Use of UHF (Ultra High Frequency) RFID technology in the data capture, traceability and monitoring interface in the official cattle animal identification program

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Abstract

The use of radio frequency RFID devices is already widespread in animal identification. The need to adopt new, more flexible and efficient technologies is part of the demand by technicians, farmers, government entities and food companies. Innovative Ultra High Frequency (UHF) technology is a viable alternative, considering its applicability, flexibility and use efficiency in line with good production practices in the food chain.

In 2013, the State of Mato Grosso do Sul, Brazil, in order to maintain and expand its sanitary status at OIE - World Organization for Animal Health, implements a Zone of High Surveillance - ZAV in the regions bordering Paraguay, Argentina and Bolivia. This zone establishes an area of approximately 12,000 km², encompassing 13 municipalities. To guarantee the inventory of animals, control of movement and monitoring of sanitary procedures, the state government establishes the use of individual and inviolable eartags with RFID - UHF technology laser printed with official numbering provided by MAPA - Ministry of Agriculture and Livestock.

Mobile collectors with an internal UHF RFID antenna were used with the ability to read and record electronic eartags information, linking it to the GPS coordinate (Global Position System), data transmission via mobile telephone network using GSM / GPRS technology, and centralizing the storage of data and information in an official database; provided an effective tool for the traceability and individual monitoring of ZAV animals. In addition, the official system of issuing the animal transit guide - GTA, as well as the fiscal documentation for the movement of the animals in the same collector was implemented, thus generating agility and safety in official controls. In the implementation of this project, more than 1,000,000 bovines were identified, thus confirming the viability and efficiency of this technology for animal identification.

Introduction

After an outbreak of foot-and-mouth disease in Mato Grosso do Sul in 2005, and in compliance with the actions advised by the World Organization for Animal Health (OIE), a High Surveillance Zone - ZAV in the border regions between Brazil, Paraguay, Argentina and Bolivia was created resulting of the recommendations made by said organization. This sanitary region covers an area of approximately 12,000 km², involving 13 (thirteen) MS counties, as shown in figure 1.

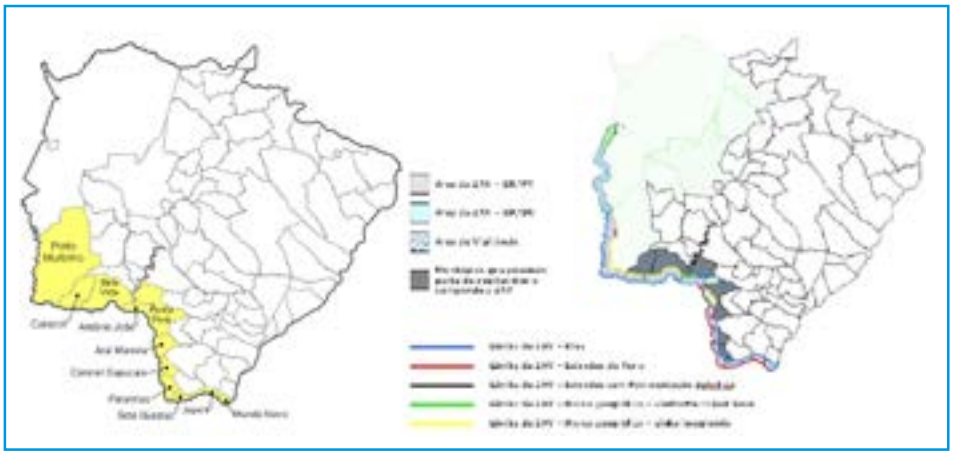

Figure 1. High Surveillance Zone of Mato Grosso do Sul.

The implementation of the ZAV denoted the establishment of an area to strengthen the animal health surveillance system, including the implementation of specific activities such as: individual identification of animals susceptible to foot-and-mouth disease; georeferencing of rural properties; intensive control of animal movement; vaccination against foot-and-mouth disease under the supervision of the official veterinary service throughout the livestock holding, and the direct execution of it, and the intensification of the inspection of the existing livestock holding.

Materials and methods

In this project, a double identification with an inviolable eartag and botton was used, also with RFID - UHF technology, operating between 860 - 960 Mhz, with ISO / IEC 18000-6C protocol (EPC Gen2). The earytags and bottons were laser marked with the official numbering of SISBOV - Brazilian System of Individual Identification of Bovines and Buffaloes, and the activation of the chip was given with the same number as the SISBOV.

Data collection and transmission of information was performed using a HIT 731 collector, which has an integrated UHF reader / antenna, numeric keypad, thermal printer, GPS, and GSM / GPRS / Wi-fi modem; which is accessed through a Smartcard, provided to each producer, and to the technicians involved in the project. Each Smartcard was customized for each user, according to their access permission.

All the information collected was transmitted to an official central system, SIRMA - Integrated Animal Traceability and Monitoring System, which interfaces with the official health system, where it is possible to issue animal transit guides (GTA), as well as to the Secretariat of the State Treasury, thus allowing the issue of the invoices of the animals.

At the time of identification of the animal, the information of the animal's sex, breed, age and owner were recorded on the eartag chip and then sent to SIRMA.

Subsequently, all information on official vaccination, surveillance, and movement was performed on the HIT 731 collector, updating the SIRMA database.

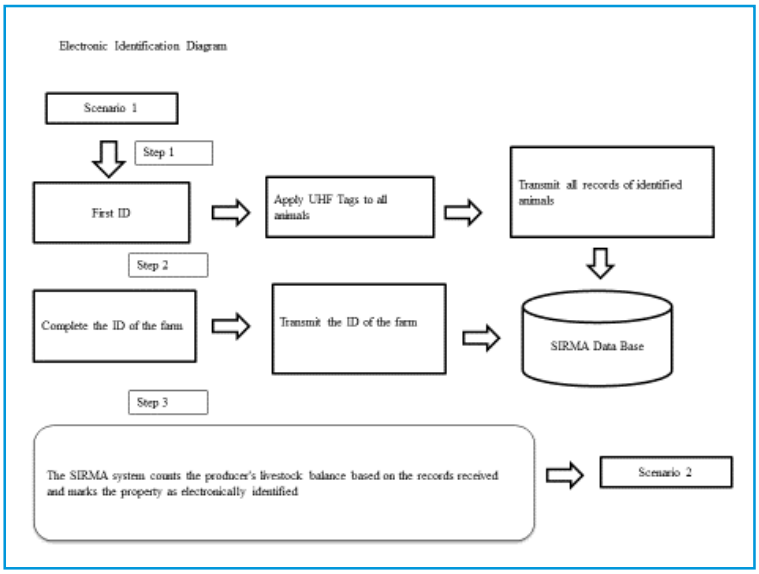

Figure 2. Eletronic Identification Diagram – Scenario 1.

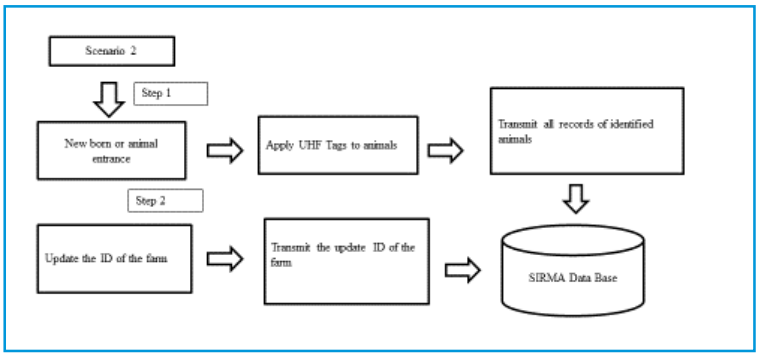

Figure 3. Eletronic Identification Diagram – Scenario 2.

At the beginning of the identification of the animals in the ZAV, the estimated bovine herd was 776.730 animals.

The animal identification work began in October 2013 and ended in September 2017 when it presented the following inventory of live animals in the SIRMA database.

During the 4 years that the identification project was executed, more than 1,000,000 animals were identified electronically.

Conclusion

The animal identification project in the ZAV with the use of UHF-RFID technology demonstrated the technical and operational capacity of this solution in the identification, monitoring and processing of animals, in a safe, efficient and viable way.

Table 1. ZAV Herd - June 2013.

County	Farms	Bovine herd (heads)
Antonio João	336	89.630
Aral Moreira	230	23.350
Bela Vista	901	163.640
Caracol	83	59.840
Coronel Sapucaia	176	46.580
Corumbá	779	22.170
Japorã	570	40.530
Ladário	3	150
Mundo Novo	582	31.170
Paranhos	295	61.060
Ponta Porã	2.721	44.130
Porto Murtinho	265	129.020
Sete Quedas	293	65.460
ZAV Herd	7234	776.730

Table 2. ZAV Herd - September 2017.

County	Bovine herd (heads)
Antonio João	111.851
Aral Moreira	36.119
Bela Vista	103.962
Caracol	70.044
Coronel Sapucaia	85.080
Corumbá	39.881
Japorã	57.842
Ladário	562
Mundo Novo	40.888
Paranhos	60.484
Ponta Porã	50.188
Porto Murtinho	121.175
Sete Quedas	82.304
ZAV Herd	860.380

The UHF-RFID technology allows important advances in the storage of data in the tag, since it has enough memory to store basic information of the animal, besides being more flexible in the reading possibilities.

New advances must be made in the implementation, standardization and regulation of the use of UHF-RFID technology in the identification of animals.