

Cost and value of animal identification and traceability along the agrifood supply chain.

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Abstract

An analysis of the cost benefits of animal identification and traceability (AIT) for the different stakeholders gives key information for its design and its management. The analysis should be undertaken for each particular AIT system, for each country, for each species without confusing animal identification and animal traceability. Few general conclusions could be drawn from the numerous existing evaluation of the cost of AIT apart from the elements for a framework to address cost benefits evaluation of the stakeholders of an AIT system. The paper gives element of such a framework in four steps: 1) precise description of the AIT system and of the concerned agrifood sector, 2) inventory and categorization of stakeholders, 3) cost evaluation for each actor, 4 cost benefit evaluation for each stakeholder.

Key words: animal identification, animal traceability, cost-benefit analysis, animal identification and traceability cost.

1. Introduction

This paper does not deal with the agricultural products traceability. It is limited to animal identification traceability which is often a part of a wider system to ensure product traceability. Many animal identification and traceability (AIT) systems have been implemented everywhere in the world for different species. However, the economic literature on traceability systems in animal production is rather scarce. There is lot of detailed reports, about their running costs^{i ii} and little information about their benefits^{iii iv}. The existing papers focus on the effect of AIT systems on the control of animal disease. A cost benefits analysis of an AIT system may provide information to:

- Decide between different variants before the implementation.
- Analyze the impact of technical changes e.g. the introduction of electronic identification by RFID.
- Decide how to finance the system according the cost / benefit for the different stakeholders.
- Asses the acceptability of the system by the stakeholders..
- ...

A specific analysis of cost / benefits is required for each AIT system because the results depend on many factors:

- Organization of the AIT system.
- Characteristics of the concerned agrifood sector.
- Cost labor of the actors.
- ...

Because the costs and the complexity of traceability may be twice those of identification, because the stakeholders of traceability systems are more numerous and diverse and because the impact on the concerned agrifood sector and the benefits are different this paper considers them as two types of system whose finalities are different:

1. Animal identification provides a standardized, shared, lifetime, unique and readable number on a mark applied to the animal (ear tag, bolus...). An animal number may be used for different purpose and among them, animal traceability.
2. Animal traceability is the aptitude to find the history, the use and the localization of an animal by the mean of a number. The number may be an animal number or a number referring to the holding of origin. In case of a number referring to the holding of origin, the number may be applied either to the animals or to the batch to which the animal belongs.

The objective of the paper is to give elements for a framework which may facilitate the evaluation of cost benefit evaluation for the different stakeholders of an AIT system in four main steps:

1. Detailed description of the AIT system and of the concerned agrifood sector.
2. Inventory and categorization of the stakeholders of the AIT system.
3. Cost evaluation for each category of actors.
4. Cost benefits analysis for each category of stakeholders.

2. Detailed description of the AIT system and of the concerned agrifood sector

The objective of this step is to collect information which will be necessary for cost and benefits assessment.

For the AIT system, detailed descriptions for:

- The processes of the AIT system (business processes, management processes, support processes, data management processes...)
- The tasks of the actors of the processes in order to evaluate the required amount of labor
- The marking system: conventional or electronic, ear tag, bolus or insert, individual animal number or group number...
- Cost of services: mailing...
- The investment and the running cost of data management.
- ...

For the concerned agrifood sector,

1. Figures about :

- Animals, renewal, animal movements...
- Holdings and keepers per type (farm, collecting centers, abattoirs...) and their repartition according their size.
- Standardized cost of labor
- ...

2. Information about:

- Public regulation: disease eradication, control of animal movement...
- Type and importance of service providers to farmers (advisory or extension, milk recording, voluntary animal health improvement program...)
- Farm management practices
- Use of on farm automatic devices for milking, feeding...
- Animal marketing patterns
- ...

3. Inventory and categorization of the stakeholders of the AIT system

The objective of this step is to get a detailed inventory of stakeholders being defined as persons or organizations with an interest in AIT. The actors of AIT are a particular type of stakeholder. The stakeholders should be distributed in categories relevant in regard with the cost and the benefit evaluation. These categories mainly depend on:

- Type of AIT system: animal identification, animal traceability, group traceability...
- Species: cattle, small ruminants...
- Characteristics of the concerned agrifood sector.

The following categories of stakeholders are often identified:

- Government,
- Public administration: animal health, food safety, premium...
- Farmers which should be divided in different subgroups: small holder, collective herds, medium size dairy farm, suckler herds of beef breeds, large farms, fattening farm...
- Service providers to the farmers: animal health voluntary program, data performance recording, herd book keeping, artificial insemination, voluntary quality product program...
- Animal insurance.
- Trade which also should be divided into subgroups: collecting center of trade companies, sales yard, haulers...
- Abattoirs
- Rendering plants
- Meat processors and retailers in case of an official meat labeling.
- Consumers.
- ..

4. Cost estimation for each category of actor.

4.1. Introduction

Two main categories of cost are to be considered:

- Cost for implementing.
- Annual operational cost.

A cost benefit analysis should be based only on the operational costs which can be distributed into the following categories:

1. Indirect costs for:

- Permanent technical team.

- Data management.
- 2. Direct costs for:
 - Holding and keeper identification.
 - Animal identification
 - Animal traceability.

4.2. Indirect costs

Permanent technical team AIT system needs a permanent technical team. There is a lack of information about these costs. The main tasks are: i) permanent improvement of the procedures, ii) calculation of indicators to follow up the implementation of the procedures by the actors, iii) information, training and support of the actors, iv) data administration (fix the errors...), v) advice for the responsible of the management of the AIT as well as for the competent authorities. The key issues are i) for holding registration: an update database, ii) for animal identification: a reliable animal numbering system, the lowest possible rate for the retagging and an efficient procedure of retagging and iii) for animal traceability: a reliable data base quickly updated and easily usable by the relevant stakeholders.

Data management Efficient data management services are required for holding identification, animal identification and animal traceability. Literature gives little information about that issue. The main components of the cost are the software and equipment investments, the software licenses, the software maintenance, the hosting and the communication.

4.3. Direct costs

Holding and keeper identification That is the cost to register and update data about the holdings and their keepers. The unit for cost calculation is the number of holding. Its components are labor cost of the keepers and administrative labor cost. This cost is independent of species and from the size of the holding. When there is lot of small keepers this cost may be relatively high.

Cost of animal identification The units are the number of identifies animals and the number of keepers. The main components are i) labor cost of keeper, ii) cost of the mark (Ear tags, bolus, insert...), iii) cost of retagging and iv) labor administrative cost The major variations depend on:

- technology for marking: plastic tags or electronic identification
- rate of re tagging which may from 7.5 to 11.5% ^v for ear tag according many factors whose the main ones are i) initial quality of ear tag, ii) quality of the applicator, iii) support and iv) farming conditions.

Cost of animal traceability The objective is to get from the birth of the animal to its death the full and consistent series of the periods of presence in the different holdings. The cost unit is the number of individual movements, (arrival or the departure from a holding) as well as the number of keepers. The major components are:

- Movement registration: keeper's labor, about 1mn 30 per movement according JRC studies ^{vi}.
- Movement notification: keeper's labor cost and cost of communication.
- Invalid data correction (3,5% to 7 % of movements for a stable AIT system ^{vii}) : keeper's labor cost, cost of communication and labor cost of the technical team .
- In case of animal paper passport the following costs should be added:
 - Specific secure papers.
 - Printing.
 - Mailing.
 - Keeper's labor for passport filing.

5. Cost benefits.

5.1. Introduction

Two different types of benefit should be considered separately:

- Government benefits.
- Stakeholder benefits

5.2. Government benefits

Generally the objective is to enhance country's ability to quickly and successfully contain a food safety incident or a disease outbreak. In some cases, that is also to help maintain access to key export markets. There is a lack of information about the way to quantify these benefits. The example of foot and mouth disease shows that the difficulties of these evaluations are not in the cost of the disease but in the low and the unpredictable probability of an outbreak as well as in the percentage of registered animals by the AIT system ^{viii}. A study conducted in 2001 analyzed the economic impacts of improved animal identification systems using a hypothetical foot-and-

mouth disease (FMD) outbreak in the United States. According this study, an improved animal identification system in cattle could provide economic benefits with average benefit-cost ratios for cattle ranging from 1.24 to 3.15^{ix}.

5.3. Stakeholder benefits

Animal identification At farm level the benefits from animal identification depends on:

- A farm management system which requires animal identification for data recording (heat, mastitis, food consumption...) and for acting on the animal (treatment, blood sampling, artificial insemination...)
- The number of automatic devices for feeding, milking...
- The number and the importance of service providers which require an animal identification: advice services, performance recording, pedigree recording, blood sampling for disease testing

A standardized and shared animal identification avoids from implementing specific systems for each type of activity. It allows to operate databases for the service providers and / or the herd management. The benefit may be high in comparison with the cost of animal identification. A recent Danish study^x gives an example of the benefit for large intensive and specialized dairy herds. The conclusions are not the same for other types of farms. For smallholders with low need for herd management, the benefits may be found for service providers (advice service, pedigree recording, blood sample for testing animal disease, property guarantee, animal insurance, animal premium...)

For trade and abattoirs the benefits depends on the marketing systems. When the live animals are sold according their live weights and paid according to the carcass weight and the carcass quality, the benefits of animal identification may be important.

Animal traceability This issue is not well documented. An efficient database allows a better react of the veterinarians authorities in case of disease outbreak or in case food safety problems. The animal passports allow a better control of animal movements between holdings with different health status and facilitate the eradication of non contagious diseases but of high importance for livestock production. It allows also to implement quality product program along the supply chain and to solve legal problems dealing with the liability about the food safety. However these benefits are often potential and depend on many factors whose the main ones may be:

- Data reliability.
- Delay for updating the databases.
- Technical and legal availability of the data for the stakeholders.
- Ability to deliver simultaneously traceability data and other types of data (animal health, food safety...)
- ..

6. Conclusions

Little information about the cost benefit of AIT can be drawn from similar systems in other countries or for other species. A specific analysis is necessary for each particular system, for each species and for each country. As many organizations or persons have an interest in AIT the analysis should be done for each group of stakeholders. The main difficulty in cost evaluation is the assessment of the amount of labor of the actors. There is little methodology for the evaluation of the benefits especially in regards with animal health. The cost benefits are not the same for all the stakeholders and in some cases the government savings from a better administration of animal disease is only a part of the overall benefits.^{xi}

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