

Agrarian extension activities: contribution to the environmental management of a farm in the cooperative sector

Actividades de extensión agraria: contribución a la gestión ambiental de una finca en el sector cooperativo



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ABSTRACT

The work was developed in the period from February 2016 to October 2018, in the farm with swine production "La Reina" of the producer Osmar Enrique Garcés González, with the aim of developing a plan of agrarian extension activities for environmental management in the farm "La Reina", in La Isla de la Juventud. The area is located in the Popular Council Centro Histórico of the town of Santa Fe, opposite Esbec No 18, on the Júcaro highway and has a total of 4 hectares, with low fertility soils of agroproductive category III. For the study, the methodology of participatory action research was used, which encourages the participation of all actors actively, in addition to obtaining as a result change, the transformation of reality and awareness. The farm was divided into three areas for the execution of the research and for the understanding of this process, a diagram is proposed to define

RESUMEN

El trabajo se desarrolló en el período comprendido desde el mes de febrero de 2016 hasta octubre de 2018, en la finca con producción porcina "La Reina" del productor Osmar Enrique Garcés González, con el objetivo de desarrollar un plan de actividades de extensión agraria para la gestión ambiental en la finca La Reina, en la Isla de la Juventud. El área se encuentra ubicada en el Consejo Popular Centro Histórico del poblado de Santa Fe, frente a la ESPEC No 18, en carretera Júcaro y cuenta con un total de 4 ha., con suelos de baja fertilidad de categoría agroproductiva III. Para el estudio, se utilizó la metodología de la investigación acción participativa, la cual propicia la participación de todos los actores de forma activa, además de obtener como resultado el cambio, la transformación de la realidad y la toma de conciencia. La finca fue dividida en tres áreas para la ejecución de la investigación y para la comprensión de

the sequence of steps to follow for the elaboration of a plan of activities. As a result, a plan of agrarian extension activities was elaborated to improve environmental management and promote the development of an environmentally friendly agriculture, starting from the active participation of the producer, the workers and the family.

Keywords: agrarian extension; environmental management; swine production

este proceso, se propone un diagrama para definir la secuencia de pasos a seguir para la elaboración de un plan de actividades. Como resultado se elaboró un plan de actividades de extensión agraria para mejorar la gestión ambiental y propiciar el desarrollo de una agricultura amigable con el medioambiente, partiendo de la participación activa del productor, los trabajadores y la familia.

Palabras claves: extensión agraria; gestión ambiental; producción porcina

INTRODUCTION

Territorial planning at the municipal level is one of the main tools for the management of socio-economic development at the local level. It makes it possible to integrate, coordinate and agree, in a coherent manner, on the implementation of economic, social and environmental policies and/or guidelines, in accordance with the potentialities and restrictions presented by the territory in the use of its endogenous and exogenous resources (Cardoso Carreño, Torres Páez, & Menoya Zayas, 2016; Zúñiga Igarza, Rodríguez Gómez, & Hijuelo Pupo, 2014).

In this context, current Cuban agriculture is immersed in achieving food production that contributes to food sustainability. Where the producer plays an essential role because of his implicit knowledge and practical experience, in addition to being the direct production managers (Cruz Cabrera, Vecino Rondón, & Cánova Herrandiz, 2018). Faced with this situation, the Ministry of Agriculture reached an agreement to decentralize agricultural production through the implementation of the Agricultural Extension System, with the objective of

serving a larger number of producers and contributing to a decrease in imports.

According to the FAO (2016), world pig production is characterized by the growing dichotomy of production systems; on the one hand, traditional small-scale subsistence systems; on the other, specialized industrial systems. These last follow a distribution pattern similar to that of the intensive poultry sector as they are concentrated near urban centers and input sources.

It is necessary to emphasize that, among animal waste, the pig is the most polluting and one of the causes lies in the fact that about 40% of the microflora of wastewater from pig farms, where waste is deposited, are made up of species of pathogenic bacteria and result in the presence of dissimilar diseases (García et al., 2010; Machado Hernández, Robayo Gómez, Ayala Bello, & Chávez Porras, 2016).

In keeping with this, pigs have been bred for the purpose of producing and obtaining their meat for human consumption, as well as for distributing, marketing and

exchanging goods. The pig (*Sus scrofa domestica*) is characterized by its high production capacity as it adapts to different environmental and climatic conditions. In addition, in countries of the region such as Ecuador, Bolivia, Nicaragua and Guatemala, the population has limited purchasing power, they consider them a piggy bank and take advantage of their capacity to consume products such as kitchen waste, restaurants, crops or agro-industries, which are transformed into proteins, fats, carbohydrates, vitamins and minerals of great importance for human nutrition (Alonso Pesado & Rodríguez de Jesús, 2016; Vera, Mayorga, García, Molina, & Taylor, 2016).

In this sense, and as part of the economic and social policy guidelines and the conferences of the Communist Party of Cuba, it was decided, on the Isla de la Juventud, to implement the proposal for an Integral Development Program in its projection, until 2030, aligned in three subprograms; one of them, dedicated to food, called Integral Agricultural Development Program, where the conditions for pig exploitation were created, which is the object of this study.

It is expected that, by 2020, there will be an increase to 32,000 head of pigs in the hands of producers whose main activity is the production of meat for social consumption. And as a starting point, we have that the three state farms, currently in existence, concentrate on the reproduction of these animals to put in the hands of producers the offspring for a more efficient development, which contributes to the sustainability of the species and is carried out, in a sustainable way, to the population (Vecino Rondón, Cánova Herrandiz, Castillo Mestre, & Perera Rodríguez, 2015).

However, the productive process has developed throughout these years of special period, under significant economic pressure, product to which the insufficient infrastructure of the port and internal transport led to the availability of some agricultural products and inputs had two to three days of coverage to feed the mass livestock and to sustain the plantations in various crops.

The empirical experiences of the authors of the present research, in the systematic participation in agro-livestock activities, as well as the diagnosis, in productive units and the training to the producers, have contributed to verify that, persist unfulfilled in the technological discipline, insufficient sources of food for the animals, of self-management by the workers and directors to the levels of base units and scarce actions of qualification and labor incentive, all which repercussions in the problems of labor motivation and productivity.

Taking into account the aforementioned elements, the Isla de la Juventud is converted into an experimental polygon, as part of the New Economic and Social Model. It was approved to extend the exploitation of the porcine species, for consumption purposes, for this region population and to accompany other territories of the country, in this program. As a pilot experience, there is a step forward in this direction. The usufructuary owner of the farm "La Reina", his workers and relatives are in the best disposition to develop an improvement in the environmental management that leads to an improvement of their environment and the production of the system and thus diminish the negative impact of the activity, optimizing the processes to project the production in the long term.

However, this increase in production, at the level of cooperatives, has generated, in the agroproductive context, a deterioration of environmental conditions. The growth in producer affiliation does not correspond to the conditions for training and direct advice. Although state control is increasing, there are few references from leading producers in the application of good practices in pig production to be used as references for obtaining cleaner productions.

All of the above, and in the opinion of the authors, forms part of the need for a plan of agricultural extension activities, at the territorial level, to accompany the wishes of pig producers for the development of an environmentally friendly agriculture. The elements described are part of the problematic situation of this study.

The problem outlined allowed the objective to be established: to develop a plan of agrarian extension activities for environmental management on the "La Reina" farm on the Isla de la Juventud.

MATERIALS AND METHODS

The work was developed in the period from February 2016 to October 2018, in the farm with pig production "La Reina", producer Osmar Enrique Garcés González, who obtained the land in usufruct, with Resolution No 145/2015 of the Delegate of Agriculture of the Isla de la Juventud, with delivery date on March 17, 2015, as established by Decree Law 300/2012 "Delivery of idle state lands in usufruct". He is an associate of the CCSf "Ovidio Pantoja".

As theoretical methods, the system approach and modeling were used and, as a procedure, analysis and synthesis. The

empirical methods used were: observation and interview techniques, survey and documentary analysis. These contributed to the development of the plan of agrarian extension activities for environmental management in the farm case study.

The total area is 4.0 ha, with fundamental activity of sowing various crops for animal feed and pork production. It is located in the Popular Council Centro Histórico of the town of Santa Fe, in front of ESBEC No 18, on the Júcaro highway. With soils of low fertility, bad drainage, eroded, little vegetal layer, limited effective depth. The plain relief and pH from 4 to 6.0 (acid soils) and agroproductive category III.

The farm was divided into three areas for the implementation of research. These are described below:

- Area No. 1: includes the infrastructure of the farm, which include: housing, ranch for training and other activities, warehouses for breeding, storage for resources and feed, sanitary filter, cistern for water storage and tanks for water distribution, for cleaning the ships and for animals.
- Area No. 2: intended for the planting of various crops, mainly for animal feed, self-consumption and, to a lesser extent, as donations for the home for the elderly and the maternal home and two lagoons of the waste treatment system.
- Area 3: Plantain, coffee and fruit crops such as mango, guava, citrus and forest plantations.

When analyzing the types and quantities of animals present on the farm, it was found that there are: a) Major cattle: one cow and three horses; b) Poultry cattle: 260 hens and 18 ducks and c) Pig cattle:

334 heads, including 4 breeders, 1 stallion, 38 offspring, 57 pre bait and 234 baits.

For the application of the participatory diagnosis, the methodology of the Agroecological Movement of the National Association of Small Farmers (2012) was used. Based on this, the environmental problem in the "La Reina" farm was defined and action could be taken on it, with the resources and capacities of the producer, the workers and the family.

With the use of this type of participatory diagnostic instruments, more valuable,

accurate and rapid information can be obtained and, even more importantly, these generate knowledge of reality and awareness of the problems and alternative proposals for the development program and the farmers.

The main phases for the development of the research are: the definition of the problem, the diagnosis, the elaboration of the plan and the implementation of the proposal. To understand this process, a diagram is proposed to define the sequence of steps to follow for the elaboration of a plan of activities (Figure 1).

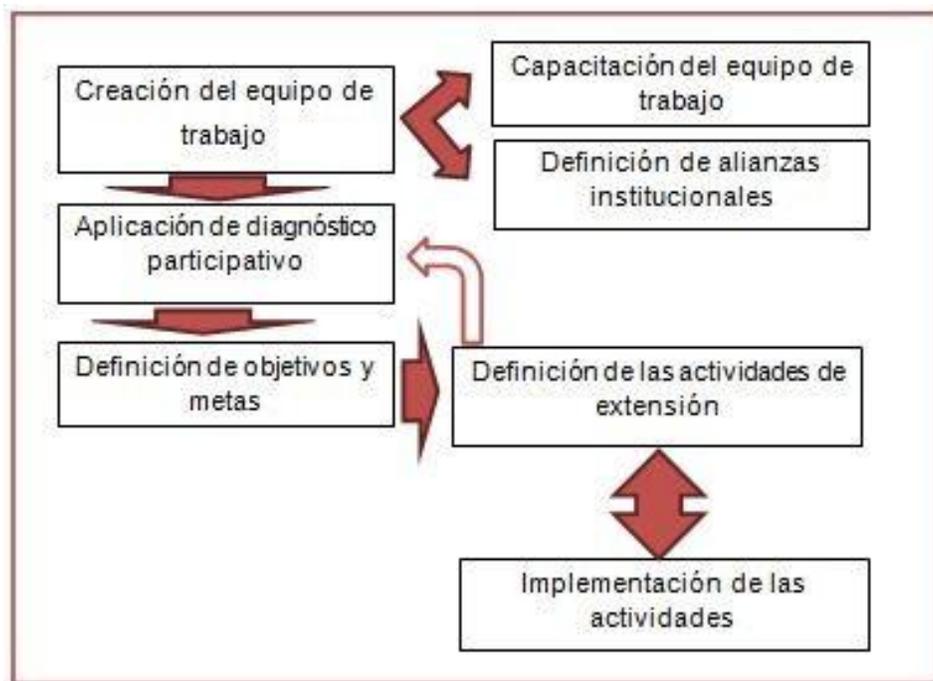


Fig. 1 - Sequence diagram of steps for the elaboration of a plan of agrarian extension activities for environmental management, in pig production farms

Source: Own elaboration

Meanwhile, the structure is flexible and allowed modifications to be made to the contents, which depended on the particular interests and regulations of the farm. This effort focuses on four main

directions: feeding management in the pig production systems of the cooperative sector; reproductive management; main bioprotection and hygiene measures that contribute to animal health and

environmental protection; and other pig breeding technologies applicable in the cooperative sector.

This research is part of the Sustainable Pig Production project, led by university professors, agro-livestock sector managers and producers.

RESULTS AND DISCUSSION

Plan of agrarian extension activities for environmental management in the farm "La Reina", with pig production.

For the definition of the agricultural extension activity, to be carried out on the farm with pig production, in order to improve environmental management, it was based on the methodology of participative action and for which the following phases were fulfilled:

Stage 1: Creation of the work team

Once the farm under study was defined, it was decided to create a working group, which was made up of a multidisciplinary team and a broad participation of training agencies such as: the University of Isla de la Juventud "Jesus Montané Oropesa", the Polytechnic Agro-livestock Institute "Amistad Cuba Corea" and the Agriculture Improvement and Training Centre (Centro de Superación y Capacitación de la Agricultura) "Manuel Orza López".

The formation of the group was approved by the producer and the territorial branch of the National Association of Small Farmers. The proposal was enriched by the need to incorporate the Ministry of Science, Technology and Environment (Citma) of the Isla de la Juventud and the

Municipal Center for Hygiene, Epidemiology and Microbiology (CHEM).

Stage 2: Work team

The work team is made up of several specialists from institutions of the territory and the farm. They are listed below:

- a) The producer
- b) The four farm workers linked to the pig activity
- c) The family of the producer (wife and child working on the farm)
- d) Three agronomists (authors of the research)
- e) A Bachelor's Degree in Sociocultural Studies
- f) An Architect
- g) A Veterinarian Doctor
- h) One soil laboratory specialist
- i) A plant health specialist
- j) Four students of the degree of Engineering in Agronomy
- k) Professors of agronomy at the University of the Isla de La Juventud

- Actions of training to the work team

After the creation of the extension group, it began training it to build capacity about the need to have farms with pig production, with adequate environmental management to eliminate the negative effects that affect the environment.

Seven actions were carried out (four tours of the farm and three workshops), which were aimed at defining the fundamental concepts of environmental management, negative environmental impacts, produced by pig production to the environment, diagnostic tools to be used, among other aspects of interest to the work team.

- Institutional Alliances

The institutional alliances were defined for the commitment with the participation of the specialists in the fulfillment of the actions to be carried out, in the farm, with a view to improving the environmental management and contributing to the mitigation of the polluting effects by the productive process of the pig farming, in the territory.

The alliances to reinforce the objectives proposed by the agrarian extension group were aimed at a group of cooperative organizations and producers, which contributed to the development of promotion, training and social recognition actions. They were:

- a) The University of the Isla de la Juventud
- b) Agricultural Improvement and Training Centre (Centro de Superación y Capacitación de la Agricultura)
- c) The Polytechnic Agro-livestock Institute
- d) Ministry of Science, Technology and Environment
- e) Territorial Delegation for Agriculture
- f) The National Association of Small Farmers
- g) Cuban Association of Animal Production
- h) Cuban Association of Agricultural and Forestry Technicians
- i) Livestock Enterprise Isla de la Juventud
- j) Department of soil
- k) Plant Health Department

Stage 3: Participatory diagnosis

For the application of the participative diagnosis, the environmental problem existing in the farm "La Reina" was

defined, on which it was possible to begin to act, with the own resources and capacities of the producer, the workers and the family.

Direct observation and contact with producers in the study area were used as participatory diagnostic tools. With this, valuable, accurate and rapid information could be obtained and these contributed to the generation of knowledge of reality and awareness of the problems and alternative proposals for the development program and the farmers.

After some years of experience to achieve significant improvements in the problems detected, it is useful to carry out a new participatory diagnosis to know the progress and to define another priority to work on. It is necessary to emphasize that the validity of the diagnosis depends on the participation of those who work in the production unit, in addition, there must be an environment of respect and harmony.

As part of the environmental problem, the following was obtained:

- a) Excreta, unpleasant odors, sewage discharged to lagoons
- b) Biological waste (placenta, dead animals)
- c) Ordinary wastes (paper, plastics, glass, aluminum cans, naylor)
- d) Hospital waste (needles, gloves, syringes)
- e) Use of raw materials and natural resources for food production and cooking
- f) Presence of vectors and insects harmful to animal and human health.
- g) Energy consumption

One of the most relevant aspects detected is the lack of knowledge and labor fluctuation on the part of the workers that

participate in the productive activity and that attend to the animals, as well as that of the producer, caused by the little experience in the agricultural sector, especially in pig production.

From the environmental point of view, the objectives, goals to be achieved and actions that contributed to diminish the environmental problems that existed in the "La Reina" farm were proposed.

Stage 4: Objectives and goals definition

For the formulation of the objectives to improve the environmental management of the farm with pig production "La Reina", four main aspects were taken into account that are projected towards the prevention, mitigation and control of significant environmental impacts, identified in the production process that, subsequently, were defined specific goals and activities with those responsible for the implementation of each of them. Table 1 defines the objectives, goals to be achieved, activities to be carried out, from the environmental point of view, and those responsible for the activities to be carried out.

Table 1 - Objectives and goals for the farm "La Reina"

Objectives	Goals	Activities	Responsible
1. Implement good environmental management practices.	1. Minimize the generation of polluting loads to the environment.	1. Dry cleaning using as little water as possible	Shipworkers
	2. Reincorporate the by-products of excreta into the production system.	2. Construction of a biodigester 3. Developing earthworm farming	Owner of the farm
	3. Avoid the generation of vectors pests and unpleasant smells.	4. Cleaning of installations 5. Installation of rodent traps	Shipworkers and farm owner
2. Implement actions for disease prevention.	4. Implementation of the training plan 5. Implementation of the agrarian extension plan of the results and experiences acquired in the environmental management of the farm.	6. Vaccination for shipworkers and other workers 7. Training on animal health and hygiene standards 8. Extension of the acquired experiences, towards other	Workers and farm owner

		farms with these productions 9. Maintenance of the common areas and adjacent areas of the pig-breeding premises.	
3. Carry out actions to reduce the visual impact of the infrastructure with respect to its environment.	6. Management of the internal and external landscape of the farm	10. Selection of plant species for animal feed 11. Acquisition of seeds, postures or cuttings 12. Soil preparation, sowing, agro-technical care and harvesting	Workers and farm owner
4. Implement the management and use of records in the production process	7. To evaluate the effectiveness of management and control activities of the production process in pig farming	13. Design records that are simple and easy for workers to understand. 14. Train workers on the use of records and the importance of using them. 15. Establish productivity and performance indicators	farm owner and facilitators

Source: Own elaboration

Stage 5: Definition of extension activities

Table 2 shows the plan of agricultural extension activities for environmental

management on the farm under study. It is divided by extension methods and by the number of people, objectives, date of the activity and its objective and the materials and means used.

Table 2 - Plan of activities of agrarian extension for the environmental management in the farm "La Reina"

Activity No: 1				
Extension method: Individual				
Extension method	Objective of the proposed method	Date of activity	Objective of the activity	Materials y means
Visit to the farm and home	Strengthen relationships between the beneficial owner, family and workers to influence the change process	1st and 3rd Tuesday of the month At 1.00 pm	To inform about the management and importance of new technologies such as biodigesters. Motivate about the separation of solid waste and its classification as raw material, disinfection or the appropriate treatment for it. Invite the producer to participate in the defense activity of the Specialty of Agrarian Extension (February/2018). Invite him to participate in the IV Symposium of the Faculty of Technical Sciences of the UIJ (May/2018). Solution of any problem that may arise on the farm.	Delivery of digital or paper documents (folders, magazines, books, pamphlets, videos, films) with information on pig production and the damage they cause to the environment, good agricultural and livestock practices, biodigester technology, environmental management and conservation agriculture.
Activity No: 2				
Extension method: Group				
Extension method	Objective of the proposed method	Date of activity	Objective of the activity	Materials and means
Field day or group demonstration	Solving a problem situation of the producers of the	May, 2017	Carry out a participatory diagnosis by all the	Guarantee cardboard, markers for

	production unit or of several farmers in the area in question		farm workers to identify the effects on the environment and interiorize the importance of establishing adequate environmental management in pig production.	sketching, making notes, drawing; carry visual aids (maps with important information), film and slide projection equipment, boards, chinks, eraser, etc. Other logistical resources so as not to interrupt the field day (define financial resources from the Proporsost project and contributions from the producer).
Demonstration of results	Demonstrate the efficiency of an agro-livestock or environmental management practice	December 2017	Demonstrate to workers at the La Reina farm and 10 producers in the surrounding areas the results achieved by implementing the actions previously proposed to improve the environmental management of the farm.	Show materials in such a way as to ensure the activity to be carried out with videos on the execution of the works carried out, the trainings, previous and subsequent photos, among others. Other logistical resources (define financial resources from the Proporsost project and contributions from the producer).

Activity No: 3				
Extension method: Massive				
Extension method	Objective of the proposed method	Date of activity	Objective of the activity	Materials and means
Specialized workshop	Apply theoretical and practical elements in the analysis of a real situation	March, 2018	To bring together pig producers, the Popular Councils of Mella Vaquero and Pino Alto, Reforma, La tumbita and Santa Fe, which are associated with the 7 CCS of this area of the territory, to exchange experiences from the point of view of environmental management on the farms.	Delivery of digital or paper documents (folders, magazines, books, pamphlets, videos, films) with information on pig production and the damage they cause to the environment, good agricultural and livestock practices, biodigester technology, environmental management and conservation agriculture. Other logistical resources (define financial resources from the Proporsost project and contributions from producers and cooperatives).
Exhibition Fair	Sample the progress achieved, according to the practical and investigative application.	December, 2018	Sample and purchase agricultural products that contribute to improving soil conditions and animal feed.	Delivery of digital or paper documents (folders, magazines, books, pamphlets, videos, films) with information on pig production and the damage they cause to the

				<p>environment, good agricultural and livestock practices, biodigester technology, environmental management and conservation agriculture. Sample of seeds used in animal feed and in the improvement of soil conditions and other technologies adapted to the conditions of the territory. Other logistical resources</p>
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Source: Own elaboration

Stage 6: Implementation of extension activities

The implementation of the activities was carried out in accordance with the planning carried out after the diagnosis, with the participation of various actors, the producer, the workers and their families:

- Individual methods: visit to the farm and individual advice
- Group method: field days, implementation of the diagnosis, activities with the Circle of Interest "Sustainable agriculture", demonstration of results, construction and repair of the Waste Treatment System and repair of the windmill.
- Massive method: specialized workshop on agroecology, sustainable development and the use of bio digesters.

When analyzing the main contributions of the research, the following stand out: farm diagnosed with the participation of specialists; the producer, workers and family members, producers trained on the need to maintain adequate environmental management on farms with pig production; creation of demonstration and training areas; execution of workshops that demonstrate the results achieved in the environmental management of the farm, which serve as a practical example and contribute to strengthening the use of environmentally friendly practices on farms with pig production.

The analysis was based on theoretical references on agricultural extension for environmental management in farms with pig production, which refer to the use of natural resources, from the adoption of viable environmental practices that

improve productive relations with the natural environment and the community.

The participatory diagnosis showed as a result the incidence of environmental problems in the farm under study. Among the problems, the following stand out:

solid and liquid residues, bad handling of residuals, indiscipline with the applied technologies and the presence of vectors and insects harmful to animal and human health. To counteract these facts present in environmental management, agrarian extension activities were developed.

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