ENTREPRENEURIAL OPPORTUNITIES THROUGH THE RECYCLING OF RENEWABLE RESOURCES IN THE EQUESTRIAN SECTOR: AN fsQCA APPROACH

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ABSTRACT

This study aims to provide insight into the current energy crisis. Key factors aggravating the energy crisis can be attributed to specific geographic and geopolitical issues, to heavy dependence on energy imports, and to inadequate exploitation of large amounts of renewable energy resources. Renewable resources are essential not only to alleviate the current energy crisis, but also to ultimately provide energy independence. Introducing horse manure into the circular economy can be an alternative for solving these problems. Therefore, this article qualitatively-comparatively analyzes by means of the fsQCA method the answers of 154 Romanian entrepreneurs regarding the interest shown in the development of a business model through the manure produced by Equines.

KEYWORDS: *bioenergy, equestrian sector, horse manure, sustainable entrepreneurship*

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1. INTRODUCTION

Electricity plays a vital role in the development of industrialized nations in the 21st century. The associated climate changes significantly affect the economic systems, ecological structures and social development of many countries. Economic drivers for the exploitation of renewable energy sources are now as important as environmental factors. However, renewable energy does not reach the energy intensity of conventional fuels. The energy crisis threatens to undermine the country's social foundations. It did not appear suddenly, being a direct consequence of energy policies, and energy production and consumption are currently being reviewed.

The seasonal nature of renewable energy sources through photovoltaic panels or wind turbines is one of the main challenges preventing their efficient use. In particular, renewable energy plants do not always operate at their maximum generation capacity, mainly due to varying weather conditions. Therefore, a permanent renewable resource can be horse manure.

The manure produced by horses, most of the time, is not exploited to its true potential, generating storage costs for stud farms or horse owners. It can be considered biodegradable waste and introduced into the circular economy through the production of renewable energy or it can also be used as a fertilizer for agricultural land. The manure has a significant impact not only on the environment, but also on society.

The manure is a nutrient resource that should be recycled efficiently. A horse weighing 400–600 kg produces an average of 19–30 kg of dung and urine per day, containing approximately 70–150 g of Sodium, 10–30 g of Phosphorus and 20–50 g of Potassium (Lawrence et al., 2003).

The increased interest in this topic is driven by mitigating climate change and overcoming the energy crisis, and horse manure could help solve the problems.

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The entrepreneurial environment in Romania could find the optimal solution for modeling a sustainable business by processing horse manure for an eco-socio-economic transformation. Therefore, the present research seeks answers to the following questions:

H1. Is there any economic and financial interest in developing a business in Romania by processing manure into bioenergy?

H2. Is developing a business through manure processing based on protecting society's interests for a green energy?

H3. Can the environment be an important factor for arousing the interest of Romanian entrepreneurs to develop a business model based on manure processing?

The purpose of the research is to investigate what is the interest of entrepreneurs in Romania to lay the foundations of a sustainable start-up by processing horse manure and developing a green economy. Meeting the demand for energy has the effect of economic and social development.

2. LITERATURE REVIEW

Energy is an essential condition for development, and sustainable energy systems are a prerequisite for sustainable development (Østergaard et al., 2020). The transformation of waste into energy is essential, considering the need to look for ecological and sustainable ways for energy sources (Mong et al., 2020).

Bioenergy helps meet global energy demand, contributing to energy security, providing opportunities for economic, social and environmental development in rural communities, as well as improving the management of resources such as waste from stud farms (I.E.A., 2009).

Bioenergy can significantly contribute to protecting economic, ecological and social needs because it helps to maintain human health, social well-being and socio-economic development (Sagar & Kartha, 2007).

Renewable energy can facilitate economic and social development in communities as there is a directly proportional link between energy consumption and quality of life (Dermibas & Dermibas, 2007).

On the other hand, improving living standards also stimulates the development of other sectors and their introduction into the circular economy. The production of horse manure with a high content of substances such as ammonia harms the ecological security and the human health. The transformation of horse manure into bioenergy represents a very good alternative both to reduce waste and to overcome the energy crisis (Su et al., 2022). The storage and disposal of horse manure is a problem that concerns many horse owners, and using it to produce energy is the best possible solution to both waste disposal and the growing energy demand (Rakhi, 2022).

In order to be able to utilize manure, proper management is essential, including the choice of bedding material, handling, storage and final use (Keskinen et al., 2017). From an environmental perspective, the bedding should have a high capacity to retain nutrients during use and storage, but at the same time to release them efficiently once recycled. Due to its beneficial effects on carbon content, it can also be considered a valuable product for soil improvement (Sweeten & Mathers, 1985).

Horse manure has not yet been implemented on a large scale as an energy source, but research has demonstrated the technical feasibility of using animal waste for energy conversion (Svanberg et al., 2018).

Neumeyer et al. (2020) argue that entrepreneurs are the main pillar that can help the transition to a more sustainable and circular economy.

It is a widely shared view in academic research that entrepreneurship can be quite a powerful force for sustainable development by connecting entrepreneurial skills on environmental and social transformations (Johnson & Schaltegger, 2019).

Social needs-oriented entrepreneurs work to generate sustainable change and genuine social transformation (Zahra et al., 2009).
The new business models required by the circular economy focus on reducing the negative impact on society, on the environment and on the efficient use of goods and services, and give rise to entrepreneurship and intrapreneurship projects within the so-called green economy (Crecente, et al., 2021).
In difficult times, with significant challenges and threats, such as global warming and the waste of non-renewable resources, the main objective that future or current entrepreneurs must accomplish, must be to broaden the contextual perspectives from a narrow focus on economic dimensions to the wider societal and ecological context (Volkamnn et al., 2021).
The use of manure to be used as feedstock for bioenergy provides a practical measure to reduce the environmental burdens (Lee et al., 2021).

3. RESEARCH METHODOLOGY

3.1. Sample and data collection

The information was collected based on a questionnaire, available at: https://forms.gle/EhLcWSgTh15rcB3z7. The target respondents for the questionnaire were people who already have a business or want to develop a business in the near future. The data for this study were collected online, using a survey of 154 who have contact with the entrepreneurial environment from different areas of Romania and from different fields of activity, having the characteristics described in Figures 1 and 2.

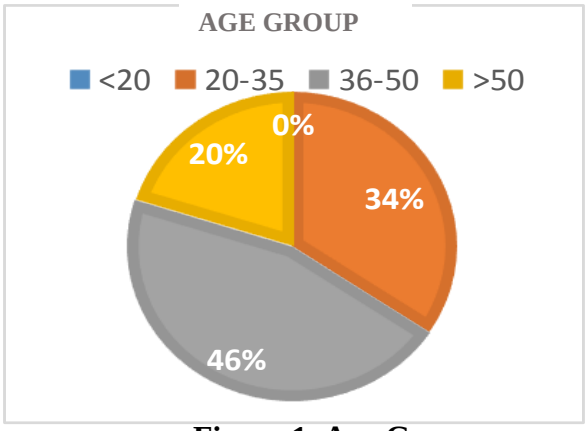

Figure 1. Age Group
Source: issued by the authors

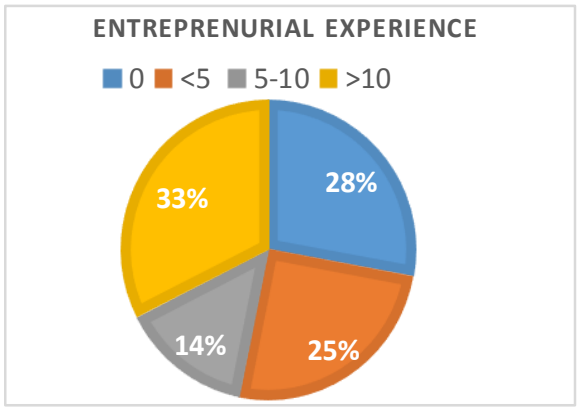

Figure 2. Entrepreneurial experience
Source: issued by the authors

3.2. FsQCA methodology

For the analysis on transforming horse manure into bioenergy from an entrepreneurial perspective, it was considered appropriate to apply the Fuzzy-set Qualitative Comparative Analysis (fsQCA). The antecedent conditions that formed the basis of entrepreneurship and the benefits brought by this field were analyzed.
The first step in fsQCA is the choice of the antecedent conditions (economic-financial interest, interest in protecting the needs of society and interest in ecology and the environment), and the next step of fsQCA is data calibration. Generally, the fuzzy scores set for the antecedent conditions range from 0.00 to 1.00.

For this study, the software application fs / QCA 3.0 (Ragin, C.C., 2014) was used, giving researchers the opportunity to identify several ways capable of explaining the same result (Pappas et al, 2017). Each model condition was rated on a 7-point scale from strongly disagree to strongly agree, and the same was done for the outcome.
The conceptual model (Figure 3) outlines the antecedent conditions - economic-financial interest, interest in societal needs and environmental protection - in close connection with entrepreneurial intentions to develop a sustainable business model in the equestrian sector.

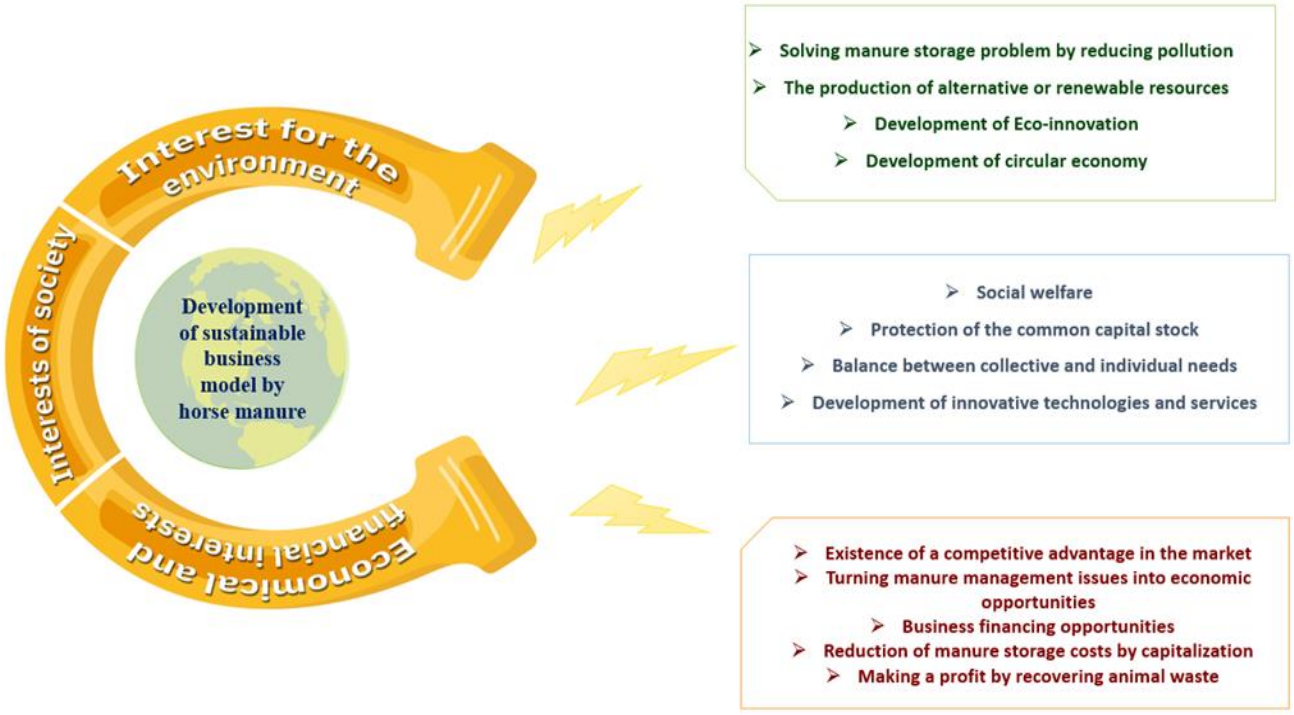

Figure 3. The conceptual model
Source: issued by the authors

3.4. Data calibration

Assuming that the intentions to develop an entrepreneurial model through horse manure transformation vary from one entrepreneur to another, we consider alternative combinations of causal conditions, interpreted as determinants that may ultimately lead to the outcome.
A new variable was created as a result of calculating the fuzzy set values (see Equation 1) of the antecedent conditions in the conceptual model (IEF, IS, IM) using fsQCA software:

$$\boldsymbol{cIEFISIM} = \text{fuzzyand (cIEF, cIS, cIM)} \quad (1)$$

The study transforms the values for the causal conditions (economic-financial interests, societal interests, environmental interests) and the outcome (developing a business model to transform manure into bioenergy) into fuzzy set scores between 0.1 and 1.00. The study established three qualitative categories for calibration: a category for entrepreneurs who want to maximize profit, a category for cards that want social welfare, a category that wants to protect the environment and a cross-point - the development of a sustainable business model.

4. RESEARCH RESULTS

The first step of the analysis aims to identify which configurations can act as sufficient conditions for entrepreneurial intention to be satisfactory.
For a configuration to be considered sufficient, the consistency measure should exceed a minimum threshold of 0.75 (Woodside, 2014), which can be assessed by analyzing consistency and coverage scores on fuzzy set XY plots (Figure 4) .

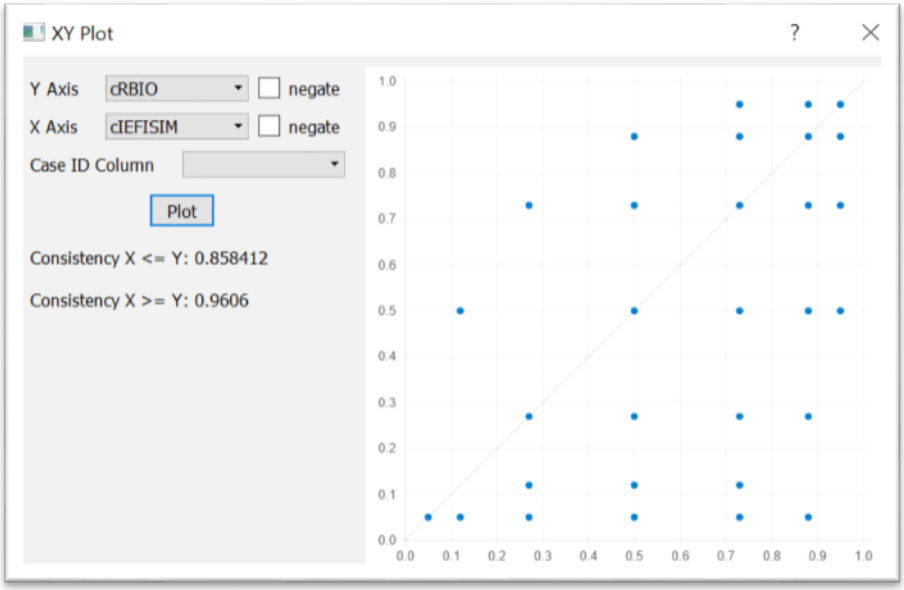

Figure 4. XY Graph
Source: fsQCA software output

As shown in Table no. 1, the consistency score is 0.846553, while the coverage score is 0.964165. These scores imply that the distribution of the fuzzy sets is very consistent with the statement that economic-financial interests together with societal and environmental interests represent a subset of the result, i.e. the transformation of horse manure into bioenergy for modeling a sustainable business (factor of coverage 96.42%).

Table 1. Solution coverage and consistency

Conditions tested	Raw coverage	Unique coverage	Consistency
Economic and financial interests * interests of society * interests for environment	0.9606	0.844465	0.858412
Solution coverage: 0.964165			
Solution consistency: 0.846553			

Source: fsQCA software output

Also, after testing 2 subsets of conditions out of 3, according to Table no. 2, it can be observed that the economic-financial interest together with the interest in protecting the environment have the greatest impact in making a decision by an entrepreneur (or future entrepreneur) in creating a business based on the transformation of manure.

Table 2. Tested conditions

Conditions tested	Consistency	Coverage
cIEF+ cIs+cIM	0.997280	0.765647
cIEF+ cIs	0.991745	0.789368
cIEF+ cIM	0.997280	0.765647
cIs+cIM	0.995122	0.773968

Source: fsQCA software output

According to the obtained results, the present research demonstrates that all three combined antecedent conditions lead to the outcome (Figure 5).

Figure 5. Research results
Source: issued by authors

5. CONCLUSIONS

The paper can be considered relevant to draw attention to the main impediments that society faces in order to develop a start-up regarding the management of horse manure.

Building a business in this field starts from the implementation of a core of indicators that includes, in addition to financial performance, social cohesion and well-being, health and environmental protection. Cooperation itself could be an innovative good practice for entrepreneurs.

The complex solution offered by fsQCA demonstrates that a combination of specific antecedent conditions of economic-financial, social and environmental interests influences to the greatest extent the outcome: the development of a sustainable business model in the equestrian sector (solution coverage: 0.964165, solution consistency: 0.846553).

Therefore, the study carried out answered the research questions, whereby it was demonstrated that entrepreneurs and future entrepreneurs, in addition to the interest in maximizing profit, are also interested in economic development, protecting the needs of society and protecting the environment, so that they can implement a model of sustainable business by turning manure into bioenergy.

The study may represent a starting point for future research and from a technical point of view for the implementation of a process to obtain renewable energy by processing the waste produced by animals.

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