Minireview Article

Use of sustainability indicators for the breeding system

ABSTRACT

Introduction: In general, the creation system in Brazil has been characterized as an activity of great importance in the socio-economic market, as it generates employment and income opportunities.

Aims: This work aims to carry out a brief bibliographical review regarding the use of sustainability indicators within the creation systems.

Literature Review: The notion of sustainability is still a recent term and is under construction. Among the countless concepts of sustainability found in specialized literature, sustainability means the "possibility of continuously obtaining equal or superior conditions of life for a group of people and their successors in a given ecosystem. On the other hand, the concept of indicators, as well as for the concept of sustainability does not have a universal definition. Sustainability indicator “is an instrument that allows, based on its interpretation, to define the condition of a system as sustainable or not.” In other words, sustainability indicators can be understood as parameters, in which the assessment shows whether the limit, established according to the values and objectives that govern a given reality, was exceeded or respected.

Keywords: Construction, ecosystem, indicator, sustainable.

1. INTRODUCTION

Among the countless sustainability concepts found in specialized literature, the definitions of Cavalcanti [1] and Conway [2] are sufficient for the interpretation of the term in the scope of this study. According to Cavalcanti [1], sustainability means the "possibility of continuously obtaining equal or superior conditions of life for a group of people and their successors in a given ecosystem". Conway [2], cited by Faeth [3], defines: "sustainability is the ability of a system to maintain its productivity, when it is subject to intense effort or alterations".

In the study of the sustainability of a system, its evaluation receives different approaches, always depending on the level of study and the environment in question Linares [4]. According to Santos [5], to identify whether a system is sustainable it is necessary to use indicators. The concept of indicators, like the concept of sustainability, does not have a universal definition. According to Marzall [6], cited by Costa [7], a sustainability indicator “is an instrument that allows, based on its interpretation, to define the condition of a system as sustainable or not”. In other words, sustainability indicators can be understood as parameters, in which the assessment shows whether the limit, established according to the values and objectives that govern a given reality, was exceeded or respected.

However, when evaluating a rearing system, three fundamentals must be taken into account, man, animal and territory, as these studies allow for a broader analysis of the main possibly existing limitations Lhoste [8]. According to Osty [9], in a breeding system, man occupies a position as a conductor of a dynamic process and acts as the main actor in the analysis of the limiting and appropriate conditions of the socioeconomic context in order to direct his goals and then check his decisions , fulfill your actions in the most appropriate time and space.

To support this research, it is essential to observe the current panorama of the creation systems in the scope of Brazilian livestock, in which there is a growing need to strengthen animal production for purposes of national and international trade. This fact, to a certain extent, induces rural establishments to produce more and more, even if the activity causes damage to the environmental heritage, mistreatment of animals or the establishment of unfair social relations. In this way, productions often become unsustainable because they fragment social and environmental objectives, emphasizing only profit making. A classic example is the intensive breeding of animals, supported by the desire to meet the growing consumer market.

On the other hand, despite the current situation of conventional farming systems, there is a progressive demand for alternative systems, as society's concern with the sustainability of processes linked to food production is also increasing. Many consumers, for example, are already paying attention to eating quality food with regard to sanitary issues (free from zoonoses) and produced with less use of artificial inputs, with a view to preserving the ecosystem and its biodiversity. In addition, consumers have increasingly valued animal welfare, as well as the generation of jobs in the countryside, with a view to optimizing the quality of life of rural actors.

Cross [10] reports that foods with characteristics associated with alternative food networks have been the target of initiatives to strengthen these systems. In this context, according to Noirtin [11], research aimed at alternative, ecologically and ethically more adequate production can help to change the contemporary unsustainable situation, which is disseminated as pertinent and essential to human life.

Another important point that justifies this research concerns the contribution to the rural establishment studied. The results obtained, for example, can serve as a decision-making tool for the farmer and his family, helping them to assess points to be rethought and also highlighting/strengthening positive aspects of the rearing system Navarre [12].

Thus, this study can collaborate with the development of sustainable and innovative strategies for the creation system analyzed and aims to make a literary review on the use of sustainability indicators in the creation system.

2. LITERATURE REVIEW

2.1 Sustainability Concept

The notion of sustainability is relatively recent and its universal concept is still under construction. Among the numerous concepts of sustainability found in specialized literature, the definitions in According to Cavalcanti and Conway [1, 2] are sufficient for the interpretation of the term in the scope of this study. According to According to Cavalcanti [1], sustainability means the "possibility of continuously obtaining equal or superior conditions of life for a group of people and their successors in a given ecosystem". Conway [2], cited by

Faeth [3], defines: "sustainability is the ability of a system to maintain its productivity, when it is subject to intense effort or alterations".

In these terms, in order to maintain the sustainability of a system under constant disturbance in its resource base, changes in the attitudes and strategies of current generations are needed in order to reasonably meet the needs of future generations Daniel et al. 2000 [13]. In this, the notion of sustainability is related to the concept of sustainable development issued by WCED [14], assuming then that this type of development is capable of promoting sustainability IWLA [15]. In general terms, the definitions of sustainability and sustainable development are different, although both consider the social, economic and environmental dimensions Douglas [16].

Nobre [17] state that the adjective “sustainable” qualifies development by assuming a “stock of natural resources and absorptive capacity of the human ecosystem”. In this sense, the notion of sustainability seeks to give development the possibility of a new standard, with new guidelines "permeating all seven dimensions of life: economic, social, territorial, scientific, technological and the cultural Veiga [18] .

Sustainability, therefore, is a concept applicable to any activity carried out by man. However, according to Bezerra [19], “in international public discussions, the idea of sustainable agriculture has a much more important presence than any other equivalent to it”.

In this context, the desire for sustainable agriculture shows the growing dissatisfaction with the current combination of modern agriculture. It also indicates the desire and the result of society's pressure for production systems that are able to conserve natural resources, establish fairer social relations, in addition to valuing the health of consumers Bezerra [19].

The understanding that one has about what sustainable agriculture would be is not uniform, although agreements are identified around its general characteristics. Thus, in a generic way, the literature points out that a sustainable agriculture must present economic, ecological or environmental and social viability. Altieri [20] states that although this concept is vague, it is useful for recognizing that agriculture is affected by the evolution of socioeconomic and natural systems.

The construction of sustainable agriculture styles, according to Costabeber and Caporal [21], must meet "social requirements, consider cultural aspects, preserve environmental resources, support the political participation of its actors and allow the achievement of favorable economic results for the society as a whole, in a long-term temporal perspective that includes both the present and future generations (ethics and solidarity)”.

For Paulus and Schlindwein [22], agriculture would be sustainable when it was: a) ecologically correct, maintaining the quality of natural resources and allowing to sustain or improve the vitality of the entire agroecosystem; b) economically viable, considering self-sufficiency and income generation; c) socially just, with a fair distribution of resources, including land use, access to capital and the right to participation by all in decision-making; d) human: respecting all forms of life and; e) adaptable, with regard to the ability to adjust to changes in time and space, ranging from the development of new and appropriate technologies to social and cultural innovations.

Gliessman [23] states that sustainable agricultural production is ecologically based, that is, it must be “capable of perpetually harvesting biomass from a system, because its capacity to renew or be renewed is not compromised”. However, it should be noted that it is impossible to prove in the present what is perpetual, only the future can actually demonstrate

sustainability. In short, at present it is only possible to demonstrate how far a set of practices is moving away from, or approaching, sustainability Marzall [7].

Among the forms of productive organization, family farming has characteristics that show its strength as a privileged location for the development of sustainable agriculture, due to its tendency to diversification, the integration of plant and animal systems, in addition to working on smaller scales Silva [25]. As can be seen in the document “Guidelines for Agrarian Policy and Sustainable Development for Brazil” FAO [26], strengthening and expanding family farming is an important strategy aimed at sustainable rural development in the country.

According to Bezerra [19], in the Amazon, sustainable agriculture is mainly affected “by the land tenure structure and by aspects related to market integration, technology, productive knowledge, credit policies and the labor market. Forced by various restrictions, farmers orient their production for the short term, adopting monocultures and inadequate management practices (use of fire, reduction of fallow time for the capoeira)”. Thus, Amazonian agriculture faces serious difficulties in generating, in a satisfactory manner, sufficient income and work to provide for social needs. It is also noted that, in general, there is no concern with the replacement of natural resources, which are the basis of agricultural production.

Given these limitations, there is a set of alternatives that point to possible paths towards sustainable agriculture in the Amazon region, according to Bezerra [19], they are: “the use of agroforestry systems, the conservation of genetic resources, the reduction of deforestation and fires, proper management of forests, forest certification, in addition to strengthening social organizations”.

In such a way, it is observed that the specialized literature indicates numerous proposals for the improvement of the Amazon rural world. Most of them, however, have solutions aimed at the problems of cropping systems. With the exception of studies on sustainability in cattle ranching, there are no references to the current scenario of sustainability in other farming systems present in the region's “agricultures”.

Namely, according to Landais [27]: “A breeding system is a set of elements in dynamic interaction, organized by man, with the objective of valuing resources through domestic animals”. The fundamental elements of the creation system, called the poles of the creation system, are man, animals and resources, which are in dynamic interaction in the system.

In the study of the sustainability of a system, its evaluation receives different approaches, always depending on the level of study and the environment in question Linares [4]. At the level of agroecosystems, the literature related to the assessment of sustainability does not have as many works as at the global, national, regional and property levels. The difficulty is even greater when it comes to social and economic aspects, with environmental sustainability being the one with the greatest research effort Daniel et al. 2000 [13].

2.2 Concept and Main Sustainability Indicators

According to Santos [5], to identify whether a system is sustainable it is necessary to use indicators. The concept of indicators, like the concept of sustainability, does not have a universal definition. According to Marzall [6], cited by Costa [24], a sustainability indicator “is an instrument that allows, based on its interpretation, to define the condition of a system as sustainable or not”. In other words, sustainability indicators can be understood as parameters, in which the assessment shows whether the limit, established according to the values and objectives that govern a given reality, was exceeded or respected.

With regard to agricultural holdings, the establishment of indicators has the advantage of providing information capable of supporting decision-making by managers, politicians, interest groups or the general public. Navarre [12], cited by Costa [7], shows that "indicators can have different uses, such as basic research or as instruments for the application of agrarian policies or, simply, to generate points of reflection and serve as decision-making instruments for the farmer and his family".

Thus, depending on the utility, it is possible to distinguish different categories of indicators, eg simple, composite, quantitative, qualitative, etc. indicators. Costa [7]. Basically, two methodological approaches related to the selection of sustainability indicators are identified. In the first, the indicators are previously defined, that is, they have a more rigid form, and in the second, they are defined according to the reality and the problem to be evaluated.

According to Müller and López-ridaura et al. [28, 29], the second approach, which concerns the modeling of indicators, enables their adaptation to the problem, the geographic area, the socioeconomic issues and the reality of the study, in several dimensions. However, the modeling of indicators is a work that it requires an interdisciplinary framework, as there is no ready-made formula, requiring analysis, interpretation and understanding by the parties involved, that is, it depends on complex studies that consider the peculiarities of the system at the level observed.

However, the consensus on the scientific objectivity of some indicators is also a relevant issue. In this sense, in the document of the Gomes [30] three groups of indicators are identified: the first group corresponds to the majority of indicators, in which tested and consensual methodologies are adopted, capable of leading to the determination of the indicator; the second group is equivalent to a less expressive part, which uses methodologies that can be adapted and adjusted and; the third group concerns a small part of indicators, which can be validated through consensus-generating processes.

The sustainability indicators most used in the agricultural sector can be seen in Table 1. These indicators result from a set of critical points that influence the sustainability of the sector's holdings, based on surveys carried out in Portugal. In addition, to this list were added indicators from various methodological approaches found in the specialized literature Costa [7].

Table 1 - Diagnostic criteria, indicators and strategic indices for assessing the sustainability of agricultural systems.

Attribute	Diagnostic Criteria	Indicators/Indices
A- PRODUTIVIDADE RENDIBILIDADE	**I – Efficiency**	1 - Energy Efficiency (%)
		2- Productive efficiency
		3- Labor productivity (Euros/ Annual Work Unit)
		4- Net Present Value
		5- Benefit-costs ratio with animal activity

B- STABILITY / RESILIENCE / TRUST	**II - Enhancement of natural resources**	6- Animal Header (CN/Hectare -Ha)
		7- Animal welfare (%)
		8- Commercial concentrates (kilograms-kg)/CN
		9- Charges with veterinarians and accessories / CN
	III - Conservation of natural resources	10- Nutrient Balance (kg) / Useful Agricultural Area
		11- Application of phytopharmaceuticals
		12- Contribution to the physical degradation of the soil (Hours -H/Ha)
		13 - Good agricultural practices (%)
		14 - Autochthonous NC in total NC (%)
	IV – Diversity	15 - Diversification of activities within the farm (pluriactivity)
		16- Diversification of activity outside the farm (products sold)
		17- Diversity of explored animal species
	V- Vulnerability of the system: (Dis)motivation of farmers	18 - Entrepreneur and Family Income
		19 - Labor on the farm
		20- Economic stability (%)
		21 - Evolution and trend of activity in the last 10 years (%)
		22- Economic confidence (%)
		23 - Proportion of high-age breeders
		24- Optimistic positive perspectives on the agrarian sector
		25 - (Dis)motivation in dedication to agricultural exploitation (%)
		26 - Activity sustainability (%)
C- ACCOUNTING	**VI - Agro-ecological and socio-economic restrictions**	27- Concentration Indicator
		28- Land structure (Ha)
		29- Landscape Physical Quality Index
	VII- Ability to change and innovate	30 - Competition Ability
		31- Availability/will to change (%)
		32- Adoption of new technology (%)
	VIII- Learning ability	33- Proportion of cattle with higher education than primary education (%)
		34 - Courses/training actions carried out
	IX- Information about the sector	35- Publications received
		36- Information sources

D- EQUITY	**X- Distribution of costs and/or benefits**	37- Form of land exploitation (% own land)
		38 - Quality of life (%)
		39 - Work satisfaction of the farmer and his household (%)
		40- Labor satisfaction of the farmer and his household (%)
		41- Proportion of price received by the farmer of the market price (%)
		42- Monetary aid received for system maintenance
		43- Greenhouse Effect /CN
	XI- Social Participation (Employment Status)	44- Jobs created (UTA)
		45 - Remuneration for work in relation to the national minimum wage (SMN)
E- AUTONOMY	**XII - Self-sufficiency**	46- Degree of dependence on external factors of production (%)
		47- Degree of indebtedness (%)
	XIII - Organization	48 - Participation of farmers in organizational aspects (%)
		49 - Organization of sales circuits (%)
		50- Existence of accounting/record (%)
	XIV - Access to resources	51- Self-financing capacity (%)
		52 - Alternative activities (%)

Source: Adaptation according to Costa [7].

According to Costa [7], the economic indicators are intended to assess the economic profitability of the systems under analysis, highlighting the aspects that most influence this point; the environmental indicators reveal the capacity of the system and the strategies adopted in it, to be considered environmentally productive and sustainable and; social indicators encompass issues related to the peculiarities of the society under study.

4. CONCLUSION

The selected use of sustainability indicators allows for a closer approach to the application of the systemic approach through the choice of social, economic and environmental parameters, which can be demonstrated in a specific period of time, determining measurable indices that express the reality of the creation system. But on the other hand, sustainability indicators still need to be further studied and adapted to the reality of the different regions of Brazil.

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