



DESIGN AND IMPLEMENTATION OF MONITORING SYSTEM FOR ANIMALS AND COMPOST

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ABSTRACT

The rabbit production is an alternative that is adopted in many countries to meet the demand of hunger due to its low cost and high efficiency results in the process. This study aims to design and implementation of a tool for the study of laboratory animals with a weight not exceeding 15 kg in a cage, for this case is set as an object of study in New Zealand white rabbits to assess White different types of food, increasing total weight, number of offspring, as response variables depending on the type of feed used. The laboratory tool developed, monitored at two locations separated by a distance of 50 meters which are located monitoring stations animal and compost. It also incorporates a user interface that allows LCD screen display, developed in Labview software for PC with information recorded in databases, file creation with the results generated by the tests and emailing, making controlled execution data and finally displaying charts and indicators monitored variables.

Keywords: monitoring stations, fertilizers, compost, rabbit.

1. INTRODUCTION

Agro industry is the economic activity involving the production, processing and marketing of agricultural, livestock, forestry and biological products. This branch of industry is divided into two categories, food and non-food. It handles food processing products agriculture, livestock, forestry and fishing wealth in processing products for food consumption. The non-food branch is responsible for part of the transformation of these products that serve as the subjects premiums, using their natural resources for various industrial products (Desrosier, 1991).

The use of resources is one of the key factors in giving a solution to various problems facing today's society, for example in Colombia meat consumption by the population is low. The situation is worst for peasant families who do not have the level of sufficient income to enable them to buy meat in the amounts needed for adequate food. An alternative for them is to establish on their land animals that can be fed with abundant and varied forage resources of the country and that do not compete with food human, so raising rabbits is a potential to improve diet and living standards of the low-income families. In order to develop food programs for rabbits so more efficient using fodder, it is necessary to have knowledge of the specific qualities for this species, including digestibility, palatability, nutritional content and effects on intestinal function and enteric diseases (Henao and Oviedo, 2011). To overcome the shortcomings noted is strictly the research necessary presence of the academy as a tool to improve the quality of life and contribute a grain of sand that can overcome difficult times. This paper aims to creation of a monitoring system for animals and compost hand to research studies canrefine and technify conventional animal husbandry practices to address demand Food in Colombia.

Compost is obtained naturally by aerobic decomposition (with oxygen) wasteorganic and plant remains, animal excrement and purines (highly polluting

liquid partoozes from all types of animal manures) in which a succession of different conditions occur due to combined activity of a wide range of bacteria and fungi that perform oxidation of matter organic, with the consequent production of heat, which raises the temperature of the mass, and substance elementary useful to plant life. Microorganisms derived from the atmosphere, water, soil or residues thereof. The crucial factors for the control of aerobic composting are moisture, oxygen, particle size, temperature, carbon / nitrogen ratio and turnings. In the process of developing compost takes place a series of related changes in pH stages influencing growth populations of fungi and bacteria, the process is as follows (Alcolea and Gonzalez, 2004).

The pH of the mass during the ripening process also suffers a similar variation in almost all the initial substrates decrease in pH (Phase I) coincides with the passage of the mesophilic phase to phasethermophilic. This phase is called acidogenic. A CO₂ production and release of acids is given organic. The decrease in pH favors the growth of fungi (whose growth is in the pH range 5.5 to 8) and attack lignin and cellulose. During the thermophilic phase is passed to an ammonia release as consequence of the degradation of proteins and amines from nitrogenous bases and release bases included in organic matter, result of these processes is given a rise in pH and resume their bacteria activity at pH 6-7.5 (Phase alkalizing). Finally a stationary phase pH is given close to neutrality on which stabilizes the organic matter and slow reactions occur polycondensation (Alvarez de la Puente, 2008). This paper provides a tool that facilitates the research study of the factors that take place in the process of preparing fertilizers which are evaluated the most important agents such as temperature, relative humidity and pH through a technological approach yield results serve as reference to the modernization of such practices.



2. METHODOLOGY

For monitoring the variables set in the project they formed the necessary steps for development of the

monitoring system of animals and compost, developing a methodology that facilitated the completion thereof, this methodology is illustrated in Figure-1.



Figure 1. Methodology used for the development of the monitoring system for animals and compost.

The monitoring system of animals and compost comprises hardware and software that contain the design and implementation of all stages containing the project.

2.1 Hardware

The hardware refers to the applicability of the designs during the development of project, which was necessary for completion the development of electronic cards, structure metal and acrylic boxes, besides obtaining power supplies that met job requirements.

Electronic cards are the result of the many designs made in stages methodological that illustrated in Figure-1 obtained as a result six cards that make up the monitoring system developed for animals and compost.

- 2 data acquisition cards.
- Two cards amplification, filtering and summation of the load cells.
- Card 1 pH meter.
- 1 card connectors

For the weighing system consisting of six load cells, placed in a metal structure of two levels an array of four cells was made to hold the cage with the animal inside are acquired weight signals and then summed in order to calculate the total weight of the animal faces it must fall freely to a tray located on the lower level, supported by two cells where it is captured the total weight of excreta as shown in Figure-2.

The metal structure shown in Figure-2 is intended to support different elements of the monitoring station for animals. Additionally acrylic material were produced two boxes containing inside the electronic cards that allow system operation animal monitoring and compost. In Figure-3, the monitoring station illustrated compost which can be transported easily due to their size.



Figure-2. Animal monitoring station with cage and tray.



Figure-3. Monitoring station compost.

Using keyboard and LCD display provides the possibility of supervised variables without having to start the software developed, facilitating operation of the instrument intuitively.

2.2 Software

Among the objectives to be achieved in the development of the monitoring system for animals and compost states that must be accompanied by a graphic interface to observe the behavior of the information obtained by each of the temperature sensors, humidity, pH



weights and also having storing this information in a respective database.

To comply with the proposed different programs that were the tools used to achieve the goals. First CCS was used to introduce the microcontroller logic programming designed, Labview as software main instrumentation allowed obtaining all data via USB from the microcontroller transmission and create a virtual instrument he facilitated the manipulation of information with the ability to email results tests and finally the use of MySQL to log into the databases in an orderly fashion and reliable.

The software developed consists of multiple tabs that allow the operation of different modules inside the

front panel conducted a user manual was made as an appendix to work extent permitted understanding the functioning and operation of this instrument.

3. RESULTS

In Figure-4, the indicators that monitor software has the shape illustrated plots the monitored variables listed below:

- Weight animal excreta weight, relative humidity and temperature station monitoring the animal.
- Relative humidity, temperature and pH monitoring station compost.

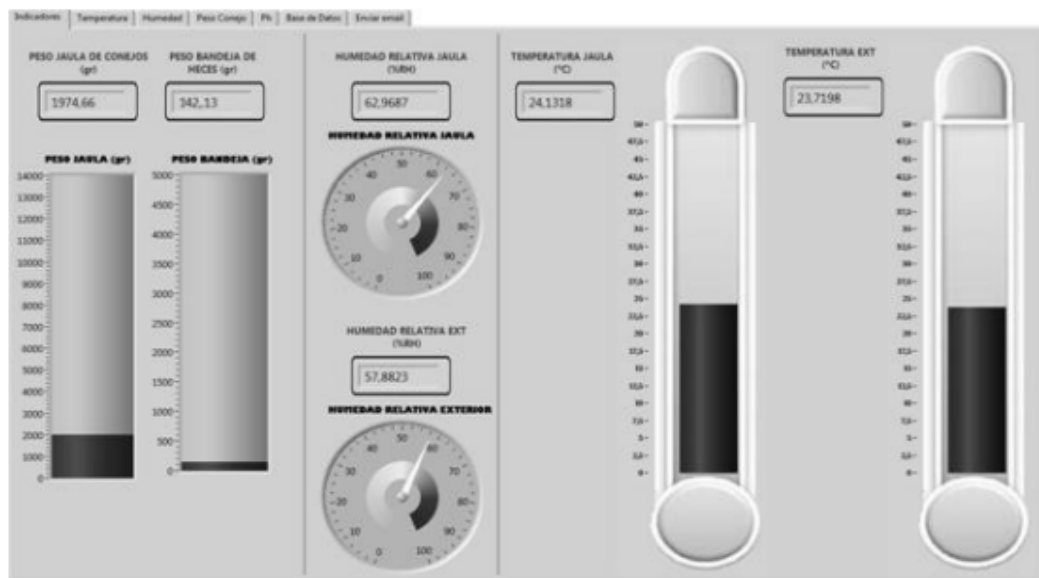


Figure-4. Viewing the system measures indicators.

It was found that the monitoring system for animals and compost made a successful acquisition of the monitored data and remote execution of the instrument with access requirements Internet and found on the instrument using the Web Server of Labview (Gongora y Cortes, 2010) and a virtual LAN with HAMACHI.

By validating the instrument showed a tolerance range for the weight of 20 grams to the actual value heavy in the cage or tray element, temperature accuracy obtained 99% of its value observed in the instruments calibration,

relative humidity also obtained a tolerance of 1% displayed on the instruments calibration value, pH showed a tolerance of 0.1 for the pH range of 0 to 14.

In Figure-5, the tab of the data record that allowed the generation of tables illustrated databases is displayed in columns where each of the variables system integrates monitoring for animals and compost, executions controlled by changing number of samples and time between these satisfactorily.

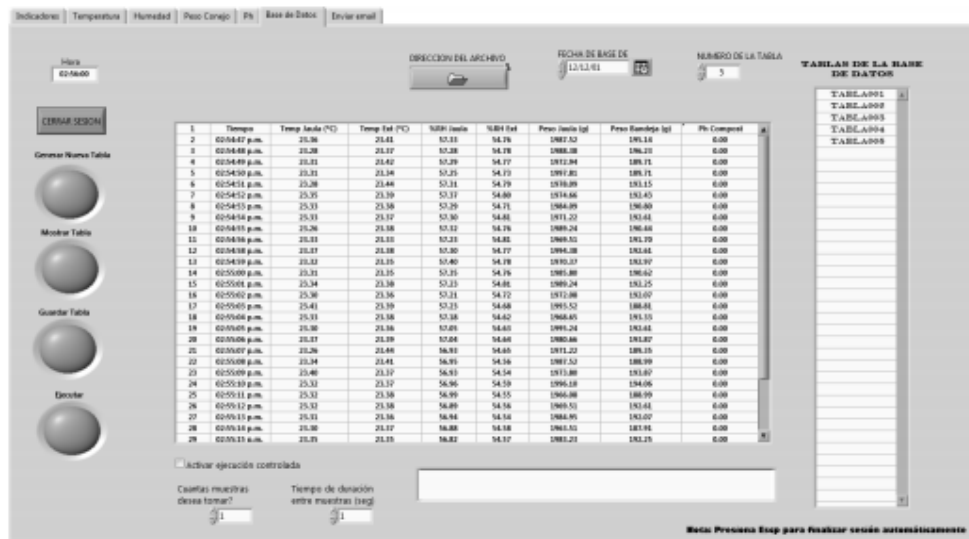


Figure-5. Generating data table in Labview.

In Figures 6 and 7 the export of test results observed from Labview in .CSV Format allowing you to

share the information generated on any PC that has Microsoft Office Excel (Guiana, 2012).



Figure-6. Export file in Labview (contains table in .csv format).

In Figure-8, sending attachments illustrated by email results a test that is done by sending an e established by changing the subject, message Annex and recipient.



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Temp	Temp	Temp	%H	%H	Peso	Peso	Peso	Peso	Peso	Peso	Peso	Peso	Peso	Peso	Peso	Peso	Peso	Peso	Peso	Peso	Peso	Peso	Peso	Peso
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25



Figure-7. File exported CSV table the database. **Figure-8.** Shipping from Labview File exported in the form of e-mails

4. CONCLUSIONS

The monitoring system has 2 stations that allow local display of variables interest, use user interface with an LCD - keyboard makes the device operation avoiding program execution on the PC.

The hardware and software developed allows the remote monitoring system stations efficiently using Labview web server, providing easy access and execution thereof from any place meeting the conditions of Internet access and be in operation.

The design of a structure is essential in this work was essential to an array of 4-cell at the top level as an empty space that allows the fall of excreta of the animal he needed a lower level to be heavy.

Some manufacturers reserve the right as to the operation of its sensors such as pH electrodes, for this reason it was decided to use an electrode with a single output signal to avoid inconvenience in understanding the operation.

The humidity sensor is used as a requirement for reliable as the transducing zone be free and clear, reducing the range of applications which could be submitted in future research.

Because Surcolombiana University has licensed the use of Labview, he was chosen MySQL as database engine as this is free and provides easy integration with Labview.

USB transmission method facilitates the operation of the device from any computer and Labview data reception since this has libraries for this purpose.

The graphical interface used in the software is very intuitive and easy operation enabling the user navigates between tabs containing modules for managing the program.

Implement tabs and rings system provided greater efficiency in the use of space panel in the software, making much greater the number of applications used in a small area.

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