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Environmental Impact of Common Swine Fattening in the Outskirts

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ABSTRACT

A 2011-2012 study was carried out in the outskirts of Camagüey city to evaluate environmental impact of common swine fattening. Answers to an inquiry applied to 106 swine private breeders served the purpose of collecting information about four fields of analysis: physical-chemical, biological-ecological, socio-cultural, and economic-operational ones. Swine breeders were distributed into three cases, i.e., sustainable, common, and negative. Evaluation of the four fields of analysis and the three cases of breeders was performed by the Rapid Impact Assessment Matrix (RIAM) method. Negative environmental impacts were focused on the absence of biogas plants leading to a failure not only in animal solid wastes management and discarding, but also in using already biodegraded residues as biofertilizers. Non-production of biogas as an alternative source of energy was evident, thus. Besides, breeders´ lack of training of training, no grains growth for swine feeding, non-incineration of swine corpses, and absent or neglected food storing facilities also contributed to the environmental negative impact. Moreover, corpses disposal and conditions of food storing facilities were translated into vectors proliferation and, hence, diseases appearance.

Key Words: *swine feeding, swine wastes, environmental impact*

INTRODUCTION

Pork consumption by the Cuban population is mostly guaranteed by the National Pig Industry. The national production, however, cannot meet the growing needs, despite the high social and economic importance it has. Prices continue to be high. And international prices are not the solution, since the in-bone pork shoulder and thighs cost up to US $ 2402.00 and US $ 24 442.50 MT-1, respectively (Central Bank of Cuba, 2012).

Small-scale pig production plays an important role in the national balance, 73.9 %,according to Pérez (2005), and should be permanently and multilaterally assessed (FAO, 2002; Olazabal and Guevara, 2011). The study of the environmental impact became one of the pressing issues for pig production.

The aim of this work was to readily assess the environmental impact of small-scale pig fattening in the outskirts of Camagüey city.

MATERIALS AND METHODS

A survey was applied to 106 small-scale private breeders engaged in pig fattening in the outskirts of Camaguey city, Cuba, in the period 2011-2012. The survey included 39 questions, which werelater used as components of the four areas of analysis: physical-chemical (Ph/Ch), biological-ecological (B/E), socio-cultural (S/C), and economic-operational (E/O), assessed by the RIAM method. Each question (component) could have two answers: positive (yes) or negative (no). Verbs like to own, make, have or obtain were used for each component during the preparation of the questionnaire.

In order to use RIAM, three cases were chosen:

Case I: a sustainable breeder who would answer all the questions positively. This breeder would have the drainage structures, filters, biogas plant and electric power saving, tradition, knowledge, efficient management, adequate hygienic conditions, animal daily weight increase, and positive salesbalance percentagesavailable. Another condition was that the breeder should produce most of the feed pigs need for consumption. This simulated case represents the highest RIAM scoring.

Case II: the second case comprised the regular breeder. For profile determination, breeders were required to answer more than 80 % of any of the questions, positively or negatively. Only three breeders (2.83 %) had a biogas plant working;the rest (96.22 %) did not produce a considerable amount of their animal feed. There was a high frequency of food leftovers to feed the pigs. Cleaning, veterinary assistance, vaccination, and alert system measures were performedor taken very often. Tradition, breeding culture, family acceptance, incomes and profitability characterized this group.

Case III: the negative breeder is the one who answered negatively to all the questions and has neither knowledge nor training, or the necessary

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facilities. There is no concern about polluting, squandering (water, resources and power). Feed is not produced and management is deficient. This simulated case represents the lowest RIAM scoring.

For assessment, the updated version of the Rapid Impact Assessment Matrix (RIAM) (3.0-2002.09.05), Pastakia (1998) methodology was used. Component assessment should be made with this formula,

(a1) x (a2) =aT; (b1) + (b2) + (b3) =bT y (aT) x (bT) =ES

Where,

(a1) and (a2): individual values of the criteria related to the importance of the environmental impact (A)

(b1), (b2) and (b3): individual scores of criteria concerning importance of the environmental impact (B)

aT: results of multiplying all the scores (A).

bT: results of adding all the scores (B).

ES: assessment scoring for each component.

RESULTS AND DISCUSSION

Table 1 shows the scores achieved by the three cases for each of the physical-chemical elements.

A series of components have been set up in this work to assess pig production using RIAM as a first version. This had been performed in other species, such asbovines (Acosta and Guevara, 2009).

The difference in the values of the components of the sustainable case may be misleading to some researchers and producers, because the components of the sustainable case, some scores are high (81), meaning a highly positive environmental impact; and some achieved lower scoring (27), with the same impact. This due to the fact that RIAM takes into account if the component has a local, territorial, national or global reach.

Although most breeders have permanent facilities and minimal containment measures and the vital space are kept, safety criteria say facilities should be near homes, thus reducing the optimum vital space.

Water is being wasted because the drinking troughs are so arranged that when water is poured into them it drains awas; they are placed too high, and sometimes are faulty; and people are not aware of the need to take care of the troughs.

There are no hoses or faucets nearthe facilities; the floor cracks are not repaired. These and other factors have caused an increase in cleaning water consumption. Chao, Sosa and Fernández (2005) observed that on some farms 26 l of water/animal/day are spent when cleaning. They concluded that is too much water to be spent on pig production.

Although breeders try not to waste feed, the positive scoring was affected by the use of inadequate feeders.

The fact that most regular breeders do not have the proper drainage system has been overlooked, and it goes unnoticed.

There is no evidence by any regular breeder that the cleaning residues are separated from feed and feces. Some places only have a spaced grid. In the worst of scenarios; however, the solid residues are disposed of in places not suitable, and the soils and atmosphere are polluted.

Martínez, García and Ly (2004) have reported the production of fresh material (pig feces) between 0.51 and 1.35 kg per 1 kg of solid feed that each pig eats. This amount of fresh material is necessary for the production of fuel and bio-fertilizer with the proper and available bio-digesters.

One of the causes of environmental damage produced by pig breeding in the outskirts of the city may be the lack of containers to collect the solid wastes from pigs.

The positive reach and contribution of small-scalepig fattening in the outskirts of the city might be restricted because of the lack of bio-gas plants, of earthworm culture, or because of inadequate compost production. The consequences of restrictions have generated effective criticism from specialists. Nowadays, there are several inexpensive technologies (for any of the three cases studied) that help breeders protect the environment and transform the solid wastes (feces) into clean energy and bio-fertilizers.

Around 2 186 kw/h are consumed in large-scale farms (Chaos, 2005); therefore, it is necessary to solve the problem stated in the previous paragraph (a biological source of energy such as bio-fertilizers is required). However, it is very difficult to control electricity consumption in facilities of large-scale breeders, because there are too many. This situation may bring about a negative environmental impact for both the breeders and society.

Table 2 shows the scores of the biological-ecological components. The effects of these components are long-reaching, and may affect not only the local, but also the regional environment. Furthermore, there is a big difference between the scores showed in Table 2 and the ones achieved for these components by the deficient breeders. However, according to Olazábal and Guevara (2011), with one or more regular breeders; especially those from the same area, with high education, tradition and information about the topic from different sources, (the Institute of Veterinary Medicine and Civil Defense), vital elements on sudden outbreaks can be accessed for effective veterinary assistance.

Additionally, vaccination and epizootiological supervision areaccomplished adequately, thoughthey can be improved.

One of the most deficient aspects concerning the common breeder actions is the limitation to dispose of a dead animal. That may be the result from inappropriate organization, the time of death and its treatment, the lack of fuel or any other means for incineration. Rat and insect elimination, and disinfection are determining elements to reduce pathogenic agents that can emerge on a farm in different ways. Actions should be taken to narrow the possible sources of risk according to Acosta (2006).

A negative aspect in the facilities is the lack of control over rodents and flies. Consequently, more management, support, assessment, information, fines and access to chemical and biological products for controlling those pests, are required.

Nowadays, the work that breeders must do to reach the same level as sustainable breeders is complex, but there are well established theoretical frameworks that provide the tools to start working correctly on pig bio-safety as García, Martínez and Cabrera (2010) explained.

Table 3 shows the scores of the sociocultural components, some of which can produce important changes in bio-safety improvement.

Nowadays, pig breeding is mainly done by whole families, but sometimes, help from other people is needed, when a family member is sick or needs to go out of town.

Though training and marketing practices are based on an incomplete, ineffective and superficial theoretical framework, this issue has been discussed by the media.

The means for work and protection (sometimes not available in commercial places or disregarded by breeders due to the the lack of knowledge about the need for risk mitigation (or because of financial cut backs) limit the improvement of small productive systems.

Personal income satisfaction, tradition, and acceptance by most family members (small-scale pig production) have helped increase the number of pig breeders, and have significantly contributed to feed production and consumption of a Cuban family (Cuban basic food supply) for the last two decades.

The scores of the economic-operational componentsare shown in Table 4. Like wise, the changes in the behavior of the common breeders are observed. The number of fattened pigs is quite accurate, in relation with the facilities and the feed sources (the major limitation).

Though food leftovers from breeding families and their neighbors are used to feed the pigs, breeders do not use the forage available even when it grows near their homes. A large amount of money is spent on getting residues from the rice mill; which produce poor nutrition and digestibility and can be replaced by legumes and other available forages like *Moringa oleifera*, found in hedges and elsewhere.

Food storage is one of the least considered zoo technical elements, because of the lack of resources or knowledge. The breeder needs training and awareness in that issue in order not to malpractice, as they are not allowed to purchase large feed quantities for the whole cycle when there are surpluses and low prices in the market. As a result, transportation costs are increased.

According to Pérez (2005) the Cuban pig industry has to solve the issue of local food production in the current times. However, an unfinished task for most breeders is the availability of local technologies to produce grains (sorghum), tubers (cassava), sugar cane (to meet the pig energy demand), and produce oily arborescent leguminous plants to get proteins.

One of the most noteworthy inefficient parameters is that the daily 600 gram weight gain in pigs is not achieved.

Unnecessary feed wastes are produced, along with overtime processes and capacity insufficiencies. Weights at sacrifice are over 110 kg, occasionally. Andrade and Diéguez (2010) have studied the efficiency parameters.

Economic and mentality changes have produced an increase in book keeping and record keeping; the Tax Authority, The Association of Small Farmers and the Institute of Veterinarian Medicine demand very strict controls. However, some zoo technical data are not recorded, which hinders decision making.

High demand for pork is a stimulus for small-scale pig fattening secured by high prices (based on the mean salary), a reason to continue research on the environmental impact in this sector. Also, it is important to create a system of regulations, penalties, and stimuli that contribute to sustainable development in the area; basically similar to all tropical countries (Silva Fila, 2010).

CONCLUSIONS

The main negative impacts caused by solid waste management, the inexistence of biogas plants, water squandering, poor production of grains and oily plants, elimination of dead animals and vector control, training, storage, and the lack of energy and bio-fertilizer production, were assessed and corroborated in the study.

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Table 1. Physical and chemical components (Ph/Ch)

Components	Case sustainable	Case common	Case negative
Permanent facility	24	5	-27
Efficient use of drinking water	81	15	-81
Efficient use of cleaning water	81	0	-81
Protected wells and cisterns	81	15	-81
Solid waste collection	81	-18	-81
Structures for solid waste processing	81	-18	-81
Adequate troughs and feeders	27	10	-27
Efficients unlight use	81	15	-81
Efficient use of electric power	81	15	-81
Adequate use of wood as fuel and for construction	81	15	-81

Table 2. Biological and ecological components (B/E)

Components	Case sustainable	Case common	Case negative
Comprehensive vaccination	81	30	-81
Frequent and effective mechanical cleaning	81	15	-81
Capacity for body and remains disposal	81	0	-81
Systematic veterinarian assistance	81	15	-81
Disease information management	81	15	-81
Vector control	81	-10	-81
Epizootiological surveillance measures	81	15	-81

Table 3. Social and cultural components (S/C)

Components	Case sustainable	Case common	Case negative
Tasks achieved through family labor	24	15	-27
Continuous training of breeders	54	0	-54
Availability of propertools	27	0	-27
Availability of proper protection means	24	5	-27
Acceptance by all doers	54	20	-54
Family tradition	54	10	-54
Income satisfaction	81	15	-81

Table 4. Economic and operational components (E/O)

Components	Case sustainable	Case common	Case negative
Adequate number of animals	54	10	-54
Use of human food leftovers	54	36	-54
Efficient use of forage supply	54	10	-54
Adequate feed storage	27	0	-27
Feed production and preparation with local means	54	10	-54
Feed purchase in the proper season	81	-15	-81
Feed transportation with minimum fuel consumption	81	0	-81
Rigorous supervision and controls with traces	81	15	-81
Biogas production and use	81	-36	-81
Biofertilizer production and use	81	-36	-81
Efficient use of all sacrificed animals	27	6	-27
Proper daily weight gain	27	0	-27
Proper sacrifice weight	27	6	-27
Sales at satisfying prices	54	0	-54
Suitable cost-effect rate	54	10	-54