

Limitations for the production of creole pork in the cooperative sector of eastern Cuba

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ABSTRACT

The objective of this research was to determine the controversial situations in the production of Creole pork in the cooperative sector in Cuba, through the application of a participatory diagnostic system. Interviews were conducted with 50 Creole pig producers belonging to the Cuban Cooperative Organizations of the Holguín municipality. The Vester matrix was used to classify the problems according to their degree of causality, and a SWOT matrix exercise, which was determined through the development of meetings, the application of participatory techniques and group discussions as rural extension work. The 10 main controversial situations were identified, of which four were active problems, four passive, one critical problem and one indifferent. In the evaluated Creole pig breeding systems, the treatment of residuals is null, manure and urine remain in the pens all the time. Reproduction controls are not carried out, affecting the genetic and productive potential. In all cases, the type of reproduction is direct mounting without control. Vaccination and deworming schemes are scarce. One of the demands of the Creole pig breeders surveyed was training in technical, productive and reproductive aspects of animal management.

Keywords: Creole pig, family production, participatory diagnosis, backyard breeding, agricultural extension.

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INTRODUCTION

The origins of the Cuban Criollo pig date back to the Spanish conquest and have been successfully adapted to the agro-climatic conditions of the island, forming part of the peasant folklore. However, after the introduction of intensive breeding systems with selected breeds, Criollo pig breeding has been considerably reduced, so the Cuban government has implemented programs for the conservation of the Criollo breed in the different institutions of the cooperative sector (Velázquez *et al.*, 1998, Martínez *et al.*, 2005).



In addition to contributing to the supply of animal protein for the communities, Criollo pig breeding has become a source of additional economic income for farming families (Ramos-Canché *et al.*, 2020). Therefore, it is necessary to identify viable strategies that make possible the traditional maintenance of the Criollo breed (Vadell, 2008). Emphasizing the use of joint tools between the productive sector and governmental bodies, in order to establish diagnoses that allow the formulation of efficient solutions for the sustainable breeding of the Criollo breed of pigs in the productive sectors (Velázquez *et al.*, 2008; Velázquez, 2008). Therefore, the objective of this research was to determine controversial situations in Creole pig production in the cooperative sector of the municipality of Holguín through the application of a participatory diagnostic system.

MATERIALS AND METHODS

The research was carried out with 50 producers of Creole pigs belonging to the Cuban Cooperative Organizations (CCO): Basic Unit of Cooperative Production (UBPC), Cooperative of Agricultural Production (CAP) and Cooperative of Credit and Service (CCS), belonging to the Ministry of Agriculture of Providencia Holguin, Cuba.

A semi-structured interview was applied with the objective of knowing productive, reproductive, management, housing and producers' perception of the limitations, strengths, threats and opportunities of Creole pig production in the municipality of Holguin.

The interviews were carried out in field visits to Creole pig producers of the CCO. In addition, the information was validated through field visits and direct observation (Pozo-Leyva *et al.*, 2021a). Subsequently, a meeting was held with 10 managers, CCO producers and specialists from government organizations to analyze the results and identify the problems that influence Criollo pork production (Velázquez, 2008 and Velázquez *et al.*, 2008).

Classification of controversial situations according to causes and consequences

The causes and consequences of the problems were identified by applying the Vester Matrix. This matrix is a tool developed by the German scientist Frederika Vester. It has been applied in participatory research with producers to facilitate the understanding of controversial situations in a simple and practical way (Velázquez, 2008 and Velázquez *et al.*, 2008), in addition to its multiple uses in development, security and risk management projects, as well as in regional and environmental planning in various productive sectors (Gabriel *et al.*, 2017).

Of the controversial situations identified through the interview, the 10 most common were used to form a matrix. On the X axis as well as on the Y axis, the problems were placed from 1 to 10. Subsequently, the X axis was crossed with the Y axis, assigning a value to each problem identified, according to the causality or direct or indirect consequence of each problem on the X axis, on each of the other problems on the Y axis. A numerical value was given to the interaction of each problem situation where:

0=It is not a cause of the problem.

1=It is an indirect cause of the problem.

- 2=It is a moderately direct cause of the problem.
- 3=Direct cause of the problem.

Subsequently, the values assigned for each problem on both the X and Y axis were added (Velázquez, 2008 and Velázquez *et al.*, 2008), as shown in Table 1.

The sum of the X-axis constitutes the active problems corresponding to the appreciation of the degree of causality of the problem on the others. The sum of the Y-axis makes up the passive problems, corresponding to the appreciation of the degree of causality of the other problems on the analyzed problem and the level of consequence. Higher scores mean that the problem is a direct consequence of the other problems (Velázquez, 2008 and Velázquez *et al.*, 2008).

Strengths, Weaknesses, Opportunities, Threats and Opportunities (SWOT) Analysis Matrix

The SWOT analysis is the tool most commonly used by decision makers in strategic management processes (Moghaddaszadeh *et al.* 2015). This matrix makes it possible to relate the internal environment to the external environment within a productive organization, identifying key factors for decision-making in a simplified way (Domon *et al.*, 2019; Forleo and Palmieri, 2019). It has as inputs, on the one hand: the results of the internal analysis, where the strengths are the positive internal factors that can help the increase of Creole pig production. Weaknesses constitute the negative internal factors that hinder the development and perpetuation of Creole pig breeding in the municipality.

The external analysis identifies the opportunities that are the circumstances that can be taken advantage of for the maintenance of the production system over time and the threats are the external limitations that intervene in the sustainable production of Creole pigs. The general problem is the strategic situation that the organizational system must change to reach the desired state, successfully fulfilling the mission (Geoheritage, 2020).

Table 1. Application of the Vester Matrix to the main controversial situations.

Problem	1	2	3	4	5	6	7	8	9	10	Summation
1-Technologies not appropriate to the stages of swine and agricultural production.	0	2	1	3	1	1	3	1	1	2	15
2-Lack of control of reproductive and productive indicators.	1	0	0	0	0	1	0	1	1	0	4
3-Unstable allocation of food by CCO.	1	0	0	0	0	0	0	0	0	1	2
4-Non-compliance with biosafety standards.	1	0	1	0	0	0	1	0	0	0	3
5-Lack of knowledge of producers.	3	3	0	3	0	1	1	1	1	1	14
6-Lack of training and extension of the CCO.	3	3	0	3	3	0	1	2	2	3	20
7-Lack of veterinary assistance.	2	3	0	3	2	3	0	1	3	3	20
8-Lack of a sense of ownership of the CCO by the producers.	3	2	0	2	3	3	3	0	1	3	20
9-Genetic potential.	1	0	0	0	0	1	1	0	0	0	3
10-Lack of knowledge of ration formulation.	1	0	2	0	1	1	1	0	0	0	6
Summation	16	13	4	14	10	11	11	6	9	14	

RESULTS AND DISCUSSION

General information on Creole swine production systems

Of the 50 Creole pig producers interviewed, 13.5% were women and 86.5% were men. Of the 144.13 ha of land owned by the respondents, 30.4 ha are dedicated to raising Criollo pigs. The productive sector has 725 Creole pigs, of which 16.3% are dedicated to reproduction with an average of 7.9 offspring per farrowing and lactation of 48.8 days on average.

Sixty percent of the breeding systems are extensive, 30% are backyard breeding and 10% are semi-extensive. The construction characteristics of the few facilities that exist are rustic, with dirt floors and wooden walls or live fences. There is no waste treatment; manure and urine remain in the corrals all the time, whether they are permanent corrals or resting corrals, mainly at night.

Problem bank and classification by application of the Vester Matrix

As shown in Table 2, four active, four passive, one critical and one indifferent problems were obtained. The four active problems are those with a high active total and a low passive total; they represent the problems that have a strong influence on the others, but are not caused by others. The four passive problems are those that have a low active total and a high passive total, do not strongly influence other problems, but are caused by most of the other problems.

The critical problem has a high number of both active and passive problems. It represents the problem that is an appreciable cause of causation on the other problems and which in turn is caused by the other problems. The indifferent problem has a low active and low passive, representing problems that have no causal effect on the analyzed set and are not caused by any of these problems.

Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis

Table 3 shows the SWOT analysis made to CCO through field visits to determine the strengths, weaknesses, opportunities and threats facing Criollo pork production in Holguín province. The four strengths identified are made up of internal factors, the five weaknesses partially or totally limit the correct functioning of the product systems, the four

Table 2. Classification of problem situations according to causes and consequences.

Active Problems	Passive Problems
5- Lack of knowledge of the producers.	2-Lack of control of reproductive and productive indicators.
6- Lack of training and extensionism of the CCO.	4-Compliance with biosecurity norms.
7- Lack of veterinary assistance.	9-Genetic potential.
8- Lack of sense of ownership of the CCO towards the producers.	10-Unknowledge of ration formulation.
Critical Problems	Indifferent Problems
1-Technologies not appropriate to the two phases of swine and agricultural production.	3-CCO unstable food allocation.

Table 3. Determination of weaknesses, threats, strengths and opportunities.

Strengths	Threats
Single state purchaser.	Diseases.
Human resources.	Climate.
Pricing.	Production costs.
Movement of elite producers.	
Weaknesses	Opportunities
Lack of training.	Demand.
Lack of technical knowledge.	Low competition.
Lack of biosecurity.	Delivery of land.
Lack of reproductive control.	State Priority Program.

opportunities are made up of those factors outside the production systems, while the three threats are made up of the limitations that could slow down the production process.

General information on Creole pig production systems

Creole pig raising is not the main economic activity of the producers, since they are more involved in the production of cow's milk and agricultural products. The main crops grown include corn, sugar cane, squash, cassava, sweet potatoes, beans, plantains, soybeans and sorghum to a lesser degree. This corresponds to the work carried out by Vadell (2008) in Uruguay, who states that Creole pig production is characterized by small backyard productions, with less than 50 head per production unit and an average of 8.8 live-born offspring per farrowing. On the other hand, it mentions that pig breeding is not the main productive activity, since the producers' main source of income is the sale of milk and vegetables.

Intensive pig breeding systems have substantially replaced traditional systems, putting at risk the perpetuation of creole breeds, which are at a disadvantage in terms of productive and reproductive efficiency (Cardozo and Rodríguez, 2010). Although the Criollo pig shows early sexual maturity, it has a low reproductive potential with less than 2 farrowings per year, as well as long lactation periods and low weaning weights (Linares *et al.*, 2001, Ramos-Canché *et al.*, 2020), which corresponds to the results of this research.

One of the benefits of Creole breeds is their adaptation to different environmental and climatic conditions and greater hardiness (Ramos-Canché *et al.*, 2020). This implies greater resistance to the presence of diseases and their low requirements in terms of feeding and comfort of the facilities (Gourdine *et al.*, 2010; Linares *et al.*, 2011), compared to commercial lines, which are not very resistant to high temperatures, since above 30 °C voluntary feed consumption, live weight gain and fertility are affected (Linares *et al.*, 2011).

Another satisfactory factor is that consumers of animal products today are increasingly demanding in terms of quality standards. Consumers prioritize products with low exposure to antibiotics, steroids and hormones, which has led to an increased demand for backyard products (Ramos-Canché *et al.*, 2020). As for the consumption of Criollo pigs, consumers'

perception is that it has a greater flavor, tenderness, juiciness, nutritional value and taste stimulation to the palate. This has led to a better acceptance and demand with respect to specialized breeds of pork (Cardozo and Rodriguez, 2010; Linares *et al.*, 2011).

The results of this research are in agreement with those reported by Linares *et al.* (2011), who documented that Criollo pigs are mostly raised in extensive, semi-extensive and agro-pastoral production systems. They are well adapted to different feeding regimes and agroecological conditions, but with long lactation periods and slow growth.

Similarly, Cardozo and Rodriguez (2010) agree that most of the rearing systems are extensive, where animals are fed with local products, crop residues, seasonal fruits and vegetables, since supplementation with commercial concentrates is scarce. In addition, they commented that the facilities are insufficient and rustic. Generally, there are large corrals close to the producers' homes where the animals only spend the night. Gourdine *et al.* (2010) reported that in this type of breeding, the reproduction method used is direct mating, without establishing a control of productive and reproductive indicators, which corresponds to the findings of the research described here. This directly affects the three phases of production (reproduction, development and completion).

Problem bank and classification through the application of the Vester Matrix

Four active, four passive, one critical and one indifferent problems were obtained, which is in agreement with Velázquez *et al.* (2008) who reported that the production of Creole pigs in rural areas lacks participatory strategies, in order to promote the optimal development of production systems. In this research, the following were documented as controversial situations:

- Indiscriminate crossbreeding of the Criollo pig breed.
- Lack of economic support from breeders.
- Insufficient technical assistance, lack of training on genetic conservation.
- Lack of biosecurity.
- Lack of food support to cover the nutritional requirements of the pigs.
- Lack of productive and reproductive control.
- Deficient facilities, inappropriate management.
- The non-existence of value-added products to the Cuban Criollo pigs.

Caicedo *et al.* (2012) agree that one of the main controversial situations in the Cuban Creole pig production sector is:

- Non-compliance with swine breeding standards.
- Lack of technical advice.
- Lack of veterinary and zootechnical services.
- Lack of knowledge of the producer in genetics and reproduction.
- Deficient breeding, feeding and sanitation technologies.
- Lack of training and extension systems.
- Lack of biosecurity.

Documented that 52% of the producers carry out an inadequate management of reproductive, productive and housing indicators, and 44% do not comply with any of the biosecurity norms, which is in correspondence with the results found here.

Analysis of weaknesses, threats, strengths and opportunities (SWOT)

The four identified strengths are formed by the internal factors that can help maintain the Creole pig production systems in a positive way. On the other hand, the weaknesses are the factors that make it difficult to perpetuate Creole pig production in the municipality over time. The opportunities are the external factors that can be used in a favorable way for the strengthening of Creole pig breeding and the threats are the barriers that limit the production in an optimal way, which corresponds with previous research carried out by Geoheritage (2020), Saygin (2017) and Moghaddaszadeh *et al.* (2015).

The productive limitations are firstly related to the lack of training of producers which brings low technical knowledge for the management of swine production, implying the absence of biosecurity conditions that can directly influence with the threat of presence of diseases.

On the other hand, the lack of control of reproduction may result in a lower number of offspring per birth, inbred animals. This leads to greater susceptibility to disease and lower live weight gain, which increases production costs. All of the above is aggravated by climatic conditions, since rainfall is increasingly erratic, affecting the quantity and quality of crops used for animal feed, which corresponds to the studies carried out by Pozo-Leyva *et al.* (2021b).

Therefore, feeding strategies adapted to each production system are required, which in turn optimize the use of resources. The main action of the CCO is to create a group of specialized extensionists capable of meeting the particular demands of producers, since these rearing systems face heterogeneous environmental, social and economic challenges (Domon *et al.*, 2019). This strategic management tool allows to know the working aspects to improve the functioning of the productive systems being of great utility for the CCO managers, government entities and decision makers.

CONCLUSIONS

One of the demands of the Creole pig breeders surveyed was training in technical, productive and reproductive aspects of herd management. The use of the Vester matrix and SWOT tools constitute an effective diagnostic method for identifying problems in swine breeding. Technologies not appropriate to the stages of swine and agricultural production are the critical problem that directly affects Creole pig breeding in the municipality of Holguín.

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