

LIVESTOCK RF IDENTIFICATION AND MANAGEMENT – PART I: THE LIVESTOCK MANAGEMENT PROGRAM

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Abstract. In this paper is presenting the management software proposed for portable readers and desktops for a livestock 13,56 MHz RFID transponder based system. The program was created according with specific laws for cattle, but can easily be adapted for sheep, hogs, horses or even pets. The management program provides a robust software package with capabilities of importing and exporting data to memory tags. It is designed for the medium to large size farms, for meat producer to assist in management process or even townhalls. The program provides analysis of cow and calf performances in order to optimize production. Both versions, Romania and English were created.

Keywords: database, transponder, livestock, RFID, management, identification, tracking, animal.

1. Introduction

The first part of this paper proposed a new 13,56 MHz RFID transponder based system for animal identification and tracking. The present barcode system introduced already on large scale in Europe and the 125/134 kHz transponder based systems were compared with the proposed system. The first part of this paper underlines the mainly benefits for the new system: read/write procedures, larger operating range and shorter read/write time. The main components of this new system are depicted in figure 1.

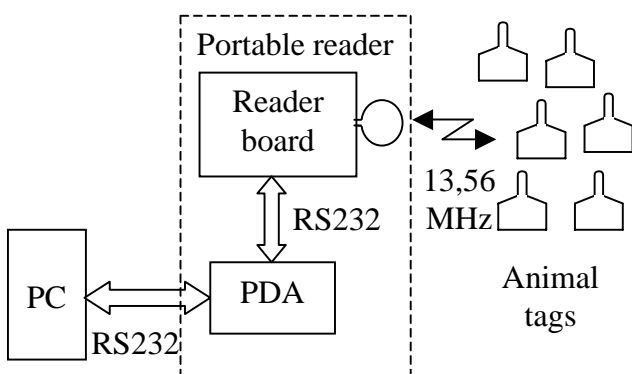


Figure 1. The main components of the 13,56 MHz RFID system

Each animal from the farm will have an ear tag permanently mounted. On the front side of this tag a barcode together with few specific data required by the law are printed. A label format transponder, working on 13,56 MHz, is attached on the backside of each animal tag. The transponder used in the proposed system is containing a minimum 1kbit available EEPROM memory for animal data. This memory can be read and write by a special portable reader. The data communication is performed according with ISO 15693 standard, using 13,56 MHz operating frequency [1]. The read and write distance, read and write time and few other performances for the new system proposed are evaluated in [2], using specific procedures. In the tested system we used a TEK Protégé 13,56 MHz reader with a 10 cm circular antenna [3]. To read data from the tag (transponder) and to write new data to the same tag, a Personal Digital Assistant (PDA) was used. This is practically the human interface and, the reader together with this PDA will be called a portable reader from now on. The communication between PDA and the reader is performed according with RS 232 standard. The PDA contains a compact flash with a capacity according with customer request (16MB, 32 MB

or 64MB). Basically, this flash memory should store all animal data for all animals from the operator's area. The same data stored in the PDA flash memory, under a unique identification number (a specific animal) is stored in the transponder memory attached to the tag with the same unique identification number. Both Palm PDA and Handera PDA were used during tests.

Periodically, the PDA will update the PC database, using a RS232 connection (or HotSync). This database is used to store all animal data from the entire farm, being updated by all portable readers from the farm. The database is also used to create periodically reports for the farm management team.

Two distinct software parts were created for this management program: the PDA software program and the desktop software program. Both parts are the property of the CAOM SA company, the sponsor of this research.

2. The PDA software

The PDA software was created using Palm OS operating system [4]. This new software is designed to track information about animal, their ownership, diseases and treatments, by writing data in a highly compressed format to an ear tag containing a 13,56 MHz transponder. Using this program, the operator can also update the database from the PC unit (up-load) or can be updated by this database (down-load). For speed and convenience, the data entry forms have been designed on sound ergonomic principles (exploiting the PDA facilities), permitting data to be recorded with minimum effort and time.

The main menu is presented in figure 2.

The PDA program includes eight record types as:

a) Birth/buy

This is the first task in the identification and tracking process. This task will be processed for each birth in the farm or for each purchase/import of the animal, if the record is not already stored in one similar tag/transponder. Using this task, the operator can record the birth of the animal. This

information includes the visible tag number from the attached tag, the date of birth, the birth



Figure 2. The main menu of the PDA program

weight, the breed, animal type, colour, location, sire, dam, and calving ease. An example for this record, in a cattle farm, is shown in figure 3.

The operator can introduce all necessary data using a local database stored in PDA memory for breed, animal type, colour, location, sire and dam (if are recorded) or calving ease. The rest of data can be introduced using PDA facilities as



Figure 3. The birth record

calendar and Graffiti writing. After all fields are completed, the final record is shown like in figure 3 and the operator can write all these data to the tag using "Write to Tag" task from the menu.

b) Receive

Using this task, the operator can introduce purchase details, including purchase price, purchase weight, supplier, received date. All these data can be added if a tag with a transponder included is already attached to the animal or can be introduced after the birth/buy task was recorded. Because some of these data are private information, the operator can write them on tag or cannot write them, keeping only for the central database.

c) Wean

Using this task the operator can record the weaning date and the weight at weaning.

d) Treatment

Using this task, the veterinary can record the diagnosis, the treatments, temperature, weight and process (each time when a injection or any tablets are administered according with the protocol recorded). Each time when a process is recorded, the animal temperature is also recorded.

e) Ship/Sell

Using this task, the operator can record the sale or shipping or the movement to other location inside the same farm. The sale price and buyer can also be recorded but only in the central database because are private information.

f) Death

This task is used to record the date and cause of death. This data is recorded when the animal is sent to the butchery also. In both cases, the tag, with the entire animal history stored, is kept by the owner or processing company, according with the law prescriptions [6].

g) Production (optional)

The operator can record each day the quantity of milk obtained, for example.

h) Food (optional)

The operator can record each day the quantity and type of food delivered to the animal.

All these data are first recorded in the tag memory. The private information (as prices,

supplier or buyer) are stored in the PDA flash memory and will be transferred to the central database only.

3. The desktop management and reporting software

The desktop software was created using Visual Basic version 6.0 [5] and it is designed to provide a simple, but effective method of managing and maintaining animal records. This information can be used to analyse animal health, productivity and profit. As with any software, the information and benefit derived is directly proportionate to the effort and accuracy in which information is entered into the program. In comparison to handwritten records the effort is much the same, however the results can be much more beneficial.

As the user enters animal data into the desktop program, this data is stored in an internal database. This data is then available for viewing, editing or generating reports. Every animal that is entered into this database gets assigned a unique ID (Identification number). This ID is automatically generated and will never be the same for any two animals. All of the reports that are generated by this program contain this ID for each animal.

As animals are physically removed from the farm, either by death or by sales, they are not removed from the database; they are marked as either, "Sold" or "Died". Animals that are currently in the farm are marked as "Active".

The data fields available for each animal are presented in Table 1.

Table 1.

Animal ID	A unique number that is assigned for each animal that is entered.
Tag	The Tag number of the animal entered by user.
Type	The "Type" of animal. For cattle, there are seven types of animals: Bull, Cow, Heifer, Steer, Bull Calf, Steer Calf and Heifer Calf.
Breed	A breed type for each animal.
DOB	Date of birth for the animal.
Sire ID	The ID number of the Sire
Dam ID	The ID number of the Dam
Loca-tion	The Location of the animal. The user

	maintains the Location list.
Colour	Colour of the animal. Can be anything entered as text.
Date Acq	The purchase date of the animal, if applicable.
Purch. Price	The purchase price of the animal, if applicable.
Descrip.	An area for the user to enter any comments or descriptions (if any).
Date Died	The date the animal died, if applicable.
Date Sold	The date the animal was sold, if applicable.
Selling Price	The selling price of the animal, if applicable.
User1	A user field for any parameter that the user wishes to keep track of.
User2	Same as User1.
Birth Weight	The birth weight of the animal.
Wean Date	The date the animal was weaned.
Wean Weight	The weight of the animal when weaned.

Each animal may have multiple instances that are recorded as in Table 2.

Table 2.

Event	The type of event performed on the animal.
Date	The date the event was performed.
Cost	The cost of the event.
Comment	Any comments concerning the event.

The program consists of two primary visual components: the Main Data Area and the Navigation Bar. The main data area displays an overview of all active cattle in each location. This view is maintained in all different sections of the program. An example for cattle farm is presented in figure 4.

The navigation bar on the left side in figure 4 is used to access the four major sections of the program: Ranch Setup, Cattle, Cow/Calf Reports and General Reports. A new navigation bar appears with different options for each of them. In figure 4, the navigation bar corresponds to the Ranch Setup section.

Briefly, the four main sections of the program are presented as follow:

a) Ranch Setup section

The following programs are available in this section:

- ranch configuration;
- define location;
- activate breeds (for PDA software update);
- premium program (if any animal get a special health or feeding program);
- address book (sellers, buyers, etc.)
- tag prefix (first up to 16 digits from the tag ID number)
- create Sire's (when a animal becomes Sire);
- create Dam's (when a animal becomes Dam);

b) Cattle section

Allows to maintain information on individual animals and on the entire herd. It also allows adding and removing animals to the herd as well as relocating them and to capture relevant *events* (treatments) associated with the animals.

The following programs are available in this section:

- move, to change the location for a specific animal;
- remove, to delete the entire data about one animal;
- edit/view, to edit/view all recorded data for a specific animal;
- define protocol, where the veterinary can describe the treatment and medication;
- edit events cost, to add the cost for each event (antibiotic, vaccine, implants, etc.);
- import tag, for import data from the PDA.

An example for a edit event report is presented in figure 5;

c) Cow/Calf report and General report sections

These sections are providing the following reports:

- Farm Summary – A report of all animals in each location, plus totals of types in each location.
- Location Detail – A detailed list of all animals in each location, sorted by location and then by type within the location.

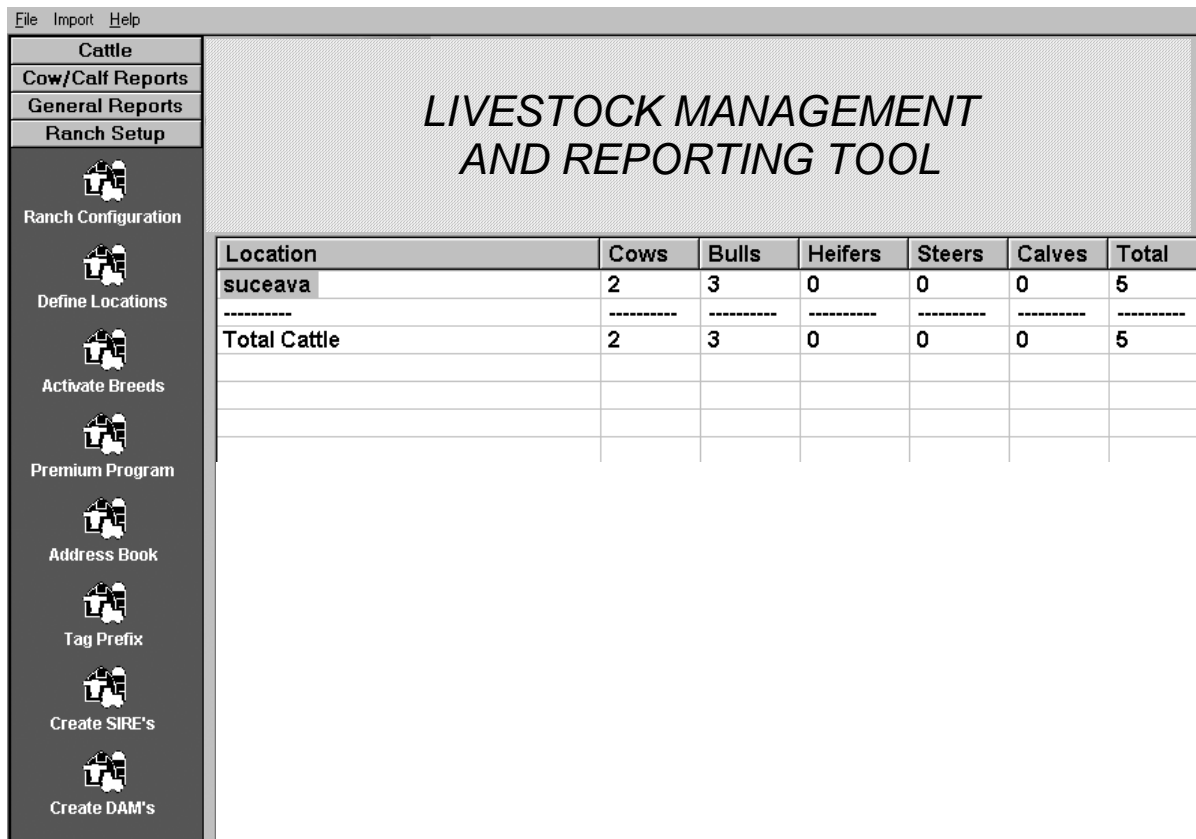


Figure 4. The management and reporting program – main menu

- Cow Performance - A summary listing of all active cows with a summary of the *number of calves, months since last calf* and *age* of each cow.
- Cow/Calf - A detail listing of all calves for all active cows.
- Calf Production - A summary of all calves produced for a given period with performance details for each. Ratios are also calculated.
- Calf Weaning -A summary of all active calves in each pasture sorted by age.

- Farm Financial -A comprehensive report that lists all recorded sales, purchases and losses for a given time period. A summary of all event costs by type can be shown in graphically format.
- Animal Detail -A comprehensive report of all information for any one animal plus a detail report for all calves born or sired by the animal. This is a great tool to get a complete report of an animal to be used for sales, etc. Optional, a (milk) production report and/or food delivered

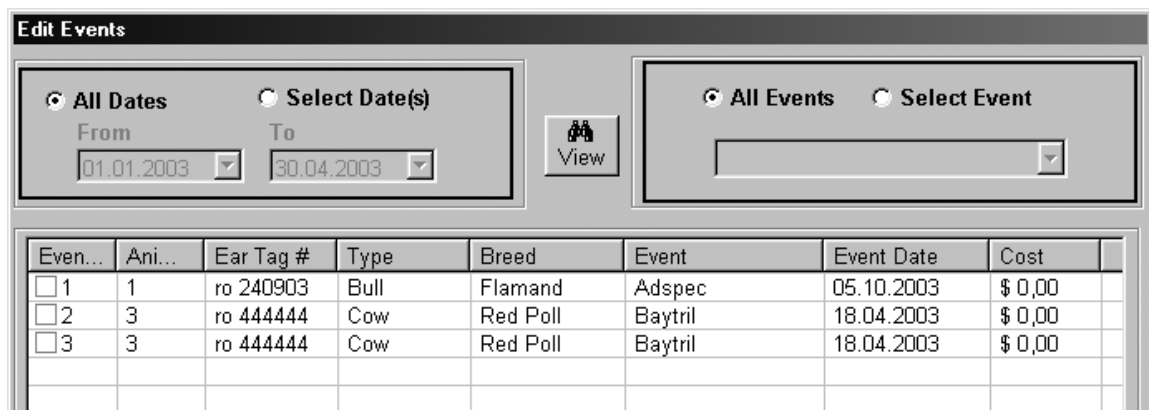


Figure 5. The edit/view report

report can be issued.

- Sold -A listing of all animals sold over a specified time period and profit or loss on each.
- Died -A listing of all animals that have died over a specified time period and loss on each.

program can provide analysis of cow and calf performance in order to optimize production.

The program was created according with the specific laws for cattle [6], but can easily be adapted for sheep, hogs, horses or even pets

Location: suceava												
Cow Information				Current Age of this Cow (years): 0.0				Number of Calves on Record for this Cow: 0				
Ear Tag #	EID #	Breed	Birth	Color	Description	User Field 1	User Field 2					
ro 444.444	1375777546	Red Poll	4/18/2003	8								
Calf Information				Birth Info		Weaning Info			Id of Sire			
Type	Tag	EID #	Color	Date	Wght	Date	Age	Wght	Grade	Description	User Field 1	User Field 2

Figure 6. The cow/calf report

- Event History -A detail listing, by location, of all events (treatments) over a specified time period.
- Event by Type -A detail listing, by type, of all events (treatments) over a specified time period.
- Weaning Weight and Date for the entire farm.
- Sire Information – all Sires from the farm.
- Dam Information – all Dams from the farm.

An example for a cow/calf report is depicted in figure 6.

4. Conclusions

The livestock management program provides a robust software package with capabilities of importing and exporting data to memory tags with a dedicate reader/writer. Both versions, Romania and English were created.

The operator can create protocols (treatments), Sire, Dams, Tag ID and can define locations and he do not have to remember what he did to the animal because the system keeps track automatically by importing the data straight from the reader/writer. Basically, all information about one animal are recorded in three different memories: tag memory, PDA memory and PC database (exception; private information that are store in PDA memory and PC database).

This management program is designed for the medium to large size farms, for beef producer to assist in managing a cow/calf or breeding operation or even by many townhalls for ownerless dogs or pets management. The

management systems. The software program is designed to work together with the 13,56 MHz RFID transponder based system proposed in [2].

5. Acknowledgement

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References

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