*Journal of Agriculture and Technology Management (JATM)*
*26(2): (July-December 2023)*
Article ID: 10015 | Received: 06-23-2022 Revised: 00-00-2022 Accepted: 06-25-2023

**Original article**

# Social sustainability assessment of hog growing business as experienced by hog growers in Southwestern Cebu Philippines

Felix Q. Pocong, Jr.[ab*], Glynne P. Bate[ab], Nerissa Mae E. Hernandez[ab], Rosalea Fenina A. Margallo[ab], and Barbara B. Comision[c]

[a]Graduate School, Cebu Technological University, Malabuyoc Extension, Poblacion Dos, Malabuyoc 6029, Cebu, Philippines
[b]Cebu Technological University, Moalboal Campus, Poblacion West, Moalboal 6032, Cebu, Philippines
[c]Cebu Technological University, Malabuyoc Extension, Poblacion Dos, Malabuyoc 6029, Cebu, Philippines

## ABSTRACT

This study aimed to investigate the experiences of the smallholder and subsistence hog producers of hog-growing businesses in Southwestern Cebu, Philippines. The population of the study was 16 smallholder hog growers and two subsistence hog producers. Empirical data were collected from the smallholder hog growers. For the purpose of validating the sustainability of the hog-growing business, an interview with the subsistence hog producers was conducted. The findings of the study showed that most of the smallholder pig growers were female and the significant problem in hog growing was waste processing or disposal. The subsistence hog producers had long years of experience; very optimistic about the potential or prospect of hog operation and the social sustainability of the hog growing business. Both smallholder pig producers and subsistence hog producers continue to operate hog production since pork meat demand is high, profitable business help sustain the food supply for the southwestern part of Cebu Island, Philippines, and it is a sustainable industry. The social sustainability indicators considered in this study were job creation, social acceptance, contribution to the local economy, health and safety, and community involvement. Hog growing business contributed to the SDG goals such as no hunger, food security, and decent job; therefore, the hog-growing business is socially sustainable.

**KEYWORDS:** *Hog Business, Hog Growers, Social Sustainability, Social Sustainability Indicators, Southwestern Cebu Philippines*

## 1 INTRODUCTION

Hog growing is a booming industry in the Philippines, although the majority are into backyard raising (Ayomen & Kingan, 2019) or smallholder pig producers (Stanton et al., 2010; Perey, 2017) with 1-20 heads of growing-finishing pigs. Hog production has contributed to the Gross Domestic Product (GDP) of the country. In 2019, the production had an increase of 2.8 percent based on the 2017 and 2018 production of around 200,000 metric tons (Central Bank of the Philippines, 2019). Backyard pig farming has contributed to the swine industry and it is one of the most popular business enterprises in the country (Perey, 2017). Hence, hog growing should be sustainable. Sustainability has three overlappings, mutually dependent principles: the economic, environmental, and social principles (Elkington, 1997; Purvis et al., 2018). Among the three sustainability principles, social sustainability has historically received the least attention (Rashidfarokhi et al., 2018).

Sustainability or the concept of sustainable development ideology was first discovered in the report "Our Common Future" (Brundtland Report, 1987) which defined sustainable development as that "meets the needs of the present without compromising the ability of future generations to meet their own needs" (Atanda, 2018). Sustainable development is meant as an advancement that improves the quality of life, enables individuals to live in a healthy and safe environment, and heightens the social, economic, and environmental aspects of the present and future generations. It is described as a harmony between the accessible technologies, procedures of development, and the approaches of governments and as a non-material aspect of life - the impulsive, emotional, inventive, and spiritual aspects. Sustainable development is considered a dynamic state of equilibrium that can be attained by balancing long-term environmental, economic, and social health (Dempsey et al., 2011: Atanda, 2018).

Social sustainability is a conceptual framework (Eizenberg & Jabareen, 2017; Vallance et al., 2011) that provides an acceptable level of well-being and quality of life for all people in society over time (Bain et al., 2019;

*corresponding author: felix.pocong@ctu.edu.ph
p-ISSN: 2599-4875 e-ISSN: 2599-4980

Woodcraft et al., 2011; Jaffar et al., 2019; Ahmadi et al., 2017). For the last decades, scholars have paid little attention to social sustainability. However, there is a growing strength in the idea that development without equity is not development (Pitarch-Garrido, 2018). As observed by scholars that social sustainability in several dimensions such as Sachs (1999) discusses social sustainability in reference to two factors which are democracy and equity and Becker and Jahn (1999) described it as a longtime relationship between nature and the society (Atanda, 2018).

Social sustainability is a new conceptual framework as proposed by Eizenberger and Jabareen (2017) that it strives to confront risk while addressing social concerns. They agreed that without socially oriented practices, efforts to achieve sustainability will be undermined, as too many gaps exist in practice and theory. Eisenberger and Jabareen (2017) introduced a comprehensive conceptual framework of social sustainability, which is composed of four interrelated concepts of socially oriented practices where each concept has a distinctive function in the framework and incorporates major social aspects which are equity, safety, eco-presumption, and urban forms.

Then social sustainability in hog growing can be challenging to define and apply in an actual situation. The challenges these days for hog growing are to maximize feed efficiency while minimizing production costs and environmental impacts (Pomar & Remus, 2019). Hog is one specific section of livestock farming often viewed in the context of sustainability issues such as animal welfare, environmental impacts, or food safety (Stern et al., 2005). Hence, sustainable development and sustainability play an essential role in the area of hog production (Klein et al., 2016; Wei et al., 2016).

The indicators in each aspect of sustainability, such as in environmental sustainability, are climate change, land-use change, biodiversity, water use, and water quality. For the economic aspect of sustainability, these are investment costs, operation and management costs, productivity, product cost, and feasibility. While for social sustainability, these are job creation, social acceptance, contribution to the local economy, health and safety, and community involvement (Camargo et al., 2018; Padilla-Rivera et al., 2019).

The gap or focus of this study as compared to most studies on hog production, mostly cover the two aspects of sustainability (Camarago et al., 2018) such as the environmental and economic, while this study focused on the social sustainability aspect and more specifically on the experiences of the hog growers particularly the small-holders and subsistence producers of hog growing business in Southwestern Cebu Philippines. The smallholder growers are the sixteen beneficiaries of the hog growing extension project of the Graduate School of Cebu Technological University Moalboal Campus, Moalboal, Cebu, while the subsistence growers are two businessmen who have been growing several thousands of pigs. One had the experience of more than thirty years while the other one had experience of at least five years. To answer the gap of the study, therefore, is to assess the hog growing business, particularly on the social sustainability of the hog growing industry.

## 2 MATERIALS AND METHODS

A descriptive research method using a survey questionnaire and actual or face-to-face interviews was used between 2019 to 2021. The participants were 16 smallholder pig producers (Haldar, 2017) or backyard pig farmers (Perey, 2017), and two subsistence producers. The location of the study is in the municipality of Moalboal located in the southwestern side of the province of Cebu. The municipality of Moalboal is a fourth-class municipality and a tourist destination together with the adjacent municipalities such as Badian and Alegria. Southwestern Cebu, Philippines is an area with several tourist destinations or tourist spots and populated municipalities, and the Cebu Technological University (CTU) has several campuses located in this southwestern part. Then the faculty of the Graduate School of CTU Moalboal Campus has an existing Hog Growing Extension Project in two barangays such as Balabagon and Bugho, of the municipality of Moalboal.


p-ISSN: 2599-4875 e-ISSN: 2599-4980

Figure 1: Map of Municipality of Moalboal, Cebu where the study is conducted, and the neighboring municipalities

The data were collected and treated, which were the survey questionnaire from the 16 smallholder pig producers and interviews with the two subsistence producers. The smallholder pig producers are those individuals who usually grow ten to 20 pigs, and during this study, they were beneficiaries of the Extension Project of the Graduate School of Cebu Technological University Moalboal Campus, Moalboal, Cebu. The two subsistence producers were key informants who were operating piggery in Moalboal with several hundred or thousands of pigs grown.

**Ethical Consideration**

The study was conducted in accordance with the principles of the Helsinki Declaration and principles set forth by the Philippine Health System Research Act of (2013) and CHED Memorandum Order no. 34 series of 2007 has required the review of research endeavors involving human subjects.

## 3 RESULTS AND DISCUSSIONS

The study has three sets of respondents. The first set of respondents is the 16 smallholder pig producers, and they are the beneficiaries of the Hog Growing Extension Project of the Graduate School of CTU Moalboal Campus. The second set is the two subsistence producers who operate piggeries in the municipalityy of Moalboal. The majority of the smallholder pig producers are married, female, and below 50 years old, high school graduates, and self-employed, as shown in Figure 1. Most of them have experience in growing hogs from six to 15 years, usually backyard growing (Perey, 2017). They work either in government or private institutions, with few being self-employed. At the same time, the subsistence producers had been operating piggery for five years to more than 30 years. One subsistence producer grows several hundreds or thousands of hogs since hog growing was already the business of his parents before he was born. The other one is new but very fast in establishing his farm.

The problems encountered by smallholder pig producers (Haldar et al., 2017; Ruvuna et al., n.d.) are reflected in Table 2. It is noteworthy that there are five problems with mean results between 1.0 to 1.63 with the description Never. These problems are not significant in hog growing since they can be solved. In the minds of the smallholder pig producers, these are problems, but they were able to find solutions; hence these problems could not significantly bar the willingness to engage in hog growing (Perey, 2017). Those problems with Rarely description are then to be considered as not hindrances for operation. They are rarely encountered, and they can be settled. Also, with one problem described as Sometimes, which is the lack of capital to restructure, it means that the problem had no high impact on hog growing.

The most significant factor was waste processing or disposal. It is considered the most problematic since the smallholder pig farmer participants are operating small scale, and usually, they have difficulty in treating waste properly, unlike the subsistence producers whose farms have proper waste disposal systems since they are controlled by the government and required to follow the policies on proper waste disposal. If the subsistence producers cannot follow the standard required by the authority, their operation will be closed. Hence, they must follow the policies to be able to continue operations; otherwise, the investment would be lost.

An unstructured or informal way of interviewing subsistence producers was done sometimes after the smallholder pig producers returned their questionnaires. The following are the questions and responses of the subsistence producers:

Question 1: Can you tell or explain the business situation of hog growing?

The answers of the first participant subsistence producer are as follows:

"*Hog production has very good business potential because almost all Filipinos eat pork and pork meat products. The Philippines is importing pork from abroad since the local production cannot suffice the demand. Since domestic production is not able to supply the existing demand, we are asking for approval from the government authority to import more pork meat.*"

The second participant subsistence producer said that,

"*It is very good business. Since I was a kid, my family always grow pigs. There is a high demand for pork in the country and abroad. I am planning to produce 100,000 pigs annually. To do that, I need to build more buildings for my piggery. With this industry, we can help more Filipinos to have jobs.*"

Question 2: Is hog growing sustainable business?

The answers of the first participant:

"*Yes, it is very sustainable because, again, the same reason that majority of Filipinos eat pork meat. It is sustainable due to the prevailing demand for pork.*"

The second participant's answers:

"*I believe it is sustainable because of high demand, and we do not have a problem with labor since a lot of people are looking for jobs. They are willing to work on the farm and willing to be trained, and of course, they must be hardworking. At this time, there are already existing 30 sows ready for piglets production in my area.*"

Question 3: How to minimize feed costs? Several hog growers always complained that feeds are very expensive. How to solve this problem?

The first participant's answers:

"*The solution is to have its own feed formulation using materials available locally like corn and other basic feeds. The formulated feed must contain the suitable*

p-ISSN: 2599-4875 e-ISSN: 2599-4980

Table 1: Profile of the smallholder pig producers, subsistence producers, and consumers; F = frequency; n = 475

| Gender | | Educational Level | F | Age | F | Status | F | No of children | F | Occupation | F | Years of growing pigs | F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1. Smallholder pig producers** | | | | | | | | | | | | | |
| Male | 1 | Secondary | 1 | 41 - 50 | 1 | Single | 7 | 1 -4 | 10 | Government | 4 | 1 – 5 | 6 |
| | | Primary | 1 | 41 - 50 | 9 | Married | 9 | 5 - 10 | 6 | Private | 1 | 6 – 10 | 3 |
| Female | 15 | Secondary | 10 | 51 - 65 | 6 | | | | | Self-employed | 11 | 11 – 15 | 7 |
| | | College | 4 | | | | | | | | | | |
| Total | 16 | | | | | | | | | | | | |
| **2. Subsistence producers** | | | | | | | | | | | | | |
| Male | 2 | College | 2 | 50 - 60 | 2 | Married | 2 | 1 – 3 | 1 | Private | 2 | 1 -5 | 1 |
| | | | | | | | | 4 - 5 | 1 | | | 6 - 40 | 1 |
| **3. Consumers** | | | | | | | | | | | | | |
| Male | 138 | Primary | 27 | <30 | 343 | Single | 372 | Not specified | | Employed | 89 | | |
| Female | 155 | Secondary | 100 | >30 | 114 | Married | 85 | | | Self-employed | 368 | | |
| Not specified | 164 | College | 330 | | | | | | | | | | |
| Total | 457 | | 457 | | 457 | | 457 | | | | 457 | | |

Table 2: Problems experienced by the smallholder pig producers

| | Statement | SD | Mean | Median | Description |
|---|---|---|---|---|---|
| 1 | Waste processing or disposal | 0.25 | 4.94 | 5.00 | Always |
| 2 | Disease outbreak | 0.72 | 1.63 | 1.50 | Never |
| 3 | Lack of market information | 1.42 | 2.19 | 1.50 | Rarely |
| 4 | Compromised feed mixed with a prohibited substance | 1.63 | 1.88 | 1.00 | Rarely |
| 5 | Lack of capital to restructure | 1.69 | 2.94 | 3.00 | Sometimes |
| 6 | Lack of space to restructure | 1.54 | 2.31 | 2.00 | Rarely |
| 7 | Sudden death of hogs | 0.89 | 1.58 | 1.00 | Never |
| 8 | Feud with neighbors due to hog raising | 0.50 | 1.13 | 1.00 | Never |
| 9 | Facilities are un-sanitized | 0.82 | 1.50 | 1.00 | Never |
| 10 | Have encountered legal complaints or local government unit's complaints | 0.00 | 1.00 | 1.00 | Never |

*nutrient needed to boost growth. It is very important that if the grower makes his or her feeds, the formulation should provide the basic nutrients and have material that can boost fast growth. More meat means heavier and better-quality meat.*"

Then for the second participant's answers:

"*One solution is to formulate your own feeds. All my corn comes from Mindanao from our cooperative farmers. We have to purchase in bulk and transport by ship container to minimize the cost of feeds. There is a need to build its own milling plant for feed production. It is very necessary to utilize available raw materials and formulate cheaper feeds.*"

The emerging themes of the answers from the subsistence produce are the following:

1. Hog business situation: very good potential. Most Filipinos prefer to eat pork meat high demand, low domestic production, import of pork meat, employment potential;
2. Sustainability of hog growing: sustainable due to Filipinos mostly prefer pork meat, high demand, and available labor; and
3. High feeds cost: solution to this problem is to formulate your own feeds.

p-ISSN: 2599-4875 e-ISSN: 2599-4980

Examining the perception of the hog growers, either smallholder pig producers or subsistence producers, all of them considered hog growing has potential in business and sustainable business. Several studies established that sustainability has three aspects such as economic, environmental, and social. This study focused on the social aspect of sustainability Camargo et al., (2018) and Padilla-Rivera et al., (2019) with indicators such as job creation, social acceptance, contribution to the local economy, health and safety, and community involvement.

**Job creation**

Munzhelele et al. (2016), for most smallholder pig producers, hog growing is considered a part-time job since this is in addition to their other employment (Behera & France, 2016), and it is an additional income for their family. However, for the subsistence producers, for them, hog growing really meant business. They invest a large amount of money in the operation (Saini et al., 2017). Since they put investment in hog growing, therefore, they need labor to work and perform the actual operation. The higher investment (Hermann, 2016) they put into the hog business, which had contributed to employment for the people of the Southwestern part of Cebu, Philippines.

**Social acceptance**

Looking into the operation of the smallholder pig producers, whose operations are usually done in the backyard area of their houses (Perey, 2017). Pork meat had been the favorite of Filipinos during fiestas and other celebrations. Growing hogs were already accepted by Filipino ancestors. Therefore, it is socio-culturally accepted (Conejero et al., 2019; Caplenor et al., 2017; Longo et al., 2016).

**Contribution to the local economy**

Every local government unit (LGU) R.A. No. 7160 has ordinances or guidelines on hog growing and piggery operation. Local taxation (Aladejebi, 2018; Thuronyi & Brooks, 2016) is granted to LGUs. Some LGUs charge tax per head of pigs or if the number of heads exceeds the minimum quantity to be exempted. For instance, in the municipality of Moalboal, if the number of sows is more than three, then the classification of water consumption is not residential but commercial, which is double compared to the residential rate. This way, the growers contribute a certain amount of money to the LGU. Another is during slaughter, the municipality charges a fee per head during slaughter, and there is an ordinance that all pigs must be slaughtered in the municipal slaughterhouse before selling. The minimum charge is P150.00 per head. This is a source of income for the municipality.

**Health and Safety**

This is a very important part of hog rowing operations because the local officials must be vigilant to the health and safety of Malone and Lusk (2017) consumers. It is the responsibility of the growers to produce good quality pork (Caballero et al., 2017), and the local officials assigned to check the meat must be very careful in the quality control of the meat (Ebrahimnejad et al., 2018) sold in the public market.

**Community involvement**

In a hog-growing business or operation, almost all people are involved (Wing, 2017)- the growers themselves, the workers, then the slaughter people in the municipality, the market vendors, and the local public officials have to do their jobs as well. Therefore, hog growing requires community involvement (Crandall, 2017).

## 4 CONCLUSION

The smallholder pig producers said that the hog-growing business is a potentially profitable endeavor and socially sustainable. In addition to this, based on the experiences of the subsistence pig producers that hog growing or piggery operation is a promising business. It has high demand in the domestic market. Both smallholder pig producers and subsistence hog producers continue operating hog production since the demand is high. It is a profitable business, helps sustain the food supply for the southwestern part of Cebu Island, and is a sustainable industry.

## ACKNOWLEDGEMENT

The proponents of this study would like to acknowledge the help of the administration, officials headed by the University President, faculty, and staff of the Graduate School Cebu Technological University Moalboal Campus, Moalboal, Cebu. The Campus Director of this campus, the Vice President for Research and Development of CTU, other Vice Presidents, University Directors, and all campus chairpersons. This is also to acknowledge the participants of the extension project of the Graduate School of CTU Moalboal Campus. Special thanks to the research participants, the hog growers, and the 457 respondents to the google form. This study would not have been realized without the help and or participation of the abovementioned individuals. Thank you very much.

## REFERENCES

Aladejebi, O. (2018). Measuring tax compliance among small and medium enterprises in Nigeria. *International Journal of Accounting and Taxation, 6*(2), 29-40.

Ahmadi, H. B., Kusi-Sarpong, S., & Rezaei, J. (2017). Assessing the social sustainability of supply chains using Best Worst Method. *Resources, Conservation and Recycling, 126*, 99-106.

Atanda, J. O. (2018). Developing a Social Sustainability Assessment Framework. Sustainable Cities and Societies.https://doe.org/10.1016/j.scs.2018.09

.023.

Ayomen, J. P., & Kingan, M. S. (2019). Value Chain Analysis of Pig (Sus scrota) in a Highland, Indigenous Community. *Mountain Journal of Science and Interdisciplinary Research (formerly Benguet State University Research Journal), 79*(2 Supp 1), 139-151.

Bain, P. G., Kroonenberg, P. M., Johansson, L. O., Milfont, T. L., Crimston, C. R., Kurz, T., ... & Park, J. (2019). Public views of the sustainable development goals across countries. *Nature Sustainability, 2*(9), 819-825.

Becker, E., & Jahn, T. (1999). Sustainability and social sciences: Zed Books New York.

Behera, U. K., & France, J. (2016). Integrated farming systems and the livelihood security of small and marginal farmers in India and other developing countries. *Advances in Agronomy, 138*, 235-282.

Caballero, D., Pérez-Palacios, T., Caro, A., Amigo, J. M., Dahl, A. B., ErsbØll, B. K., & Antequera, T. (2017). Prediction of pork quality parameters by applying fractals and data mining on MRI. *Food Research International, 99*, 739-747.

Camargao, T.F., Zanin, A., Mazzioni, S., Dias de Moura, G., and Afonso, P.S.L.P. (2018). Sustainability indicators in the swine industry of the Brazilian State of Santa Catarina. Environmental Development Sustainability. *Springer*. DOI: 10.1007/s10668-0147-6.

Caplenor, C. A., Poudyal, N. C., Muller, L. I., & Yoest, C. (2017). Assessing landowners' attitudes toward wild hogs and support for control options. *Journal of Environmental Management*, 201, 45-51.

Central Bank of the Philippines (2019). Report on Regional Economic Developments in the Philippines. Department of Economic Research.

Chávez-Fuentes, J.J., Capobianco, A., Barbušová, J., & Hut˘nan, M. (2017). Manure from our agricultural animals: A quantitative and qualitative analysis focused on biogas production. *Waste Biomass Valorization, 8*, 1749–1757. [CrossRef]

Conejero, C., Castillo-Contreras, R., González-Crespo, C., Serrano, E., Mentaberre, G., Lavín, S., & López-Olvera, J. R. (2019). Past experiences drive citizen perception of wild boar in urban areas. *Mammalian Biology, 96*(1), 68-72.

Dempsey, N., Bramley, G., Power, S., & Brown, C. (2011). The social dimension of sustainable development: Defining urban social sustainability. *Sustainable development, 19*(5), 289-300.

Crandall, J. (2017). Community Ownership of Essential Businesses in Small Nebraska Towns.

Ebrahimnejad, H., Ebrahimnejad, H., Salajegheh, A., & Barghi, H. (2018). Use of magnetic resonance imaging in food quality control: a review. *Journal of biomedical physics & engineering, 8*(1), 127.

Eizenberg, E., & Jabareen, Y. (2017). Social sustainability: A new conceptual framework. *Sustainability, 9*(1), 68.

Elkington, J. (1997). The triple bottom line. Environmental management: *Readings and cases, 2*, 49-66.

Hermann, D., Mußhoff, O., & Agethen, K. (2016). Investment behavior and status quo bias of conventional and organic hog farmers: An experimental approach. *Renewable agriculture and food systems, 31*(4), 318-329.

Haldar, A., Das, D., Saha, B., Pal, P., Das S., Das, A., Rajkhowa, D., Hazarika, S., and DAtta, M. (2017). Smallholder Pig Farming for Rural Livelihoods and Food Security in North East India. *Journal of Animal Research*: v. 7 n.3, p. 471-481, June 2017.

Jaffar, N., Harun, N. Z., & Abdullah, S. A. (2019). The Key Determinant Factors for Social Sustainability in Traditional Settlement. *Environment-Behaviour Proceedings Journal, 4*(12), 43-52.

Klein, F., Schodl, K., and Winckler, C. (2016). Mapping Sustainability in Pig Farming Research using Keyword Network Analysis. *Livestock Science*. https://dx.doi.org/10.1016/j.livsci.2016.12.005.

Longo, S., Misamis, S., Katsu, E., Costa, C. N., Theologides, C. P., & Fatone, F. (2016). Social aspects of livestock waste management in Cyprus. *Waste and biomass valorization, 7*(4), 765-777.

Malone, T., & Lusk, J. L. (2017). Taste trumps health and safety: Incorporating consumer perceptions into a discrete choice experiment for meat. *Journal of Agricultural and Applied Economics, 49*(1), 139-157.

Munzhelele, P., Oguttu, J. W., & Fasina, F. O. (2016). Is a 10-sow unit economically sustainable? A profitability assessment of productivity amongst smallholder pig farmers, Mpumalanga, South Africa. Onderstepoort *Journal of Veterinary Research, 83*(1), 1-11.

Ngapo, T. M., Lozano, M. R., & Varela, D. B. (2018). Mexican consumers at the point of meat purchase. Pork choice. *Meat Science, 135*, 27-35.

Padilla-River, A.P., Paredes, M.G., ang Guereca, L.M. (2019). A systematic review of the sustainability assessment of bioenergy: The case of gaseous biofuels. Biomass and Bioenergy. Elsevier. www.elevier.com/locate/bio,bioe.

Perey, E. P. (2017). Determinants of sustainability of

backyard pig farming in the Philippines. *International Journal of Advanced Research, 5*(4), 1055-1064.

Pitarch-Garrido, M. D. (2018). Social sustainability in metropolitan areas: Accessibility and equity in the case of the metropolitan area of Valencia (Spain). *Sustainability, 10*(2), 371.

Pomar, C. and Remus, A. (2019). Precision pig feeding. A breakthrough toward sustainability. Sherbrooke Research and Development Centre. Agriculture and Agri-Food Canada. Sherbrooke, QC JIM 0C8, Canada.

Purvis, B., Mao, Y., & Robinson, D. (2019). Three pillars of sustainability: in search of conceptual origins. *Sustainability science, 14*(3), 681-695.

R.A. No. 7160. (1991). Local Government Code of the Philippines

Ruvuna, F., Cartwright, T. C., Smith, G. M., Bradford, Y. M., Berger, C., Ahuja, C., & Muia, J. (n.d.). Productivity measures and challenges facing smallholder livestock farmers in humid North Central Nigeria. *Tropical Grasslands, 32*, 195-200.

Sachs, I. (1999). Social sustainability and whole development: exploring the dimensions of sustainable development. On Zed Book, London.

Saini, R. K., Orindi, B. O., Mbahin, N., Andoke, J. A., Muasa, P. N., Mbuvi, D. M., ... & Borgemeister, C. W. (2017). Protecting cows in smallholder farms in East Africa from tsetse flies by mimicking the odor profile of a non-host bovid. *PLoS Neglected Tropical Diseases, 11*(10), e0005977.

Silbergeld, E.K.; Graham, J.; Price, L.B. (2008) Industrial Food Animal Production, Antimicrobial Resistance, and Human Health. *Annual Review of Public Health, 29*, 151–169. [CrossRef]

Stern, S.; Sonesson, U.; Gunnarsson, S.; Öborn, I.; Kumm, K.I.; Nybrant, T. (2005). Sustainable development of food production: A case study on scenarios for pig production. *Ambio, 34*, 402–407. [CrossRef]

Thuronyi, V., & Brooks, K. (2016). Comparative tax law. Kluwer Law International BV.

Vallance, S., Perkins, H. C., & Dixon, J. E. (2011). What is social sustainability? A clarification of concepts. *Geoforum, 42*(3), 342-348.

Wei, S., Bai, Z. H., Qin, W., Xia, L. J., Oenema, O., Jiang, R. F., & Ma, L. (2016). Environmental, economic, and social analysis of peri-urban pig production. *Journal of Cleaner Production, 129*, 596-607.

Wing, S. (2017). Social Responsibility and Research Ethics in Community-Driven Studies of Industrialized Hog Production. In Community Research in Environmental Health (pp. 245-261). Routledge.

Woodcraft, S., Hackett, T. & Caistor-Arendar, L. (2011): Design for Social Sustainability: A framework for creating thriving new communities. *Future Communities*.

p-ISSN: 2599-4875 e-ISSN: 2599-4980