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Index of sustainability of the greenhouses of Chilcuatla, Hidalgo

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Abstract

The present research project aims to analyze whether greenhouses located in the municipality of Chilcuatla, Hidalgo, are social, economic and environmentally sustainable. Although, greenhouses are controlled production systems and increase the effectiveness of production, they do not guarantee sustainability. In order to carry out this project the methodology structure was divided into three main stages: First, a census including the greenhouses in the city was elaborated. Second, a survey embracing social, economic and environmental aspects was administered. Third, the data obtained was analyzed and processed. The contribution of this work is to have a census and create a database of economic and environmental data of greenhouses located in the municipalitie analyzed to determine if they meet the conditions of sustainability

Sustainability, Socioeconomic Responsibility, Environmental Responsibility

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Introduction

The present work aims to analyze if the greenhouses located in the municipality of Chilcuatla, located in the Mezquital valley, Hidalgo are sustainable or not from the economic, social and environmental points of view, applying an index of sustainability. It should be mentioned that this work is part of a research on the greenhouses located in the municipalities of the Mezquital valley, Hidalgo. The production of food as one of the fundamental activities for society should be a sustainable activity to ensure food supply, hence the importance of determining if the productive activity of greenhouses is sustainable.

The present work was focused on gathering and analyzing relevant information to determine the operating characteristics of the greenhouses established in the mentioned municipality, in order to determine if they comply with the conditions of economic, social and environmental sustainability. This information was collected through a survey; the objective of this work is to determine if producers of protected crops in the municipality of Chulcuatla meet the socioeconomic and environmental factors necessary to achieve sustainability in greenhouse activity. Due to the need to have a more mathematical and non-subjective tool, the information was analyzed by introducing sustainability indexes.

Sections in which this work is divided are: Background where the location of the municipality studied is exposed, the current situation of the subject; Methodology; Results where the information obtained is presented and the analysis of this and finally conclusions.

Background

Chilcuatla is located south of the state of Hidalgo, between the parallels 20º 20" north latitude, at 99º 14" west longitude with an average height of 1860 meters above sea level, adjoins the north with the municipality of Ixmiquilpan; to the south with Chapantongo and Mixquiahuala; To the west with Alfajayucan and Chapantongo and to the east with Progreso and San Salvador. It has a surface area of 222.94 Km2, which represents 1.10% of the surface of the state of Hidalgo. It has about 1624 bodies of water, pass the rivers Tula, Pánuco, Amajac, the river Agulia and the basin of the Moctezuma River. Its soil is semi-desert and rich in organic matter and nutrient, regular amount of lithosol type in 55%, rendzin in 30% and luvisol in 10% and a minimal part fluvisol. The main use of the land is agricultural. (INAFED, 2010).

Food production should be a sustainable activity to ensure food supply. Greenhouses being a controlled production system, increase the effectiveness of production, but do not ensure its sustainability. In the case of protected crops (Greenhouses) A relevant point is the generation of fixed jobs compared to traditional planting, in which, during the vegetative development of the crop, only temporary labor is required. It is estimated that a greenhouse of 2000 m2 generates 4 direct and 10 indirect fixed jobs, which is why this technology should be considered as a factor of rural development in marginalized areas. The impact of the introduction of protected crops brings a positive increase in the quality of life, food security, economy of a region and therefore in the general progress of the nation (Hernández-Díaz, 2006); are also known to generate impact on the environment such as chemical waste, plastics and organic waste, however this type of crop provides protection against adverse environmental factors and regardless of geographical location. (Campos, 2005; DeVere y Cooper, 2009)

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The National Development Plan 2013-2018 presents the actions that the Government of the Republic will implement in the finance and financial sectors to ensure the availability of fiscal and financial resources for the development of Mexico in specific, the program is marked within the National goal Prosperous Mexico where one of its main objectives is to democratize access to financing projects with growth potential that comply with protected crops (greenhouses) (PRONAFIDE, 2013; SAGARPA, 2012)

Sustainability of greenhouses depends on many factors such as the type of substrate used, nutrients (post-harvest residue), energy, income (economic profitability), must also include the changes that greenhouses generate in the ecosystem (changes in the landscape, changes in the composition of water and soil, poisoning, ignorance of pesticide handling) (Montero, 2008; Hernández-Díaz, 2006; Alonso, 2004; Gómez-Arrollo, 2013).

The sustainable development of any one process is defined as that which satisfies the needs of the present generation without compromising the ability of future generations to meet their own needs (Thiersein and Walser, 1997: 159), we will analyze three factors to assess the sustainability of greenhouses: economic-social, technical and environmental viability, in each of the various aspects will be verified to determine if they meet the requirements necessary to be considered sustainable by means of a BSI business sustainability index (Moctezuma, 2015). Greenhouses in a more global way by municipalities (Carballo, 2015), in the present work will be done individually by each greenhouse to be able to determine the individual situation of each one.

Methodology

The present work was proposed in four stages and was addressed to producers in the greenhouses of the municipality of Chilcuatla. First, a census of the greenhouses was carried out in the municipality. Second, a questionnaire was structured with two sections (economic-social, and environmental), in order to identify the main social, environmental and economic risk factors. Third, students were trained in the Financial Engineering educational program of the Polytechnic University of Francisco I. Madero, in terms of the mechanics of application of the questionnaires designed. Fourth, the questionnaire was applied and the information collected analyzed.

Results

In the present work, socioeconomic, environmental and productive factors were evaluated in the greenhouses present in the municipality of Chilcuatla, in order to determine the conditions in which the greenhouses are located, in these areas and to determine if these are sustainable or not, in This municipality were found 19 active greenhouses and none outside of operation.

Municipality of Chilcuatla	Greenhouses
Active	19
Closed	0
Total	19

Table 1 Population surveye

The Economico-social factor will be divided in two, therefore the BSI will be based on 4 factors: Economic, Social, Environmental and Technical; the following scale will be considered in the determination of the corporate sustainability index.

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BSI	Sustentability level
0	None
1	Very low
2	Low
3	Intermediate
4	High

Table 2 Index scale

In each of the factors we will analyze several aspects, which will be assigned a proportional value and will be considered to meet this characteristic if it obtains more than 66% this on the basis that in some of the evaluations will be considered three aspects, Meet at least two, you get 66.66%. If we consider four aspects to meet two will have 50% and if it meets three will have 75%. If the analyzed factor complies with the above, it will be assigned a point, if not zero. These will be added and a rating will be given according to Table 2. The following table lists the aspects to be analyzed in the economic factor.

Aspect	Caracterización	Weighing
Registered to SHCP	Yes	1/3
	No	0
Has funding	Yes	1/3
	No	0
Has reliable system	Yes	1/3
	No	0

Table 3 Economic Factor

The following tables show the analyzed aspects for the factors: Social, Environmental and Technical.

Aspect	Caracterización	Weighing
Workers	De 0 a 5	0
	6 ó más	1/3
Workers benefits	Si	1/3
	No	0
Job rotation	De 0 a 6 meses	0
	7 ó mas	1/3

Table 4 Factor Social

Aspect	Caracterización	Weighing
Water recycle	Si	1/3
	No	0
Uses Biofertilizers	Si	1/3
	No	0
Fumigations per year	De 1 a 2	1/3
	3 ó mas	0

Table 5 Environmental factor

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Aspect	Caracterización	Weighing
Train staff	Yes	1/4
	No	0
It has adequate technology	Yes	1/4
	No	0
It has irrigation system and fertilization	Yes	1/4
	No	0
It has maintenance program	Yes	1/4
	No	0

Table 6 Technical Factor

Based on the above aspects the BSI of the 19 greenhouses of the municipality of Chilcuatla was determined, showing the results obtained in table 7.

No. Inv	Factor				ISE
	Eco.	Soc.	Amb.	Tec.	
1	0	0	0	0	0
2	1	1	0	1	3
3	1	0	0	0	1
4	0	0	0	0	0
5	0	0	1	1	2
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	0	0
9	0	0	0	0	0
10	0	0	0	0	0
11	0	0	0	0	0
12	0	0	0	0	0
13	0	0	0	1	1
14	1	0	0	1	2
15	0	0	0	1	1
16	1	0	0	0	1
17	0	0	0	0	0
18	0	0	0	0	0
19	0	0	0	0	0

Table 7 Índice de sustentabilidad Empresarial

Conclusions

In the greenhouses analyzed, located in the municipality of Chuilcuatla, it was observed that of the 19 greenhouses, none reaches a high degree of sustainability, one reaches an intermediate degree, two a low degree, four a very low degree and the remaining twelve a degree null; It should be noted that the environmental and social factors were the lowest with only a greenhouse that meets these headings and are different greenhouses that meet these points, in the economic factor only four greenhouses meet and in the technician only meet 5 out of 19.

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The Numbered greenhouse with 2 is the one that reaches a degree of intermediate sustainability and the greenhouse number 5 a low degree and the rest a very low or null degree. From the above it appears that most of the greenhouses are not sustainable in economic, social and environmental aspects, the last two are not fulfilled in almost all the greenhouses and are the ones that require more attention and the technical aspect (26.32%), followed by the economic aspect with 21.05% and social and environmental aspects with 5.26%.

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