33.209.990		252.835.809	253.666.058
Small breeders						
Total EU 27	2.252.855	2.252.855	2.252.855		0	0
Markets						
Total EU 27	7.960.354	8.124.944	32.917.876		-24.957.522	-24.792.932
Slaughterhouses						
Total EU 27	11.750.910	11.832.359	16.289.820		-4.538.910	-4.457.461
Total labour and equipment cost per year						
Total EU 27	308.009.918	309.086.206	84.670.541		223.339.377	224.415.665

Unit cost for the reading of 1 ID (e-reading compared to manual reading)

UNIT COST (Equipment + Labour)			
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 1
	e-Reading	*e-Reading*	*Manual reading*
	(1)	*(2)*	*(3)*
Big breeders			
Total EU 27	5,24	5,25	0,61
Small breeders			
Total EU 27	0,29	0,29	0,29
Markets			
Total EU 27	0,15	0,15	0,60
Slaughterhouses			
Total EU 27	0,42	0,42	0,58

Identification of benefits

The comparison that has been presented above is limited to the readings that are imposed by regulation. It can however be considered that the actors for which electronic reading has been assumed, will also be able to use this equipment for other – non regulatory – readings. This seems especially the case for fattening and milking farms. Concerning the slaughterhouses, it should be pointed out that additional benefits of e-reading could be realised by optimising the transfer of the ID of the bovine animal to the carcass. Without EID, this needs to be done manually.

TASK 4: NOTIFICATION - TRANSFER OF THE READ ID TO REGISTER OR DATABASE

Frequency of the actions

The frequency of the actions depends on the way in which the transfer of the data is organised. In case of manual reading, the frequency of the transfers is equal to the frequency of the births and movements. However, when e-reading is used, it is assumed that the reading is performed once a week per reader used.

Frequency of the actions required for each method for transferring the read data

Actor	Number of transfers of ID that is done in a manual way			Number of transfers of ID or of information that is stored in handset readers			Number of transfers of ID or of information that is stored in static readers		
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3
	e-reading	e-reading	manual reading	e-reading	e-reading	manual reading	e-reading	e-reading	manual reading
Big breeders									
Total EU 27	0	0	54.628.209	42.736.200	42.736.200		0	0	
Small breeders									
Total EU 27	7.724.807	7.724.807	7.724.807	0	0		0	0	
Markets									
Total EU 27	0	0	54.608.910	293.488	293.488		293.488	293.488	
Slaughterhouses									
Total EU 27	0	0	28.074.388	1.024.088	1.024.088		512.044	512.044	
Total for all actors									
Total EU 27	0	0	145.036.314	44.053.776	44.053.776		805.532	805.532	

Total cost

The total and unit costs of transferring the data, based on mix of manual and automated transfers are presented below.

Overview of the total cost of transferring data for regulatory obligations

Actor	Total cost of transferring ID in a manual way			Total cost of transferring ID that was read with a handset reader		
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3
	e-reading	e-reading	manual	e-reading	e-reading	manual
Big breeders						
Total EU 27	0	0	16.604.995	121.696.073	121.696.073	0
Small breeders						
Total EU 27	1.126.427	1.126.427	1.126.427	0	0	0
Markets						
Total EU 27	0	0	16.458.938	808.331	808.331	0
Slaughterhouses						
Total EU 27	0	0	8.144.910	2.825.090	2.825.090	0
Total cost						
Total EU 27	1.126.427	1.126.427	42.335.271	125.329.494	125.329.494	0

Actor	Total cost of transferring ID that was read with a static reader			Total cost of transferring ID		
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 1	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 1
	e-reading	e-reading	manual	e-reading	e-reading	manual
Big breeders						
Total EU 27	0	0	0	121.696.073	121.696.073	16.604.995
Small breeders						
Total EU 27	0	0	0	1.126.427	1.126.427	1.126.427
Markets						
Total EU 27	484.998	484.998	0	1.293.329	1.293.329	16.458.938
Slaughterhouses						
Total EU 27	847.527	847.527	0	3.672.617	3.672.617	8.144.910
Total cost						
Total EU 27	1.332.525	1.332.525	0	127.788.447	127.788.447	42.335.271

Comparison between options and identification of benefits

The table below presents the potential cost savings in case all parties that do e-reading, also transfer the read data electronically to the competent authorities:

Overview of possible cost savings based on e-transfers of data (neg. value = cost saving)

Actor	Cost saving of electronic transfer compared to manual transfer		
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 1
	e-reading	e-reading	manual
Big breeders			
Total EU 27	105.091.078	105.091.078	0
Small breeders			
Total EU 27	0	0	0
Markets			
Total EU 27	-15.165.609	-15.165.609	0
Slaughterhouses			
Total EU 27	-4.472.293	-4.472.293	0
Total cost			
Total EU 27	85.453.176	85.453.176	0

TASK 5: PROCESSING OF THE INFORMATION RECEIVED FROM THE SECTOR

Frequency of the actions

As it is assumed that the automated transfer of data does not require the intervention of the competent authority, there is only a cost for the CA in case the transfer of data is done manually, i.e. per fax. It is assumed that this case today represents 50% of the transferred information.

Volume of received data received by the CA for processing in the database

Actor	Frequency of the required action		
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3
Competent authority			
Total EU 27	**0**	**0**	**72.518.157**
AT	0	0	2.557.942
BE	0	0	1.955.633
BG	0	0	224.000
CZ	0	0	988.000
CY	0	0	29.183
DK	0	0	850.000
EE	0	0	111.535
FI	0	0	455.000
FR	0	0	11.362.983
DE	0	0	16.083.064
EL	0	0	525.500
HU	0	0	537.500
IE	0	0	4.937.500
IT	0	0	5.108.885
LV	0	0	258.857
LT	0	0	355.945
LU	0	0	140.996
MT	0	0	8.000
NL	0	0	2.850.000
PL	0	0	4.452.607
PT	0	0	1.057.000
RO	0	0	1.931.500
SI	0	0	483.500
SK	0	0	508.690
ES	0	0	4.577.593
SE	0	0	1.090.632
UK	0	0	9.076.115

Total cost and unit costs and Comparison between options

By consequence, only in case of manual treatment there is a cost linked to Task 5.

Overview of the yearly total and unit costs (per livestock unit) for the manual processing of data for the central database

	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	
			Total cost	Unit cost (per LSU)
Competent authority				
Total EU 27	**0**	**0**	**20.283.298**	**0,22 €**
AT	0	0	850.023	0,43 €
BE	0	0	647.738	0,24 €
BG	0	0	4.506	0,01 €
CZ	0	0	67.324	0,05 €
CY	0	0	4.238	0,08 €
DK	0	0	333.073	0,21 €
EE	0	0	6.889	0,03 €
FI	0	0	134.396	0,15 €
FR	0	0	3.333.805	0,17 €
DE	0	0	5.680.136	0,44 €
EL	0	0	90.973	0,13 €
HU	0	0	37.454	0,05 €
IE	0	0	1.746.599	0,30 €
IT	0	0	1.475.020	0,24 €
LV	0	0	13.678	0,04 €
LT	0	0	17.447	0,02 €
LU	0	0	55.862	0,28 €
MT	0	0	1.009	0,06 €
NL	0	0	903.544	0,23 €
PL	0	0	316.024	0,05 €
PT	0	0	142.554	0,10 €
RO	0	0	99.274	0,04 €
SI	0	0	66.715	0,14 €
SK	0	0	19.890	0,04 €
ES	0	0	835.907	0,14 €
SE	0	0	353.201	0,22 €
UK	0	0	3.046.020	0,30 €

Identification of benefits

Clearly, as the introduction of EID, combined with e-reading and e-transfer of data could strongly reduce the work for the CA, this actor would be a main beneficiary of a full automation of the process.

TASK 6: REMOVAL AND RECUPERATION OF ID MATERIAL

Frequency of the actions

The frequency of the actions is directly related to the number of slaughtered animals per Member State.

Number of identifiers per type to be removed and recuperated

Technology	Frequency of the required actions		
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3
Number of conventional ID to be removed			
Total EU 27	28.074.388	28.074.388	56.148.776
Number of E-Eartags to be removed			
Total EU 27	28.074.388	0	0
Number of Boluses to be removed			
Total EU27	0	28.074.388	0

Total cost and unit costs and Comparison between options

Multiplying these volumes with the efficient duration for the removal and recuperation of each type of identifier finally leads to the following total and unit costs per slaughtered animal:

Total and unit cost per slaughtered animal for the removal and recuperation of the identifier

Technology	Total cost per year (per technology) in EUR			Technology	Unit cost per slaughtered animal (per technology) in EUR		
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3		OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3
Removing of conventional ear tags				Removing of conventional ear tags			
Total EU 27	4.886.946	4.886.946	9.773.892	Total EU 27	0,17	0,17	0,35
Removing of E-Ear tags				Removing of E-Ear tags			
Total EU 27	4.886.946	0	0	Total EU 27	0,17	0,00	0,00
Removing of boluses				Removing of boluses			
Total EU27	0	16.289.820	0	Total EU27	0,00	0,58	0,00
Total cost of removing identifiers				Total cost of removing identifiers			
Total EU27	9.773.892	21.176.766	9.773.892	Total EU27	0,35	0,75	0,35

OUTPUT OF THE MODEL

In the following paragraphs, the detailed results of the cost model are presented. First, the global outcome of the model is presented in a format that is tailor-made for this cost modelling exercise.

This is done for 2 scenarios:

1) SCENARIO 1: Obligation of EID, BUT NO e-reading and NO e-transfer of data are assumed;
2) SCENARIO 2: Obligation of EID, AND FULL e-reading and FULL e-transfer of data are assumed;

Afterwards and in order to enhance comparability and standardisation, a reporting based on the report sheet on the Impact Assessment website will be presented, including more detailed ad hoc additional information.
As such, the common report will act as a summary of more detailed analyses.

Finally, detailed results per actor and per individual member state are presented.

Total yearly cost per task and per actor - SCENARIO 1

Scenario 1: Cost of regulation with EID, but NO e-reading and NO e-transfer of data to the competent authorities												
	Task 1: Preparatory phase			Task 2: Identification - Tagging (& Retagging)			Task 3: Registration - Reading			Task 4: Notification - Transfer of the read ID to register or database		
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3
Holdings (Big breeders)												
Total EU 27	70.209.273	70.209.273	0	174.472.830	238.039.580	153.348.393	33.209.990	33.209.990	33.209.990	16.604.995	16.604.995	16.604.995
Holdings (Small breeders)												
Total EU 27	75.525.986	75.525.986	0	27.112.370	36.697.860	23.796.451	2.252.855	2.252.855	2.252.855	1.126.427	1.126.427	1.126.427
Markets and Assembly Centers												
Total EU 27	932.689	932.689	0	0	0	0	32.917.876	32.917.876	32.917.876	16.458.938	16.458.938	16.458.938
Slaughterhouses												
Total EU 27	1.629.860	1.629.860	0	0	0	0	16.289.820	16.289.820	16.289.820	8.144.910	8.144.910	8.144.910
Competent authorities												
Total EU 27	113.703	113.703	0	0	0	0	0	0	0	0	0	0

Scenario 1: Cost of regulation with EID, but NO e-reading and NO e-transfer of data to the competent authorities

Task 5: Processing of the information received from the sector			Task 6: Removal and recuperation of ID material			Total of all tasks			Delta electronic compared to manual (OPTION 3)	
OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus
0	0	0	0	0	0	294.497.088	358.063.838	203.163.379	91.333.709	154.900.460
0	0	0	0	0	0	106.017.637	115.603.128	27.175.734	78.841.904	88.427.394
0	0	0	0	0	0	50.309.504	50.309.504	49.376.814	932.689	932.689
0	0	0	9.773.892	21.176.766	9.773.892	35.838.481	47.241.355	34.208.622	1.629.860	13.032.733
20.283.298	20.283.298	20.283.298	0	0	0	20.397.001	20.397.001	20.283.298	113.703	113.703

Total yearly cost per task and per actor - SCENARIO 2

Scenario 2: Cost of regulation with EID, AND e-reading AND e-transfer of data to the competent authorities												
	Task 1: Preparatory phase			Task 2: Identification - Tagging (& Retagging)			Task 3: Registration - Reading			Task 4: Notification - Transfer of the read ID to register or database		
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3
Holdings (Big breeders)												
Total EU 27	70.209.273	70.209.273	0	174.472.830	238.039.580	153.348.393	286.045.799	286.876.049	33.209.990	121.696.073	121.696.073	16.604.995
Holdings (Small breeders)												
Total EU 27	75.525.986	75.525.986	0	27.112.370	36.697.860	23.796.451	2.252.855	2.252.855	2.252.855	1.126.427	1.126.427	1.126.427
Markets and Assembly Centers												
Total EU 27	4.494.053	4.494.053	0	0	0	0	7.960.354	8.124.944	32.917.876	1.293.329	1.293.329	16.458.938
Slaughterhouses												
Total EU 27	7.843.317	7.843.317	0	0	0	0	11.750.910	11.832.359	16.289.820	3.672.617	3.672.617	8.144.910
Competent authorities												
Total EU 27	113.703	113.703	0	0	0	0	0	0	0	0	0	0

Scenario 2: Cost of regulation with EID, AND e-reading AND e-transfer of data to the competent authorities

Task 5: Processing of the information received from the sector			Task 6: Removal and recuperation of ID material			Total of all tasks			Delta electronic compared to manual (OPTION 3)	
OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus
0	0	0	0	0	0	652.423.975	716.820.975	203.163.379	449.260.596	513.657.596
0	0	0	0	0	0	106.017.637	115.603.128	27.175.734	78.841.904	88.427.394
0	0	0	0	0	0	13.747.737	13.912.326	49.376.814	-35.629.078	-35.464.488
0	0	0	9.773.892	21.176.766	9.773.892	33.040.735	44.525.058	34.208.622	-1.167.887	10.316.436
0	0	20.283.298	0	0	0	113.703	113.703	20.283.298	-20.169.595	-20.169.595

Standard cost model (Report Sheet Impact Assessment website)

Regulation (EC) No 1760/2000 of the European Parliament and of the Council of 17 July 2000 establishing a system for the identification and registration of bovine animals and regarding the labelling of beef and beef products and repealing Council Regulation (EC) No 820/97 (and Commission Regulation (EC) No 911/2004 of 29 April 2004 implementing Regulation (EC) No 1760/2000 of the European Parliament and of the Council as regards eartags, passports and holding registers (Text with EEA relevance))					Tariff (€ per hour)		Time (hour)		Price (per action or equipment)	Frequency (per year)	Number of entities	Total number of actions	Total cost	Regulatory origin			
No.	Article	Type of Obligation	Description required action	Target group	i	e	i	e						Int	EU	Nat	Reg
1		Preparatory actions	Monitoring legislation, provide information and training	CA	17,64 €	-	300	-	5.291,06 €	*1*	27	27	142.858,74 €		100%		
2		Preparatory actions	Monitoring legislation, training			-		-									
				Holdings	8,60 €		5		82,63 €	*1*	3.398.490	3.398.490	280.805.745,85 €		100%		
				Markets & Assembly centers	16,53 €		10		165,52 €	*1*	5.644	5.644	934.185,74 €		100%		
				Slaughterhouses	16,55 €		10		0,00 €	*1*	9.847	9.847	0,00 €		100%		
3	Art. 4 (1760/2000)	Identification bovine animals	Tagging and retagging of bovine animals	Holdings (farms)		-		-							100%		
			OPTION 1 - Ear tag														
			Labour cost		15,67 €	-	0,0938	-	1,47 €	34.278.628		34.278.628	50.399.542,82 €		100%		
			Equipment cost identifier						2,37 €	34.278.628		34.278.628	81.171.791,10 €		100%		
			Equipment cost applicator						10,00 €		3.398.490		33.984.900,00 €		100%		
			OPTION 1 - Bolus														
			Labour cost		15,67 €	-	0,0979	-	1,53 €	34.278.628		34.278.628	52.556.965,52 €		100%		
			Equipment cost identifier						2,62 €	34.278.628		34.278.628	89.844.283,99 €		100%		
			Equipment cost applicator						34,00 €		3.398.490		115.548.660,00 €		100%		
			OPTION 3 - Status quo														
			Labour cost		15,67 €	-	0,0950	-	1,49 €	34.278.628		34.278.628	51.026.180,12 €		100%		
			Equipment cost identifier						1,71 €	34.278.628		34.278.628	58.685.011,14 €		100%		
			Equipment cost applicator						10,00 €		3.398.490		33.984.900,00 €		100%		
4	Art. 7 (1760/2000)	Reading ID	Reading of ID in case of birth, movements, ..	Sector actors (excl. competent authorities)	15,67 €	-	0,033333333	-	0,52 €	145.696.665		145.696.665	76.098.198,84 €		100%		
5	Art. 7 (1760/2000)	Transferring ID	Transferring the read ID to the CA	Sector actors (excl. competent authorities)	15,67 €	-	0,0167	-	0,26 €	145.696.665		145.696.665	38.049.099,42 €		100%		
6	Art. 5 (1760/2000)	Processing ID	Processing of the received ID from the sector	Competent authorities	17,64 €	-	0,014	-	0,250 €	72.848.332		72.848.332	18.201.579,84 €		100%		
7	Art. 2c (911/2004)	Removing ID	Removal and recuperation of ID material	Slaughterhouses													
			OPTION 1 - Ear tag		15,67 €	-	0,020	-	0,313 €	28.074.388		28.074.388	8.798.047,77 €		100%		
			OPTION 1 - Bolus		15,67 €	-	0,043	-	0,679 €	28.074.388		28.074.388	19.062.436,83 €		100%		
			OPTION 3 - Status quo		15,67 €	-	0,020	-	0,313 €	28.074.388		28.074.388	8.798.047,77 €		100%		

Please note that the costs presented above are related to the first scenario (introduction of EID excl. the cost of e-reading and e-transfer of data) since only the cost of regulation is strictly limited to the cost of regulation of the introduction of EID.

Minor differences in the total costs per task can be observed between the detailed calculations presented in this report and the summary based on the Impact Assessment report sheet. These differences are mainly due to the usage of EU average costs figures, multiplied by total EU volumes (e.g. average labour cost) instead of EU Member State specific costs, multiplied by Member State specific volumes.

Also, for some calculations presented in the Impact Assessment report sheet, minor simplifications have been made. For the cost of identification, these relate e.g. to the fact that this cost is based on the cost of tagging the new born animals per year (Frequency = new born animals per year). No costs are added for re-tagging in case of loss of tags.

Total yearly cost per task per actor for each Member State (SCENARIO 1) Big holdings (farms)

Scenario 1: Cost of regulation with EID, but NO e-reading and NO e-transfer of data to the competent authorities												
	Task 1: Preparatory phase			Task 2: Identification - Tagging (& Retagging)			Task 3: Registration - Reading			Task 4: Notification - Transfer of the read ID to register or database		
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3
Holdings (Big breeders)												
Total EU 27	**70.209.273**	**70.209.273**	**0**	**174.472.830**	**238.039.580**	**153.348.393**	**33.209.990**	**33.209.990**	**33.209.990**	**16.604.995**	**16.604.995**	**16.604.995**
AT	2.612.190	2.612.190	0	3.721.981	5.028.410	3.274.448	701.020	701.020	701.020	350.510	350.510	350.510
BE	2.345.056	2.345.056	0	4.816.785	5.279.655	4.227.066	1.274.931	1.274.931	1.274.931	637.465	637.465	637.465
BG	24.921	24.921	0	2.604.703	6.016.566	2.403.568	5.233	5.233	5.233	2.617	2.617	2.617
CZ	105.111	105.111	0	1.656.067	1.945.238	1.307.638	106.023	106.023	106.023	53.011	53.011	53.011
CY	13.250	13.250	0	82.232	88.117	67.525	14.001	14.001	14.001	7.000	7.000	7.000
DK	1.404.364	1.404.364	0	3.978.620	4.272.987	3.557.698	1.124.337	1.124.337	1.124.337	562.168	562.168	562.168
EE	21.774	21.774	0	372.763	529.585	303.111	17.518	17.518	17.518	8.759	8.759	8.759
FI	1.359.491	1.359.491	0	1.622.689	1.930.122	1.429.567	415.875	415.875	415.875	207.938	207.938	207.938
FR	17.329.244	17.329.244	0	36.202.559	40.022.593	31.585.144	8.923.997	8.923.997	8.923.997	4.461.998	4.461.998	4.461.998
DE	11.575.785	11.575.785	0	23.339.234	26.299.817	20.382.592	5.662.072	5.662.072	5.662.072	2.831.036	2.831.036	2.831.036
EL	520.056	520.056	0	1.030.715	1.434.841	883.394	151.985	151.985	151.985	75.992	75.992	75.992
HU	84.260	84.260	0	1.032.311	1.440.322	841.394	47.449	47.449	47.449	23.724	23.724	23.724
IE	7.886.150	7.886.150	0	9.389.622	11.020.446	8.300.853	2.501.805	2.501.805	2.501.805	1.250.902	1.250.902	1.250.902
IT	4.228.063	4.228.063	0	9.093.956	11.642.642	7.901.721	2.236.166	2.236.166	2.236.166	1.118.083	1.118.083	1.118.083
LV	47.988	47.988	0	939.905	1.874.596	834.000	17.032	17.032	17.032	8.516	8.516	8.516
LT	72.758	72.758	0	2.433.846	5.127.710	2.193.926	20.755	20.755	20.755	10.378	10.378	10.378
LU	129.887	129.887	0	336.786	360.505	292.179	63.078	63.078	63.078	31.539	31.539	31.539
MT	5.933	5.933	0	18.528	22.443	15.242	2.637	2.637	2.637	1.319	1.319	1.319
NL	2.938.350	2.938.350	0	7.258.465	7.861.256	6.319.138	2.336.853	2.336.853	2.336.853	1.168.426	1.168.426	1.168.426
PL	1.981.866	1.981.866	0	12.485.539	24.864.799	11.138.692	235.464	235.464	235.464	117.732	117.732	117.732
PT	349.934	349.934	0	2.384.077	3.424.298	1.984.518	168.697	168.697	168.697	84.349	84.349	84.349
RO	217.971	217.971	0	15.541.802	37.325.973	14.617.892	69.995	69.995	69.995	34.997	34.997	34.997
SI	167.765	167.765	0	937.058	1.702.591	828.712	38.901	38.901	38.901	19.451	19.451	19.451
SK	19.784	19.784	0	716.494	1.045.774	584.230	25.845	25.845	25.845	12.923	12.923	12.923
ES	3.404.046	3.404.046	0	12.752.321	15.669.242	10.690.769	1.995.650	1.995.650	1.995.650	997.825	997.825	997.825
SE	1.657.428	1.657.428	0	2.799.879	3.187.432	2.480.607	695.452	695.452	695.452	347.726	347.726	347.726
UK	9.705.852	9.705.852	0	16.923.893	18.621.621	14.902.767	4.357.221	4.357.221	4.357.221	2.178.611	2.178.611	2.178.611

Scenario 1: Cost of regulation with EID, but NO e-reading and NO e-transfer of data to the competent authorities

Task 5: Processing of the information received from the sector			Task 6: Removal and recuperation of ID material			Total of all tasks			Delta electronic compared to manual (OPTION 3)	
OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus
0	**0**	**0**	**0**	**0**	**0**	**294.497.088**	**358.063.838**	**203.163.379**	**91.333.709**	**154.900.460**
						7.385.701	8.692.129	4.325.978	3.059.723	4.366.152
						9.074.237	9.537.107	6.139.462	2.934.775	3.397.645
						2.637.473	6.049.337	2.411.417	226.056	3.637.920
						1.920.211	2.209.383	1.466.672	453.540	742.711
						116.483	122.367	88.526	27.957	33.841
						7.069.489	7.363.857	5.244.204	1.825.285	2.119.653
						420.815	577.636	329.389	91.426	248.248
						3.605.993	3.913.426	2.053.380	1.552.613	1.860.046
						66.917.798	70.737.832	44.971.139	21.946.658	25.766.693
						43.408.126	46.368.709	28.875.700	14.532.427	17.493.010
						1.778.748	2.182.874	1.111.370	667.377	1.071.503
						1.187.744	1.595.755	912.567	275.177	683.188
						21.028.479	22.659.303	12.053.560	8.974.919	10.605.743
						16.676.267	19.224.953	11.255.970	5.420.297	7.968.983
						1.013.441	1.948.132	859.548	153.892	1.088.584
						2.537.737	5.231.601	2.225.059	312.678	3.006.542
						561.289	585.008	386.795	174.493	198.213
						28.417	32.332	19.198	9.219	13.134
						13.702.094	14.304.885	9.824.417	3.877.677	4.480.469
						14.820.600	27.199.860	11.491.888	3.328.712	15.707.972
						2.987.056	4.027.278	2.237.564	749.492	1.789.714
						15.864.765	37.648.936	14.722.884	1.141.882	22.926.052
						1.163.174	1.928.707	887.064	276.111	1.041.644
						775.046	1.104.325	622.998	152.048	481.327
						19.149.842	22.066.763	13.684.245	5.465.597	8.382.518
						5.500.485	5.888.037	3.523.785	1.976.699	2.364.252
						33.165.577	34.863.305	21.438.599	11.726.978	13.424.706

Small holdings (farms)

Scenario 1: Cost of regulation with EID, but NO e-reading and NO e-transfer of data to the competent authorities

	Task 1: Preparatory phase			Task 2: Identification - Tagging (& Retagging)			Task 3: Registration - Reading			Task 4: Notification - Transfer of the read ID to register or database		
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3
AT	4.205.271	4.205.271	0	1.054.739	1.424.956	927.916	200.176	200.176	200.176	100.088	100.088	100.088
BE	791.236	791.236	0	645.799	707.857	566.734	31.252	31.252	31.252	15.626	15.626	15.626
BG	1.170.506	1.170.506	0	245.612	567.336	226.646	9.920	9.920	9.920	4.960	4.960	4.960
CZ	215.271	215.271	0	87.652	102.957	69.210	4.657	4.657	4.657	2.328	2.328	2.328
CY	2.120	2.120	0	5.942	6.367	4.879	101	101	101	51	51	51
DK	888.745	888.745	0	391.689	420.669	350.250	43.028	43.028	43.028	21.514	21.514	21.514
EE	119.948	119.948	0	29.016	41.223	23.594	2.455	2.455	2.455	1.227	1.227	1.227
FI	638.435	638.435	0	425.398	505.993	374.770	34.785	34.785	34.785	17.392	17.392	17.392
FR	5.469.611	5.469.611	0	5.220.205	5.771.032	4.554.400	206.174	206.174	206.174	103.087	103.087	103.087
DE	5.791.987	5.791.987	0	3.518.213	3.964.499	3.072.522	247.348	247.348	247.348	123.674	123.674	123.674
EL	784.548	784.548	0	265.758	369.957	227.773	28.833	28.833	28.833	14.416	14.416	14.416
HU	351.340	351.340	0	91.586	127.784	74.648	9.160	9.160	9.160	4.580	4.580	4.580
IE	3.551.220	3.551.220	0	2.115.465	2.482.886	1.870.167	152.713	152.713	152.713	76.356	76.356	76.356
IT	6.979.925	6.979.925	0	1.391.366	1.781.312	1.208.955	277.851	277.851	277.851	138.925	138.925	138.925
LV	766.432	766.432	0	116.324	232.003	103.217	16.476	16.476	16.476	8.238	8.238	8.238
LT	2.095.253	2.095.253	0	225.278	474.623	203.071	37.281	37.281	37.281	18.641	18.641	18.641
LU	16.856	16.856	0	37.451	40.089	32.491	592	592	592	296	296	296
MT	3.164	3.164	0	2.826	3.424	2.325	105	105	105	52	52	52
NL	696.956	696.956	0	868.578	940.710	756.174	41.321	41.321	41.321	20.660	20.660	20.660
PL	13.783.942	13.783.942	0	3.466.942	6.904.372	3.092.954	312.475	312.475	312.475	156.238	156.238	156.238
PT	1.281.735	1.281.735	0	317.687	456.301	264.445	28.355	28.355	28.355	14.178	14.178	14.178
RO	15.744.593	15.744.593	0	1.307.154	3.139.326	1.229.448	170.927	170.927	170.927	85.464	85.464	85.464
SI	1.324.938	1.324.938	0	158.849	288.621	140.482	33.955	33.955	33.955	16.977	16.977	16.977
SK	232.824	232.824	0	27.098	39.551	22.096	2.442	2.442	2.442	1.221	1.221	1.221
ES	4.576.460	4.576.460	0	2.184.158	2.683.754	1.831.065	212.389	212.389	212.389	106.195	106.195	106.195
SE	1.137.726	1.137.726	0	435.482	495.760	385.824	44.151	44.151	44.151	22.076	22.076	22.076
UK	2.904.948	2.904.948	0	2.476.105	2.724.496	2.180.397	103.934	103.934	103.934	51.967	51.967	51.967

Scenario 1: Cost of regulation with EID, but NO e-reading and NO e-transfer of data to the competent authorities

Task 5: Processing of the information received from the sector			Task 6: Removal and recuperation of ID material			Total of all tasks			Delta electronic compared to manual (OPTION 3)	
OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus
						5.560.273	5.930.490	1.228.180	4.332.093	4.702.310
						1.483.912	1.545.970	613.611	870.301	932.359
						1.430.999	1.752.723	241.527	1.189.472	1.511.196
						309.907	325.212	76.195	233.712	249.018
						8.214	8.639	5.031	3.183	3.608
						1.344.976	1.373.956	414.792	930.184	959.164
						152.646	164.853	27.276	125.370	137.577
						1.116.009	1.196.605	426.946	689.063	769.659
						10.999.077	11.549.905	4.863.661	6.135.416	6.686.243
						9.681.221	10.127.507	3.443.543	6.237.678	6.683.963
						1.093.555	1.197.754	271.022	822.533	926.732
						456.665	492.864	88.387	368.278	404.476
						5.895.754	6.263.175	2.099.236	3.796.518	4.163.939
						8.788.067	9.178.013	1.625.731	7.162.336	7.552.282
						907.471	1.023.150	127.932	779.539	895.218
						2.376.452	2.625.797	258.992	2.117.460	2.366.805
						55.194	57.832	33.378	21.816	24.453
						6.148	6.745	2.482	3.665	4.262
						1.627.515	1.699.647	818.155	809.360	881.492
						17.719.596	21.157.026	3.561.667	14.157.929	17.595.360
						1.641.955	1.780.569	306.977	1.334.978	1.473.591
						17.308.137	19.140.309	1.485.838	15.822.299	17.654.471
						1.534.719	1.664.491	191.414	1.343.304	1.473.076
						263.585	276.038	25.759	237.826	250.280
						7.079.201	7.578.798	2.149.649	4.929.552	5.429.149
						1.639.435	1.699.713	452.051	1.187.384	1.247.663
						5.536.954	5.785.346	2.336.299	3.200.655	3.449.047

Market & Assembly centers

Scenario 1: Cost of regulation with EID, but NO e-reading and NO e-transfer of data to the competent authorities												
	Task 1: Preparatory phase			Task 2: Identification - Tagging (& Retagging)			Task 3: Registration - Reading			Task 4: Notification - Transfer of the read ID to register or database		
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3
Markets and Assembly Centers												
Total EU 27	**932.689**	**932.689**	**0**	**0**	**0**	**0**	**32.917.876**	**32.917.876**	**32.917.876**	**16.458.938**	**16.458.938**	**16.458.938**
AT	18.481	18.481	0				1.711.192	1.711.192	1.711.192	855.596	855.596	855.596
BE	7.053	7.053	0				962.180	962.180	962.180	481.090	481.090	481.090
BG	270	270	0				5.004	5.004	5.004	2.502	2.502	2.502
CZ	689	689	0				153.798	153.798	153.798	76.899	76.899	76.899
CY	0	0	0				0	0	0	0	0	0
DK	7.639	7.639	0				15.669	15.669	15.669	7.835	7.835	7.835
EE	153	153	0				1.251	1.251	1.251	625	625	625
FI	0	0	0				0	0	0	0	0	0
FR	270.941	270.941	0				2.660.350	2.660.350	2.660.350	1.330.175	1.330.175	1.330.175
DE	174.814	174.814	0				13.436.825	13.436.825	13.436.825	6.718.412	6.718.412	6.718.412
EL	2.232	2.232	0				122.710	122.710	122.710	61.355	61.355	61.355
HU	748	748	0				84.783	84.783	84.783	42.392	42.392	42.392
IE	21.800	21.800	0				3.229.298	3.229.298	3.229.298	1.614.649	1.614.649	1.614.649
IT	207.858	207.858	0				1.098.050	1.098.050	1.098.050	549.025	549.025	549.025
LV	654	654	0				10.529	10.529	10.529	5.265	5.265	5.265
LT	0	0	0				0	0	0	0	0	0
LU	1.785	1.785	0				105.288	105.288	105.288	52.644	52.644	52.644
MT	0	0	0				0	0	0	0	0	0
NL	10.516	10.516	0				192.453	192.453	192.453	96.227	96.227	96.227
PL	9.175	9.175	0				535.691	535.691	535.691	267.845	267.845	267.845
PT	1.252	1.252	0				175.138	175.138	175.138	87.569	87.569	87.569
RO	1.794	1.794	0				39.014	39.014	39.014	19.507	19.507	19.507
SI	1.608	1.608	0				130.605	130.605	130.605	65.303	65.303	65.303
SK	2.354	2.354	0				73.692	73.692	73.692	36.846	36.846	36.846
ES	115.189	115.189	0				524.963	524.963	524.963	262.481	262.481	262.481
SE	468	468	0				634.015	634.015	634.015	317.008	317.008	317.008
UK	75.218	75.218	0				7.015.377	7.015.377	7.015.377	3.507.688	3.507.688	3.507.688

Scenario 1: Cost of regulation with EID, but NO e-reading and NO e-transfer of data to the competent authorities

Task 5: Processing of the information received from the sector			Task 6: Removal and recuperation of ID material			Total of all tasks			Delta electronic compared to manual (OPTION 3)	
OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus
0	**0**	**0**	**0**	**0**	**0**	**50.309.504**	**50.309.504**	**49.376.814**	**932.689**	**932.689**
						2.585.268	2.585.268	2.566.788	18.481	18.481
						1.450.322	1.450.322	1.443.270	7.053	7.053
						7.775	7.775	7.505	270	270
						231.385	231.385	230.697	689	689
						0	0	0	0	0
						31.143	31.143	23.504	7.639	7.639
						2.029	2.029	1.876	153	153
						0	0	0	0	0
						4.261.466	4.261.466	3.990.525	270.941	270.941
						20.330.051	20.330.051	20.155.237	174.814	174.814
						186.297	186.297	184.065	2.232	2.232
						127.923	127.923	127.175	748	748
						4.865.747	4.865.747	4.843.947	21.800	21.800
						1.854.933	1.854.933	1.647.075	207.858	207.858
						16.448	16.448	15.794	654	654
						0	0	0	0	0
						159.717	159.717	157.932	1.785	1.785
						0	0	0	0	0
						299.196	299.196	288.680	10.516	10.516
						812.711	812.711	803.536	9.175	9.175
						263.959	263.959	262.707	1.252	1.252
						60.316	60.316	58.522	1.794	1.794
						197.516	197.516	195.908	1.608	1.608
						112.893	112.893	110.538	2.354	2.354
						902.633	902.633	787.444	115.189	115.189
						951.491	951.491	951.023	468	468
						10.598.284	10.598.284	10.523.065	75.218	75.218

Slaughterhouses

Scenario 1: Cost of regulation with EID, but NO e-reading and NO e-transfer of data to the competent authorities

	Task 1: Preparatory phase			Task 2: Identification - Tagging (& Retagging)			Task 3: Registration - Reading			Task 4: Notification - Transfer of the read ID to register or database		
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3
Slaughterhouses												
Total EU 27	**1.629.860**	**1.629.860**	**0**	**0**	**0**	**0**	**16.289.820**	**16.289.820**	**16.289.820**	**8.144.910**	**8.144.910**	**8.144.910**
AT	675.260	675.260	0				417.921	417.921	417.921	208.960	208.960	208.960
BE	13.444	13.444	0				605.115	605.115	605.115	302.557	302.557	302.557
BG	185	185	0				1.048	1.048	1.048	524	524	524
CZ	5.554	5.554	0				37.851	37.851	37.851	18.926	18.926	18.926
CY	106	106	0				6.521	6.521	6.521	3.260	3.260	3.260
DK	27.617	27.617	0				481.832	481.832	481.832	240.916	240.916	240.916
EE	2.750	2.750	0				7.180	7.180	7.180	3.590	3.590	3.590
FI	8.584	8.584	0				200.293	200.293	200.293	100.147	100.147	100.147
FR	56.178	56.178	0				3.913.121	3.913.121	3.913.121	1.956.561	1.956.561	1.956.561
DE	202.448	202.448	0				2.601.777	2.601.777	2.601.777	1.300.889	1.300.889	1.300.889
EL	11.160	11.160	0				87.445	87.445	87.445	43.723	43.723	43.723
HU	3.564	3.564	0				16.275	16.275	16.275	8.138	8.138	8.138
IE	45.780	45.780	0				1.292.018	1.292.018	1.292.018	646.009	646.009	646.009
IT	355.935	355.935	0				1.581.966	1.581.966	1.581.966	790.983	790.983	790.983
LV	2.752	2.752	0				15.327	15.327	15.327	7.663	7.663	7.663
LT	1.831	1.831	0				19.560	19.560	19.560	9.780	9.780	9.780
LU	595	595	0				17.439	17.439	17.439	8.719	8.719	8.719
MT	79	79	0				1.477	1.477	1.477	738	738	738
NL	48.869	48.869	0				1.347.173	1.347.173	1.347.173	673.587	673.587	673.587
PL	5.707	5.707	0				219.500	219.500	219.500	109.750	109.750	109.750
PT	2.191	2.191	0				68.931	68.931	68.931	34.465	34.465	34.465
RO	1.495	1.495	0				105.076	105.076	105.076	52.538	52.538	52.538
SI	1.974	1.974	0				32.164	32.164	32.164	16.082	16.082	16.082
SK	4.513	4.513	0				8.915	8.915	8.915	4.457	4.457	4.457
ES	56.421	56.421	0				846.675	846.675	846.675	423.337	423.337	423.337
SE	14.514	14.514	0				328.495	328.495	328.495	164.247	164.247	164.247
UK	80.352	80.352	0				2.028.727	2.028.727	2.028.727	1.014.363	1.014.363	1.014.363

Scenario 1: Cost of regulation with EID, but NO e-reading and NO e-transfer of data to the competent authorities											
Task 5: Processing of the information received from the sector			Task 6: Removal and recuperation of ID material			Total of all tasks				Delta electronic compared to manual (OPTION 3)	
OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3		OPTION 1 : E-Eartag	OPTION 1 : Bolus
0	**0**	**0**	**9.773.892**	**21.176.766**	**9.773.892**	**35.838.481**	**47.241.355**	**34.208.622**		**1.629.860**	**13.032.733**
			250.752	543.297	250.752	1.552.894	1.845.438	877.634		675.260	967.805
			363.069	786.649	363.069	1.284.186	1.707.766	1.270.741		13.444	437.025
			629	1.363	629	2.386	3.120	2.201		185	918
			22.711	49.206	22.711	85.041	111.537	79.487		5.554	32.050
			3.912	8.477	3.912	13.800	18.364	13.694		106	4.671
			289.099	626.382	289.099	1.039.464	1.376.747	1.011.847		27.617	364.900
			4.308	9.334	4.308	17.829	22.855	15.078		2.750	7.777
			120.176	260.381	120.176	429.200	569.405	420.616		8.584	148.789
			2.347.873	5.087.058	2.347.873	8.273.733	11.012.918	8.217.555		56.178	2.795.363
			1.561.066	3.382.310	1.561.066	5.666.181	7.487.425	5.463.732		202.448	2.023.692
			52.467	113.679	52.467	194.795	256.006	183.635		11.160	72.372
			9.765	21.158	9.765	37.742	49.134	34.178		3.564	14.957
			775.211	1.679.623	775.211	2.759.017	3.663.429	2.713.237		45.780	950.192
			949.180	2.056.556	949.180	3.678.063	4.785.439	3.322.128		355.935	1.463.311
			9.196	19.925	9.196	34.938	45.667	32.186		2.752	13.481
			11.736	25.427	11.736	42.906	56.598	41.075		1.831	15.523
			10.463	22.670	10.463	37.216	49.423	36.621		595	12.802
			886	1.919	886	3.180	4.213	3.101		79	1.113
			808.304	1.751.325	808.304	2.877.933	3.820.955	2.829.064		48.869	991.891
			131.700	285.350	131.700	466.657	620.307	460.950		5.707	159.357
			41.359	89.610	41.359	146.946	195.198	144.755		2.191	50.443
			63.046	136.599	63.046	222.155	295.708	220.660		1.495	75.048
			19.298	41.813	19.298	69.518	92.033	67.544		1.974	24.489
			5.349	11.589	5.349	23.234	29.474	18.721		4.513	10.753
			508.005	1.100.677	508.005	1.834.439	2.427.111	1.778.017		56.421	649.094
			197.097	427.043	197.097	704.353	934.299	689.839		14.514	244.460
			1.217.236	2.637.345	1.217.236	4.340.678	5.760.786	4.260.326		80.352	1.500.461

Competent Authorities

Scenario 1: Cost of regulation with EID, but NO e-reading and NO e-transfer of data to the competent authorities												
	Task 1: Preparatory phase			Task 2: Identification - Tagging (& Retagging)			Task 3: Registration - Reading			Task 4: Notification - Transfer of the read ID to register or database		
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3
Competent authorities												
Total EU 27	**113.703**	**113.703**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
AT	6.702	6.702										
BE	7.014	7.014										
BG	426	426										
CZ	1.443	1.443										
CY	3.075	3.075										
DK	8.298	8.298										
EE	1.308	1.308										
FI	6.255	6.255										
FR	6.213	6.213										
DE	7.479	7.479										
EL	3.666	3.666										
HU	1.461	1.461										
IE	7.491	7.491										
IT	6.114	6.114										
LV	1.119	1.119										
LT	1.038	1.038										
LU	8.340	8.340										
MT	2.655	2.655										
NL	6.582	6.582										
PL	1.503	1.503										
PT	2.856	2.856										
RO	1.083	1.083										
SI	2.922	2.922										
SK	828	828										
ES	3.867	3.867										
SE	6.858	6.858										
UK	7.107	7.107										

Scenario 1: Cost of regulation with EID, but NO e-reading and NO e-transfer of data to the competent authorities

Task 5: Processing of the information received from the sector			Task 6: Removal and recuperation of ID material			Total of all tasks			Delta electronic compared to manual (OPTION 3)	
OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus
20.283.298	**20.283.298**	**20.283.298**	**0**	**0**	**0**	**20.397.001**	**20.397.001**	**20.283.298**	**113.703**	**113.703**
850.023	850.023	850.023				856.725	856.725	850.023	6.702	6.702
647.738	647.738	647.738				654.752	654.752	647.738	7.014	7.014
4.506	4.506	4.506				4.932	4.932	4.506	426	426
67.324	67.324	67.324				68.767	68.767	67.324	1.443	1.443
4.238	4.238	4.238				7.313	7.313	4.238	3.075	3.075
333.073	333.073	333.073				341.371	341.371	333.073	8.298	8.298
6.889	6.889	6.889				8.197	8.197	6.889	1.308	1.308
134.396	134.396	134.396				140.651	140.651	134.396	6.255	6.255
3.333.805	3.333.805	3.333.805				3.340.018	3.340.018	3.333.805	6.213	6.213
5.680.136	5.680.136	5.680.136				5.687.615	5.687.615	5.680.136	7.479	7.479
90.973	90.973	90.973				94.639	94.639	90.973	3.666	3.666
37.454	37.454	37.454				38.915	38.915	37.454	1.461	1.461
1.746.599	1.746.599	1.746.599				1.754.090	1.754.090	1.746.599	7.491	7.491
1.475.020	1.475.020	1.475.020				1.481.134	1.481.134	1.475.020	6.114	6.114
13.678	13.678	13.678				14.797	14.797	13.678	1.119	1.119
17.447	17.447	17.447				18.485	18.485	17.447	1.038	1.038
55.862	55.862	55.862				64.202	64.202	55.862	8.340	8.340
1.009	1.009	1.009				3.664	3.664	1.009	2.655	2.655
903.544	903.544	903.544				910.126	910.126	903.544	6.582	6.582
316.024	316.024	316.024				317.527	317.527	316.024	1.503	1.503
142.554	142.554	142.554				145.410	145.410	142.554	2.856	2.856
99.274	99.274	99.274				100.357	100.357	99.274	1.083	1.083
66.715	66.715	66.715				69.637	69.637	66.715	2.922	2.922
19.890	19.890	19.890				20.718	20.718	19.890	828	828
835.907	835.907	835.907				839.774	839.774	835.907	3.867	3.867
353.201	353.201	353.201				360.059	360.059	353.201	6.858	6.858
3.046.020	3.046.020	3.046.020				3.053.127	3.053.127	3.046.020	7.107	7.107

Total yearly cost per task per actor for each Member State (SCENARIO 2)

Big Holdings (farms)

Scenario 2: Cost of regulation with EID, AND e-reading AND e-transfer of data to the competent authorities

	Task 1: Preparatory phase			Task 2: Identification - Tagging (& Retagging)			Task 3: Registration - Reading			Task 4: Notification - Transfer of the read ID to register or database		
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3
Holdings (Big breeders)												
Total EU 27	**70.209.273**	**70.209.273**	**0**	**174.472.830**	**238.039.580**	**153.348.393**	**286.045.799**	**286.876.049**	**33.209.990**	**121.696.073**	**121.696.073**	**16.604.995**
AT	2.612.190	2.612.190	0	3.721.981	5.028.410	3.274.448	10.171.827	10.189.353	701.020	4.527.796	4.527.796	350.510
BE	2.345.056	2.345.056	0	4.816.785	5.279.655	4.227.066	7.458.406	7.490.280	1.274.931	4.064.764	4.064.764	637.465
BG	24.921	24.921	0	2.604.703	6.016.566	2.403.568	1.204.584	1.204.715	5.233	43.196	43.196	2.617
CZ	105.111	105.111	0	1.656.067	1.945.238	1.307.638	1.584.193	1.586.843	106.023	182.192	182.192	53.011
CY	13.250	13.250	0	82.232	88.117	67.525	87.500	87.850	14.001	22.967	22.967	7.000
DK	1.404.364	1.404.364	0	3.978.620	4.272.987	3.557.698	3.419.622	3.447.731	1.124.337	2.434.231	2.434.231	562.168
EE	21.774	21.774	0	372.763	529.585	303.111	393.210	393.648	17.518	37.742	37.742	8.759
FI	1.359.491	1.359.491	0	1.622.689	1.930.122	1.429.567	4.397.794	4.408.191	415.875	2.356.451	2.356.451	207.938
FR	17.329.244	17.329.244	0	36.202.559	40.022.593	31.585.144	58.461.670	58.684.770	8.923.997	30.037.355	30.037.355	4.461.998
DE	11.575.785	11.575.785	0	23.339.234	26.299.817	20.382.592	39.501.059	39.642.611	5.662.072	20.064.694	20.064.694	2.831.036
EL	520.056	520.056	0	1.030.715	1.434.841	883.394	3.215.758	3.219.558	151.985	901.430	901.430	75.992
HU	84.260	84.260	0	1.032.311	1.440.322	841.394	1.319.621	1.320.807	47.449	146.051	146.051	23.724
IE	7.886.150	7.886.150	0	9.389.622	11.020.446	8.300.853	25.128.776	25.191.321	2.501.805	13.669.327	13.669.327	1.250.902
IT	4.228.063	4.228.063	0	9.093.956	11.642.642	7.901.721	19.298.871	19.354.775	2.236.166	7.328.642	7.328.642	1.118.083
LV	47.988	47.988	0	939.905	1.874.596	834.000	959.099	959.525	17.032	83.179	83.179	8.516
LT	72.758	72.758	0	2.433.846	5.127.710	2.193.926	1.528.944	1.529.463	20.755	126.113	126.113	10.378
LU	129.887	129.887	0	336.786	360.505	292.179	457.215	458.792	63.078	225.137	225.137	31.539
MT	5.933	5.933	0	18.528	22.443	15.242	51.780	51.846	2.637	10.283	10.283	1.319
NL	2.938.350	2.938.350	0	7.258.465	7.861.256	6.319.138	10.067.607	10.126.028	2.336.853	5.093.140	5.093.140	1.168.426
PL	1.981.866	1.981.866	0	12.485.539	24.864.799	11.138.692	30.998.903	31.004.790	235.464	3.435.234	3.435.234	117.732
PT	349.934	349.934	0	2.384.077	3.424.298	1.984.518	3.855.827	3.860.045	168.697	606.552	606.552	84.349
RO	217.971	217.971	0	15.541.802	37.325.973	14.617.892	5.009.689	5.011.439	69.995	377.816	377.816	34.997
SI	167.765	167.765	0	937.058	1.702.591	828.712	1.579.233	1.580.205	38.901	290.792	290.792	19.451
SK	19.784	19.784	0	716.494	1.045.774	584.230	418.261	418.907	25.845	34.291	34.291	12.923
ES	3.404.046	3.404.046	0	12.752.321	15.669.242	10.690.769	20.157.176	20.207.068	1.995.650	5.900.346	5.900.346	997.825
SE	1.657.428	1.657.428	0	2.799.879	3.187.432	2.480.607	4.943.811	4.961.198	695.452	2.872.875	2.872.875	347.726
UK	9.705.852	9.705.852	0	16.923.893	18.621.621	14.902.767	30.375.363	30.484.293	4.357.221	16.823.477	16.823.477	2.178.611

Scenario 2: Cost of regulation with EID, AND e-reading AND e-transfer of data to the competent authorities

Task 5: Processing of the information received from the sector			Task 6: Removal and recuperation of ID material			Total of all tasks			Delta electronic compared to manual (OPTION 3)	
OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus
0	**0**	**0**	**0**	**0**	**0**	**652.423.975**	**716.820.975**	**203.163.379**	**449.260.596**	**513.657.596**
						21.033.795	22.357.749	4.325.978	16.707.817	18.031.771
						18.685.011	19.179.754	6.139.462	12.545.549	13.040.292
						3.877.404	7.289.399	2.411.417	1.465.987	4.877.981
						3.527.563	3.819.385	1.466.672	2.060.891	2.352.713
						205.949	212.183	88.526	117.423	123.657
						11.236.837	11.559.313	5.244.204	5.992.633	6.315.109
						825.489	982.748	329.389	496.100	653.359
						9.736.425	10.054.255	2.053.380	7.683.045	8.000.875
						142.030.827	146.073.962	44.971.139	97.059.688	101.102.823
						94.480.772	97.582.906	28.875.700	65.605.072	68.707.207
						5.667.959	6.075.885	1.111.370	4.556.589	4.964.514
						2.582.243	2.991.440	912.567	1.669.676	2.078.873
						56.073.875	57.767.244	12.053.560	44.020.314	45.713.683
						39.949.531	42.554.121	11.255.970	28.693.561	31.298.151
						2.030.171	2.965.288	859.548	1.170.623	2.105.740
						4.161.661	6.856.044	2.225.059	1.936.602	4.630.985
						1.149.023	1.174.320	386.795	762.228	787.524
						86.523	90.504	19.198	67.325	71.306
						25.357.561	26.018.774	9.824.417	15.533.145	16.194.358
						48.901.541	61.286.687	11.491.888	37.409.653	49.794.799
						7.196.390	8.240.829	2.237.564	4.958.826	6.003.265
						21.147.279	42.933.199	14.722.884	6.424.396	28.210.316
						2.974.847	3.741.352	887.064	2.087.783	2.854.289
						1.188.830	1.518.755	622.998	565.832	895.758
						42.213.889	45.180.702	13.684.245	28.529.644	31.496.456
						12.273.993	12.678.933	3.523.785	8.750.208	9.155.147
						73.828.585	75.635.243	21.438.599	52.389.985	54.196.644

Small Holdings (farms)

Scenario 2: Cost of regulation with EID, AND e-reading AND e-transfer of data to the competent authorities												
	Task 1: Preparatory phase			Task 2: Identification - Tagging (& Retagging)			Task 3: Registration - Reading			Task 4: Notification - Transfer of the read ID to register or database		
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3
Holdings (Small breeders)												
Total EU 27	**75.525.986**	**75.525.986**	**0**	**27.112.370**	**36.697.860**	**23.796.451**	**2.252.855**	**2.252.855**	**2.252.855**	**1.126.427**	**1.126.427**	**1.126.427**
AT	4.205.271	4.205.271	0	1.054.739	1.424.956	927.916	200.176	200.176	200.176	100.088	100.088	100.088
BE	791.236	791.236	0	645.799	707.857	566.734	31.252	31.252	31.252	15.626	15.626	15.626
BG	1.170.506	1.170.506	0	245.612	567.336	226.646	9.920	9.920	9.920	4.960	4.960	4.960
CZ	215.271	215.271	0	87.652	102.957	69.210	4.657	4.657	4.657	2.328	2.328	2.328
CY	2.120	2.120	0	5.942	6.367	4.879	101	101	101	51	51	51
DK	888.745	888.745	0	391.689	420.669	350.250	43.028	43.028	43.028	21.514	21.514	21.514
EE	119.948	119.948	0	29.016	41.223	23.594	2.455	2.455	2.455	1.227	1.227	1.227
FI	638.435	638.435	0	425.398	505.993	374.770	34.785	34.785	34.785	17.392	17.392	17.392
FR	5.469.611	5.469.611	0	5.220.205	5.771.032	4.554.400	206.174	206.174	206.174	103.087	103.087	103.087
DE	5.791.987	5.791.987	0	3.518.213	3.964.499	3.072.522	247.348	247.348	247.348	123.674	123.674	123.674
EL	784.548	784.548	0	265.758	369.957	227.773	28.833	28.833	28.833	14.416	14.416	14.416
HU	351.340	351.340	0	91.586	127.784	74.648	9.160	9.160	9.160	4.580	4.580	4.580
IE	3.551.220	3.551.220	0	2.115.465	2.482.886	1.870.167	152.713	152.713	152.713	76.356	76.356	76.356
IT	6.979.925	6.979.925	0	1.391.366	1.781.312	1.208.955	277.851	277.851	277.851	138.925	138.925	138.925
LV	766.432	766.432	0	116.324	232.003	103.217	16.476	16.476	16.476	8.238	8.238	8.238
LT	2.095.253	2.095.253	0	225.278	474.623	203.071	37.281	37.281	37.281	18.641	18.641	18.641
LU	16.856	16.856	0	37.451	40.089	32.491	592	592	592	296	296	296
MT	3.164	3.164	0	2.826	3.424	2.325	105	105	105	52	52	52
NL	696.956	696.956	0	868.578	940.710	756.174	41.321	41.321	41.321	20.660	20.660	20.660
PL	13.783.942	13.783.942	0	3.466.942	6.904.372	3.092.954	312.475	312.475	312.475	156.238	156.238	156.238
PT	1.281.735	1.281.735	0	317.687	456.301	264.445	28.355	28.355	28.355	14.178	14.178	14.178
RO	15.744.593	15.744.593	0	1.307.154	3.139.326	1.229.448	170.927	170.927	170.927	85.464	85.464	85.464
SI	1.324.938	1.324.938	0	158.849	288.621	140.482	33.955	33.955	33.955	16.977	16.977	16.977
SK	232.824	232.824	0	27.098	39.551	22.096	2.442	2.442	2.442	1.221	1.221	1.221
ES	4.576.460	4.576.460	0	2.184.158	2.683.754	1.831.065	212.389	212.389	212.389	106.195	106.195	106.195
SE	1.137.726	1.137.726	0	435.482	495.760	385.824	44.151	44.151	44.151	22.076	22.076	22.076
UK	2.904.948	2.904.948	0	2.476.105	2.724.496	2.180.397	103.934	103.934	103.934	51.967	51.967	51.967

Scenario 2: Cost of regulation with EID, AND e-reading AND e-transfer of data to the competent authorities

Task 5: Processing of the information received from the sector			Task 6: Removal and recuperation of ID material			Total of all tasks			Delta electronic compared to manual (OPTION 3)	
OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus
0	0	0	0	0	0	106.017.637	115.603.128	27.175.734	78.841.904	88.427.394
						5.560.273	5.930.490	1.228.180	4.332.093	4.702.310
						1.483.912	1.545.970	613.611	870.301	932.359
						1.430.999	1.752.723	241.527	1.189.472	1.511.196
						309.907	325.212	76.195	233.712	249.018
						8.214	8.639	5.031	3.183	3.608
						1.344.976	1.373.956	414.792	930.184	959.164
						152.646	164.853	27.276	125.370	137.577
						1.116.009	1.196.605	426.946	689.063	769.659
						10.999.077	11.549.905	4.863.661	6.135.416	6.686.243
						9.681.221	10.127.507	3.443.543	6.237.678	6.683.963
						1.093.555	1.197.754	271.022	822.533	926.732
						456.665	492.864	88.387	368.278	404.476
						5.895.754	6.263.175	2.099.236	3.796.518	4.163.939
						8.788.067	9.178.013	1.625.731	7.162.336	7.552.282
						907.471	1.023.150	127.932	779.539	895.218
						2.376.452	2.625.797	258.992	2.117.460	2.366.805
						55.194	57.832	33.378	21.816	24.453
						6.148	6.745	2.482	3.665	4.262
						1.627.515	1.699.647	818.155	809.360	881.492
						17.719.596	21.157.026	3.561.667	14.157.929	17.595.360
						1.641.955	1.780.569	306.977	1.334.978	1.473.591
						17.308.137	19.140.309	1.485.838	15.822.299	17.654.471
						1.534.719	1.664.491	191.414	1.343.304	1.473.076
						263.585	276.038	25.759	237.826	250.280
						7.079.201	7.578.798	2.149.649	4.929.552	5.429.149
						1.639.435	1.699.713	452.051	1.187.384	1.247.663
						5.536.954	5.785.346	2.336.299	3.200.655	3.449.047

Markets & Assembly Centers

Scenario 2: Cost of regulation with EID, AND e-reading AND e-transfer of data to the competent authorities												
	Task 1: Preparatory phase			Task 2: Identification - Tagging (& Retagging)			Task 3: Registration - Reading			Task 4: Notification - Transfer of the read ID to register or database		
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3
Markets and Assembly Centers												
Total EU 27	**4.494.053**	**4.494.053**	**0**	**0**	**0**	**0**	**7.960.354**	**8.124.944**	**32.917.876**	**1.293.329**	**1.293.329**	**16.458.938**
AT	84.105	84.105	0				249.413	257.969	1.711.192	25.627	25.627	855.596
BE	27.245	27.245	0				117.259	122.070	962.180	9.780	9.780	481.090
BG	12.259	12.259	0				16.957	16.982	5.004	374	374	2.502
CZ	10.154	10.154	0				27.323	28.092	153.798	955	955	76.899
CY	0	0	0				0	0	0	0	0	0
DK	24.045	24.045	0				24.025	24.104	15.669	10.592	10.592	7.835
EE	2.677	2.677	0				3.588	3.595	1.251	212	212	625
FI	0	0	0				0	0	0	0	0	0
FR	1.095.658	1.095.658	0				1.381.889	1.395.190	2.660.350	375.705	375.705	1.330.175
DE	713.688	713.688	0				1.990.897	2.058.081	13.436.825	242.408	242.408	6.718.412
EL	14.852	14.852	0				28.772	29.386	122.710	3.095	3.095	61.355
HU	11.475	11.475	0				22.641	23.065	84.783	1.037	1.037	42.392
IE	84.900	84.900	0				387.125	403.271	3.229.298	30.229	30.229	1.614.649
IT	1.067.911	1.067.911	0				1.285.203	1.290.693	1.098.050	288.229	288.229	549.025
LV	12.643	12.643	0				17.471	17.524	10.529	906	906	5.265
LT	0	0	0				0	0	0	0	0	0
LU	7.464	7.464	0				17.604	18.130	105.288	2.475	2.475	52.644
MT	0	0	0				0	0	0	0	0	0
NL	42.697	42.697	0				62.166	63.128	192.453	14.582	14.582	96.227
PL	141.054	141.054	0				231.231	233.910	535.691	12.723	12.723	267.845
PT	13.872	13.872	0				33.648	34.524	175.138	1.736	1.736	87.569
RO	39.654	39.654	0				55.708	55.903	39.014	2.488	2.488	19.507
SI	15.490	15.490	0				31.242	31.895	130.605	2.230	2.230	65.303
SK	47.786	47.786	0				69.349	69.718	73.692	3.265	3.265	36.846
ES	734.831	734.831	0				901.198	903.822	524.963	159.728	159.728	262.481
SE	1.730	1.730	0				60.699	63.870	634.015	649	649	317.008
UK	287.865	287.865	0				944.946	980.023	7.015.377	104.303	104.303	3.507.688

Scenario 2: Cost of regulation with EID, AND e-reading AND e-transfer of data to the competent authorities

Task 5: Processing of the information received from the sector			Task 6: Removal and recuperation of ID material			Total of all tasks			Delta electronic compared to manual (OPTION 3)	
OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus
0	**0**	**0**	**0**	**0**	**0**	**13.747.737**	**13.912.326**	**49.376.814**	**-35.629.078**	**-35.464.488**
						359.144	367.700	2.566.788	-2.207.643	-2.199.087
						154.283	159.094	1.443.270	-1.288.986	-1.284.175
						29.590	29.615	7.505	22.085	22.110
						38.431	39.200	230.697	-192.265	-191.496
						0	0	0	0	0
						58.663	58.741	23.504	35.159	35.237
						6.477	6.483	1.876	4.601	4.607
						0	0	0	0	0
						2.853.252	2.866.553	3.990.525	-1.137.273	-1.123.972
						2.946.993	3.014.177	20.155.237	-17.208.244	-17.141.060
						46.719	47.333	184.065	-137.345	-136.732
						35.153	35.577	127.175	-92.022	-91.598
						502.254	518.401	4.843.947	-4.341.693	-4.325.547
						2.641.342	2.646.832	1.647.075	994.267	999.757
						31.020	31.073	15.794	15.226	15.279
						0	0	0	0	0
						27.542	28.069	157.932	-130.390	-129.863
						0	0	0	0	0
						119.446	120.408	288.680	-169.234	-168.272
						385.008	387.687	803.536	-418.528	-415.850
						49.256	50.132	262.707	-213.451	-212.576
						97.850	98.045	58.522	39.328	39.523
						48.963	49.616	195.908	-146.945	-146.292
						120.401	120.769	110.538	9.862	10.231
						1.795.756	1.798.381	787.444	1.008.312	1.010.937
						63.079	66.249	951.023	-887.944	-884.774
						1.337.114	1.372.191	10.523.065	-9.185.951	-9.150.874

Slaughterhouses

Scenario 2: Cost of regulation with EID, AND e-reading AND e-transfer of data to the competent authorities												
	Task 1: Preparatory phase			Task 2: Identification - Tagging (& Retagging)			Task 3: Registration - Reading			Task 4: Notification - Transfer of the read ID to register or database		
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3
Slaughterhouses												
Total EU 27	**7.843.317**	**7.843.317**	**0**	**0**	**0**	**0**	**11.750.910**	**11.832.359**	**16.289.820**	**3.672.617**	**3.672.617**	**8.144.910**
AT	3.073.060	3.073.060	0				3.988.967	3.991.056	417.921	1.521.586	1.521.586	208.960
BE	51.935	51.935	0				119.685	122.711	605.115	30.295	30.295	302.557
BG	8.388	8.388	0				13.611	13.616	1.048	416	416	524
CZ	81.905	81.905	0				129.300	129.489	37.851	12.515	12.515	18.926
CY	737	737	0				1.646	1.679	6.521	239	239	3.260
DK	86.931	86.931	0				142.523	144.933	481.832	62.231	62.231	240.916
EE	48.182	48.182	0				75.512	75.548	7.180	6.198	6.198	3.590
FI	33.824	33.824	0				60.207	61.209	200.293	19.343	19.343	100.147
FR	227.179	227.179	0				645.625	665.190	3.913.121	126.588	126.588	1.956.561
DE	826.507	826.507	0				1.270.031	1.283.040	2.601.777	456.184	456.184	1.300.889
EL	74.260	74.260	0				112.082	112.520	87.445	25.147	25.147	43.723
HU	54.675	54.675	0				85.713	85.794	16.275	8.031	8.031	8.138
IE	178.290	178.290	0				338.453	344.913	1.292.018	103.158	103.158	646.009
IT	1.828.689	1.828.689	0				2.573.316	2.581.226	1.581.966	802.040	802.040	790.983
LV	53.232	53.232	0				84.585	84.662	15.327	6.201	6.201	7.663
LT	37.167	37.167	0				60.031	60.129	19.560	4.126	4.126	9.780
LU	2.488	2.488	0				4.740	4.827	17.439	1.341	1.341	8.719
MT	710	710	0				1.177	1.184	1.477	178	178	738
NL	198.416	198.416	0				371.649	378.384	1.347.173	110.119	110.119	673.587
PL	87.737	87.737	0				155.549	156.646	219.500	12.860	12.860	109.750
PT	24.276	24.276	0				42.793	43.138	68.931	4.937	4.937	34.465
RO	33.045	33.045	0				61.747	62.272	105.076	3.369	3.369	52.538
SI	19.011	19.011	0				31.058	31.219	32.164	4.447	4.447	16.082
SK	91.591	91.591	0				144.280	144.325	8.915	10.168	10.168	4.457
ES	359.932	359.932	0				578.740	582.974	846.675	127.136	127.136	423.337
SE	53.636	53.636	0				94.999	96.641	328.495	32.705	32.705	164.247
UK	307.512	307.512	0				562.892	573.035	2.028.727	181.060	181.060	1.014.363

Scenario 2: Cost of regulation with EID, AND e-reading AND e-transfer of data to the competent authorities

Task 5: Processing of the information received from the sector			Task 6: Removal and recuperation of ID material			Total of all tasks			Delta electronic compared to manual (OPTION 3)	
OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus
0	**0**	**0**	**9.773.892**	**21.176.766**	**9.773.892**	**33.040.735**	**44.525.058**	**34.208.622**	**-1.167.887**	**10.316.436**
			250.752	543.297	250.752	8.834.365	9.128.999	877.634	7.956.731	8.251.365
			363.069	786.649	363.069	564.984	991.590	1.270.741	-705.757	-279.151
			629	1.363	629	23.043	23.782	2.201	20.842	21.581
			22.711	49.206	22.711	246.430	273.115	79.487	166.943	193.628
			3.912	8.477	3.912	6.534	11.131	13.694	-7.159	-2.562
			289.099	626.382	289.099	580.785	920.476	1.011.847	-431.063	-91.371
			4.308	9.334	4.308	134.200	139.262	15.078	119.121	124.183
			120.176	260.381	120.176	233.550	374.757	420.616	-187.066	-45.859
			2.347.873	5.087.058	2.347.873	3.347.265	6.106.016	8.217.555	-4.870.289	-2.111.539
			1.561.066	3.382.310	1.561.066	4.113.788	5.948.041	5.463.732	-1.349.944	484.309
			52.467	113.679	52.467	263.957	325.606	183.635	80.322	141.971
			9.765	21.158	9.765	158.184	169.658	34.178	124.006	135.480
			775.211	1.679.623	775.211	1.395.111	2.305.983	2.713.237	-1.318.126	-407.254
			949.180	2.056.556	949.180	6.153.225	7.268.510	3.322.128	2.831.096	3.946.382
			9.196	19.925	9.196	153.215	164.020	32.186	121.028	131.834
			11.736	25.427	11.736	113.060	126.850	41.075	71.985	85.775
			10.463	22.670	10.463	19.032	31.326	36.621	-17.589	-5.295
			886	1.919	886	2.951	3.992	3.101	-150	891
			808.304	1.751.325	808.304	1.488.488	2.438.245	2.829.064	-1.340.576	-390.819
			131.700	285.350	131.700	387.845	542.593	460.950	-73.105	81.643
			41.359	89.610	41.359	113.365	161.961	144.755	-31.390	17.206
			63.046	136.599	63.046	161.206	235.285	220.660	-59.453	14.625
			19.298	41.813	19.298	73.814	96.490	67.544	6.270	28.945
			5.349	11.589	5.349	251.388	257.673	18.721	232.667	238.952
			508.005	1.100.677	508.005	1.573.814	2.170.719	1.778.017	-204.204	392.702
			197.097	427.043	197.097	378.437	610.026	689.839	-311.401	-79.813
			1.217.236	2.637.345	1.217.236	2.268.699	3.698.952	4.260.326	-1.991.626	-561.374

Competent Authorities

Scenario 2: Cost of regulation with EID, AND e-reading AND e-transfer of data to the competent authorities												
	Task 1: Preparatory phase			Task 2: Identification - Tagging (& Retagging)			Task 3: Registration - Reading			Task 4: Notification - Transfer of the read ID to register or database		
	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3
Competent authorities												
Total EU 27	**113.703**	**113.703**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
AT	6.702	6.702										
BE	7.014	7.014										
BG	426	426										
CZ	1.443	1.443										
CY	3.075	3.075										
DK	8.298	8.298										
EE	1.308	1.308										
FI	6.255	6.255										
FR	6.213	6.213										
DE	7.479	7.479										
EL	3.666	3.666										
HU	1.461	1.461										
IE	7.491	7.491										
IT	6.114	6.114										
LV	1.119	1.119										
LT	1.038	1.038										
LU	8.340	8.340										
MT	2.655	2.655										
NL	6.582	6.582										
PL	1.503	1.503										
PT	2.856	2.856										
RO	1.083	1.083										
SI	2.922	2.922										
SK	828	828										
ES	3.867	3.867										
SE	6.858	6.858										
UK	7.107	7.107										

Scenario 2: Cost of regulation with EID, AND e-reading AND e-transfer of data to the competent authorities

Task 5: Processing of the information received from the sector			Task 6: Removal and recuperation of ID material			Total of all tasks			Delta electronic compared to manual (OPTION 3)	
OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus	OPTION 3	OPTION 1 : E-Eartag	OPTION 1 : Bolus
0	**0**	**20.283.298**	**0**	**0**	**0**	**113.703**	**113.703**	**20.283.298**	**-20.169.595**	**-20.169.595**
0	0	850.023				6.702	6.702	850.023	-843.321	-843.321
0	0	647.738				7.014	7.014	647.738	-640.724	-640.724
0	0	4.506				426	426	4.506	-4.080	-4.080
0	0	67.324				1.443	1.443	67.324	-65.881	-65.881
0	0	4.238				3.075	3.075	4.238	-1.163	-1.163
0	0	333.073				8.298	8.298	333.073	-324.775	-324.775
0	0	6.889				1.308	1.308	6.889	-5.581	-5.581
0	0	134.396				6.255	6.255	134.396	-128.141	-128.141
0	0	3.333.805				6.213	6.213	3.333.805	-3.327.592	-3.327.592
0	0	5.680.136				7.479	7.479	5.680.136	-5.672.657	-5.672.657
0	0	90.973				3.666	3.666	90.973	-87.307	-87.307
0	0	37.454				1.461	1.461	37.454	-35.993	-35.993
0	0	1.746.599				7.491	7.491	1.746.599	-1.739.108	-1.739.108
0	0	1.475.020				6.114	6.114	1.475.020	-1.468.906	-1.468.906
0	0	13.678				1.119	1.119	13.678	-12.559	-12.559
0	0	17.447				1.038	1.038	17.447	-16.409	-16.409
0	0	55.862				8.340	8.340	55.862	-47.522	-47.522
0	0	1.009				2.655	2.655	1.009	1.646	1.646
0	0	903.544				6.582	6.582	903.544	-896.962	-896.962
0	0	316.024				1.503	1.503	316.024	-314.521	-314.521
0	0	142.554				2.856	2.856	142.554	-139.698	-139.698
0	0	99.274				1.083	1.083	99.274	-98.191	-98.191
0	0	66.715				2.922	2.922	66.715	-63.793	-63.793
0	0	19.890				828	828	19.890	-19.062	-19.062
0	0	835.907				3.867	3.867	835.907	-832.040	-832.040
0	0	353.201				6.858	6.858	353.201	-346.343	-346.343
0	0	3.046.020				7.107	7.107	3.046.020	-3.038.913	-3.038.913

ANNEX 4: QUANTITATIVE QUESTIONNAIRE

LIST OF QUESTIONS RELATED TO INPUT PARAMETERS FOR THE COST-BENEFIT ANALYSIS REGARDING THE INTRODUCTION OF EID FOR BOVINE ANIMALS IN THE EU 27 MEMBER STATES

Question 1: What is the total number of BOVINE LIVESTOCK units (heads) in your country (per year)?

Question 2: What is the total number of CALVES BORN (heads) in your country (per year) ?

Question 3: What is the total number of SLAUGHTERED ANIMALS (heads) in your country (per year) ?

Question 4: What is the number of BOVINE MOVEMENTS in your country as registered in the national Database? (volume per year)

Question 5: What is the number of ASSEMBLY CENTERS in your country?

Question 6: What is the number of SLAUGHTERHOUSES in your country?

Question 7: What is the number of MARKETS in your country?

Question 8: Is ELECTRONIC IDENTIFICATION (EID) already used for bovine animals in your country? If yes, can you provide an estimation of the % of the organisations in which this is already used on a voluntary basis?

	Electronic Ear-Tag	**Bolus**
	In %	*In %*
Farms		
Assembly centers		
Slaughterhouses		

ANNEX 5: DATA SOURCES USED

Legislative texts:

- Regulation (EC) N° 1760/2000 of the European Parliament and of the Council of 17 July 2000 establishing a system for the identification and registration of bovine animals and regarding the labelling of beef and beef products and repealing Council Regulation (EC) N° 820/97;

- Commission Regulation (EC) N° 911/2004 of 29 April 2004 implementing Regulation (EC) N° 1760/2000 of the European Parliament and of the Council as regards ear tags, passports and holding registers;

- Council Directive 64/432/EEC of 26 June 1964 on animal health problems affecting intra-Community trade in bovine animals and swine;

- Council Regulation (EC) N° 21/2004 of 17 December 2003 establishing a system for the identification and registration of ovine and caprine animals and amending Regulation (EC) N° 1782/2003 and Directives 92/102/EEC and 64/432/EEC;

- Commission Decision 2006/968/EC of 15 December 2006 implementing Council Regulation (EC) N° 21/2004 as regards guidelines and procedures for the electronic identification of ovine and caprine animals;

- Regulation (EC) No 998/2003 of the European Parliament and of the Council of 26 May 2003 on the animal health requirements applicable to the non-commercial movement of pet animals and amending Council Directive 92/65/EEC.

Reports and publications:

- Report from the Commission to the Council on the implementation of electronic identification in sheep and goats COM(2007)711;

- Report from the Commission to the Council and the European Parliament on the possibility of introduction of electronic identification for bovine animals COM(2005)9;

- Summary assessment of the financial impact of establishing a system for EID (internal SANCO material);

- ICAR publications and technical materials;

- Reports & conclusions from FP Research project: IDEA;

- Cost analysis for small ruminant holdings in Member States, JRC/IPSC, 2007;

- Cost analysis of NLIS compliance for beef producers in Australia, Alliance Consulting & Management, May 2004;

- Lessons learnt from the introduction of electronic cattle identification in Australia, A paper prepared for the European Commission by Meat and Livestock Australia, Aug. 2004;

- Memorandum on a report from The Commission to The Council and the European Parliament on the possibility of introduction of electronic identification for bovine animals COM(2005)9 by Ministry for Rural Affairs and Environment – Malta, July 2006;

- Technical guidelines for Council Regulation N° 21/2004 of 17/12/2003-Part 1, EC JRC IPSC, July 2005;

- Technical guidelines for Council Regulation N° 21/2004 of 17/12/2003-Part 2, EC JRC IPSC, July 2006;

- Erfahrungen mit elektronischen Ohrmarken in Niedersachsen -Projekt ITeK-Rind by Dirk Albers, Landwirtschaftskammer Niedersachsen - Geschäftsbereich Landwirtschaft, Fachbereich Tierzucht und Tierhaltung Versuchsstation für Futterbau und Rindviehhaltung Infeld;

- UK EID evidence report- Electronic identification of sheep and goats: Commission report in connection with Article 9(4) of regulation (EC) N° 21/2004;

- VIT informs: Experience with Bovine Identification in Germany, Eggers B and *al*, Jul.08;

- Use of electronic boluses for the traceability of ruminants: state of the art, implementation and evaluation in sheep and cattle. G.Caja - Group of Ruminant Research, Department of Animal and Food Sciences, University Autonomous of Barcelona – Spain; 2006;

- EID website of JRC: http://eid.jrc.ec.europa.eu;

- ISO 11784: Radio frequency identification of animals – Code structure;

- ISO 11785: 1996, Radio frequency identification of animals – Technical concept;

- DIS 24631: Radio frequency identification of animals – Test procedures:
    - Part 1: Evaluation of the conformance of RFID transponders with ISO 11784 and ISO 11785 (including granting and use of a manufacturer code)
    - Part 2: Evaluation of the conformance of RFID transceivers with ISO 11784 and ISO 11785
    - Part 3: Evaluation of the performance of ISO 11784 and ISO 1178 RFID transponders
    - Part 4: Evaluation of the performance of ISO 11784 and ISO 11785 RFID mobile transceivers

- ICAR EID website: http://www.icar.org/pages/ICAR_approvals/animal_identification.htm;

- Haalbaarheidsonderzoek Elektronische Identificatie, A.H. Ipema. A.C. Smits, P.H. Hogewerf en W. Houwers (IMAG), K. van der Walle, A.G.J. Velthuis en H. Hogeveen (ABE), R. Hoste, C.P.A. van Wagenberg en L.F. Puister-Jansen (LEI), IMAG Rapport 2002-07;

- Characterization of Costs and Benefits to the Canadian Sheep Industry of The Canadian Sheep Identification Program. Kentville, AgraPoint. Firth, S. (2006);

- National Animal Identification Costs and Regulations- Fourdaine, R. (2006);

- Milan, J G.Caja, et al. (2005). "Cost Evaluation of the use of Conventional and Electronic Identification and Registration Systsemes for the Natioanl Sheep and Goats Populations in Spain" Journal of Animal Science 83: 1215-1225.