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Beekeeping Production In Three Life Zones As A Strategy For Environmental Sustainability In Apurimac, Peru – 2021

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Abstract

The present research aims to evaluate beekeeping production in three life zones as a strategy for environmental sustainability in Apurimac, the life zones are Pampas, Chicmo and Huancaray, where beekeeping is considered as a secondary and precarious activity with limited production capacity, which causes low agricultural production due to the lack of pollinators and a decrease in economic income, it was conducted with a cross-sectional descriptive design, data collection was through a structured questionnaire of interviews and direct observation sampling, In the three dimensions that are economic, social and environmental, each one with 5 study indicators, financial autonomy, economic stability, net monthly income, use of technology, management of number of hives, in social, job satisfaction, access to health, social integration, access to education, access to essential services, in environmental, impacts on natural resources, impacts on local biodiversity, use of chemicals, availability of melliferous flora, level of vegetative cover were considered. The methodology to determine sustainability was the Biogram with a scale of 0 - 0.5. It was evaluated with the statistical analysis ANOVA at 5% and compared the sustainability indexes with a Student's t-test at 5%. The results of the sustainability indexes for each study zone were: Pampas life zone 0.41 corresponds to optimal sustainability, Chicmo life zone 0.38 corresponds to stable sustainability, and Huancaray life zone 0.40 corresponds to sound sustainability.

keywords: *Beekeeping production*, *Life zones*, *sustainability, stragy for enviromental, bee production.*

1. INTRODUCTION

Sustainable development

In 1980, the UN World Commission on the Environment, chaired by Norwegian Prime Minister Gro Harlen Brundtland, introduced the term sustainable development to designate challenges for the future development of the planet. Sustainable development is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs. (Buitrago, A. and Pinto, P., 2015)

In the Rio Declaration on Environment and Development held from June 3 to 14, 1992, in Rio de Janeiro, a set of principles for the sustainability of a new development model were incorporated. (Barry, F. et al., 2018)

These three fundamental principles of sustainable development have an economic, social, and environmental dimension and will only be sustainable when a balance is achieved between the different factors that influence the quality of life among the factors involved; it is also worth mentioning that sustainable development has a different meaning for each country or territory, the sector company the individual are two main ideas according to the definition of the Brundtland Commission.

Social and environmental economic development in a productive and competitive economy favors employment for citizens with multiple benefits such as equal opportunities and social cohesion, respect for the environment and the rational use of natural resources. (Flores, J. et al., 2019)

The beekeeping activity is oriented to the breeding of A. mellifera bees with the objective of taking advantage of the production as honey, jelly, pollen, propolis, etc. Taking care of the A. mellifera species Beekeeping is fundamentally linked to the beekeeper's social economic development and therefore sustainable development, generating jobs and playing an important role in the service of preserving biodiversity and genetic and ecosystemic diversity through pollination (Quispe, W. et al., 2020).

Likewise, "crop pollination with bees perceives a growing trend given the growth of export crop areas. (Zawislak, J. et al., 2019) The study of beekeeping production systems currently provides data on the main limitations and problems that affect the production of beehive derivatives such as honey, pollen, royal jelly, propolis and others for intervention and improvement in sustainable beekeeping development (Quispe, W. et al., 2020).

Life zones IFE ZONES

A life zone is a set of delimitations by climatic parameters such as temperature precipitation is also defined as a classification of geographical areas according to their overall bioclimatic behavior and life forms in a biogeographic region (Derguy, M., 2017).

The model defines life zones as a natural set of associations that use three limiting variables for the development of biological processes expressed in logarithmic scales, which are mean annual biotemperature, mean annual total precipitation, coefficient of potential evapotranspiration, and mean annual precipitation. (Olate, V. et al., 2021)

2. METHODOLOGY

The study of bee honey production was carried out in three life zones within the department of Apurimac, in the provinces of Andahuaylas and Chincheros, respectively Table 01.

Table 1.

Geographical location of the study's life zones

Zone	Life Zone	Geographic Coordinates

		Latitude-Longitude
Zone 1: Pampas Valley, province of Chincheros.	Thorn Forest, Subtropical	E=642681 N=8480229
Zone 2: District of Huancaray Province of Andahuaylas	Low Montane Thorn Steppe, Subtropical	E=657338 N=8480389
Zone 3: District of Chicmo Province of Andahuaylas	Humid Forest, Subtropical Montane	E=658371 N=8489795

The resulting framework for the sustainability of the beekeeping farming system is structured in six dimensions three which are farm-centered dimensions which are: quality of life, economic viability, assured bee production, and three other dimensions that consider the contribution of beekeeping to development or the interactions of beekeeping with its social environmental and economic surroundings such as beekeeping sector and societal issues, environmental impacts, local development, and integration. (Kouchner, C. et al., 2019).

Sustainability analysis of beekeeping production was performed according to Biogram proposed by Sepulveda(2008), which is the use of 5 colors to quickly characterize the state of sustainable development in the units of analysis for such effect, the radial graph or called spider web is used with equivalents from 0 to 1 this is given when the valuation scale is from 0 to 10, but in the present research the valuation scale is from 1 to 5 then the valuation scale is adjusted according to as mentioned in table 2. (Cornelissen, B. et al., 2019)

Table 2.

Colors to characterize sustainable development

Color	Scale	Value
Red	0.1	Collapse
Orange	0.1-0.2	Critical
Yellow	0.2-0.3	Unstable
Blue	0.3-0.4	Stable
green	0.4-0.5	Optimal

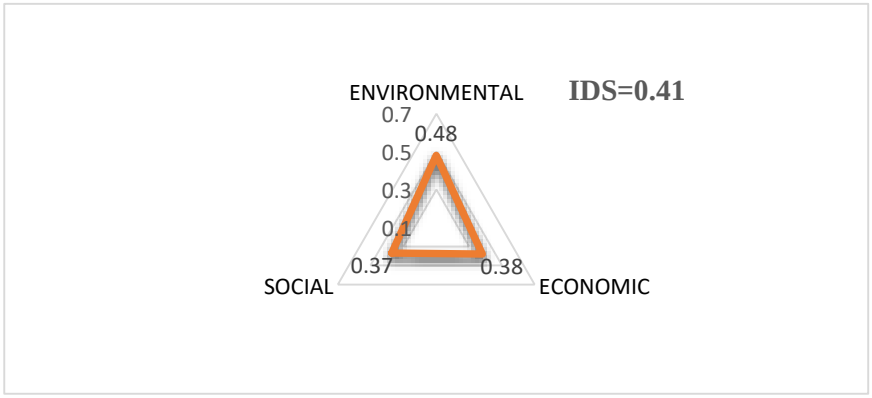
Sepúlveda's valuation scale is from 0 to 1, which corresponds to studies with values from 1 to 10 of Table 2 is adjusted to values from 0.1 to 0.5, which correspond to the values taken from 1 to 5 in the present investigation.

3. RESULTS

The results obtained from the development of the sustainability index of beekeeping production in the three life zones are detailed as follows. (FAO, 2019)

Figure 1.

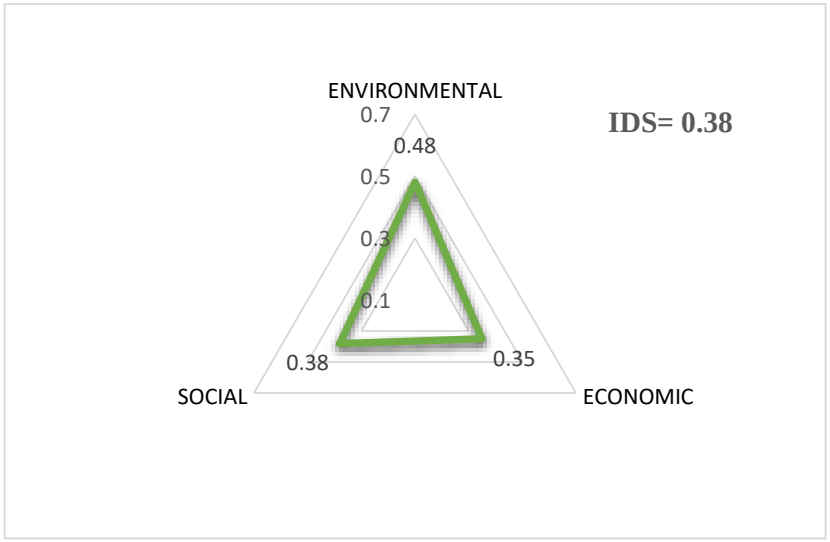
Sustainability index IDS Pampas life zone



Results of the sustainability index (IDS) of the environmental, economic, and social dimensions of beekeeping production in the Pampas Valley life zone showed the average of the measurements and gave a value of 0.41 and corresponds according to Table 2 to the green color, which indicates that beekeeping production is sustainable and optimal.

Figure 2.

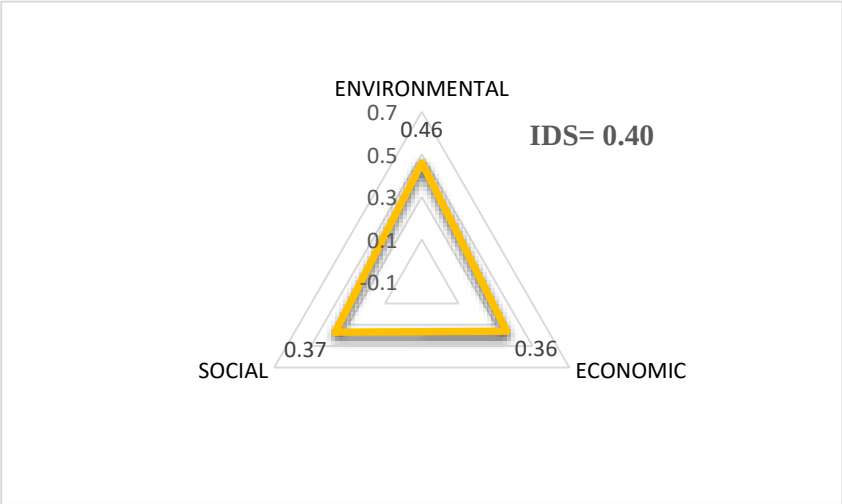
Sustainability Index IDS Chicmo life zone



Results of the sustainability index (IDS) of the environmental, economic, and social dimensions of beekeeping production in the life zone of the Chicmo district showed the average of the measurements. They gave a value of 0.38, which corresponds to the blue color according to Table 2, indicating that beekeeping production is sustainable and stable. (Geo, J. et al., 2020)

Figure 2.

Sustainability index IDS Huancaray life zone



Results of the sustainability index (IDS) of the environmental, economic, and social dimensions of beekeeping production in the life zone of the Huancaray district showed the average of the measurements and gave a value of 0.40, which corresponds to the blue color according to Table 2, indicating that beekeeping production is sustainable and stable. (Gerard, M. et al., 2020)

4. DISCUSSION

The integrated indicator of sustainable development and Biogram is widely used in various studies such as this methodology applied, is a reflection of the sustainability of the use of sugarcane bagasse produced in Valle del Cauca. (Odemer, R. et al., 2020) For this analysis, a diagnosis of the current situation of the service was made, the variables and periods involved were defined, the results obtained were analyzed allowing to establish the level of sustainability of the current use of sugarcane bagasse in Valle del Cauca. (Larcher, F. et al., 2021) It was accepted that the current sustainability of sugar cane bagasse utilization is unstable, being the environmental, social, and economic dimensions in descending order the ones that contributed to the general result of the sector's sustainability in the evaluated periods. (Bixby, M. et al., 2021)

According to the graphic representation of the Program, the values indicated in the scale from 0 to 1 is proposed by, in which the author takes as a value scale for his evaluation of sustainable development from 1 to 10 in the present investigation. (Salchizadeh, A. et al., 2002) I consider as a value scale from 1 to 5 of the assessment of the sustainability indicators of bee production. (Varikou, K. et al., 2020) which were very useful to determine the sustainability of bee production in the three life zones under study.

According to the program methodology, it is observed that the environmental dimension in the three life zones presents high values, which are 0.48,0.48,0. 46, which indicates that beekeepers use only minimal chemical products in beekeeping production, only detergents for washing beekeeping utensils and some chemicals for the treatment of diseases and parasites. (Vazquez, D. et al., 2020) The economic and social dimensions in the three life zones presented similar values, this is because the three life zones have the same customs and are in the jurisdiction of the same department and the support of the regional government training is carried out jointly with the three zones under study and other zones that are in the jurisdiction of Apurimac. (Vercelli, M. et al., 2020)

5. CONCLUSIONS

The sustainability indexes of beekeeping production in the three life zones of the Pampas Valley, Chicmo and Huancaray, in the environmental, economic, and social dimensions range from stable to optimal, respectively, which indicates, according to the analysis of the program, that the ecological size is highly sustainable because beekeeping contributes positively to the impact on biodiversity and the impact on natural resources, and also minimizes the use of chemicals in management, Concerning the economic sustainability index, it is stable because there is an interest in beekeeping. Still, the weaknesses are the lack of knowledge of management technology, a primary factor in beekeeping. Finally, the social sustainability index is slightly low because the beekeepers are engaged in other activities such as livestock and agriculture and practice beekeeping as a secondary activity.

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