

Use of tics in the performance of agricultural activities

Uso de las tics en el desempeño de las actividades agrícolas

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ABSTRACT

The objective of this work is to determine the use of ICTs in the performance of agricultural activities of the Agronomy Engineering Career at the Guayaquil campus of the Agrarian University of Ecuador. During the development of this work we examined the necessary aspects such as the fulfillment of goals, privacy of information, access and administration of information regarding the management of information and communication technologies and inclusion of new ideas, use of working hours, predisposition with the agricultural work, fulfillment of goals, predisposition of the members to perform their work regarding the performance of agricultural actions, to determine the impact of this study, we used statistical tools, observation, surveys in order to improve some appropriate aspects with the resources that we have in the aforementioned institution.

Keywords: Tics, Performance, Impact, Survey, Agricultural Activities.

RESUMEN

El presente trabajo tiene objetivo es determinar el uso de las Tics en el desempeño de las actividades agrícolas de la Carrera de Ingeniería Agronómica Sede Guayaquil, Universidad Agraria del Ecuador. Durante el desarrollo de este trabajo se examinó los aspectos necesarios como el cumplimiento de las metas, privacidad de información, acceso y administración de información en cuanto al manejo de las tecnologías de información y comunicación se refiere e inclusión de nuevas ideas, aprovechamiento de horas de trabajo, predisposición con la labor agrícola, cumplimiento de metas, predisposición de los miembros para realizar su trabajo en cuanto al desempeño de acciones agrícolas, para determinar el impacto de este estudio, se usó las herramientas estadísticas, de observación, encuestas con el fin de mejorar algunos

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aspectos adecuados con los recursos que se tiene en la institución antes mencionada.

Palabras clave: Tics, Desempeño, Impacto, Encuesta, Actividades Agrícolas.

INTRODUCTION

The effect of data innovation on the planet is given by covering the need to get to the data and work in different cycles, particularly in agricultural activities and furthermore the requirement for farmers to work in their activities as a functional worker in giving and procuring information intuitively, therefore understanding that at present in numerous companies put the attempt to invest in applications and technology so that their clients have the right climate so that they can use them and perform their activities in a more suitable way.

For farmers, ICT - Information and Communication Technologies - are essential to their daily routines. No doubt, at every moment of the day, they use these advances, whether in precision farming, on the Internet, in online market observation.... In agribusiness, we have entered the period of machine-to-machine communication and onboard intelligence.

Despite the computerized divide that persists between urban and rural regions, agricultural producers must be at the forefront of innovative advances. In other words, wherever farming takes place, we will have computerized technological advances. Finally, agriculture can be considered as possibly one of the sectors where advanced technology has developed the most.

In addition, like water, seeds and fertilizers, data is a major part of agriculture and ICT plays an important role in facilitating access to information.

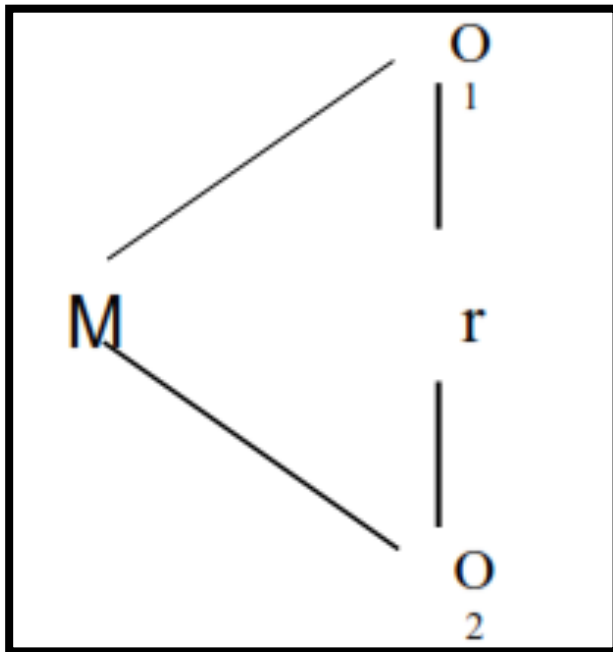
MATERIALS AND METHODS

The design to be applied in the research will be descriptive and correlational, since before establishing a relationship, the behavior of each of the variables will have to be studied and described separately. These designs have the particularity of allowing the researcher to analyze and study the relationship of facts and phenomena of reality (variables), to know their level of influence or absence of them, seeks to determine the degree of relationship between the variables under study. (Carrasco, 2015).

Through the research method we arrive at the problem statement, i.e. the need to determine the importance of the use of ICTs also leads to assess how to proceed in terms of the optimal use of technological tools for an adequate approach to the needs of agricultural activities in the agronomy engineering career at the Guayaquil campus of the Agrarian University of Ecuador.

The sketch placed to symbolize this design is as follows. (Mendoza, 2016):

Figure 1. Components involved in the Research Design



Note: The components that make up the research design. Mendoza, R. (2016). Information and communication technology and job performance of the administrative staff of the 404 Executing Unit 404 Hospital II-2 Tarapoto, 2016. Trujillo-Peru: Universidad Cesar Vallejo. Retrieved from https://repositorio.ucv.edu.pe/bitstream/handle/20.500.12692/12888/mendoza_fr.pdf?sequence=1&isAllowed=y

Where:

M: Members of the educational community of the agronomy engineering career, Universidad Agraria del Ecuador.

O₁ : Information and Communication Technologies

O₂ : performance of agricultural activities

r: ratio

Variables and Operationalization.

Variables.

Variable 1: Information and communication technologies

Variable 2: Performance of agricultural activities

Table I. Operationalization of variables

Variables	Dimensions	Indicators
Information communication technologies	ICT's and community	Transformation brought about by ICTs
	Manage ICT's	The academic unit and ICTs Adaptability to ICT's
	Use ICT's	ICT skills ICT management in the company Feedback of information using ICT's New techniques for the management of Information. ICT skills progress
Performance of agricultural activities	Skills and capabilities	Appropriate approach to ICTs Originality New ideas Troubleshooting Staff efficiency Effectiveness in achieving goals Results in relation to goals
	Behavior	Compliance with standards Fulfillment of functions Effective working hours Cooperation in the face of problems Acceptance of ideas Willingness to work as part of a team
	Results	Dedication at work Respect of rules at work Staff knowledge and skills Achievement of goals Performance of duty Job performance

Note: Variables, dimensions and indicators that integrate the academic unit under study.

The following types of research have been considered for the respective study:

Ponce (2003) expresses: "He is not interested in the increase of scientific theory but in the resolution of practical problems" (p. 65). (p. 65).

The application of new ideas leads the student to enrich their knowledge, since it is not only important to rely on scientific theoretical research without the analysis itself that serves to generate new learning.

Ponce (2003) regarding experimental or field research, states:

It is the investigation or experiment in which the researcher manipulates and controls the conditions of occurrence and maintenance of a phenomenon whose purpose is to

observe the change. With this research it is possible to observe the manipulation of the independent variable to control the dependent variables. It is the one that is located in reality or as close to it as possible. It uses quantitative methodology for ex-post-facto work and field experiments (for the social meanings that people give to the environment that surrounds them). As the name indicates it is an experimental research that with hypothetical deductive reasoning and quantitative methodology seeks to explain phenomena even when maximum control is exercised to the provoked phenomenon. (p. 67).

Experimental research has been designed with the purpose of determining, as reliably as possible, cause-effect relationships, where the researcher controls and manipulates conditions through observation when these phenomena have evolved.

The empirical method is a model of scientific research, which is based on empirical logic and, together with the phenomenological method, is the most widely used in the field of social sciences and hard sciences. (Cobas, Romeu, & Macias, 2010).

Its contribution to the research process is fundamentally the result of experience. Its usefulness stands out in the entry into unexplored fields or in those in which the descriptive study stands out.

Therefore, empirical data are drawn from successful tests and errors, i.e., from experience.

Non-participant scientific observation will make it possible to identify needs related to knowledge formation of users and participant observation will make it possible to identify problems affecting the effectiveness of knowledge formation work in learning.

The problem and the object of investigation are known, studying its natural course, without altering the natural conditions, that is to say that the observation has a contemplative aspect. According to OCHOA (2002) Observation forms the basis of knowledge of all science and, at the same time, is the most generalized empirical procedure of knowledge. He recognizes five elements in the process of observation:

1. The object of observation.
2. The subject or observer.
3. The circumstances or environment surrounding the observation.
4. Means of observation.
5. The body of knowledge of which the observation is a part. (page 4).

The survey will make it possible to evaluate the impact of the use of ICTs on the performance of agricultural activities in the Agronomy Engineering program at the Guayaquil campus of the Agrarian University of Ecuador.

The definition of the terms population and sample assumed in this work refers to: (Sanchez, 2012) Defines: "THE aggregate or totality of the elementary units, that is, the subjects whose study is of interest". (p. 132).

The Finite Population: For this study, the population of the Agronomy Engineering Career at the Guayaquil campus of the Agrarian University of Ecuador will be represented by:

Table 2. Population of the Agronomy Engineering Program, Guayaquil Campus, Universidad Agraria del Ecuador.

Item	Stratum	Population
1	Coordinator	1
	Teachers	
	Students	614
TOTAL		646

Note: These make up the academic unit under study.

The sample as (Jiménez Carlos 1999 as cited in Quiroz & Mendoza, 2017). describes:

"The sample is a representative subset of the population or of the universe as a whole. Studies conducted on a sample can be generalized to the population by statistical procedures, that is, their results can be extended to the universe, so the sample must have two basic characteristics: size and representativeness." (p. 119).

It is a set of units, a portion of the total, that represents the behavior of the total universe. In other words, the sample is a part that represents the whole (universe) by reproducing the constant characteristics in the universe or population.

The 31 teachers, including the Coordinator, were surveyed by applying random numbers for selection.

The 614 students were randomly administered a survey.

It was calculated with the above data indicating that the population is 646, the confidence level of 95%, and with a margin of error of 5% with which 242 participants were obtained for the surveys, of which the same number of teachers and students would be 211.

The instruments used for this research were the following:

Observation

It is the action of observing, of looking closely, in the researcher's sense it is the experience, it is the process of looking closely, that is, in a broad sense, the experiment, the process of submitting behaviors of some things or manipulated conditions according to certain principles to carry out the observation.

Observation also means the set of things observed, the set of data and the set of phenomena. In this sense, which we could call objective, observation is equivalent to data, to phenomena, to facts. (Pardinas, 2005, p. 89).

In the opinion of (Sabino, 1992) observation is a very ancient technique, whose first contributions would be impossible to trace. Through his senses, man captures the reality that surrounds him, which he then organizes intellectually and adds: Observation can be defined as the systematic use of our senses in the search for the data we need to solve a research problem. (p. 111).

Observation is direct when the researcher is an active part of the group being observed and assumes its behaviors; it is called participant observation. When the observer does not belong to the group and is only present for the purpose of obtaining information (as in this case), the observation is called non-participant or simple.

In social research, the observation of social phenomena, points out that (Pardinas, 2005) are human behaviors; behavior means a series of actions or acts that are perceptibly seen or observed in a given entity or groups of entities.... (p. 90).

Those actions or acts occur following a sequel that appears repeated with the same characteristics in other entities of that class; information and communication has chosen among human behaviors those that transmit a message from an individual or group of individuals to another individual or group of individuals, in all cases, observations, data, phenomena are the behaviors that transmit or receive a message.

In conclusion, observation allows us to know reality through direct perception of objects and phenomena.

RESULTS

The data collection instruments are the material means used to collect and file the data necessary for the development of the research. Examples: questionnaire forms, interview guides, checklists, tape recorders, attitude or opinion scales (Likert type), etc. In the surveys conducted, it was possible to establish valuable criteria for the fulfillment of the goals and objectives of this educational project, and the respondents were receptive and predisposed to provide the required information.

The surveys were directed to a statistically representative sample of 211 students and 31 teachers of the Agronomy Engineering Career at the Guayaquil branch of the Agrarian University of Ecuador. They were carried out during two days, from 7:00 a.m. to 8:45 p.m. The predisposition of the students, teachers and coordinator contributed to the agility of the process.

The application of the instrument allowed demonstrating to the students and coordinating teachers that they are important and that their opinions are beneficial to measure the use of ICT's in the development of their agricultural activities in order to improve the development of the Agronomy Engineering Career at the Guayaquil campus of the Agrarian University of Ecuador.

Appreciation of the expectations generated to the respondents by the scientific meaning of each question:

In principle, the students were predisposed to answer the survey, since they agreed to collaborate because of the value of the questions posed, and the teachers were always willing to give their point of view under the technical approach of the items posed.

The appropriate instrument to use the survey technique is a questionnaire that, as far as possible, is elaborated with closed questions and options that allow a simplified, concrete and precise analysis of the data. The survey, addressed to students, teachers and coordinator, consisted of closed questions with response options on a Likert-type scale.

The Likert scale is a type of measurement or data collection instrument that consists, in the words of (Salkind, 1998) in writing: Statements that express an opinion or feeling about an event, object, or person... The statements are listed, and to the right of each one a space is left for the respondent to indicate the degree to which he/she agrees or disagrees, using a five-point scale. In the development of the present work, texts from books and the Internet were researched as supporting documents that sustain the theoretical, methodological and scientific foundations about the problem.

For the instruments that were designed in this research, the scale was composed of 5 response options, which are the following:

- Very Efficient (5)
- Efficient (4)
- Regular (3)
- Deficient (2)
- Very Deficient(1)

The main purpose of applying the survey is to obtain the most valuable data to support this research work. However, the survey was headed by three specific objectives, which are detailed below:

- To identify and describe the factors that affect affective communication on the part of teachers and students of the Agronomy Engineering Career at the Guayaquil campus of the Agrarian University of Ecuador.
- Determine the level of usefulness and interest with respect to the contributions to the completion of goals set by both teachers and students.

- To provide teachers and students with knowledge of legal aspects, privacy of information and access in order to effectively use information and communication technologies.
- Describe the ratings with respect to access, ability and engagement by teachers and students regarding the management of ICTs,

Thus, the survey was carried out on the university campus during working hours. It should be emphasized that the questions posed to the students and teachers respond not only to the objectives set but also to the characteristics of a technical-practical and technological training that involves a work process.

The following tables present a compendium of the data obtained from the surveys applied to students, teachers and coordinator of the Agronomy Engineering Career at the Guayaquil campus of the Agrarian University of Ecuador. The data obtained was analyzed by grouping the results according to the objectives and questions.

Table 3. Statistical summary of the results obtained from the surveys applied with respect to the use of ICTs.

No	QUESTIONS	SCALE					Total PN/NT
		Very Efficient:	Efficient	Regular	Deficient	Very Deficient	
		5 # X5	# X4	# X3	# X2	1 # X1	
	Use of ICTs						
I	How do you evaluate the interest shown by the members of the university community you belong to in order to complete the goals you have set?	260	336	249			881 8,8
	How do you evaluate the knowledge of the members of the university community to which you belong about the legal scope of ICTs?			82 246			869 8,7

	How would you rate the information privacy compliance of the members of the university community to which you belong?	295				882	8,8
	How would you rate the members of the university community to which you belong in relation to providing full access to information?	240	292	264		848	8,5
5	How do you rate the faculty of the members of the university community to which you belong for the management of information concerning the institution?		332	243		878	8,8

Note: Results of the survey to students and teachers of the Agronomy Engineering Career, Guayaquil, Universidad Agraria del Ecuador.

Table 4. Statistical summary of the results obtained from the surveys applied with respect to the performance of agricultural activities.

No	QUESTIONS	SCALE					#	Total PN/NT
		5 Very Efficient:	Efficient	Regular	Deficient	1 Very Deficient		
		# X5	# X4	# X3	# X2	# X1		
I	Performance of agricultural activities How do you rate the interest shown by the members of the university community to which you belong in reference to the inclusion of new ideas?	295	376			0 0	923	9,2

	How would you rate the members of the university community to which you belong with respect to the use of working hours?	305			0	0	916	9,2
	How would you rate the willingness and dedication of the members of the university community you belong to with respect to the agricultural work you do?		372		0	0	908	9,1
	How do you rate the members of the university community to which you belong with respect to the fulfillment of your goals?	285	376	189			903	9,0
5	How would you evaluate the predisposition of the members of the university community to which you belong for the performance of your duties?		388	192	0	0	931	9,3

Note: Results of the survey to students and teachers of the Agronomy Engineering Career, Guayaquil, Universidad Agraria del Ecuador.

Table 5. Statistical Summary of Results Obtained

Items		1	5	PT/PN	PROM.			
PERFORMANCE	TICS	8,81	8,69	8,82	8,48	8,78		
							9,23	9,16
							9,08	9,03
							9,31	45,81
							45,81	9,16
							43,58	8,72

Note: These are results that compare the use of ICTs and the performance of agricultural activities in order to indicate the impact they have on the development of the various activities of the academic unit mentioned above.

Once the data analysis was completed, the researcher answered the following questions that he had at the beginning of the research, by analyzing the answers obtained from the students and teachers, interesting references can be found about the reality inside the classrooms and in the environment.

It should be emphasized that the research responds to the questions that are posed and that are the guides to what is intended to be discerned with the field work. In turn, the questions not only seek to identify with approximation the reality of the study phenomenon, but also try to interrelate the variables that arise in the analysis of the problem. The following is an attempt to answer the questions posed through the data obtained from the research.

How do you evaluate the interest shown by the members of the university community you belong to in order to achieve the goals set?

In the case of the results it is observed that according to 22% and 35% are: Very Efficient and Efficient respectively agree that the interest shown by the members to conclude the goals outlined, while 34% say it is Regular, 5% and 4% say it is Deficient and Very Deficient. This indicates that the interest in completing the goals set is efficient.

How do you evaluate the knowledge of the members of the university community to which you belong about the legal scope of ICTs?

In the case of the results it is observed that according to 22% and 31% are: Very Efficient and Efficient respectively agree that the interest shown by the members to conclude the goals outlined, while 34% say it is Regular, 9% and 4% say it is Deficient and Very Deficient. This indicates that when evaluating the knowledge of the legal scope of ICTs by the members of the university community, it is efficient.

How would you rate the information privacy compliance of the members of the university community to which you belong?

In the case of the results it is observed that according to 24% and 29% are: Very Efficient and Efficient respectively agree that the interest shown by the members to conclude the goals outlined, while 37% say it is Regular, 6% and 4% say it is Deficient and Very Deficient. This indicates that when rating the fulfillment of information privacy by the members of the university community, it is efficient.

How would you rate the members of the university community to which you belong in relation to providing full access to information?

In the case of the results it is observed that according to 20% and 30% are: Very Efficient and Efficient respectively agree that the interest shown by the members to conclude the goals outlined, while 36% say it is Regular, 8% and 6% say it is Deficient and Very Deficient. This indicates that when rating the, granting full access to information by the members of the university community is, efficient.

How do you rate the faculty of the members of the university community to which you belong for the management of information concerning the institution?

In the case of the results it is observed that according to 21% and 34% are: Very Efficient and Efficient respectively agree that the interest shown by the members to conclude the goals outlined, while 34% say it is Regular, 13% and 1% say it is Deficient and Very Deficient. This indicates that when qualifying the faculty of the members of the university community for the administration of information regarding the institution, it is efficient.

Performance of agricultural activities

How do you rate the interest shown by the members of the university community to which you belong in reference to the inclusion of new ideas?

In the case of the results it is observed that according to 24% and 39% are: Very Efficient and Efficient respectively agree that the interest shown by the members to conclude the goals outlined, while 31% say it is Regular, 6% and 0% say it is Deficient and Very Deficient. This indicates that the interest shown by the members of the university community with respect to the inclusion of new ideas is efficient.

How would you rate the members of the university community to which you belong with respect to the use of working hours?

In the case of the results it is observed that according to 25% and 39% are: Very Efficient and Efficient respectively agree that the interest shown by the members to conclude the goals outlined, while 24% say it is Regular, 12% and 0% say it is Deficient and Very Deficient. This indicates that the members of the university community make efficient use of their working hours.

How would you rate the dedication of the members of the university community you belong to with respect to the agricultural work you do?

In the case of the results it is observed that according to 23% and 38% are: Very Efficient and Efficient respectively agree that the interest shown by the members to conclude the goals outlined, while 29% say it is Regular, 10% and 0% say it is Deficient and Very Deficient. This indicates that the predisposition and dedication of the members of the university community with respect to the agricultural work they are doing efficiently.

How do you rate the members of the university community to which you belong with respect to the fulfillment of your goals?

In the case of the results it is observed that according to 24% and 39% are: Very Efficient and Efficient respectively agree that the interest shown by the members to conclude the goals outlined, while 26% say it is Regular, 10% and 1% say it is Deficient and Very Deficient. This indicates that the members of the university community with respect to the fulfillment of their goals are doing it efficiently.

How would you evaluate the predisposition of the members of the university community to which you belong for the performance of your duties?

In the case of the results it is observed that according to 26% and 40% are: Very Efficient and Efficient respectively agree that the interest shown by the members to conclude the goals outlined, while 26% say it is Regular, 8% and 0% say it is Deficient and Very Deficient. This indicates that the members of the university community, with respect to the predisposition to perform their duties, are efficient.

DISCUSSION

In this project we have designed, implemented and tested an automated system using WIFI relay ICH, Tuya Alexa, which through previously configured orders activates an irrigation system using voice commands, with the help of wireless networks and Internet connectivity avoids data wiring to the place where the watering action is performed. It has strong advantages and opportunities to be implemented in homes and organizations that have a space for green areas.

A limitation of the project is that it must be implemented in an area with Internet access or service, it will not be possible to control the device efficiently if there is a weak signal or when there is no connection, to overcome this limitation it must be additionally equipped with a manual control.

REFERENCES

- Antúnez B., Alejandro; Mora L., David and Felmer E., Sofía (2010). Efficiency in Drip Irrigation Systems in the Dryland [online]. Chile: INIA, 2010 Available at: <http://www2.inia.cl/medios/biblioteca/ta/NR36672.pdf>. Accessed: 5/05/2021
- Arganza R., and Arroyo, M. (2019) Positioning the future. A paradigm shift thanks to the implications of "voice search" Available at: <https://www.marketing-xxi.com/voice-search-asistentes-voz-altavoces-inteligentes-seo-sem> Accessed 19/06/2021
- Balestrini, M. (2002). Como se elabora un proyecto de investigación. Sixth edition. Venezuela. Consultores Asociados.

- Cinjordiz C. (2016). Electromechanical relay. Available at: <https://www.infootec.net/rele-electromecanico/> Accessed 12/05/2021.
- Demin Pablo (2014). Contributions to the improvement of irrigation systems management Irrigation methods: basics, uses and adaptation. Available at: https://inta.gob.ar/sites/default/files/inta_aportes_para_el_mejoramiento_del_manejo_de_los_sistemas_de_riego.pdf Accessed 21/05/2021.
- Hernández R., Fernández C. and Baptista P. (2014). Metodología de la investigación. Sixth edition. Mexico. McGraw-Hill Interamericana.
- Peláez C. Betzari (n/d) Impact of applied technology in agriculture. Available at: <http://www.sofoscorp.com/impacto-tecnologia-aplicada-agricultura/>. Accessed 12/06/2021.
- Pineda J. (n/d). Types of irrigation systems. Available at: <https://encolombia.com/economia/agroindustria/agronomia/tipos-de-sistemas-de-riego/>. Accessed 12/04/2021.