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RINOE Journal-Financial Economy

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Presentation of the Content

In the first article we present, *Environmental impact assessment in a company* by TAVERA-CORTÉS, María Elena, SANDOVAL-GÓMEZ, Raúl Junior and VERGEL-RANGEL, Guillermo Alexis, with affiliation in the Instituto Politécnico Nacional, as following article we present, *Efficient processes with TPM in companies in the south central region of the state of Chihuahua*, DELGADO-MARTÍNEZ, Martha Lilia, AGUIRRE-OROZCO, Mario Abelardo, MÁRQUEZ-MONÁRREZ, Olivia and GANDARILLA-NÚÑEZ, Rafael with adscription in the Instituto Tecnológico de Delicias, as the third article we present, *Inventory of tourism resources: a strategy for the development of sustainable tourism in the communities of the southern and northern zone of the Municipality of Compostela, Nayarit*, by RODRÍGUEZ-HERNÁNDEZ, Eusebio, with adscription in the Universidad Autónoma de Nayarit, the next article we present, *Tourist characterization of the Municipality of Ruiz, Nayarit; to contribute to the touristic development of the region*, by ALTAMIRANO-ROLDÁN, Glafira Eugenia, VILLARREAL-BAÑUELOS, Erixander and GARCÍA-GONZÁLEZ, Frasin with adscription in the Universidad Tecnológica de la Costa, the last article we present, *Impact of COVID-19 on Fractal Capital Market Recursion*, by RAMOS-ESCAMILLA, María, with adscription in EORFAN-Mexico, S.C.

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Environmental impact assessment in a company**Evaluación de impacto ambiental en una empresa**

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Abstract

This article addresses the environmental impact in an enterprise of the agricultural sector through the analysis of the life cycle of the nopal brine elaboration, where the identified impact categories were identified for their evaluation as well as the opportunities for improvement. The methodology used followed a cradle to gate approach, from the nopal vegetable growing area in Milpa Alta, Mexico City, to the processing stage in the company; the functional unit was a ton of nopal in brine and the software used was SimaPro V8.5.2.

Environmental impact, Life Cycle Analysis, SimaPro, Nopal, Milpa Alta

Resumen

Este artículo aborda el impacto ambiental en una empresa del sector agrícola mediante el análisis del ciclo de vida de la elaboración del nopal salmuera, donde se procedió a la identificación de las categorías de impacto especificadas para su evaluación, así como las oportunidades de mejora. La metodología utilizada siguió un enfoque de la cuna a la puerta (cradle to gate), desde la zona de cultivo de nopal verdura en Milpa Alta, Ciudad de México, hasta la etapa de procesado en la empresa; la unidad funcional fue una tonelada de nopal en salmuera y el software utilizado fue SimaPro V8.5.2.

Impacto ambiental, Análisis de Ciclo de Vida, SimaPro, Nopal, Milpa Alta

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Introduction

In socioeconomic terms, the agricultural sector represents a key player in the growth of Mexico (Ayala et al., 2011), contributing 3.607% of the Gross Domestic Product (GDP) for 2015 (World Bank, 2016); In terms of occupation, the agricultural sector in Mexico constitutes an important driver of employment, occupying 17.52% of the economically active population. Globally, Mexico has an important presence in the agricultural market, ranking 10th in world food production. (SIAP, 2018). In contrast, from the environmental aspect, the agricultural sector in Mexico represents one of the activities with the greatest negative impact on the environment, because according to the National Inventory of Greenhouse Gases (INEGEI) published in 2013, it ranks second in emissions of greenhouse gases (GHG) into the atmosphere (SEMARNAT, 2013), in addition, it is also responsible for problems such as overexploitation and pollution of aquifers, loss of biological diversity, deforestation, and soil degradation and pollution (Santoyo et al, 2013).

In that order of ideas, the agricultural sector in Mexico has important opportunities for improvement (Vega Campos, Medina Jiménez and Vega Juárez, 2013) around the restructuring of sustainable production systems, which ensure food security and guarantee consumer health (Paz García et al, 2018). In view of this need, the present investigation arises, whose main objective was “To evaluate the environmental impact in a nopal producing and processing company of the Milpa Alta area, CDMX”.

The methodological strategy carried out consisted of a mixed research approach of a descriptive nature through the application of a case study in a nopal producing and processing company. Using the SimaPro V8.5.2 software, the Environmental Impact Assessment (EIA) was carried out taking into account data extracted from the company and secondary sources, mainly from research articles such as “Ecology of cultivation, management and uses of prickly pear cactus”, Bulletin of Agricultural Services” and “Conservation of nopal vegetable 'Milpa Alta' (opuntia ficus mdica mill.) Despiled in containers with modified atmosphere”, ISO standards and official databases referring to the sector such as the stages of cultivation or sectors affected in the production of the cactus.

Once the environmental impact categories were quantified, important opportunities for improvement were identified in the case study company, especially related to the fertilization used and the absence of an integral management of its organic waste.

Conceptual framework: Environmental Impact Assessment (EIA)

Environmental economics, whose central approach is that the correct application of market tools is sufficient to address environmental issues without sacrificing the ultimate goal of unlimited economic growth (Lizarazo, J. S. 2018). An important application of environmental economics is the Environmental Impact assessment, it is an environmental management tool made up of a series of procedures aimed at identifying, predicting and interpreting the impact generated by any human activity on the environment, with the objective of establish strategies to mitigate these effects (Cuesta, 2018). Currently there are different EIA methodologies, one of them is the Life Cycle Analysis (LCA), a tool for measuring the environmental impact by quantifying the flows of matter and energy linked to a product, process or system during its cycle of life, totally or partially, starting from the obtaining of the raw material, its processing, until its final disposal as waste (Labandeira et al., 2007). According to the Public Society for Environmental Management (2009), four different approaches to LCA are considered.

- From door to door (gate to gate): it consists of all the processes involved in the processing of a product, from its arrival as raw material to the “door” of the factory, until its exit as a finished product.
- From the cradle to the door (cradle to gate): it is made up of all the processes involved from the phase of extraction of raw materials, their transport and processing (if any), their transfer to the factory and production.
- From cradle to grave (cradle to grave): it refers to all the stages of the “cradle to the door” approach and also explores the phases of distribution to the client, its use and the management carried out as waste at the end of its useful life .

- From cradle to cradle: includes all the processes analyzed in the “cradle to the grave” approach, that is, from raw material extraction to waste management.

The globally accepted norm for the Life Cycle Analysis is the one published by the International Organization for Standardization (ISO) known as ISO 14040: 2006, evaluation of the life cycle principles and framework. Following the guidelines proposed by the International Standard ISO (2006), the methodology for Life Cycle Analysis can be observed in Figure 1.

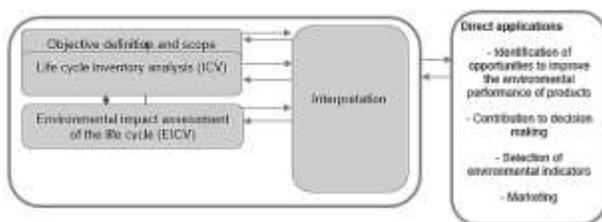


Figure 1 Stages of Life Cycle Analysis

Various computer tools have been developed to facilitate the widespread application of LCA, especially during the Evaluation stage of the life cycle inventory analysis (ICV), for which use is made of databases of processes, activities and pre-established materials. Among the most used ACV software are SimaPro, GaBi, Umberto, TEAM, OpenLCA. After reviewing the literature, it was found that the SimaPro software, developed by the Dutch company PRé Consultants, is one of the most used programs for Life Cycle Analysis; Several investigations around the world have resorted to this due to its multiple functionalities, among which the incorporation of the most important databases such as Ecoinvent, ILCD, Agri-footprint and the creation of own databases, in addition to using the methodologies of the most up-to-date impact assessment, such as: ILCD 2011 Midpoint +, CML - IA baseline, ReCiPe 2016, IPCC 2013 and Traci 2.1., characteristics that provide studies with a higher level of truthfulness and reliability (Instituto Superior de Medio Ambiente, 2017). Therefore, in the present investigation the SimaPro software was used in its version V8.5.2, to apply the Life Cycle Analysis in the company case study.

Cactus industry in Mexico

Belonging to the opuntia genus of the family of cacti, the cactus, also known as nopal vegetables or nopalitos, is a species native to America, with a special presence in Mexico, center of greater diversity of cacti and nopales of the continent. Since pre-Hispanic times, the nopal has occupied an important place in the gastronomy, history and culture of Mexico being today a basic element in the diet of Mexicans and an icon of their identity (Valencia-Sandoval, Brambila-Paz, & Mora-Flores, 2010).

The nopal is a very rich fiber food that helps a good digestion, it also contains vitamin A, vitamin C, vitamin K, riboflavin, vitamins B5, B6, B12 and minerals especially calcium, sodium, potassium, magnesium, iron. Given its nutritional and medicinal properties, nopal are currently demanded by some communities in the United States, Canada, Japan, Italy and Turkey, with Mexico being the number one producer worldwide (Osorio-Córdoba et al., 2011). Figure 2 shows the parts of the cactus plant, Milpa Alta variety, which is characterized by being robust, erect, with oval-shaped cladodes, with high productivity in summer and sensitive to low temperatures. The fruit, known as prickly pear, is of medium size, with yellow-orange peel and pulp, not very juicy, with medium-sized seeds (FAO, 2018).



Figure 2 Parts of the cactus plant indicates Milpa Alta variety

Source: image taken in situ and adapted from Osorio-Córdoba et al., (2011)

According to the Agrifood Atlas published in 2018 by the Agrifood and Fisheries Information Service (SIAP) of the Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA), the national cactus production has had a steady increase in the last decade. As can be seen in Figure 3, from 2006 to 2017, on average Mexico has produced 785 thousand tons of nopal vegetables per year.

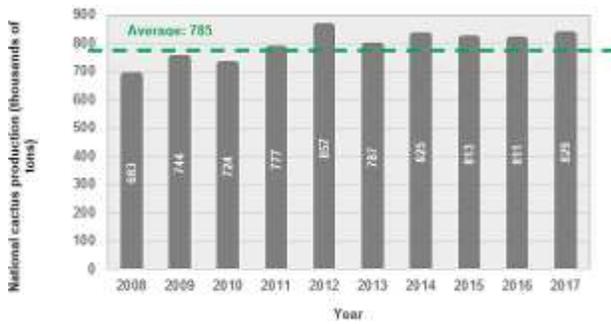


Figure 3 National volume of cactus production in thousands of tons (2006-2015)

Source: own elaboration based on data from SIAP (2018)

For 2017, Mexico produced 829 thousand tons, of which, 45.26% corresponded to the state of Morelos, 24.58% to Mexico City and 10.94% to the State of Mexico, it is in these three federative entities where the 80.78% of the national production of nopal vegetables (SIAP, 2018).

Case study company

The case study carried out in the present investigation consisted of a family business, 100% Mexican dedicated for more than 20 years to the production, processing and distribution of nopal vegetables and derivatives, located in the town of San Gregorio Atlapulco de la Mayor of Xochimilco in Mexico City.

As additional information, it is important to mention that, during the year 2017, the case study company processed an average of one ton of nopal vegetables for the production of 800 units of nopal in brine of 1.2 kilograms (kg) per day in a shift of 8 hours; It also has an area of seven hectares located in the lower area of the Tehutli volcano in Milpa Alta, a key region where the main nopal producers in Mexico are located.

Given the increase in demand for its products, its cultivation capacity reached the limit, so it also buys part of its raw material from third parties, given the strategic relationship it maintains with around 100 nopal vegetable producers in the Milpa Alta area with which it integrates a cluster.

Figure 4 shows the geographical location of the cultivation and processing area of the company case study.



Figure 4 Geographic location of the processing plant (A) and the nopal cultivation area (B)

Source: images taken in situ with information from Google Maps (2017)

The nopal cultivated by the case study company and its suppliers, is planted in open field orchards, sometimes under plastic cover according to bad weather conditions. Regarding the methods of fertilization, the producers in the Milpa Alta area carry out a mixed system that includes the use of manures and chemical or mineral fertilizers, a combination that has had positive impacts on crop yield and nutritional quality of the product. Occasionally maintenance of prickly pear leaves is done manually in order to guarantee efficient production of nopal vegetables and prevent the plant from growing irregularly or spreading a pest throughout the crop. Finally, the collection of nopal vegetables is an artisanal activity characterized by the extraction of cladodes after 30 and 60 days of sprouting.

The transport of the harvested prickly pear from the cultivation area to the processing plant is carried out using the vehicle of the case study company, traveling on average eight kilometers (km) per day per route. The transformation of fresh prickly pear cactus into brine carried out by the company case study consists of the production processes: cut and unpinned, washed, chopped, cooked, packed-sealed, cooled and labeled-embedded.

Methodological framework: Application of Life Cycle Analysis (LCA)

The first step for LCA was the definition of the objective and scope of the study; The first was aimed at identifying the environmental impact associated with the process of cultivation of nopal vegetables and its process of transformation into prickly pear cactus in the company's case study. It is important to mention that the LCA methodology was adapted to the specific conditions of the company.

Regarding the scope, the functional unit selected for the study corresponded to a ton of prickly pear cactus and the system limits followed a “Cradle to Door Gate” approach, that is, they were taken into account the stages concerning from the cultivation and harvest of prickly pear, transport to the plant and its process of transformation in prickly pear cactus in brine, as observed in Figure 5, where the dotted line denotes the delimitation of the system including all activities analyzed and in turn, excluding subsequent phases that were not part of the study, such as storage, distribution, product consumption, end of life and final disposal as waste.

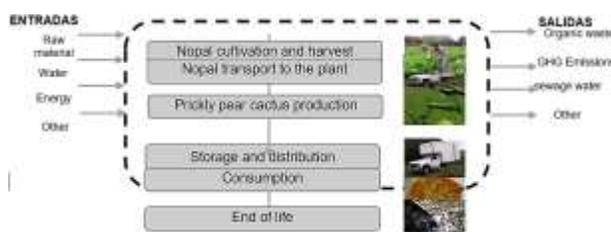


Figure 5 System Limits for LCA

Source: own elaboration obtained with information in situ, 2017

The second phase of the LCA consisted of the Life Cycle Inventory, which was comprised of the definition and quantification of the inputs of natural resources, raw material and energy to the system, as well as their outputs in emissions to air, water and water. soil, for which it was necessary to collect data from the company case study which was complemented with information from other producers in the region and secondary sources referring to the sector. Among the information collected from the nopal producers, the following were considered: crop variety, growth cycle, harvest planting date, yield of fresh and dry matter, planting density, crop management, rotation, irrigation, used machinery, pruning tillage method. In addition, data concerning the fertilization methodology applied in the cactus cultivation were extracted, as well as the phytosanitary treatments used. On the other hand, from secondary sources of information such as the United Nations Food Organization (FAO, 2015), the Intergovernmental Panel on Climate Change (IPCC, 2006), Sagarpa (SIAP, 2018), AGROASEMEX (2011) and the Ministry of Environment and Natural Resources (SEMARNAT, 2016).

Information related to geographic data of the cultivation area, agroclimatic zone, rainfall and evapotranspiration was taken as reference, as well as soil data such as texture, type, depth, structure, pH, percentage of clay, sand, silt, organic matter and nitrogen.

The Emissions Calculation Matrix for the agricultural sector, developed in the framework of the LIFE and Futur Agrari project (LIFE + Farms for the future LIFE12 ENV / ES / 000647), was used to calculate the emissions of the cactus cultivation conducted by researchers from different countries in Europe (Antón Vallejo et al., 2017). With the objective of guaranteeing the rigor of the present investigation, it was attempted to use mostly data from the Mexican context, however, the calculation of GHG emissions in Mexico, the research on LCA are still emerging issues, so part of The data used corresponded to European standards, extracted mainly from official reports of the European Environment Agency (EEA, 2013). Even with the slight variations that they bring, European standards represent a good role model and open the door for future research conducted in Mexico to direct their efforts towards the creation of a database of their own and consistent with the national agricultural dynamics.

Results: Life Cycle Impact Assessment (EICV)

The third stage of the LCA corresponded to the Life Cycle Impact Assessment, for which the SimaPro V8.5.2 software was used. In Table 1, the categorization of the inventory analysis data for the nopal cultivation stage can be observed.

During this phase several elements intervened, the cactus's own cultivation, the use of mineral fertilizers such as Multi NPK (nitrogen, phosphorus and potassium), potassium sulfate, monoammonium phosphate, calcium nitrate and the generation of solid waste.

The results correspond to the environmental impacts for the cultivation of a kilogram of nopal vegetables.

The SimaPro software yields a total of 18 impact categories which are Climate Change, Stratospheric Ozone Depletion, Ionizing Radiation, Ozone Formation, Human Health, Fine Particle Formation, Ozone Formation, Terrestrial Ecosystems, Terrestrial Acidification, Water Eutrophication Sweet, Marine Eutrophication, Terrestrial Ecotoxicity, Freshwater Ecotoxicity, Marine Ecotoxicity, Human Carcinogenic Toxicity, Human Non-Carcinogenic Toxicity, Land Use, Scarcity of Mineral Resources, Scarcity of Fossil Resources and Water Use.

However, based on literary review, literary review and experience, only 12 of these were taken into account because they were the most significant with the research.

Environmental category	Nopal cultivation	Multi NPK	Fosfato monoamónico	Calcium nitrate	Potassium sulfate	Solid Waste Generation
Global warming	83.1274	0.7159	0.284	0.4115	4.5043	10.957
Ozone layer reduction	99.2477	0.3646	0.0038	0.3074	0.0546	0.0219
Ionizing radiation	0	1.5317	6.5922	0.7755	38.6641	52.4364
Acidification	90.8602	0.6047	0.6324	0.2291	7.4948	0.1788
Eutrophication of aquatic systems	52.8546	0.4083	2.9158	0.4224	38.8598	4.539
Earth Ecotoxicity	0	0.3467	10.4003	2.7825	85.7147	0.7558
Aquatic ecotoxicity	0	0.0004	0.2057	0.029	1.8919	97.873
Marine ecotoxicity	0	0.0023	0.239	0.0338	2.1074	97.6175
Land use	0	0	36.7307	0.0815	53.747	9.4408
Depletion of mineral resources	0	39.432	10.4278	4.4295	45.4342	0.2763
Depletion of fossil resources	0	10.167	7.47	2.3827	78.51	1.4697
Water consumption	97.9695	0.0006	0.0336	0.0044	0.1564	1.8355

Table 1 Impact categories - Nopal cultivation stage (1 kg)

In Figure 6, the results of inventory analysis for the crop stage are presented graphically, each activity was assigned a different color for better interpretation.

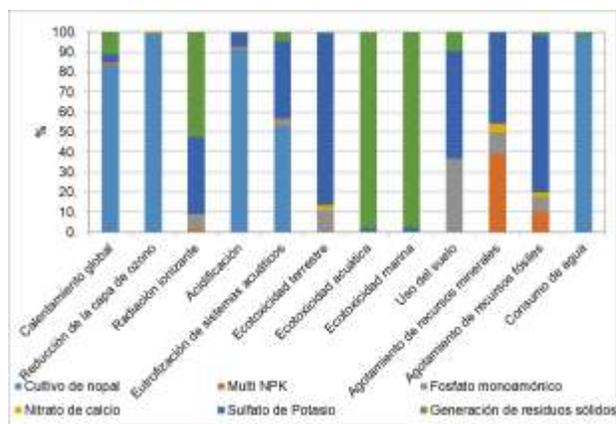


Figure 6 Bar chart - Nopal Cultivation Stage
Source: own elaboration based on the result of the application of the SimaPro V8.5.2 software

As can be seen in Figure VI, Prickly pear cultivation is not a process beyond global warming, in fact, it seriously contributes to the emission of greenhouse gases that generate this phenomenon.

Similarly, it can be seen that it presents important opportunities for improvement in the categories of ozone reduction, acidification, eutrophication of aquatic systems and water consumption. For its part, the generation of solid waste is an activity that demands a prompt solution as its responsibility is evident in the categories of impact of ionizing radiation and aquatic and marine ecotoxicity. Finally, the production of mineral fertilizers does not represent a significant value, except for that concerning potassium sulfate, since it can be observed that it is present in the categories of terrestrial ecotoxicity, land use and depletion of natural resources. In turn, Table 2 and Figure VII show the categorization of the inventory analysis data for the nopal transport phase from the cultivation area to the processing plant. During this stage, in addition to transportation, the production of the fuel used was also included, in this way two elements were analyzed for one ton per kilometer traveled.

Label	Transportation crop to plant	Fuel
Global warming	95.8865	4.1135
Ozone layer reduction	88.8846	11.1154
Ionizing radiation	0	100
Acidification	84.5582	15.4418
Eutrophication of aquatic systems	0	100
Earth Ecotoxicity	98.7184	1.2816
Aquatic ecotoxicity	58.2499	41.75
Marine ecotoxicity	87.9297	12.0703
Depletion of mineral resources	0	100
Depletion of fossil resources	0	100
Water consumption	0	100

Table 2 Impact categories - Nopal transport stage (1 Ton / km)

Source: own elaboration based on the result of the application of the SimaPro V8.5.2 software

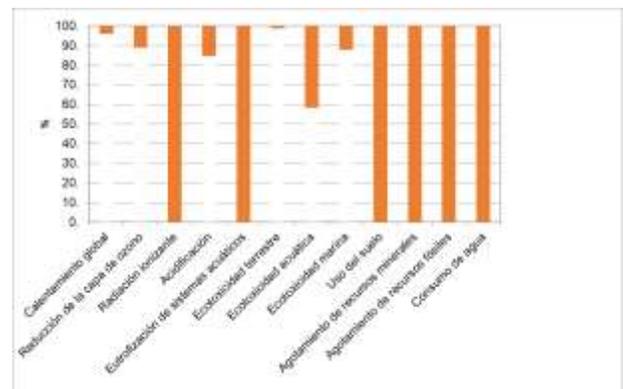


Figure 7 Bar chart - Nopal transport stage (one ton per kilometer)

Source: own elaboration based on the result of the application of the SimaPro V8.5.2 software

It can be seen in Figure 7, that transport activity has the highest percentage in each category, especially global warming, terrestrial ecotoxicity and reduction of the ozone layer, which is consistent with official information from the National Inventory of Greenhouse Gases from Mexico (INEGI), where the transport sector is part of the main GHG emitters. Similarly, Table 3 and Figure 8 present the categorized data for the inventory of the processing stage of prickly pear cactus in brine, final phase of the analyzed system.

Environmental category	Prickly pear cactus	Brine	Plastic bag and labeling	Carton box	Natural gas	Residues generation
Global warming	46.3794	0.8881	2.5002	5.5534	0.2013	44.117
Ozone layer reduction	99.3769	0.0001	0.0193	0.0065	0.0066	0.2079
Smog formation	10.7805	5.2151	9.2425	25.7736	0.0734	48.5536
Acidification	88.5407	1.2767	3.192	5.4906	0.071	1.459
Depletion of aquatic systems	20.8877	6.8106	6.3029	80.3257	0.0001	14.9101
Earth ecotoxicity	07.8610	1.2537	5.104	24.3004	0.0076	1.4712
Aquatic ecotoxicity	9.5942	0.0339	0.0513	0.3891	0.0003	89.9905
Marine ecotoxicity	9.6324	0.0062	0.0062	0.006	0.0001	89.9804
Land use	1.6850	0.3998	2.5017	90.277	0.0016	1.3729
Depletion of mineral resources	80.9508	0.4993	4.9369	11.9101	0.0049	2.129
Depletion of fossil resources	22.3403	4.286	34.4109	34.2069	2.1217	2.243
Water consumption	84.0586	0.9551	0.104	0.0942	0.0005	14.7832

Table 3 Impact categories - Nopal processing stage (one ton)

Source: own elaboration based on the result of the application of the SimaPro V8.5.2 software

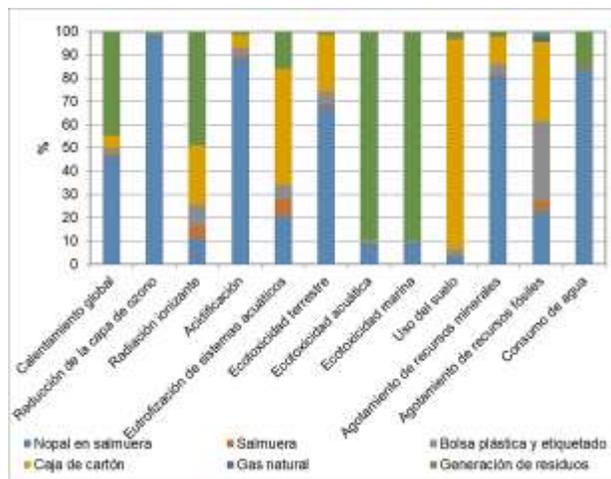


Figure 8 Bar chart - Processed Phase (1 Ton)

Source: own elaboration based on the result of the application of the SimaPro V8.5.2 software

As detailed in Figure 8, the prickly pear cactus production process consists of several sub processes, in which different elements such as brine ingredients and manufacturing materials such as plastic bag and cardboard box are involved. . In addition, during the process natural gas is consumed as fuel for the cooking activity and solid waste is generated. During the process of producing prickly pear cactus in brine, large amounts of water are consumed, which after their assignment are discharged into the drainage without any prior treatment. Similarly, large quantities of organic waste are generated, which are not given an appropriate treatment either.

This was reflected in the environmental performance of the phase, especially in the category of global warming. Once the processes have been analyzed separately, the system analysis is presented below, which consisted of the study together. Figure 9 shows the environmental impact categories and the three phases with their respective values.

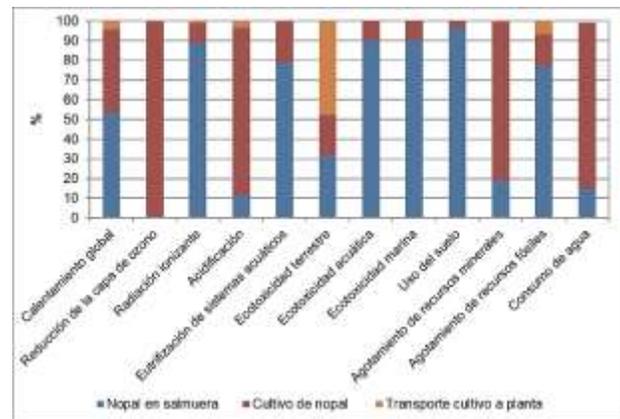


Figure 9 Impact categories Cultivation, Transportation and Processing

Source: own elaboration based on the result of the application of the SimaPro V8.5.2 software

As can be seen in Figure 9, in the Global Warming category, the Nopal Production in Salmuera represents the activity of the system with the worst environmental performance with a 53.62% participation, mainly derived from the generation of solid waste responsible for the emission of significant amounts of methane and nitrous oxide, as mentioned in the previous section. It is important to mention that the Nopal Cultivation also contributes significantly to this category by contributing 42.01%, as it is also responsible for the emission of nitrous oxide and methane into the atmosphere due to the application of mineral fertilizers and manure respectively.

For its part, Transport activity is the one with the lowest participation (4.36%), because the distance traveled between the cultivation area and the plant is not too long, and therefore, its GHG emission is not as relevant as in the previous activities. In this way, it can be concluded that the activities that have the greatest environmental impact in the nopal life cycle in brine are the generation of solid waste in the cultivation and processing stages and the application of mineral fertilizers and manure as fertilizer.

Discussion

Various similar results were obtained in similar or close studies in this case study in the culture stage. In order to make the comparison, the carbon footprint of the nopal vegetable was first studied. In Figure 10, the Sankey diagram or also called a tree diagram is presented (Freund et al, 2000), where you can see in detail the total greenhouse gas emissions in CO₂ corresponding to the production of 1 kg of cactus Vegetable per year. The thicker red lines express the flow of greatest impact according to the amounts provided in the program.

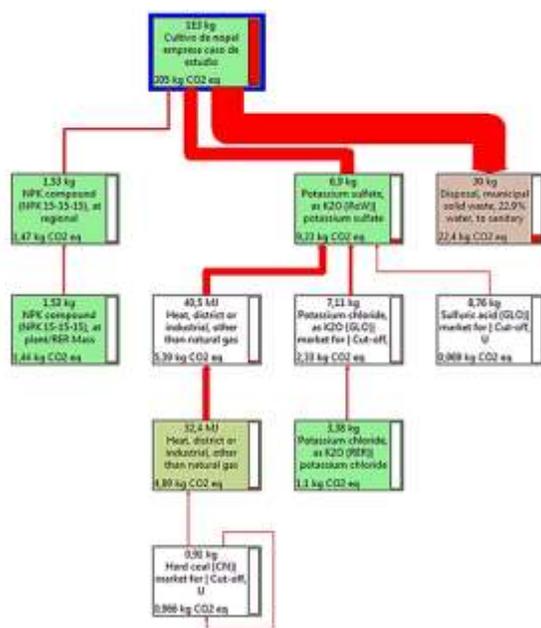


Figure 10 Sankey diagram - Nopal cultivation
Source: own elaboration based on the information collected

Table 5 shows agricultural products from different countries around the world with their respective carbon footprint in CO₂ per kilogram produced. Making the comparison with the results obtained in the present investigation it can be observed that the environmental impact of the cactus is similar to that of products such as sweet corn from the United States and apples from Italy. However, it is much smaller compared to other products such as New Zealand Kiwi or Moroccan asparagus. It is important to mention that this comparison was made without taking into account other parameters of each agricultural crop, therefore, for future research it would be convenient to study the performance of the nopal vegetable with other products with similar characteristics, for example, to study the nopal carbon footprint produced by the three entities with the highest production in Mexico.

Product	Carbon footprint (kg CO ₂)	Country	Reference
Onions	0.280	Japan	Yoshikawa, et al., 2008
Asparagus	1.593	Morocco	Hofer, 2009
Green peas	0.424	France	Meul, et al., 2012
Kiwi	1.993	New Zealand	Bowlig, 2009
Sweet corn	0.655	USES	Frate, et al., 2008
Apples	0.645	Italy	The International Environmental Product Declaration System, 2014
Peaches	1.113	Spain	Peris Martínez, 2015
Nopal	0.562	Mexico	
Cucumbers	0.282	Netherlands	Hofer, 2009
Bananas	1.426	Costa Rica	Dole Bananas, 2012
Tomato	1.013	Spain	Anton, 2009

Table 5 Comparison carbon footprint agricultural products around the world

Source: own elaboration based on the result of the application of the SimaPro V8.5.2 software

Conclusions

After analyzing the dynamics of the cactus industry in the area of Milpa Alta, Mexico City, where the case study company is located, it can be affirmed that a traditional production system still prevails, characterized by the use of rudimentary techniques of cultivation and fertilization, highlighting the complete absence of environmental management, mainly due to ignorance and lack of training of producers.

The study carried out in the present investigation confirms the importance of the Environmental Impact Assessment as one of the solutions to the problem that exists today in environmental matters in the agricultural sector, mentioned above and that is mainly caused by the disproportionate emission of greenhouse gases into the atmosphere that has triggered the phenomenon known as global warming.

The case study carried out in a nopal producing and processing company consisted in the application of a Life Cycle Analysis (LCA) to the brine cactus product, whose system covered the cultivation, transport and processing stages. Thanks to the different visits made to the company, information was collected and, together with secondary sources, the quantification of the life cycle inventory was carried out, which highlights the emission of greenhouse gases.

During this process, some limitations were found regarding prior information. In Mexico, the National Emissions Registry still has great opportunities for improvement and there is not enough data to carry out a deeper analysis.

However, with the results obtained life cycle analysis using SimaPro V8.5.2 software, it was identified that the process of nopal production in brine does not present an optimal environmental performance, analyzing the three phases of the system, it was observed that each it presents important opportunities for improvement, especially, the nopal cultivation stage, which, as mentioned earlier, lacks environmental management. It is necessary to point out that the cactus cultivation is not a process outside of global warming, since it seriously contributes to the emission of greenhouse gases that generate this phenomenon. On the one hand, mineral fertilizers, responsible for the emission of nitrous oxide into the atmosphere, are presented as GHG, which represents 50.4% of the emissions of the agricultural sector in equivalent units of carbon dioxide.

Likewise, the use of manure of bovine or equine origin as fertilizer, although it seems otherwise, is also an important emitter of methane (CH₄) and nitrous oxide (N₂O), (Herran et al, 2008). Therefore, within the recommendations for this phase, there is the gradual replacement of the fertilization model used by a more environmentally friendly one that does not sacrifice productivity or the quality of the final product, one of the solutions currently is the compost application.

References

- AGROASEMEX (2011) "Mapa Nacional de Erosión Potencial", Tecnología y ciencias del agua, 2(1), pp. 5–17. Disponible en: <http://www.scielo.org.mx/pdf/tca/v2n1/v2n1a1.pdf>.
- Antón Vallejo, A. et al. (2017) Cálculo de emisiones debidas a la aplicación de fertilizantes. Disponible en: http://www.futuragrari.cat/4/documentacio_tecnica_563781.html.
- Ayala, A. V. et al. (2011) "Determinación de la competitividad del sector agropecuario en México, 1980-2009", Revista Mexicana de Ciencias Agrícolas, 2(4), pp. 501–514. Disponible en: <http://www.scielo.org.mx/pdf/remexca/v2n4/v2n4a3.pdf>.
- Cuesta Aguirre, R. L. (2018). La curva de kuznets como herramienta para medir el desarrollo económico y el equilibrio ambiental: revisión sistemática.
- EEA (2013) "EMEP/EEA air pollutant emission inventory guidebook 2013: Technical guidance to prepare national emission inventories", EEA Technical report, (12/2013), p. 23. doi: 10.2800/92722.
- FAO (2015) Estimación de emisiones de gases de efecto invernadero en la agricultura. doi: 978-92-5-308674-0.
- FAO (2018) Ecología del cultivo, manejo y usos del nopal, Boletín De Servicios Agrícolas De La Fao. Disponible en: <http://www.fao.org/3/i7628es/I7628ES.pdf>.
- Freund, J. E., Miller, I., & Miller, M. (2000). Estadística matemática con aplicaciones. Pearson Educación.
- Herrán, J. A. F., Torres, R. R. S., Martínez, G. E. R., Ruiz, R. M., & Portugal, V. O. (2008). Importancia de los abonos orgánicos. Ra Ximhai: revista científica de sociedad, cultura y desarrollo sostenible, 4(1), 57-68.
- IPCC (2006) Directrices del IPCC de 2006 para los inventarios nacionales de gases de efecto invernadero, IPCC. doi: 10.1017/CBO9781107415324.004.
- ISO - Organización Internacional de Normalización (2006) 14044:2006 Gestión Ambiental - Análisis de Ciclo de Vida - Principios y marco. Ginebra.
- Lizarazo, J. S. (2018). Economía Ecológica y la construcción epistemológica de una ciencia revolucionaria para la sostenibilidad y la transformación del mundo. Gestión y Ambiente, 21(1supl), 13-34.
- Osorio-Córdoba, J. et al. (2011) "Conservación de nopal verdura 'Milpa Alta' (opuntia ficus mdica mill.) desespinado en envases con atmosfera modificada", Revista Mexicana de Ingeniera Química, 10(1), pp. 93–104.

Paz García, A. P., Imhoff, D., Vieyra, C., & López, N. (2018). Tratamiento de los temas soberanía y seguridad alimentarias en medios de comunicación hegemónicos y alternativos (Córdoba, Argentina, 2012-2015). *Estudios sociales (Hermosillo, Son.)*, 28(51), 0-0.

Santoyo, A. H., Vilardell, M. C., Sánchez, M. A. L., Fernández, R. C., & León, V. E. P. (2013). La Ciencia Económica y el Medio Ambiente: un aporte desde la valoración económica ambiental. *Revista Paranaense de Desenvolvimento-RPD*, 34(125), 25-38

SEMARNAT (2013) Inventario Nacional de Emisiones de Gases de Efecto Invernadero 1990-2010. doi: 10.1017/CBO9781107415324.004.

SEMARNAT (2016) Sistema Nacional de Indicadores Ambientales. Disponible en: <http://apps1.semarnat.gob.mx/dgeia/indicadores16/index.html>.

SIAP (2018) Atlas agroalimentario 2018. Disponible en: https://nube.siap.gob.mx/gobmx_publicaciones_siap/pag/2018/Atlas-Agroalimentario-2018.

Vega Campos, M. Á., Medina Jiménez, A. y Vega Juárez, M. Y. (2013) “Los sistemas de gestión ambiental y su aplicación en la industria agropecuaria de México: una breve revisión del tema”, *Entreciencias*, 1(2), pp. 197–210.

Efficient processes with TPM in companies in the south central region of the state of Chihuahua

Eficientar los procesos con el TPM en empresas de la región centro sur del estado de Chihuahua

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Abstract

In terms of maintenance talk of Mexico is of great importance because there is plenty of resources in order to be transformed, in the south central region of the state of Chihuahua, the municipality of Delicias, belongs to this area within its main activities are those related to the agriculture, livestock industries, the transformation of timber resources, as well as those relating to the derived from dairy products, within their major challenges is to efficientar their production processes in order to prolong the life of the instruments, machinery and equipment of work of processing industries and processing of the different productive areas. To facilitate the tasks and quality service to consumers of these industries, with the application of techniques of Total Productive Maintenance. This through proper maintenance supported in a program adapted to the needs of production and wear of the systems used frequently, thus reducing the costs of same, corrections and contingency plans, ensuring the safety of workers and the proper functioning of the machinery. It is necessary to implement these measures, to not only keep the labor personnel safe, but also to provide a reduction of time and costs to firms, resulting in a better job available to customers, seen this by way of quality, delivery and service as well, using a system with improvements and quality from the inside to the outside, with the methodology of process engineering.

Resumen

En términos de mantenimiento hablar de México es de gran importancia ya que existe infinidad de recursos para poder ser transformados, en la región centro sur del estado de Chihuahua, el municipio de Delicias, pertenece a esta zona que dentro de sus actividades principales se encuentran las relacionadas con el sector agrícola, ganadero, industrias de la transformación de los recursos maderables, así como también las concernientes a los derivados de los lácteos, dentro de sus principales retos es efficientar sus procesos de producción para de esta manera prolongar el periodo de vida de los instrumentos, maquinaria y equipo de trabajo de las industrias de transformación y procesamiento de las diferentes áreas productivas. Para con esto facilitar las tareas y servicio de calidad a los consumidores de dichas industrias, con la aplicación de técnicas de mantenimiento productivo total. Esto por medio de un correcto mantenimiento apoyado en un programa adecuado a las necesidades de la producción y desgaste de los sistemas utilizados frecuentemente, reduciendo así mismo, los costos por correcciones y planes contingentes, asegurando la seguridad de los trabajadores y el buen funcionamiento de la maquinaria. Siendo necesario implementar estas medidas, para no solamente mantener al personal laboral a salvo, sino también para proporcionar una reducción de tiempo y costos a las empresas, teniendo como consecuencia un mejor trabajo a disposición de los clientes, visto este a modo de calidad, entrega y servicio así, utilizando un sistema con mejoras y calidad desde el interior hacia el exterior, con la metodología de ingeniería de procesos.

Process Engineering, Total, Productive Maintenance Efficiency

Ingeniería de Procesos, Mantenimiento Productivo Total, Eficiencia

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Introduction

In the central south region of the State of Chihuahua, there are 157 companies related to different productive sectors according to INEGI (2015), in their economic census, concerning the agricultural sector, livestock, as well as the industries of the transformation of timber resources and the dairy products, which within its main challenges is to streamline its production processes and thus prolong the life of the instruments, machinery and work equipment of the processing and processing industry of the different branches, for this facilitate quality tasks and service to consumers in these industries, with the application of total productive maintenance techniques. It is necessary to implement these measures to not only keep the workforce safe, but also to provide a reduction in time and costs to companies, resulting in better work available to customers, given this by way of quality, delivery and service. Thus, using a system with improvements and quality from the inside to the outside with the process engineering methodology.

Speaking of the evolution of maintenance, from the Industrial Revolution to the 40s, including the first part of the 50s of the twentieth century, the concept of maintenance was to repair the equipment when it was damaged, from then until shortly before the 80's, maintenance began to be conceived as planning and scheduled repairs, in fact, it can be said that at the end of the 70s the first ideas of what today is the maintenance administration based on reliability were developed, concepts that had his first publications precisely in 1978.

According to Newbrough (2005) Total Productive Maintenance is the translation of TPM (Total Productive Maintenance). It is the Japanese industrial maintenance system developed from the concept of "preventive maintenance" created in the United States industry. Total Productive Maintenance is a management system that avoids all kinds of losses during the entire life of the production system, maximizing its efficiency and involving all departments and all personnel from operators to senior management and guiding their actions based on Small group activities. The main innovation of T.P.M. is that operators are responsible for the basic maintenance of their own equipment.

They keep their machines in good working order and develop the ability to detect potential problems before they cause breakdowns. According to Dounce. V, (2006), the origin of the term Total Productive Maintenance (T.P.M.) has been discussed in various scenarios.

While some claim that it was initiated by American manufacturers more than forty years ago, others associate it with the plan that was used in the Nippodenso plant, a manufacturer of automotive electrical parts in Japan in the late 1960s Seiichi Nakajima, a senior official of the Japanese Plant Maintenance Institute (JIPM) receives the credit of having defined the concepts of TPM and to see for its implementation in hundreds of plants in Japan.

Materials and methods

The overall objectives of Total Productive Maintenance, is to reduce the six major losses, according to Niebel (2009), maximizes the effectiveness of the team through two types of approaches: quantitative, generating greater equipment availability and improving its productivity within a given period of operational time; qualitative, reducing the number of defective products stabilizing and improving quality. That is why this type of zero breakdown methodology will be developed in the south central region.

Using as an example companies in the agribusiness sector that are dedicated to pecans nut shelling. This research is carried out in order to develop standardized maintenance programs that help companies to take better control of the entire plant, as well as to apply the different types of maintenance to the machines, this depending on the degree of importance that have for the development of the process.

Building a facility maintenance program involves determining various types of tasks that require completion to ensure that the facility is operating efficiently and effectively. The TPM program consists in establishing a list of tasks outlining how long it takes to complete the task and who is responsible for ensuring its maintenance and completion.

In this case, in the south central region there are seven companies dedicated to pecan nut processing, where a pilot program was developed that allowed its operators and administrators to have better control of the total productive maintenance of their facilities, which resulted in saving time and money, by reducing claims by a large percentage, as well as zero breakdowns that could occur in the future. In order to carry out the maintenance plan, first of all, you must know each of the teams that make up the process, developing technical sheets and thus be able to classify the resources as vital, important and trivial, in order to prolong the period of life of the instruments, machinery and work equipment of the food industry processing and processing industry, facilitating quality work and service to consumers in that industry.

Defining Total Productive Maintenance, as an administration system designed to facilitate the development of the industry. It relies on the proactive participation of all the staff that makes up the company, including suppliers. It is supported by the technical-administrative sciences that allow it to obtain a constant improvement in the productivity and quality of its products or services, emphasizing the prediction and prevention of zero defects, errors and failures of its resources. Starting from the needs of the clients, it is oriented to reorder the internal processes of the different areas of the company in order to make them more efficient.

With the TPM, as a privileged tool for the creation of Lean companies, which is a management methodology aimed at optimizing business assets through the total elimination of losses. By identifying these deteriorations in the production process and transforming them into opportunities for improvement, the TPM promoted cost reduction, identifying six major losses, the following being the following.

- a) Losses due to breakdowns: breakdowns are the largest group of losses among the six mentioned. There are two types: function loss faults and function reduction faults. Failures of loss of function usually occur sporadically (suddenly) and are easy to detect since they are relatively dramatic: the equipment stops completely. On the other hand, reduced function failures allow the equipment to continue operating, but at a lower level of efficiency.
- b) Losses due to preparation and adjustment: these are losses due to interruptions that occur during the process, such as change of tools and begin when the manufacture of a product has been completed and ends when the standard quality is achieved.
- c) Losses due to downtime and small downtime: unlike ordinary breakdowns, inactivity and small interruptions are the result of transient problems in the equipment.
- d) Speed reduction losses: speed reduction losses occur when there is a difference between the speed provided in the design of the machine and its current operating speed. Speed reduction losses are generally ignored, although they constitute a major obstacle to the effectiveness of the equipment.
- e) Quality Defects and Work Repetition: quality defects and repaired work are losses caused by machine malfunctions.
- f) Start-up losses: the losses between start-up and stable production are; those that occur due to the reduced performance between machine start time and stable production.

Problem Statement

In some of these companies there is no adequate maintenance record for the equipment and machinery, which is essential because, if there was a control of the production, the process would not stop at any time and the costs for the company would decrease . There are several factors for which you do not have full control over this issue and this is one reason why the machines break down, among these you can include the human resource, as well as the pieces that make up each team and the care that is it gives among other aspects.

Business situation (activities carried out)

Cd. Delicias, Chihuahua is known for being an important nogalera region and for the nut processing business in the state, being a pioneer in the country in pecan nut production. The state procurement for the year 2017 was 51,316 tons, of which between 50 and 60% belongs to the edible part of the nut (25,658 to 30,790 tons) and between 50 to 40% represents the nut shell (25,658 to 20,526 tons) (SIAP-SAGARPA, 2017).

The pecan nut processors that are dedicated to the breaking and commercialization of the nut, their activities range from the selection to the sanitizing of the boxes with the walnut ready to ship them to different destinations, national and international. It is important to mention that each and every one of the different processes that are carried out in these industries are necessary for the product to have hygiene and quality.

Current maintenance in companies

The maintenance they perform in these companies is initially preventive, since they are responsible for greasing all the machines, motors and bearings, with a periodic routine sheet every month. In some equipment such as small breakers, the maintenance that is applied to them is at the beginning of each week, in which the bullets that they have internally are reviewed because they are sensitive after so many blows, because this is how these equipment operate. In large cracks the pieces that are most common that are damaged are the cups that are inside. On average, 97 to 157 AC motors are changed per year, according to registered statistical data from these industries, this is because operators misplaced the bands or parts of the motor. Another of the pieces that are changed regularly are the bands and the bearings. In continuous dryers, they are not properly and timely preventive maintenance, so there are unforeseen events such as fires which should be avoided at all costs. In figure 1, a characteristic plant distribution of the nut processors is observed, which according to their process improperly locate the equipment, this being one of the main factors for this type of contingencies to occur. As can be seen in figure 1, in the plant distribution there are many crosses of raw material, it is recommended to develop a reordering so that the process has a better fluidity of products and with this it is easier to transport a machine one cellar to another.

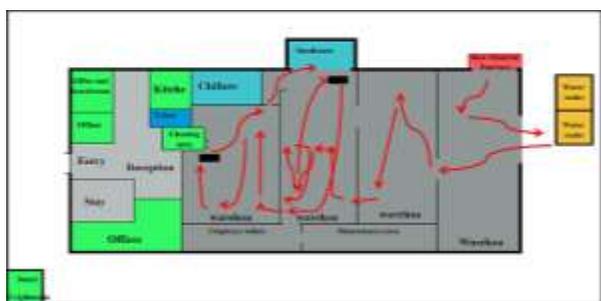


Figure 1 Plant distribution of a nut processing company
Own source

In figure 2, the recommended plant distribution is appreciated so that there are not many raw material transport crossings, rearranging the equipment and therefore the production process so that it has a better fluidity and thus is more efficient.

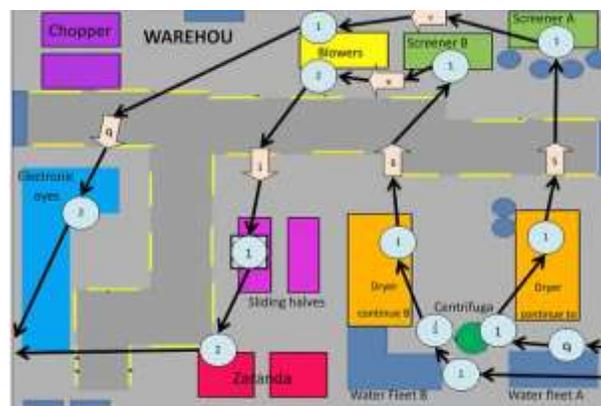


Figure 2 Recommended plant distribution to nut processors
Own source

Engineering techniques and tools

Within these companies, several positive and negative situations have been detected, so it is necessary to use different types of tools that support which parts are working well within the plant and other tools that help to verify in which aspects it is failing. Starting from simple tools such as the identification of machine types divided into codes, as well as the ICGM index that relates to the classification of resources divided into vital, important and trivial, to the most complex, which use different methods of collecting data. First, you must analyze the environment in which the company is developing, knowing its characteristics as its strengths and weaknesses, this is possible by means of a cause or Ishikawa diagram, helping to better understand each aspect of the plant and your work and thus you have the opportunity to generate a new diagram with the specific information of a given fault. Another tool that can be used for these purposes, is the flow process diagram, which will allow to know the sequence of production that is developed in the plants, to know if the order of the activities is in a properly structured way. Among the most important tools that should be used, are the technical data sheets, which will allow to know every aspect of the machinery with which one works in the companies, giving opportunity to know in what can fail and granting a wider knowledge of the same.

Janania Abraham, Camilo. (2008). Manual de tiempos y Movimientos. Ingeniería de Métodos. México: Limusa. ISBN-13: # 978-968-18-7079-9

Kanawati George. (1996). Introducción al Estudio del Trabajo. Ginebra: Oficina Internacional del Trabajo. ISBN #92-2-307-108-1

Maynard H.B (1980). Manual de Ingeniería de la Producción Industrial. Barcelona: Reverte. ISBN # 9788429126709.

Newbrough. E.T. (1997). Administración de Mantenimiento Industrial., México: Ed. Diana. ISBN # 968-13-0666-X

Niebel-Freivalds. (2009). Ingeniería industrial, métodos, estándar y diseño del trabajo. México: Mc Graw Hill. ISBN # 9789701069622

Nakajima, S. (ed.). (1989). Programa de desarrollo de TPM: implementando el mantenimiento productivo total. Cambridge, MA: Prensa de productividad. ISBN 9780915299379

Inventory of tourism resources: a strategy for the development of sustainable tourism in the communities of the southern and northern zone of the Municipality of Compostela, Nayarit

Inventario de recursos turísticos: una estrategia para el desarrollo del turismo sustentable en las comunidades de la zona sur y norte del Municipio de Compostela, Nayarit

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Abstract

The present study was carried out in the municipality of Compostela, Nayarit; in collaboration with the XL City Council of this city and the Academic Unit of Tourism of the Autonomous University of Nayarit. The purpose was to develop an inventory of tourism resources as a strategy for the development of sustainable tourism in nine communities in the south and north of this municipality. For this, the methodology shown in the manual for the formulation of the inventory of tourism resources at the national level edited by the Ministry of Foreign Trade and Tourism MINCETUR 2008 in Lima, Peru was used. The instruments that were applied to the nine key informants of the communities for the collection of the data were the technical sheet on the facilitating resources and providers of tourist services and the semi-structured interview for the classification of the natural tourist resources of the categories specified in the manual. The type of research was descriptive and exploratory with a qualitative approach. The subjects who participated in this study were nine community links which represented the intentional sample. In the results obtained, it was recorded that in the nine rural communities there are viable natural and cultural resources for the practice of alternative tourism such as ecotourism, rural tourism, mining, gastronomy, ethnotourism, adventure tourism and sports among others; Likewise, productive projects were detected that can contribute to the development in each community according to the inventory that reactivates the economic situation and improves the standard of living and well-being of the inhabitants.

Inventory, Tourism Resources, Sustainable Tourism, Strategy, Development

Resumen

El presente estudio se realizó en el municipio de Compostela, Nayarit; en colaboración con el XL Ayuntamiento de esta ciudad y la Unidad Académica de Turismo de la Universidad Autónoma de Nayarit. El objetivo era desarrollar un inventario de recursos turísticos como estrategia para el desarrollo del turismo sostenible en nueve comunidades del sur y norte de este municipio. Para ello, se utilizó la metodología que se muestra en el manual para la formulación del inventario de recursos turísticos a nivel nacional editado por el Ministerio de Comercio Exterior y Turismo MINCETUR 2008 en Lima, Perú. Los instrumentos que se aplicaron a los nueve informantes clave de las comunidades para la recopilación de los datos fueron la ficha técnica sobre la facilitación de los recursos y proveedores de servicios turísticos y la entrevista semiestructurada para la clasificación de los recursos turísticos naturales de las categorías especificadas en el manual. El tipo de investigación fue descriptiva y exploratoria con un enfoque cualitativo. Los sujetos que participaron en este estudio fueron nueve vínculos comunitarios que representaban la muestra intencional. En los resultados obtenidos, se registró que en las nueve comunidades rurales existen recursos naturales y culturales viables para la práctica del turismo alternativo como el ecoturismo, el turismo rural, la minería, la gastronomía, el etnoturismo, el turismo de aventura y el deporte entre otros; Asimismo, se detectaron proyectos productivos que pueden contribuir al desarrollo en cada comunidad según el inventario que reactive la situación económica y mejore el nivel de vida y bienestar de los habitantes.

Inventario, Recursos Turísticos, Turismo Sustentable, Estrategia, Desarrollo

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Introduction

Tourism is an activity that relates to economic well-being as it is one of the main sources of foreign exchange and a detonator of local development that fosters sources of employment and diversifies economic activities (López, Vázquez, Reyes & Guzman 2015). Likewise, to achieve its social transformation and integral territorial development, reduce the social inequality gap since it can link vulnerable communities in remote areas, facilitating the construction of a new one.

For the generation of tourism programs and projects and for the investment of the government sector as private, it is essential to define and classify the attractions and resources that each region with tourism potential has. That is why the need to prepare an inventory of tourism resources, which according to SECTUR (2017) defines as the ordered catalog of places, objects or events of tourist interest in a given area.

The inventory of tourist resources, constitutes a registry and an integrated state of all the tourist elements that, due to their natural, cultural and human qualities, can constitute a resource for the tourist, so it represents a valuable instrument for tourism planning, since it serves as a starting point for evaluations and establishing the necessary priorities for national tourism development (MINCETUR, 2008).

Regarding public policies, according to the Tourism Superstructure, the PND of Mexico 2013-2018 points out in its section on Tourism and Regional Development in the main objective "to consolidate tourism as an engine of economic activity with the strengthening of development programs and a culture of quality.

Likewise, one of its strategies is sustainable regional development with actions to promote tourism activity according to the potential of the different production chains. On the other hand, the Municipal Development Plan (PMD) 2017-2021 of Compostela, Nayarit; points out in its proposed lines of action and activities: carry out the follow-up of the magical town distinction for tourist attraction towards this destination and encourage adventure and alternative tourism.

For the attraction of tourists it is necessary to carry out the inventory of tourist resources of these two areas of the municipal seat, which implies the redefinition of the role played by all the actors involved in the process of generation and use of knowledge and, consequently, the dissolution of the gap between knowledge producers and recipients thereof.

The benefit provided by the inventory of tourism resources to society is to design strategies that facilitate the use of natural and cultural resources of each of the communities studied in order to improve their standard of living, contributing to the generation of jobs, to economic recovery, cultural development and non-migration of the inhabitants to other places in the country and abroad in search of better social welfare.

Tourism is an economic activity that is increasing year by year in our country and its tendency is to reach 40 million tourists by 2018 (SECTUR, 2016). This causes more growth and development of the villages as well as more tourist infrastructure such as: hotel rooms, more restaurants, more airports and complementary services to serve this large number of visitors. Given this, the Municipal Head of Compostela, Nayarit; It has a great wealth of its potential in natural and cultural resources and tourist attractions favoring its geographical space since it is located in a strategic point between Puerto Vallarta, Jalisco; Mazatlan, Sinaloa and Guadalajara, Jalisco; Consequently, this municipality has resorted to storing and managing the information of the inventoried and registered tourist resources, which will facilitate the decision-making of the municipal government regarding its resources that are a fundamental part of tourism development in these communities.

Among the communities selected for this study, there are: Juan Escutia or Borbollón, Carrillo Puerto, Zapotán, Mazatán, located towards the southern part of the municipality and Miravalles, Tepiqueños, Jaltepec, Vizcarra and the Summit of Huicicila located in the north zone, which make an ideal place for the practice of alternative tourism such as: rural tourism, adventure, ecotourism, agrotourism, hunting, religious, cultural, gastronomic tourism among others.

That is why a study was carried out in the aforementioned communities with the implementation of sustainable tourism, conserving and respecting their natural and cultural resources, making good use and use of these for the benefit of the communities and for the conservation of the surrounding environment, guaranteeing that future generations can enjoy them in the same way. The study is made up of eight points: 1) Introduction, 2) development of the topic, 3) methodology, 4) strategies for the development of sustainable tourism, 5) results, 6) conclusions, 7) annexes and 8 references.

Development of the topic

The development of the theme is broken down into two sessions: a) conceptual framework that describes each of the terms and concepts related to the subject addressed and b) contextual framework that describes the geographical space where the study was carried out.

Conceptual framework.

Inventory of tourism resources

The inventory of tourist resources, constitutes a registry and an integrated state of all the tourist elements that, due to their natural, cultural and human qualities, can constitute a resource for the tourist, so it represents a valuable instrument for tourism planning, since It serves as a starting point for evaluations and establishing the necessary priorities for national tourism development (MINCETUR, 2008). For Valseca, (2009) the tourist inventory is a registry and an integrated state of all the tourist elements that, due to their natural, cultural and human qualities, can constitute a resource for the tourist, so it represents a valuable instrument for tourism planning. According to Valseca (2009) the characteristics of the tourist inventory are:

- It must be a faithful reflection of the reality of the tourist resources, indicating the technical information and the situation in which they are, because from this instrument the necessary conditioning can be propitiated that allows the tourist development leading to produce certain benefits for the space Geographic studied.

- The survey must quantify the resources and provide them with a qualitative assessment.
 - It must be clear, open and dynamic, allowing its periodic updating of all the variations that are experienced in tourism resources, and its new situation; as well as the incorporation of them.
 - It is convenient to select the initial documentation of the area under study.
 - The inventory must be a tool that allows conclusions to be drawn about the potential of the area, as well as the prioritization of actions that favor the planning process.
 - The results of the inventory and its subsequent actions must follow the predetermined objectives by all the parties that make up the development process.
- The objectives of the inventory are:
- Have an essential working instrument for the development of tourism development plans and programs, in order to motivate public and private investment.
 - Satisfy the requests for information requested by the public sector, the private sector and users in general, with the intention of achieving the best use of the database.
 - Encourage the development of tourism products and their integration, based on inventory information.

What is intended, in short, is to make an assessment (qualitative and quantitative) of the attractions and resources available to a region in order to select those susceptible to tourist use, in addition to establishing actions that will improve their quality for their Introduction in the design of tourism products (Valseca, 2009).

Tourist heritage.- The tourist space is the consequence of the presence and territorial distribution of tourist attractions. The tourist heritage plus the tourist plant is sufficient to define the tourist space of any country. Table 1 shows how some elements of the tourism system are distributed to integrate what forms the tourist space.

Tourist heritage + Tourist plant = Tourist space	
Tourist attractions	Transport
Tourist plant	accommodation
Touristic infrastructure	Feeding
Tourist superstructure	Recreation

Table 1 The tourist space

Source of consultation: own elaboration

Development.- Growth or increase in the physical, biological, intellectual or moral order of an individual until reaching an accepted fullness.

Economic, social, cultural, structural or political growth of a human community and within a human community. Multidimensional process that involves changes in social structures, attitudes of the population and national institutions, acceleration of economic growth, reduction of inequality and the eradication of poverty.

In this section on development, it is a priority to know the differences between tourism development and tourism development. In the appreciation of table 2 tourism development becomes strategic, towards marketing and its profitability. On the other hand, development tourism is more directed towards a humanitarian and social vision of tourism.

Tourism development vs development tourism	
The community at the service of tourism	Tourism at the service of the community
Macroeconomic Development Goals	Integral Development Goals
The tourist consumes	The tourist learns
International corporate	Micro and medium enterprises
Priority: currencies	Priority: welfare
Mass tourism	Solidarity, sustainable and socially responsible tourism
Mercantile vision of tourism	Humanitarian and social vision of tourism
Tourism linked to quantity	Tourism linked to quantity and quality
Towards a humanitarian and social vision of tourism	

Table 2 The development of tourism towards a development tourism

Source of consultation: own elaboration

Region.- The regions must be thought of as “open systems in constant process of definition”, in which the strategies, the interest and the regional identity must not be the expression of deterministic causal factors, nor the expression of desires, interests and strategies from those observers, but it must arise and be owned by its actors, in a framework in which the definition of “regional interest” must be understood as a “complex political process” (Keating, 1998).

North Region	Sierra Region	Center Region	Southern region	South Coast Region	North Coast Region
Acaponeta, Rosa Morada y Ruiz	Huajicori, El Nayar y La Yesca	Tepic, Xalisco.	Ahuacatlán, Amatlán de Cañas, Ixtlán del Río, Jala, San Pedro Lagunillas y Santa María del Oro.	Compostela, Bahía de Banderas.	San Blas, Tuxpan, Tecuala, Santiago Ixcuintla

Table 3 Regionalization of the state of Nayarit
Source of consultation: own elaboration

From the adoption of the mentioned criteria that allowed the conformation of the administrative regions for the planning of the development of the State, the following conditions are guaranteed: a) The optimal grouping of the municipalities according to the long-term project for the integral development de Nayarit, all this defined in the State Development Plan 2005 - 2011; and b) Generate a process of integral, sustainable and sustained development in each region, emphasizing economic growth, regional autonomy in decision making, processes with citizen participation, culture and environmental education and the adequate and responsible management of natural resources, promotion of the sense of regional belonging and the promotion of the great potentials and capacities of each region. This regionalization process is itself a strategy for the integral development of the State that involves actions such as the territorial integration of the 20 municipalities in the 6 regions defined for administrative purposes for development planning and intermunicipal coordination.

Regional development.- Localized process of permanent social change whose ultimate goal is the progress of a territory, of the regional community and of each person who integrates it. Particularly in the state of Nayarit, where a recent regionalization process has begun with the promotion of tourism such as the so-called “Riviera Nayarita”, it is appropriate to devise models that allow sustainable development.

Local development.- For his part, Sergio Boiser translates a definition of Buarque that summarizes that “Local development is an endogenous process registered in small territorial units and human settlements capable of promoting economic dynamism and improving the quality of life of the population.

Despite constituting a movement of strong internal content, local development is inserted in a broader and more complex reality with which it interacts and from which it receives positive and negative influences and pressures. Local development within globalization is a direct result of the ability of local actors and society to structure and mobilize based on their potential, and in their cultural matrix, to define, explore their priorities and specificities in the search for competitiveness in a context of rapid and profound transformations”(cited by Boisier, 2005: 52 in Varisco 2007).

Local economic development.- The local economic development approach is far from constituting an autarkic project. On the contrary, it seeks to disseminate development from below and with local actors, trying to territorially endogenize the bases of support for economic growth and productive employment. With this, in addition, the possibilities of taking advantage of existing external dynamism opportunities are increased”(Albuquerque, 2004: 17).

The question of the endogeneity of the development process is key when this theory is applied to the field of tourism for two reasons: first, as indicated above, tourism development always generates income and always generates jobs; What in some cases makes it difficult for these incomes and jobs to translate into improvements in the quality of life of the receiving communities is the remission of economic benefits to the issuing areas and also the hiring of extra local staff to occupy the hierarchical positions in the Business.

Vázquez-Barquero, defines local economic development as “a process of growth and structural change that through the use of the development potential existing in the territory leads to the improvement of the well-being of the population of a locality or region. When the local community is able to lead the process of structural change, endogenous development processes are produced thanks to the efficient use of local economic potential that is facilitated by the proper functioning of the institutions and mechanisms for regulating the territory.” (Vázquez Boatman, 2000: 5/6).

Economic dimension of tourism.- Since tourism became a mass activity in the postwar period and according to different paradigms, it has been considered that there is a direct relationship between tourism and development to the point of considering the expressions of tourism development and regional development as equivalent (Varisco, 2007) The author adds that according to the foregoing, the origin of this causal relationship is based on the economic benefits of tourism, especially income generation, employment generation and foreign exchange. The employment generated by the tourist activity is classified into three categories: direct employment, generated in the tourism characteristic activities (1) such as hospitality, gastronomy, travel agencies, etc .; indirect employment, generated by tourism in non-characteristic activities, such as commerce, the public sector, educational institutions, etc .; and induced employment as a result of the linkages in the chain of input suppliers, for example in the primary sector or in the industry (Varisco, 2007).

Sustainable tourism.- According to the World Tourism Organization (UNWTO, 2016), it is defined as “tourism that fully takes into account the current and future economic, social and environmental repercussions that involve satisfying the needs of visitors, the industry, environment and host communities. ” Sustainable tourism must consider an inclusive social participation to democratize decisions and assume the responsibilities involved in the conservation of the natural and cultural heritage of a locality or region (SEMARNAT, 2017).

Contextual Framework

Compostela, Nayarit.- The Municipality of Compostela is located to the South of the State; It borders the South with the Municipality of Bahía de Banderas and the State of Jalisco; to the West with the Municipality of San Pedro Lagunillas; to the North and Northwest with the Municipality of Xalisco and to the Northwest with that of San Blas. The municipal head is between 104°, 54', 0'' west longitude of the Greenwich Meridian and 21°, 14', 2 'north latitude. Its height above sea level is 860 m.

Localización de la zona de estudio.

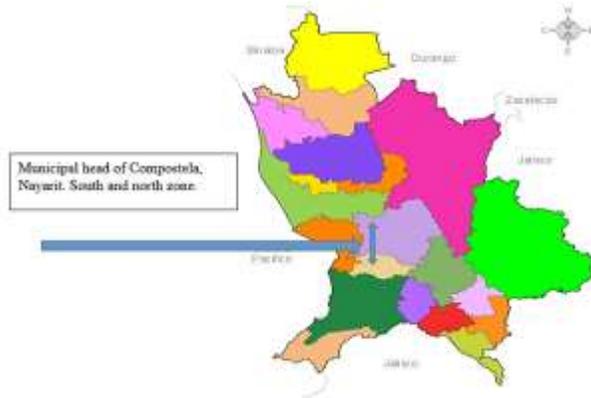


Figure 1 Location of the study area

Source of consultation: own elaboration. Taken from: Miguel Conde. *Once TV Mexico*

Methodology

In the present study, the methodology shown in the manual for the formulation of the inventory of tourism resources at the national level edited by the Ministry of Foreign Trade and Tourism MINCETUR 2008 in Lima, Peru was used. The instruments that were applied to the nine key informants of the communities for the collection of the data were the technical sheet on the facilitating resources and providers of tourist services and the semi-structured interview for the classification of the natural tourist resources of the categories specified in the Handbook. The type of research was descriptive and exploratory with a qualitative approach. The subjects who participated in this study were nine community links which represented the intentional sample. The population under study were the nine communities in the south and north of the municipality of Compostela: Juan Escutia or Borbollón, Carrillo Puerto, Zapotán, Mazatán, located towards the southern part of the municipality and Miravalles, Tepiqueños, Jaltepec, Vizcarra and La Cumbre of Huicicila located in the north zone. The material and equipment used for the field investigation was a video camera, a camera, a reporter recorder and a transport unit for the visit to each of the communities. Some sources of information such as electronic journals, web pages, books, congresses, scientific articles, among others, were used to support the theoretical framework. The hypothesis formulated was: “The communities of the southern and northern region of the municipality of Compostela, Nayarit; They have a potential for tourism resources that are a fundamental basis for decision-making and for the development of sustainable tourism development strategies that contribute economy to the region.

The team of collaborators for the study were students of the Master's program in Sciences for Development, Sustainability and Tourism (MCDST) of the Academic Unit of Tourism of the Autonomous University of Nayarit, as the nine community links in the southern areas and North of the municipality. In addition there was the participation of the authorities of the XL City Council of Compostela, the ejido commissioners of each community and the educational authorities of the Autonomous University of Nayarit.

Students of the MCDST VII Generation: Brianda Leonor Arroyo Macías, Cynthia Lora Rosales, Fatima Carolina Medina Gutiérrez, Fernando Delgado Landey, José Francisco López Bañuelos, Martín Francisco Franco Palomera, Micalia Magdalena Huerta Guzmán, Wilma Sofía Santos Mackintosh and Luis Vidal Aranda García.

Community links: Ing. Oscar Rodríguez in Juan Escutia, Professor Jorge Manjarrez de Carrillo Puerto, Mr. Ranulfo Medina de Zapotán, Mr. Jesús Barajas de Mazatán, Profr. Antonio González de Miravalles, Mr. Enrique Salazar de Tepiqueños, Luis Cuevas and Mrs. Natividad Salazar López in Jaltepec, Mr. Isidro de Haro Gutiérrez in Vizcarra and Mr. Antonio Cuevas at the Summit of Huicicila

Strategies for the development of sustainable tourism

Tourism Policy Dimension.- The National Development Plan (PND) 2013-2018 in its section VI.4 Mexico thrives, in its objective 4.4 states: to promote and guide an inclusive and facilitating green growth that preserves our natural heritage while generating wealth, competitiveness and employment. In objective take advantage of Mexico's tourism potential to generate a greater economic spill in the country. Regarding section VI.5 Mexico with Global Responsibility, objective 5.2 corresponds to promoting the value of Mexico in the world through economic, tourist and cultural dissemination. In this PND, it is observed that the national policy is directed mainly to the use of our natural and cultural resources for the generation of economic resources for the country, which suggests that development strategies applied to sustainable tourism can be implemented.

With respect to the State Development Plan of Nayarit (PED) 2011-2017, the government body of the State of Nayarit points out in point 6 the strategic objectives: vulnerability to natural phenomena and in 6.3.3.2 tourism and regional development also in point 6.3.4 the commitment to sustainable development, finally 6.3.4.2 environmental sustainability. In this PED, sustainable development is accentuated with good intentions which is favorable as a strategy for decision-making in the proposals for the development of tourism products and services in the southern and northern region of the municipality of Compostela with the condition of meeting the needs of sustainability such as loading capacity, the use of sustainable materials in the construction of lodging and food and beverage establishments, promotion of the environmental culture for tourists and designing a tourism system that contemplates a new sustainable model for nature tourism or green as some scholars have named him and that the trend is currently going towards this type. The XL City Council of Compostela Nayarit specifies in its Municipal Development Plan (PDM) 2017-2021 the following section on tourism: III.2.8 on tourism development and its objective: to achieve the strengthening of the tourism sector in all its modalities. Its strategy is to: improve and improve the provision of tourist services in the municipality. The proposed lines of action and activities: promoting adventure or alternative tourism, promoting environmentally friendly tourist corridors, creating and distributing advertising about the alternative tourism options offered by the municipality, designing a Compostela tourist guide that points out alternative sites Tourism, strengthen beach tourism, conduct cultural and sporting events on the beaches of the municipality in low season, make Compostela a magical town, make the request to the Secretary of Tourism, prepare each of the requirements established to achieve the appointment of magical town, carry out the follow-up of the distinction for the tourist attraction towards this destination, indicators encourage adventure or alternative tourism, increase of visitors in alternative tourism sites, strengthen beach tourism, increase of visitors on the beaches in low seasons, increased hotel occupancy a, Compostela magical town, appointment of magical town and increase of visitors in the town of Compostela. In this PDM there are several objectives and strategies in which several actions are integrated with respect to tourism development.

One of the main opportunities that contributes to the sustainable development of tourism is the name of Magic Town for its characteristics, regulations and other requirements that must be met for the achievement of this denomination. Likewise, the formulation of tourism projects will have to be derived from the objectives, strategies and actions of both the PND and the PED and of course abide by them in the PMD.

Types of tourism

Both in the southern and northern areas of the municipality of Compostela there are conditions to develop alternative tourism strategies such as: archaeological tourism, ecotourism, gastronomic tourism, rural tourism, ethnotourism, adventure and sports tourism among others. The different types of tourism and their contribution to the study are described below.

Archaeological tourism.- The National Institute of Anthropology and History (INAH) has registered more than 20,000 pre-Columbian archaeological zones in Mexico. Of these, 106 archaeological zones scattered throughout Mexico can be visited and have all the necessary infrastructure services for archeological tourism, communication routes, site museum, lodging, food and recreational places. In the north zone the archeological vestiges are more accentuated in the town of Mazatán, Nayarit; since it is a very old town that dates from before the pre-Hispanic period.

Ecotourism.- Ceballos (2007) states that ecotourism is “that environmentally responsible tourist modality consisting of traveling or visiting relatively undisturbed natural spaces, in order to enjoy, appreciate and study the natural attractions of these spaces; as well as any cultural manifestation of the present and the past that may be found there, through a process that promotes conservation, has low environmental and cultural impact and induces an active and socioeconomically beneficial involvement of local populations.” This practice can be carried out in places such as the Huicicila Summit, Miravalles, Mazatan and some other inventory communities that have the natural resources of flora and fauna, landscape and attractions to motivate tourists to visit them.

Gastronomic tourism.- Mexican cuisine, with its great variety of traditional regional dishes, is rich in taste, smell and color, pride of the nation's cultural heritage; attributes that attract the tourist alone. According to the definition proposed by (Hall and Sharples 2003: 10, in Montecino 2013) gastronomic tourism is: "The visit to primary and secondary food producers, gastronomic festivals, restaurants and specific places where the tasting of dishes and / or the experimentation of the attributes of a region specialized in food production is the main reason for a trip".

Rural tourism.- The Ministry of Tourism states that this segment is the most human side of alternative tourism, since it offers tourists the great opportunity to experience the encounter with the different ways of living of the communities that live in a rural environment and defines as "the trips that have as an objective to carry out activities of coexistence and interaction with a rural community, in all those social, cultural and productive everyday expressions of the same" (SECTUR, 2004). Rural tourism is the activity that most adapts in its different applications to the 9 communities studied, so it is feasible some alternatives such as agrotourism, adventure tourism, ethnotourism, extreme zip line sports, rappelling, bird watching, landscape observation, among other.

Ethnotourism.- Trips that relate to indigenous peoples and their habitat, in order to learn from their culture and traditions. Some communities have native groups such as the Huicholes and Coras that nowadays go down from their place of origin to the rural towns with the purpose of being used in agricultural and agroindustry activities such as corn, coffee, sugar cane, mango, avocado among other. In addition, they are the ones who make handicrafts and some tourist products that are attractive to tourists who visit them.

Adventure tourism.- Its natural wealth, privileged geographical position and biological diversity, make Mexico a territory to explore. On board a train, horse or bicycle; On foot, by kayak, in camps and ascending mountains, visitors will be amazed by the options to admire unique landscapes, observe endemic species of flora and fauna, and challenge nature.

By way of concept, Adventure Tourism is identified as "Travel or excursion with the specific purpose of participating in activities, in a natural environment, to explore and experience a new experience, generally assuming the risk factor and some degree of skill or effort physical associated with personal challenges" (Cuyo, 2009). In all the inventoried locations the feasibility was found to carry out adventure tourism, since they have natural and cultural resources that are ideal for their exploration and for the practice of experiences where the tourist has the opportunity to live with the people and of being in contact with nature.

Sports tourism.- Mexico offers interesting sports activities throughout the country, among which are the following: fishing, golf, adventure racing, triathlon, all terrain, marathons, diving, cycling, swimming, extreme flight, nautical tourism, tennis, hunting and surfing among others. In all the locations studied, sports tourism can be practiced, since in some places you can carry out the four-engine ride through streams and gaps in the mountains, mountain biking, horseback riding, crossings with cars all terrain, explorations on foot among others.

Results

According to the result on the applications of the technical files on the facilitating resources and providers of tourist services and the interviews made to each of the community links on the classification of the tourist resources, the inventory of the tourist resources was achieved, the Results of the study showed that both in the southern and northern areas of the municipality of Compostela there are conditions to develop strategies for sustainable development of tourism through different types of tourism such as: archaeological tourism, ecotourism, gastronomic tourism, rural tourism, ethnotourism, adventure tourism and sports among others. The study generated the communication, discussion and use of scientific and technological knowledge that will contribute to the improvement of the quality of life of its inhabitants as well as to the exploration and presentation of alternative solutions to the problems of the region based on knowledge obtained.

The most significant impact was to solve a problem for society, the establishment of strategies to improve their standard of living, contribution to job creation, economic recovery, cultural development and non-migration of the inhabitants towards others. sites of the country and abroad for the search of social welfare. Strategies were proposed for the conservation of natural and cultural resources through sustainable tourism that guarantees that new generations make use of them without impacting or degrading them. Creation of a tourist culture to receive and attend tourism in a hospitable and friendly way, to practice responsible consumption in such a way that organic and inorganic wastes are reused, the population was oriented to manage actions that lead to payment projects being implemented for environmental services.

Annexes

In this section and annex a folder to the study, the two instruments of data collection for the collection of the inventory of tourist resources of the nine inventoried communities in the south and north of the municipality of Compostela, Nayarit are shown. 1) technical file on facilitating resources and tourism service providers (file for tourist resources inventory) Annex 1, and 2) the classification of natural tourist resources of the categories specified in the tourist resources inventory manual consulted that through The data were obtained from the semi-structured interview (Annex 2). The tables described in the text and another one with the figures are added in another folder.

Conclusions

The communities investigated for the most part are viable to detuned microenterprise and tourism projects that could reinforce their primary activities such as agriculture and livestock in times of low production.

Some inhabitants of the villages studied have had to emigrate to other destinations in the region, the country and the United States of America in search of better living conditions, since work is scarce in their localities and they are forced to go outside.

Some towns in the northern area such as Jaltepec, the Summit of Huicicila and Tepiqueños have found archaeological remains and artifacts such as clay baskets, monkeys, vases among others dating from the pre-Hispanic period which may be of interest to tourists. Agribusiness such as coffee occurs in most of the villages, especially in the town of Mazatán and the summit of Huicicila, which presents an opportunity to produce tourist products derived from coffee such as coffee liquor, chocolates, sweets, among others that may increase your economy. It is observed that the town of Mazatán exists a considerable historical, archaeological and cultural heritage since it is one of the oldest towns that Compostela itself and is ideal for the formulation of tourist strategies that would enhance the region and the Municipality.

It was observed that in some towns such as the Miravalles case, the dates for the religious celebrations of the patron saint festival have changed, such as that of the Virgin of Guadalupe from December 12 to March 9. The above is with the intention that there are more financial resources for that date. There are some mines still in operation such as Miravalles and others no longer exploited such as Huicicila at the Summit that could be an opportunity for the exploitation of mining tourism. Most of the inventoried communities have ample natural and cultural resources that can be used for the detonation of productive projects and thereby improve their living conditions of the population.

References

Alburquerque, F. (2004). El enfoque del desarrollo económico local. Cuaderno de capacitación No. 1. Serie: Desarrollo Económico Local y Empleabilidad Programa AREA - OIT en Argentina - Italia Lavoro Buenos Aires, Organización Internacional del Trabajo. Recuperado de: https://www.flacsoandes.edu.ec/sites/default/files/agora/files/1251776298.area_enfoque_del_0.pdf

Ceballos, L. (2007). Ecoturismo, Las Cañadas. México, 2007. p. 26.

Conde, M. (s.f). División Municipal de Nayarit. Once TV. México. Recuperado de: https://www.google.com/search?rlz=1C1RLNS_esMX825MX825&tbm=isch&sxsrf=ACYBG_NQO1ZqOB784SY1KY4WLqfaloZ_L3A%3A1571321808461&sa=1&ei=0HeoXc_gG4GWsgWzzJKIBg&q=Compostela+en+el+mapa+de+nayarit&oq=Compostela+en+el+mapa+de+nayarit&gs_l=img.3...748365.760403..761095...1.0..1.263.7839.0j42j6.....0....1..gws-wiz-img.....10..35i39j0i67j35i362i39j0i131j0i5i30j0i24j0i8i30.hJxJPA4Vbc0&ved=0ahUKEwjPiOLxvaPIAhUBi6wKHTOmBGEQ4dUDCAc&uact=5#imgdii=MLEKCOJwxsofAM:&imgrc=qvKMek40-eOQXM:

Cuyo Argentina (2009). II Seminario ente cuyo turismo, Argentina. Recuperado el día 10 de abril de 2011 en: <http://cuyoargentina.gov.ar/TURISMO%20ALTERNATIVO.pdf>

Keating, Michael (1998). *The New Regionalism in Western Europe. Territorial Restructuring and Political Change*, Aldershot: Edward Elgar.

López, B. P; Vazquez, S. V; Reyes, A. J. A & Guzman, C. M. G (2015). *Inventario de recursos turísticos como base para la planificación territorial en la zona Altiplano de San Luis Potosi, ón territorial en la zona Altiplano de San Luis Potosi, México*. Revista cuadernos de turismo México. Revista cuadernos de turismo No. 35, pp. 17-42. Universidad de Murcia, España.

Ministerio de Comercio Exterior y Turismo (2008). *Manual para la formulación del inventario de recursos turísticos a nivel nacional*. HELMEN (Ed). Lima, Perú.

Montecinos, A. (2013). *Peregrino gastrósofo*. Recuperado el día 2/10/2013 en: <http://peregrinogastrosofo.wordpress.com/2013/07/06/definicion-turismo-gastronomico/>
Plan Estatal de Desarrollo 2005-2011, La regionalización de Nayarit, p.p. 3-5

Secretaria de Turismo (2004). *Serie Turismo Alternativo*, México, D.F.

Plan Nacional de Desarrollo 2013.2018. Gobierno de la República Mexicana.

Plan Municipal del Ayuntamiento de Compostela, Nayarit; 2017-2021.

Plan Estatal de Desarrollo (2011-2017). Periódico Oficial del Gobierno del Estado de Nayarit.

Secretaria de Medio Ambiente y Recursos Naturales (2017). *Turismo sustentable en México*. (1ª. Ed.) Cuadernos de divulgación ambiental. Ciudad de México.

Varisco, C. (2008). *Turismo y desarrollo económico local. Aportes y Transferencias*, vol. 12, núm. 1, pp. 126-148, Universidad Nacional de Mar del Plata, Buenos Aires, Argentina.

Varisco, C. (2007). *Sistema productivo turístico y desarrollo local*. Revista electrónica de Ciencias Sociales Online vol. IV, No. 2. Universidad Viña del Mar, Chile.

Valseca, M. M. P. (2009). *Inventarios de recursos turísticos*. Revista digital innovación y experiencias educativas, Sevilla, España.

Vázquez, B. (2000). *Desarrollo económico local y descentralización: aproximación a un marco conceptual*. Santiago de Chile.

Tourist characterization of the Municipality of Ruiz, Nayarit; to contribute to the touristic development of the region**Caracterización turística del Municipio de Ruiz, Nayarit; para contribuir al desarrollo turístico de la región**

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Abstract

The tourist characterization of the communities is a key element in the correct tourist planning, since this allows to obtain technical information about the potential that a site has for its tourist development. This study consists of five parts, the first one includes general data, then information is collected on the elements that make up the tourism system, such as: tourism plant, infrastructure, government and receiving community. The main objective of this research is to know and document aspects and general characteristics of the municipality of Ruiz, looking for the elements of its tourist development, data such as the identification of the offer of accommodation, food and leisure services, infrastructure, as well as type of transport and accessibility that are available to move to the cities that make up the communication routes, health and energy services of the municipality, as well as the most important economic activities and government support that is poured into the municipality. This information is basic in the decision making of investors in tourism developments, both in the community and external. This instrument was applied through interviews with key people, in addition to gathering information through observation about the behavior and perception that the inhabitants of these communities have about the development of tourism in the municipality.

Tourist planification, Tourist characterization, Regional Development**Resumen**

La caracterización turística de las comunidades es un elemento clave en la correcta planificación turística, ya que esto permite obtener información técnica sobre el potencial que tiene un sitio para su desarrollo turístico. Este estudio consta de cinco partes, la primera incluye datos generales, luego se recopila información sobre los elementos que componen el sistema turístico, tales como: planta turística, infraestructura, gobierno y comunidad receptora. El objetivo principal de esta investigación es conocer y documentar aspectos y características generales del municipio de Ruiz, buscando los elementos de su desarrollo turístico, datos como la identificación de la oferta de alojamiento, alimentación y servicios de ocio, infraestructuras, así como el tipo de transporte y accesibilidad que están disponibles para trasladarse a las ciudades que conforman las vías de comunicación, servicios de salud y energía del municipio, así como las actividades económicas más importantes y apoyo gubernamental que se vierte en el municipio. Esta información es básica en la toma de decisiones de los inversores en la evolución del turismo, tanto en la comunidad como en el exterior. Este instrumento se aplicó a través de entrevistas con personas clave, además de recopilar información a través de la observación sobre el comportamiento y la percepción que los habitantes de estas comunidades tienen sobre el desarrollo del turismo en el municipio.

Planificación turística, Caracterización turística, Desarrollo Regional

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Introduction

The town of Ruíz, Nayarit is located in the north-central part of the State of Nayarit. Territorially it borders to the north with the municipalities of Rosamorada and El Nayar, to the south with the municipalities of El Nayar and Santiago Ixcuintla, to the west with Santiago Ixcuintla, Tuxpan and Rosamorada and to the east with El Nayar.

Ruíz is located at a variable height that goes from 880 to 1,640 meters above sea level (masl). According to the Ruiz Municipal Development Plan (2017-2021), its physical characteristics make it feasible in the production of tall coffee of both the robust and Arabic varieties, in addition to other agricultural products such as pineapple, mango, chili, Jamaica, Bean, Nanchi, Arrayan, Passion Fruit, Banana, Corn and Vegetables. (Ruiz, Nayarit, 2017). It is formed by a territorial extension of about 900 square kilometers. According to the results that yielded the population count that INEGI carried out in 2015, the total number of population in the municipality of Ruíz is 24,743 inhabitants (INEGI, 2015)

The municipality of Ruíz has several attractive areas where there is a great vegetation where we can find species such as the encino prieto, encino, tepehuaje, papelillo, guapinol, nanche, arrayan, coffee, pineapples, trumpet flower, mayacuyá, jamaica, guamaras, soursop, huisache and capomo blueberries; With respect to its fauna, there are mainly wild animals, among which we can find white-tailed deer, wild boar, badger, armadillo, rabbit, round-dove doves, Aguililla, Pecarí de collar, Carpenter Alirrojo, Picogrueso pechicafé; as species of special protection are the butterfly Sparrow, seven colors and the parakeet Catarina; as a threatened species the Badger and endangered the Green Macaw, (Ruiz, Nayarit, 2017).

Ruiz currently has virgin areas where man has not yet intervened for modification, these are part of the interest of people at regional and national level who seek to know the destination. These areas are formed by natural aspects as the main attraction because it generates a type of environment where people have the opportunity to enjoy what each place has and at the same time perform various recreational and outdoor sports activities.

This is what is known as nature tourism or also known as ecotourism.

It is a series of characteristics of the areas that are considered natural by the environment they have and that have somehow been preserved over time.

Among the attractions that exist in the municipality are the totally natural spas with waterfalls, some of the most visited are the Tenamache stream, El Salto and Malpaso, because they are places where nature is part of each of them and where precisely Alternative tourism is what gives them the opportunity to diversify a tourism product through innovation and creativity.

Other natural resources that the municipality has are forestry and minerals. The former are not properly exploited by the difficult access to the mountains, while the latter are exploited from the mines that exist in the mountain area in the towns of La Frazada, El Zopilote, The Hideaway, the Deer and September 8, of which gold and silver are the most extracted metals, (Ruiz, Nayarit, 2017), (Mexican Geological Service, 2018).

In addition to this, Ruíz has several attractive areas and buildings where those that are natural, historical, religious and cultural stand out, which makes it an interesting, attractive and important place for tourism development.

The purpose of this research is to present the aspects and characteristics of Ruiz, such as; the supply of services, infrastructure of basic services, government, description of the receiving community, characterization of the demand, and last but not least, describe and characterize the tourist attractions and resources, so that the results obtained serve as part initial of a macro project that contemplates the North zone of the State of Nayarit and that in turn becomes a tool of value that contributes true foundations on the value of the natural resource that the municipality possesses and therefore, contributes in the correct tourist planning and the tourism development of the region.

Theoretical framework

Theoretical aspects of regional development and tourism

Development as a complex phenomenon is not presented in a homogeneous way, it is differentially reflected between spaces showing imbalances, regional disparities and problems that need to be studied to find a solution, a situation that is intensified today by the global relations of society that integrate it with based on the hegemonic model of capitalism and which greatly influences regional and local contexts, establishing diverse territorial logics.

Based on this, it is of fundamental importance to analyze the different theoretical approaches that try to explain the phenomenon of development on a regional scale from the perspective of the capitalist system. In general, the existence of two theoretical approaches in which these theories can be classified is fully recognized, although it is worth noting that in addition to these two general domain approaches, the emergence of a third party can be mentioned, based on the current context where the process of Globalization is growing. In this third approach, new approaches emerge that incorporate the effects of the global scope into the regional or local scope into the analysis. Within the first approach, there are theories based on the neoclassical current that are based on the spatial convergence of development, which fundamentally raise the capacity of market forces to solve spatial imbalances, finding in businessmen and consumers through of its rationalist attitude, the mechanism to reach equilibrium, as it seeks to optimize for the first the return on capital and for the latter the utility in consumption, this group of thinkers and the theories they propose are known as the balanced development approach, (Peña, 2004).

These theories establish that the mechanism to achieve equilibrium is based on the free mobility of productive factors, both capital and labor, the uniqueness of production functions, perfect dissemination of innovations and a tendency to equalize marginal yields and prices in the different territories, the latter being the most important in the process.

This current considers space as a simple process of circular reasoning where any mismatch will be reflected in the prices of productive factors and consumer products, in which market forces will bring the balance back, (Castro, 2009).

The second approach integrated by the theories that maintain spatial divergence as a fundamental premise, considers that regional imbalances and disparities are caused by the dynamics of capitalism itself, stating that market forces cannot eliminate them, requiring the intervention of powers audiences actively, consciously and voluntarily. They consider that space is heterogeneous in the endowment of economic and non-economic factors, creating spatial relationships that produce and reproduce disparities or imbalances or even worsen rather than correct themselves.

The third increasingly consolidated approach includes the new theories of regional development that contemplate the influence of globalization processes at the local level, consider that the territory is an element that significantly influences the development processes of local society, considering it as an active factor in which the relations between resources and the various economic and social actors are carried out, establishing a dialectical relationship between the local and the global.

Peña (2004) establishes the relationship between theoretical currents and their objects of study, mentioning the analogical existence between the three approaches that, as currents of thought, address the aspects: a) convergence theories / models, related to the notion of space / homogeneous region, b) divergence theories / models, related to the notion of nodal and planned space / region, and; c) theories / models of globalization, related by the notion of space / territory / globalization.

In this theoretical context, the coincidence of thought was defined with the authors who criticize the positions derived from the balanced approach, whose base assumptions are unrealistic, with insufficient empirical evidence to support them, since there is no perfect mobility of factors, which conditions and substantially limits the tendency to equal pay in the regions, making this condition almost impossible to achieve, (Asuad, 2001).

As a consequence, the divergence approach (notion of nodal region space, planned) and the one related to the notion of space, territory and globalization are taken as an explanatory theoretical element, the reason for this position is based on the fact that there is greater empirical evidence in that disparities in income and regional production are the product of market forces that tend to generate imbalance and a continuous and cumulative process of inequality, (Asuad, 2001).

Tourism and regional development.

Tourism is the economic activity that has had greater dynamism in recent times worldwide, has become the spearhead of global capitalism meaning a very effective vehicle for financial globalization and the world capital movement, (Dachary & Burne, 2002). According to the World Tourism Organization, tourism activity has grown at annual average rates of up to 7.2%, tourist visits have exceeded the amount of 700 million in 2002, the UNWTO forecasts that by 2020 the tourist visits they will be around 1560 million per year (OMT, 2005). The development of new information and communication technologies will further strengthen the growth of tourism activities, these figures allow us to infer that the tourist phenomenon of increasing importance worldwide will be increasingly important and that the phenomenon of globalization It will boost it even more.

Tourism has become one of the most centralized and competitive industries in the world and almost no other economic sector illustrates so clearly the global reach of transnational corporations. In recent years, the industry has pressured governments around the world to liberalize trade and investment in services, and will likely gain enormous benefits from the General Agreement on Trade in Services, a multilateral pact within the framework of the World Organization of the Commerce (WTO).

Tourism becomes a model within global capitalism as manifested by Dachary & Burne (2006) and therefore, reproduces all its externalities. The model is real estate, produces spaces and territories with great influences and modifications of economic, social, political, cultural and environmental structures (Rubio, Torres & Velazquez, 2014)

The capitals determine their movements and move from distant areas to the tourist spaces they build, always obeying the logic of the market, in many cases they cause high social costs assumed by the receiving groups that become societies controlled by tourism developers and entrepreneurs, (Dachary & Burne, 2006).

The complex nature of tourism leads it to manifest itself as a phenomenon in various contexts. The regional scope is one of the most relevant insofar as it requires a space for its development, it is a builder and consumer of spaces and landscape modifier (Asaud, 2001)

Dachary & Burne (2004), clearly establish the relationship between tourism and regional development using the approaches of Panosso (2012), Álvarez & López Cordova, (2010) and Milton Santos (1996) based on the conception of space , taking it as an abstract reality or as a dialectical abstraction, where both material objects and human actions converge, typified as geographical objects, natural objects and social objects that manifest in dynamics that characterize them identified through the relationships established between these sets that in turn have the capacity to generate new relationships, giving particularity to the spaces and the society that is in them, that is, the spaces begin to find their identity from this dynamic and are built socially and historically.

Tourism is part of human activity and as such is carried out in a spatial area, creates and appropriates territories by significantly modifying the structures formed by the relationships between objects of geographical, natural and social nature that are originally settled in the spaces, their implications and effects of various kinds, have made the theoretical principles of thinkers such as Perroux, which consider cities as the ideal poles that favor the creation of complex networks that produce so much, are retained by the governments of multiple countries. economies of scale and external economies that facilitate the accumulation of capital (Santana Talavera, 1997)

As a result of these actions, the so-called tourist development poles have emerged, which are nothing other than tourist cities created expressly creating relationships and modifications to the economic, social, environmental, political and cultural environment of great magnitude. Moreover, tourist corridors have emerged in which the poles are combined and spatially enlarged, resizing the effects of tourism on space, territories and regions on a larger scale, generating differentiated conditions in the development process.

The multiplier effect of tourism establishes linkages back and forth in many of the economic activities, which gives dynamics to regional economies generating jobs, changes in the structure of income and consumption, but also generates inflationary pressures, insufficient food supply and other goods for resident populations, population movements that also put pressure on public services, housing and, in general, on the standard of living, tourism uses natural or cultural resources that, depending on their forms of consumption, can lead to degradation and irreversible harmful effects.

Alternative tourism

It is a set of alternative activities that are presented as the new trends of society in general, since they are carried out in a rational way and with great attachment to sustainability. The tourist seeks to have a closer contact with nature or have new experiences in a unique environment. All this as a result of the damage and inequality that is reflected in all tourist destinations in which there is great pollution, exploitation and shortage of natural resources, such as water; as well as the loss of identity of the local population, (Ibáñez & Rodríguez 2012). These activities are emphasized in an economic development in which the community receives equitably the income obtained and provides more support for the opening of local businesses, in addition to environmental conservation. Since, if it continues to be overexploited, it will increase the imbalance in the ecosystems and a social development that implies a well-being and improvement of the quality of life of the inhabitants, as well as their integration in the labor aspects, (Ibáñez & Rodríguez 2012).

In summary, this tourist modality has the purpose of carrying out trips that allow tourists to participate in recreational activities in contact with nature and cultural expressions of rural, indigenous and urban communities, respecting the natural, cultural and historical heritage of the place visited. It is known as the set of tourist modalities that aim to be consistent with natural, social and community values, also allowing both hosts and tourists to enjoy a positive interaction and shared experiences. It is worth mentioning that this modality is made up of activities such as: cultural tourism, rural tourism, agrotourism, ecotourism, adventure tourism, hunting tourism, among others. (Santos, 1996)

Ecotourism

Ecotourism according to Ibáñez & Rodríguez (2012), is a new conservative movement based on the tourism industry, which is defined as responsible trips that preserve the environment and sustain the well-being of the local community. It is accompanied by ethical codes and a huge group of international travelers, students, thinkers; It has the support of the governments of a large number of countries. It seeks education and recreation by observing and studying the values of the place, and its development must generate resources for its preservation and for the community.

Among the main activities carried out in ecotourism are: education workshops, hiking, sidereal observation, rescue of flora and fauna, observation of flora, observation of ecosystems, geological observation and observation of natural attractions. Within the following table the definition of some of these activities is carried out:

Type of Tourism	Activity	Definition
Ecotourism	Interpretive hiking	Activity where the visitor travels on foot or in a non-motorized transport, on a predefined cross country road and equipped with information cards, signs and / or guided by nature interpreters, whose specific purpose is the knowledge of a natural environment. The tours are generally of short duration and educational orientation.
	Sidereal Observation	Appreciation and enjoy the manifestations of the open field cosmos. Traditionally associated with stellar observation, with the increasing use of specialized equipment the range of objects observed has expanded to large expressions of the universe
	Environmental education workshops	Didactic activities, in direct contact with nature and where possible involving local communities; Its purpose is to sensitize and raise awareness among participants of the importance of relationships between the different elements of nature.

Table 1 Classification of Ecotourism activities
Source: own elaboration with data taken from the Ministry of Tourism (SECTUR), 2004

Adventure trip

Some call it sports tourism, others more, adventure tourism, others, adrenaline tourism or challenge tourism, and although its name is not important, the concepts do become decisive.

So these denominations generate confusion and concerns among tourists and even among providers and marketers of these services, (Ibáñez & Rodríguez, 2012). Regarding the activities that are practiced within this modality we find:

Type of Tourism	Activity	Definition
Adventure trip	Abseiling	Fixed rope descent technique, with the help of specialized equipment and techniques. Generally performed in open spaces and vertically.
	Climbing	It implies the ascent through rock walls using hands and feet as an element of progression. The use of specialized techniques and equipment allows safe movement. A contemporary version is artificial walls (bouldering).
	Ride	Horseback riding in natural areas; The main objective is the experience of riding and knowing about the handling and habits of these animals.
	Mountaineering	Considered as a sport, it is defined as the discipline that consists of hiking in the mountains.
	Hike	This activity is one of the most widely accepted and demanded. Preferential walking routes or circuits must be previously established and dosed according to the profile of the tourist who is going to practice it (children, youth, adults, senior citizens, small or large groups).
	Caving	Activity that consists of descending in caves, caves, basements and caverns and appreciating the different geological structures, flora and fauna. Caving is a discipline that has scientific and research purposes; Caving has recreational and appreciation purposes.
	Mountain biking	Cross-country tour using as a medium an all-terrain bike. The activity takes place on dirt roads, gaps and narrow paths with varying degrees of technical difficulty and physical effort.

Table 2 Classification of Adventure Tourism activities
Source: own elaboration with data taken from the Ministry of Tourism (SECTUR), 2004

Rural tourism

According to Ibáñez, & Rodríguez, (2012), rural tourism is that type of tourism that takes place in non-urban areas, enhancing the culture, values and identity of the local population, through its direct and active participation in the provision of tourist services. Traditional tourism activities complement this type of tourism and allow positive exchange between visitors and recipients. It should be clarified that it does not necessarily link visitors with agricultural activities. Finally, it is worth noting that the main motivations for the practice of this tourist modality are: the contemplation of specific areas, landscape, recreation and, of course, rest.

Type of Tourism	Activity	Definition
Adventure trip	Eco archeology	Trips to archeological zones in order to know the relations between man and his environment in ancient times, starting from the material remains that he has left.
	Agrotourism	It is based on the use of a rural environment, occupied by a peasant society, which shows and shares not only its idiosyncrasy and agricultural techniques, but also its natural environment in conservation.
	Preparation and use of traditional medicine	Knowing and participating in the rescue of one of the richest and oldest manifestations of Mexican popular culture that is the preparation and use of traditional medicine, is the reason for different travelers.
	Ethnotourism	Trips that relate to indigenous peoples and their habitat in order to learn from their culture and traditions.

Gastronomic Workshops	These activities are motivated to learn, prepare and taste the gastronomic variety offered by the hosts of the visited places.
Craft Workshops	This experience is based on participating and learning the elaboration of different crafts in the scenarios and with the native procedures.
Dialect learning	Travel with the motivation to learn the dialect of the place visited, as well as their customs and social organization.
Rural photography	This activity is of great interest for those travelers who like to capture in images the different cultural manifestations and natural landscapes of the rural environment.
Mystical experiences	It offers the opportunity to live the experience of knowing and participating in the richness of the beliefs, legends and divine rituals of a people, inherited by their ancestors.

Table 3 Classification of Rural Tourism activities

Source: own elaboration with data taken from the Ministry of Tourism (SECTUR), 2004

The tourist system and its elements

The tourism system is a conceptual process model formed by a set of elements arranged according to their functions and their spatial location, which are rationally linked to each other through the principles or rules of the market (supply, demand and regulation), maintaining their Once exchange relations with other systems of different rank. Like any conceptual system, it comes from a real system and is parallel adjusting methodologically and symbolically, facilitating the analysis and understanding of said real system and it is in this sense that its importance lies as a research tool.

Composition

It is appropriate to analyze tourism from an overview, as a system in which you can define its parts and specify links between them. The tourism system is composed of a set of heterogeneous elements that are closely linked to each other and in constant dynamism. According to the model of Sergio Molina (2006), the tourism system consists of 6 elements that pursue a common objective:



Figure 1 Molina Tourist System
 Source: Molina (2006)

Tourist attractions

They are places that arouse the interest of tourists to visit a destination thanks to its outstanding tangible and / or intangible characteristics. A destination to be considered attractive must be competitive and to achieve this, the motivations that prompted visitors to travel to it must be satisfied. The tourist attractions of a destination are divided into natural such as parks, deserts, beaches, etc., and cultural such as gastronomy, folklore and the architecture of its monuments and historical sites.

Superstructure.

They are public and private organizations that represent service providers in the tourism-related sectors, in the same way that policies are established, they look after the interests of their members, develop projects and encourage investment. In Mexico there are, for example: the Ministry of Tourism (SECTUR), the Ministry of Economy, the National Chamber of the Restaurant of Food and Spiced Food (CANIRAC), the Ministry of Environment and Natural Resources (SEMARNAT), the National Development Fund to Tourism (FONATUR), etc.

Infrastructure.

Defined by the dictionary of the Royal Spanish Academy as the set of elements, endowments or services necessary for the proper functioning of a country, a city or any organization.

In the case of the tourism sector, they are the indispensable communication routes so that the traveler can move in and out of the tourist destination. There are 3 types of infrastructure: (1) Maritime, (2) Terrestrial and (3) Aerial.

Services (offer).

In the tourism system we find 2 types of services, the basic ones such as hotels, travel agencies and restaurants, that is, those properties that a tourist needs fundamentally when traveling; and complementary services, which do not intervene directly with the tourist but are necessary, examples of these are banks, exchange houses or gas stations.

Demand (tourists).

None of the above elements could survive without tourists. They constitute the counterpart of the law of supply and demand, that is, they are the ones who consume, use and / or benefit from what destiny has to offer; In addition, it is from his experience, that within the destination strategies can be established to meet their needs in a better way, encouraging the development of the receiving community.

The receiving community.

These are local residents who directly (such as tourism service providers) or indirectly (general population or human resources of various companies) have contact with the tourism community.

For its part, the World Tourism Organization (UNWTO, 1991) focuses the tourism system on 4 elements, with demand, supply, geographical space and market operators. Roberto Boullón (2006), proposes the following elements: demand, supply, infrastructure, superstructure, attractions and facilities.

Demand: it is the most dynamic component of the system and involves the group of people (current or potential) who travel and make use of the services and facilities created for recreation. From a socio-economic point of view, demand is determined by the ease of access to transport, income, educational level and the desire to get out of the routine; Tourism demand is generated when society has generally exceeded a level of income sufficient to cover basic needs. On the other hand, societies with large polarizations in the concentration of wealth will generate a limited or restricted tourist demand. **The offer:** it is the set of elements that make up the tourist experience, that is, it is composed of those elements that attract tourists to the destination and meet their needs and expectations. This distinguishes the following components: tourism resources and attractions, tourism silver (companies related to the sector), infrastructure and institutional elements (public and private institutions involved in tourism development). **Resources and tourist attractions:** those elements that motivate the movement of tourists. They can be of natural, cultural origin, etc. It is possible to differentiate between resources and attractions being the first potential attractions while the second are those resources already valued. **The tourist plant:** they are all the companies that facilitate the stay of the tourist in the destination providing services of lodging, restoration, recreation, displacement, etc. **The infrastructure:** they are all those elements that provide services not exclusively tourism and that in the first place seek the satisfaction of the local population but without which it would be impossible the operation of tourist services would be impossible. These are roads, railways, ports, airports, communications, energy networks, drinking water and wastewater, waste collection systems, etc. Some authors make the distinction between infrastructure and supporting infrastructure, referring to the first as those static elements and to the second as those that are transformed according to needs. (ex: infrastructure: an air route, a sea route; supporting infrastructure: an airport or a sea port). **The institutional elements:** are tourism legislation in general, public, private or mixed tourism entities, promotional actions, facilitation to private companies, that is, all activities carried out by the public sector in tourism. This element is also called as a superstructure and is responsible for ensuring the overall functioning of the entire system.

From this it follows that the more important the tourist activity for the region, the stronger and more efficient the superstructure that manages said territory should be.

Tourist System proposed by Roberto Boullón



Figure 2 Roberto Boullón Tourist System
Source: Boullón (2006)

Although these authors represent different approaches to visualize the tourism system, the actors are fundamentally the same, however the difference lies primarily in relation to the tourist space according to the UNWTO (2005) and supra structure of Boullón (2006), the latter according to approach to the tourist system that is more focused on the economic activity it produces, instead it will see an overwhelming appreciation of the elements of the tourist system, something more territorial.

Importance of Tourism Planning

To work in the tourism development of a country or to promote it, it is essential to carry out a series of actions that must be aimed at achieving specific and well-defined objectives, and then translate them into a coherent and integrated development plan. According to Ander-Egg, E. (2007), planning is rationally anticipating the actions to be carried out based on the resources and objectives that are to be achieved to generate transformations. That is to say, that planning is the decision of the way in which the things that are at hand will be used to reach the point where you want to arrive. It is believed that tourism provides a country with substantial socio-economic benefits and, for this reason, many countries, developed and underdeveloped, see in these activities an opportunity to achieve sustained growth, a stable source of foreign exchange and an instrument of generation of employment.

However, the country is required to have a series of preconditions, including a combination of natural, scenic, historical, archaeological, natural and climatic attractions. Tourism is also not a panacea for the development of a country, as it certainly has great advantages but also has harmful effects and consequences. It is then advisable to count the advantages and disadvantages known as tourism development, which supports the importance of careful planning, (Quijano, 2009).

Concept and Importance of Tourist Diagnosis

Diagnostic Concept. The tourist diagnosis is a study whose main objective is to know the current and potential situation of the tourist activity in the commune. To carry it out it is necessary to analyze both its strengths and weaknesses, as well as its opportunities and threats (SWOT Analysis) (Quijano, 2009).

Importance of Tourist Diagnosis.

The diagnosis includes the analysis of: the current situation, the historical situation and the main obstacles to development and indicates the prospects for progress in response to the resources and potential of the geographical space, at the subregional and regional level and the existing structural conditions. In this primary phase of planning it is intended to detect the main obstacles that impede the fulfillment of the image and the identification of the potentialities that could help to achieve it.

Diagnostic functions.

- Dimension the distance and the difference between the actual current situation and the ideal future situation that this implies in the definition of objectives.
- Corroborate and confirm the objectives set at specific levels.
- Provide the conditions that confirm and rectify the deadlines set for achieving the objectives.
- Define and explain those internal or external variables that may constitute an obstacle to said process.

- The diagnosis involves, among other areas, raising an inventory of resources and attractions that will allow us to know, among other aspects, the five different tourism products, the stage in which each of the products is located: introduction, stabilization and the type of demand that motivates.

Methodology

The present investigation is considered qualitative, of a transversal type with a mixed approach and with an exploratory scope, since it describes aspects and characteristics of the municipality of Ruiz. The primary sources of the research were through direct subjects such as the population where the on-site visits were made in the municipality, the City Council where information on support programs and contributions to localities and service providers were obtained for Know the services they provide both in accommodation and lodging. Also in the visit, aspects and some characteristics could be observed about the general day-to-day environment of the towns (Sampieri, 2018)

For the collection of the information, the tourist characterization sheet of communities was used, which served to obtain data such as general information and demographic data of the municipality, identification of the offer of food, lodging and recreation services, to know the infrastructure of basic services, the type of transport used, accessibility, the type of communications, health, energy, some aspects of local government as well as the main economic activities of the municipality (Schulke Silke, 2003)

Results

Below are the results that were obtained in the present investigation, which were obtained through the tourist characterization sheet of communities, which served as a parameter to obtain other data such as general information of the locality, identification of the offer of lodging, food and recreation services, knowing the basic services infrastructure as well as the type of transport and accessibility, communications, health and energy as well as the most important economic activities and government support poured towards the town.

Service offer.

Lodging. The municipality of Ruiz has 6 hotels, 5 motels and 1 pension that serve to provide accommodation to tourists, which can be deduced that it has a hotel floor that allows to develop tourism activity.

Feeding. There are restaurants of different types of food, mainly of local cuisine and Mexican snacks, 22 lunch boxes, 2 bars that provide night service, 9 canteens and 15 funds including those of the local market, as well as street stalls that offer various types of food such as tacos, Burgers and seafood. On the way out to the town of El Venado there is a Salvadoran food stop and a birrería. In the town of Venado they have 1 restaurant based on meat and seafood, as well as 3 home-made food and sale of charcoal-roasted chickens.

Spreading. In this area, according to the information collected, it was known that the community has natural water spas and streams, 2 sports facilities and that it totally lacks recreational places such as discos, cinemas, and camps. It has spaces for sports activities, one in the municipal seat, sports facilities with equipment for gymnastics activities in the town of the Station and a multipurpose court in the town of Puerta de Platanares and Nayar.

Other services. As part of the complementary services, there are no travel agencies, tour operators, tourist information modules, there are 3 banks and 4 ATMs, however, the community also does not have trained and certified tourist guides to carry out the activity of tourist guides.

Basic Services Infrastructure.

Transport and accessibility. Ruíz is located 63 km from the state capital and 24 km from the municipality of Santiago Ixcuintla. The distance that exists from Ruiz and the town of El Venado is 16 km from the municipal capital, the Tenamache of 25 km, the Real del Zopilote 27 km and the Town of El Nayar 270 km.

The main access road to the community is paved, paved and in very good condition, you can also enter the different locations mentioned above by land with paved road, it has road signs but not tourist.

There is a Costa and Sierra Transportation terminal for travelers that go from the Capital to the mountain area with daily departures as well as the Transportes del Nayar that goes to the municipal seat with hourly departure frequency, within the entire municipality, we can find another type of transport that is more common than the combis with some routes to the different locations such as El Venado, Puerta de Platanares, La Bolita, El Refugio, El Zopilote and the neighboring municipalities of Santiago, Peñas and Tuxpan with a frequency of 15 to 30 minutes, it also has 2 permanent bases of local taxis for transfers over shorter distances.

Communications The locality of Ruiz has local and cellular telephone service, the nearest telephone office is 16 km away in the municipality of Tuxpan, but nevertheless there are self-service and convenience stores where you can make your payments. In the town there are 2 telephone service booths and in the surrounding towns with public telephone booths, 4 Internet cafes, 6 Mexico broadband sites connected for public internet use and a post office in Mexico. It should be noted that in most of the towns in the municipality there is a mobile phone service.

Health. 29% of the municipality have installation to the public network of piped water treated with chlorine, water is also used from wells, streams, springs and rainwater.

With respect to the drainage and sewerage system, 88% of the population has this service, the rest have latrines for the elimination of excreta. The majority of the population disposes of garbage through a collection car as part of municipal services and in locations that do not have this service, the garbage is burned.

In the health services, there is an IMSS clinic, a State Health Services Health Center, an ISSSTE interconsultation clinic as well as some medical services in the offices of the DIF. On the other hand also in the surrounding communities there are 2 mobile health units, 7 health clinics, however, as in most communities in rural areas, there are health houses with authorized personnel and trained with traditional healers, more However, the population uses the health centers located in the towns of Cordón del Jilguero, Presidio de los Reyes and El Naranjo very often

Energy. 95% of the population have electric power service, which directly benefits the entire municipality.

Type of government. The municipality of Ruiz has a City Council, which is made up of the Municipal President, the Trustee and seven Aldermen, with their respective alternates. The Regidores are five of relative majority and two of proportional representation.

In accordance with the Organic Law for the Municipal Administration of the State of Nayarit, in force, the auxiliary authorities of the Municipality are: I. The Municipal Commission of Human Rights and Administrative Justice; II. The Delegates and Municipal Commissioners; III. The Auxiliary Judges of each locality; and, IV. The Heads of the urban sector, rural or apple section who have the main purpose of Coadyuvar to fulfill the purposes of the town hall, attend in the regions and localities in which they are determined, the maintenance of tranquility, security and public order, as well as Seek compliance with the Legal, Administrative and Regulatory Ordinances of the Municipality. The Law itself also establishes auxiliary organisms of the city council, which are, the Municipal Collaboration Councils and the Citizen Action Committees who will have the purpose of contributing to the fulfillment of the purposes of the city council and participating through work and solidarity in the neighborhood, civic development and of collective benefit.

Receiving community. The most important economic activities of the municipality are agriculture, in which 68.6% of the local population is engaged in this activity and in the background is livestock and in third place with 31.4% forestry and fishing activities.

Within the community there are no formal or informal tourist jobs, there are only tourist services offered by the Travesía Cora company but this company is from the State Capital without a local presence, this offer tourist tours such as the pineapple route and canyoning activities and waterfall waterfall in the Tenamache stream.

In 2017, the community as a whole participated in the workshops for the proposal of the 2017-2021 municipal development plan, citizen participation was given through the selection through the work of participatory mapping, which consisted of identifying on a map the areas or points of greatest problem in order to have a zoned map, as well as the direct participation of the attendees.

In addition to this, the population wrote the problem, needs, ideas and projects on sheets that were delivered to each of them and, simultaneously, also opened to express their opinions openly to the moderators of the workshop.

In this way, three thematic tables were established, which were defined in coordination with the city council, which were designated as the 3 strategic axes that would work in the development of the municipality, thereby showing the opening for the integration of communities for development of local strategic plans. Once the above information is obtained, it can be deduced that tourism is not the main economic activity in the region despite having the necessary tourist resources to develop and enhance this activity, the municipality does not have the human capital trained to be able to provide tourist services, there is no presence of tour guides locally and therefore there is no staff that speaks English as a second language that facilitates attention to foreign tourism. Regarding the attitude of the municipality towards the tourist activity, it was found that 50% of the respondents considered tourism as an important instrument of development; 30% consider it as an alternative and seasonal economic activity since the most offered service are the spas in the rainy season and only 3 spas provide services charging access to the site the other streams are free to use; 40% said they had an indifference to the local development of tourism activity and 20% expressed disinterest in developing tourism activity since they consider it dangerous and do not believe they solve their economic problems.

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Tourism development in the state of Nayarit is a means to achieve local communities. It is a basic element to really seek that social and economic development that is so desired. Ecorfan as editorial of academic works has managed to establish a network of academics prepared for them to publish, and share the progress of their research, socialize them so that they have a greater impact.

We thank all the local actors who have allowed us to have their knowledge of local tourism development, in addition to sharing a long-term project that will seek to improve their social and economic conditions for the best human development of these populations.

Conclusions

The municipality of Ruiz, Nayarit has great potential for the development of eco-tourism, this as an ideal means to channel social and economic development and achieve the full human development of the members of the Ruiz communities. It has a combination of necessary elements for how Santos (1996) handles it, and Ibañez & Rodríguez (2012) can develop alternative tourism, basically ecotourism, adventure tourism and rural tourism. Taking into account the model of Molina (2006) there is the first aspect of the tourism system, which is the tourist attraction. With a vast geography with potential for ecotourism, an important demand for its attractions can be generated.

In the other elements of the system is where the main challenge is to develop, and although it has the necessary infrastructure, since it has communication channels, services, demand and the receiving community. In every aspect it can be refined, but especially in the receiving community, since it has not been developed for tourist attention, they have always seen the tourist processes too far from them, so even elements such as the treatment of tourists, development of spaces to take food, service, lodging, among others are what limits the tourism development of the region. Following the model of the World Tourism Organization (1991), the receiving community is once again the element of greatest development potential, so that decision makers will be able to determine the processes of modification of perceptions and attention of the entire population of the region.

References

- Álvarez, U. C., & López Córdova, J. H. (2010). *Desarrollo Regional y Turismo: Revisión Histórico Estructural de la Riviera Nayarit*, México TURyDES, 3(8).
- Ander-Egg, E. (2007). *La planificación estratégica*. Buenos Aires: Lumen.
- Asuad, N. (2001). *Economía regional y urbana. Introducción a las teorías, técnicas y metodologías básicas*. México, BUAP.
- Boullón, R. C. (2006) *Planificación del espacio turístico*. México: Trillas.
- Castro, U. (2009). *Estructuras regionales emergentes y desarrollo turístico sustentable: la región costa sur de Nayarit, México* (Doctoral dissertation, Tesis doctoral en Ciencias para el desarrollo sustentable de la Universidad de Guadalajara, México).
- Dachary, A. C., & Arnaiz Burne, S. M. (2002). *Globalización, turismo y sustentabilidad*, Puerto Vallarta, CUC - UDG.
- Dachary, A. C., & Burne, S. M. A. (2004). *Desarrollo y Turismo en la Costa de Jalisco*. Puerto Vallarta, CUC - UDG.
- Dachary, A. C., & Burne, S. M. A. (2006). *Territorio y turismo: nuevas dimensiones y acciones*. Puerto Vallarta, CUC - UDG, Recuperado en: <http://www.inafed.gob.mx/work/enciclopedia/EMM18nayarit/municipios/18011a.html> (05/10/2019)
- Ibañez, R., & Rodríguez, I. (2012). *Tipologías y antecedentes de la actividad turística: turismo tradicional y turismo alternativo*. *Medio ambiente y política turística en México*, 1, 17-33.
- INEGI (2015). *Banco de datos de Población*. Recuperado en: <https://www.inegi.org.mx/temas/estructura/default.html#Mapas>
- Molina, S. (2006). *El postturismo: turismo y posmodernidad*. Trillas.
- OMT. (2005) *Barómetros del Turismo Mundial*, Volumen 3, No. 2, Junio, Madrid, Organización Mundial del Turismo.

Panosso, A. & G. Lohmann (2012). Teoría del turismo: conceptos, modelos y sistemas, Trillas, México.

Peña, A. R. (2004). Las disparidades económicas intrarregionales en Andalucía. Servicio de Publicaciones de la Universidad de Cádiz.

Quijano, C. R. (2009). Manual para el diagnóstico turístico local. Guía para planificadores. Guayaquil, Ecuador, Recuperado en: <http://unrn.edu.ar/blogs/pt/files/2013/03/6-Ricaurte09-GuiaPlanTuris-ver-fichas-al-final-post-2007.pdf> (08/06/2019).

Rubio, R., Torres, K. & Velásquez, J. (2014). Diagnóstico del Potencial Turístico del Puerto de la Libertad como Polo de Desarrollo de El Salvador, (tesis de grado). Universidad Tecnológica de El Salvador.

Ruiz, Nayarit (2017) Plan de Desarrollo Municipal de Ruiz, Nayarit; 2017-2021. Tepic, Diario Oficial del Estado de Nayarit, Recuperado en: <http://www.ruiznayarit.gob.mx/trans39/PDM2018.pdf> (10/08/2019).

Sampieri, R. H. (2018). Metodología de la investigación: las rutas cuantitativa, cualitativa y mixta. McGraw Hill México.

Santana Talavera, A. (1997). Antropología y turismo: ¿nuevas hordas, viejas culturas? Ariel, Barcelona.

Santos, M. (1996). De la totalidad al lugar. Barcelona. Oikos-Tau.

Schulte Silke (2003): Guía conceptual y metodológica para el desarrollo y la planificación del sector turismo. Santiago de Chile: Naciones Unidas.

SECTUR, S. D. (2004). Turismo alternativo, una nueva forma de hacer turismo.

Servicio Geológico Mexicano (2018). Panorama Minero del Estado de Nayarit. Recuperado en: <http://www.sgm.gob.mx/pdfs/NAYARIT.pdf> (08/10/2019).

Impact of COVID-19 on Fractal Capital Market Recursion**Impacto del COVID-19 en la recursividad fractal del mercado de capitales**

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Abstract

We present the optimization of the current prices function of the Mexican Stock Exchange index and we will focus our attention on aspects of maximizing stock market margins with limits in the bookkeeping operation. We ourselves will model the possible stochastic recursion scenarios in "n" as a fractal annihilation factor within this stock market. Finally we will obtain the expected delta of the price range and its Hamiltonian to minimize the operational risk of the capital market with the presence of COVID-19 in Mexico.

Fractal, COVID-19, Prices**Resumen**

Presentamos la optimización de la función de precios corrientes del índice de la Bolsa de México y enfocaremos la atención en aspectos de maximización de márgenes bursátiles con cotas de límites en la operación de teneduría. A si mismo modelaremos los posibles escenarios de recursividad estocástica en "n" como factor de aniquilación fractal dentro de esta bolsa de valores. Finalmente obtendremos la delta esperada del rango de precios y su hamiltoniano para minimizar el riesgo operacional del mercado de capitales con presencia del COVID-19 en México.

Fractal, COVID-19, Precios

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Introduction

The companies of the BMV are capitalized and their instruments tend to rise in price. Let's start with defining the discrete dynamics system as a pair (x, f) where x is a field and $f : X \rightarrow X$. Given a point $x \in X$, set $\{x, f^1(x), f^2(x), f^3(x), f^4(x), \dots\}$ will be called the orbit of, where $f^n(x) = f \circ \dots \circ f(x)$, therefore we consider the classification of the fixed points according to their properties in a complex dynamic system (C, f) [Mandelbrot, M: 1975], are the following:

$z_0 \in C$, z_0 it is an attractor point if $|f'(z_0)| < 1$

$z_0 \in C$, z_0 it is a repulsive point if $|f'(z_0)| > 1$

$z_0 \in C$, z_0 It is an indifferent point if $|f'(z_0)| = 1$

$z_0 \in C$, z_0 it is a super attractor point if $|f'(z_0)| = 0$

The dimension tells us how many additional pieces of an object can be revealed as the resolution is more precise and there are three different ways to evaluate it: the fractal, the topological and the underlying. There are different fractal dimensions [Mandelbrot, M: 1978], the simplest is the Self-similarity Dimension: $d = \text{Log}(N) / \text{Log}(M) \rightarrow Md = N$; where M is the number of parts into which the object will be divided, d is the dimension of the object and N the number of resulting parts. Distance of the rescaled range [Frame, M., Philip, A., G., D, Robucci, A: 1992]:

$$\begin{aligned} \langle \mathbf{R}_T^2 \rangle &= N_\rho l^2 + \\ & \frac{l^2}{3\pi^2} \int_0^\infty dq q^2 D(fN_p; \frac{l^2 q^2}{6}) \beta \hat{\omega}_{AA}(q) \\ & + \frac{l^2}{3\pi^2} \int_0^\infty dq q^2 D[(1-f)N_p; l^2 q^2 / 6] \beta \hat{\omega}_{BB}(q) \\ & + \frac{l^2}{3\pi^2} \int_0^\infty dq q^2 E(1-f) \end{aligned} \quad (1)$$

$$X N_p, fN_p; l^2 q^2 / 6 \beta \hat{\omega}_{AB}(q) \quad (1.1)$$

$$\begin{aligned} \langle \mathbf{R}_A^2 \rangle &= fN_\rho l^2 + \\ & \frac{l^2}{3\pi^2} \int_0^\infty dq q^2 D(fN_p; l^2 q^2 / 6) \beta \hat{\omega}_{AA}(q) + \\ & \frac{l^2}{3\pi^2} \int_0^\infty dq q^2 \gamma [(1-f)N_p; l^2 q^2 / 6] \\ & I(fN_p; l^2 q^2 / 6) \beta \hat{\omega}_{AB}(q) \end{aligned} \quad (2)$$

Whatever method of approach to the fractal concept we use, there is a central concept, which is that of dimension. We will consider various dimension concepts; and the first of them, the topological dimension. In Euclid's "elements", the concept of dimension is already defined, implicitly and inductively. A figure is said to be one-dimensional, if its boundary is made up of points; two-dimensional, if its border is composed of curves and three-dimensional, if its border is composed of surfaces [Mandelbrot, M., J. S. Geronimo, A., N. Harrington: 1984].

Topological dimension. Hermann Weyl illustrates the concept of dimension in the following terms: We say that space is three-dimensional because the walls of a prison are two-dimensional [Mandelbrot, M: 1978].

Pricing topology

The construction of the topological dimension can be based on the idea of generalizing the concept that the dimension of a ball is three while the dimension of the sphere that limits it is two: dimension of a set X from the dimension of its boundary ∂X . On the other hand, a fractal object is first and foremost a subset of R^n . In this context, we prefer an equivalent definition of topological dimension based on the cover dimension, a concept that plays an important role in the definition of fractal dimension.

Fractal media [Frame, M., Philip, A., G., D, Robucci, A: 1994]:

$$D(\alpha; x) \approx \frac{\alpha^4 x}{12} \left(1 + \frac{\alpha x}{\sqrt[3]{24}} \right)^{-3} \quad (3)$$

Multifractal evidence:

$$\beta_u(r) = \begin{cases} K \exp[-z(r/\sigma - 1)] / (r/\sigma), & r/\sigma > 1, \\ \infty, & r/\sigma < 1, \end{cases} \quad (4)$$

Positive layer:

$$K = \frac{\beta Q^2}{\epsilon \sigma (1+z/2)^2} \quad (4.1)$$

Negative layer:

$$z^2 = -\frac{4\pi\sigma^2}{\epsilon k_B T} \sum_{i=1}^S n A_i^2 \quad (4.2)$$

Coating dimension. Let us consider a subset S of \mathbb{R}^n . An open cover of S is any collection of open sets whose meeting contains the set S . An open refinement a of the cover open a is another cover such that each open $A \in a$ is included in some open $A' \in a'$. In some sense, an open refinement to a of S provides a "more detailed" coating of S than a .

Repellent moment- COVID-19 / Ex Ante:

$$c[r, n] = \ln \frac{n_B}{z_B} + \int c_B (|r - r'| [n(r') - n_B] dr') \quad (4.2.1)$$

Recursively negative moment- COVID-19 / Apriori:

$$G(r) = \exp[-\beta \psi(r) + \int c_B (|r - r'| [n(r') - n_B] dr')] \quad (4.2.2)$$

We say that a is an open cover of order k of the set S , if, whatever $x \in S$, x belongs to a maximum of k open of the cover a . The set S has cover dimension (topological dimension) n , if any open cover a of S admits an open refinement of order $n + 1$, but not of order n .

Moment of Hope- COVID-19 / Ex Post:

$$h(r) = c_B(r) + n_B \int c_B(|r, r'|) h(r') dr' \quad (4.2.3)$$

In the case of a segment divided into three equal parts; $d = 1$, $M = 3 \rightarrow N = 3$, a surface divided into three parts each side [Frame, M., Martino, W: 2010]; $d = 2$, $M = 3 \rightarrow N = 9$ and a cube³, dividing each side into three parts; $d = 3$, $M = 3 \rightarrow N = 27$, the capacity dimension allows evaluating the dimension of geometrically irregular objects $\frac{I}{2\pi i}$. Let's consider the price P , with respect to $\max(Z)$ profit margin for the investor.

$$P'n(0) = I = \frac{I}{2\pi i} \int_{C_r} \frac{Pn(z) dz}{z^2} \quad (5)$$

Assuming that $d = \text{Log}(pN) / \text{Log}(pN)$, the smaller the radius, the greater the number of necessary circles or parts (n), from where $n = 1 / r$. Hence $d = \text{Log}(N) / \text{Log}(1 / z)$. Instead of counting the resulting self-similar parts (N), the number of circles $N(z)$ will be counted; where the capacity dimension is the value of $\text{Log} N(z) / \text{Log}(1 / z)$ when r tends to 0.

$$a_2 = \frac{I}{2\pi i} \int_{C_r} \frac{Pn(z) dz}{z^3} \quad (6)$$

Price skewed by COVID-19 risk

There are different ways to determine the price function:

Cover Dimension: The smallest number of sets needed to cover the object is calculated, which can overlap. If each point of the object is covered by no more than G sets then the coverage dimension is $d = G - 1$.

$$G_n(z) = z + \alpha_2 z^2 + \dots + \alpha_n z^n$$

$$G_n(z) = z + \beta_2 z^2 + \dots + \beta_n z^n$$

$$G_n = \lambda \pi_n + \mu \theta_n = z + b_2 z^2 + \dots + \beta_n z^n \quad (7)$$

Iterative Dimension: It is based on the fact that the edges of the space of dimension D have dimension $d - 1$, thus, every three-dimensional volume may be surrounded by two-dimensional planes [Mandelbrot, M., V. Jory, J., Herod, G. Passty: 1981]. To calculate it, the edges of the edges are searched until dimension 0 (point) is reached. The number of times the operation (H) is performed equals the dimension; $d = H$.

$$\text{Max}|H_n| \leq \lambda \text{Max}|H_n| + \mu \text{Max}|H_n| = D$$

$$|H_n| \leq \lambda |H_n| + \mu |H_n| \quad (7.1)$$

Underlying Dimension (embedding): describes the space that contains the fractal object.

A function $f: \mathbb{R} \rightarrow \mathbb{R}$ exhibits deterministic chaos [Mandelbrot, M: 1988] if it fulfills three properties according to:

$$R_2 - \alpha_2 + (R_3 - \alpha_3) + \dots + (R_n - \alpha_n) Z^{n-2} = 0 \quad (7.1.1)$$

Sensitivity to initial conditions: Arbitrarily close to each point x , there is a point y with $f^n(x)$ and $f^n(y)$ iterating away.

Periodic points: Arbitrarily close to each point x , there is a point y with $f^m(y) = y$ for some m .

Mix: For each pair of intervals I and J , for some k $f^k(J)$ and overlap.

$$\begin{aligned} i, j_n(z) &= p_n(z) - \theta S_n(z) \\ i, j_n(z) &= |P_n(z) - \theta S_n(z)| = |\zeta - \theta \zeta_1| < m_n \\ i, j(z) &= z + a_3 z^2 + \dots + a_p z^p \end{aligned} \quad (8)$$

For there to be an aperiodic price signal, the possibility of maximization must be represented by a Harmonic or Fourier Series [Mandelbrot, M., J. Elton, D. Hardin: 1989], it must respect the Dirichlet conditions ¹:

i) That it has a finite number of discontinuities in period T , if it is discontinuous with the rotation vertices of the circulation of shares:

$$\begin{aligned} \mathcal{M}_1^{\mu_1 \mu_2 \mu_3 \mu_4} &= \sum_V \mathcal{M}_V^{\mu_1 \mu_2 \mu_3 \mu_4} + \mathcal{M}_{V.1}^{\mu_1 \mu_2 \mu_3 \mu_4} + \\ \mathcal{M}_{V.2}^{\mu_1 \mu_2 \mu_3 \mu_4} &= 0 \end{aligned} \quad (8.1)$$

$$\mathcal{M}_{V,d}^{\mu_1 \mu_2 \mu_3 \mu_4} = \frac{g e^3}{2 c w} g_1^V \sum_{i=1}^6 \sum_d \mathfrak{F}_{V,d,i}^{\mu_1 \mu_2 \mu_3 \mu_4} \quad (8.2)$$

ii) The mean value in period T , be finite in your price escape bubbles:

$$\begin{aligned} T_{V1}^{\mu_1 \mu_2 \mu_3 \mu_4} &= \Gamma_{V^0 V^+ V}^{\mu_4 \sigma_8 \sigma_1} (-P_1 - P_2 - P_3 - \\ k - P_1 - P_2 - P_3, k) g^{\sigma_1 \sigma_2} \Gamma_{V^+ V}^{\mu_1 \sigma_2 \sigma_3} (p_1, -k, k - p_1) \end{aligned} \quad (8.2.1)$$

$$x g^{\sigma_3 \sigma_4} \Gamma_{V^+ V}^{\mu_2 \sigma_4 \sigma_5} (p_2, -k + p_1, k - p_1 - p_2) g^{\sigma_5 \sigma_6} \quad (8.2.2)$$

$$x \Gamma_{V^+ V}^{\mu_3 \sigma_6 \sigma_7} (p_3, -k + p_1 + p_2, k - p_1 - p_2 - p_3) g^{\sigma_7 \sigma_8} \quad (8.2.3)$$

$$T_{V.1,1}^{\mu_1 \mu_2 \mu_3} = \Gamma_{V^0 V^+ V}^{\mu_4 \sigma_6 \sigma_1} (-p_1 - p_2 - p_3, -k + p_1 + p_2 + p_3, k) g^{\sigma_1 \sigma_2} \Gamma_{V^+ V}^{\mu_1 \mu_2 \sigma_2 \delta_3} g^{\sigma_3} \quad (8.2.4)$$

$$x \Gamma_{V^+ V}^{\mu_3 \sigma_4 \sigma_5} (p_3, -k + p_1 + p_2, k - p_1 - p_2 - p_3) g^{\sigma_7 \sigma_8} \quad (8.2.5)$$

$$T_{V.2,1}^{\mu_1 \mu_2 \mu_3} = \Gamma_{V^0 V^+ V}^{\mu_1 \mu_4 \sigma_8 \sigma_1} g^{\sigma_1 \sigma_2} \Gamma_{V^+ V}^{\mu_2 \sigma_2 \delta_3} (p_2, -k, k - p_2) g^{\sigma_3 \sigma_4} \Gamma_{V^+ V}^{\mu_4 \sigma_4 \sigma_5} (p_3 - k + p_2, k - p_2 - p_3) \quad (8.2.6)$$

iii) Have a finite number of positive and negative maxima. The price coefficients that we are looking for are the ranges (Ex Post price - Ex Ante price) and divide them by the number of companies in the Mexican capital market.²

$$E_t(z) = \frac{z}{p_v} + \dots \frac{z}{p_n} \quad (9)$$

$$\left| \frac{f_v - z}{z^2} \right| - R_{p-2} < \varepsilon_v$$

Through this tool that allows the approach to the study of the fractal constraint to the realization of the stock market practice regarding its prices with fractal noise:

$$\Delta_{V,1} = (k^2 - m_v^2)[(k - p_1)^2 - m_v^2][(k - p_1 - p_2)^2 - m_v^2][(k - p_1 - p_2 - p_3)^2 - m_v^2] \quad (9.1)$$

$$\Delta_{V,1,1} = (k^2 - m_v^2)[(k - p_1 - p_2)^2 - m_v^2][(k - p_1 - p_2 - p_3)^2 - m_v^2] \quad (9.2)$$

$$\Delta_{V,2,1} = (k^2 - m_v^2)[(k - p_2)^2 - m_v^2][(k - p_2 - p_3)^2 - m_v^2] \quad (9.3)$$

$$\mathcal{M}_0^{\mu_1 \mu_2 \mu_3} = \sum_X \mathcal{M}_X^{\mu_1 \mu_2 \mu_3 \mu_4} + \mathcal{M}_{X.1}^{\mu_1 \mu_2 \mu_3 \mu_4} + \mathcal{M}_{X.2}^{\mu_1 \mu_2 \mu_3 \mu_4} \quad (10)$$

¹ By multiplying the above equation by $\phi_{m\omega(x)}$, integrating in the interval $[a, b]$ of the Ex Post and Ex Ante Prices, we obtain:

$$\begin{aligned} \int_{-p}^p f(x) \phi_n(x) dx &= c_0 \int_{-p}^p \phi_0(x) dx \\ &+ c_1 \int_{-p}^p \phi_1(x) \phi_m(x) dx + \dots \\ &+ c_n \int_{-p}^p \phi_n(x) \phi_m(x) dx + \dots \end{aligned}$$

Due to orthogonality, each term on the right hand side of the last equation is zero, except when $m=n$.

² We find the finite price and smooth it with the (sin) of (x-h) in F&V:

$$\ddot{x} + \alpha \dot{x} - ax + bx^3 + k(x-h) \ominus (x-h) = F \sin(\omega t)$$

$$F(x) = -\frac{\partial v}{\partial x} - ax + bx^3 - k(x-h) \ominus (x-h)$$

$$V(x) = -\frac{ax^2}{2} + \frac{bx^4}{4} + \frac{k(x-h)^2 \ominus (x-h)}{2}$$

$$F \rightarrow \in \tilde{F}, \alpha \rightarrow \in \tilde{\alpha}$$

$$x \doteq v$$

$$\dot{v} = x - x^3 - (x-h) \ominus (x-h) \in (-\tilde{\alpha} \dot{x} + F \sin(\omega t))$$

Evidence of noise:

$$I_{X,d,1}^{\mu_1\mu_2\mu_3} = \int \frac{d^4k}{(2\pi)^{-1}} \frac{T_{X,d,1}^{\mu_1\mu_2\mu_3}}{\Delta_{X,d,1}} \quad (11)$$

$$T_{X,1}^{\mu_1\mu_2\mu_3} = \Gamma_{V^0X^\dagger X}^{\mu_4}(-k + p_1 + p_2 + p_3, k) \Gamma_{\gamma X^\dagger X}^{\mu_1}(-k, k - p_1) \Gamma_{\gamma X^\dagger X}^{\mu_2}(-k - p_1, k - p_1 - p_2)$$

$$\Gamma_{\gamma X^\dagger X}^{\mu_3}(-k + p_1 + p_2, k - p_1 - p_2 - p_3) \quad (11.1)$$

$$T_{V,1,1}^{\mu_1\mu_2\mu_3} = \Gamma_{V^0X^\dagger X}^{\mu_4}(-k + p_1 + p_2 + p_3, k) \Gamma_{\gamma X^\dagger X}^{\mu_1}(-k + p_1 - p_2, k - p_1 - p_2 - p_3)$$

$$\Gamma_{X,2,1}^{\mu_1\mu_2\mu_3} = \Gamma_{V^0X^\dagger X}^{\mu_4} \Gamma_{\gamma X^\dagger X}^{\mu_2}(-k, k - p_2) \Gamma_{\gamma X^\dagger X}^{\mu_3}(-k + p_2, k - p_2 - p_3) \quad (11.2)$$

$$\mathcal{M}_{\gamma\gamma V^0}^{\mu_1\mu_2\mu_3} = \frac{i}{\pi^2} \frac{ge^3}{2c_w} \sum_{i=1} F_{V^0U_i} T_i^{\mu_1\mu_2\mu_3} \quad (12)$$

$$F_{V^0i} = F_{V^0i}^{\frac{1}{2}} + F_{V^0i}^1 + F_{V^0i}^0 \quad (13)$$

We proceed in an analogous way to the case $p = 1$, but conveniently changing the Trading Volume of each share and thus continue with the maximization of utility.

$$\begin{aligned} |f_v - P_n| &< \varepsilon'_v \\ E_t &= z + z^2 R_{p-2p} \\ \text{Max}|P_n| &< \rho_n \varepsilon'_v \end{aligned}$$

$$E_t = \text{Max}|R_p| \leq \text{Max}|P_n| + \varepsilon'_v$$

In each transaction there is a probability that the price will change and therefore leave the holding, and after a certain time horizon, there is a total change in the price. We obtained the price change (since the cumulative distribution obeys an inverse cubic law, the probability distribution function, by differentiation) and obeys an inverse (fourth-moment) quartic law [Frame, M., Neger, N : 2010].

$$\begin{aligned} \mu &< \rho_v + \varepsilon'_v \quad (14) \\ \mu &\leq \rho \\ \rho &= \lim_{n \rightarrow \infty} E_t \\ \text{Max}|\varphi| &= \lim_{p \rightarrow \infty} \text{Max}|E_{t_n}| \quad (14.1) \end{aligned}$$

This means that there is no characteristic scale for the diffusion of prices, because if it is diffusing around a medium with the bounding limit [Mandelbrot, B. B: 1983] that by itself is changing (like the economic universe in which we live), then the laws of diffusion change and, in particular, adopt a form of free scale.

Returns in the three times:

$$h_{ij}(r_{12}) = c_{ij}(r_{12}) + \sum_{n=1}^M \rho_n \int d^3 r_3 c_{in}(r_{13}) h_{nj}(r_{32}) \quad (14.1.1)$$

$$C_{ij}(r) = -\beta u_{ij}(r) + h_{ij}(r) - \ln(1 + h_{ij}(r)) + b_{ij}(r) \quad (14.1.2)$$

$$R = \begin{pmatrix} R_A & 0 \\ 0 & R_B \end{pmatrix} \quad (15)$$

Separation of fractal formation matrices:

$$X(k) = \begin{pmatrix} X_{AA}(k) & X_{ab}(k) \\ X_{BA}(k) & X_{BB}(k) \end{pmatrix} \quad (16)$$

North Bound

$$H_{AA}(k) = C_{AA}(k) R_A H_{AA}(k) + C_{AB}(k) R_B H_{BA}(k)$$

South Bound:

$$H_{AB}(k) = C_{AB}(k) + C_{AA}(k) R_A H_{AB}(k) + C_{AB}(k) R_A H_{AB}(k)$$

East Bound:

$$H_{BA}(k) = C_{BA}(k) + C_{BA}(k) R_A H_{AA}(k) + C_{BB}(k) R_B H_{BA}(k)$$

West Bound:

$$H_{BB}(k) = C_{BB}(k) + C_{BA}(k) R_A H_{AB}(k) + C_{BB}(k) R_B H_{BB}(k)$$

Price shadow effect of COVID-19

Furthermore, the exponents of the index probabilities and volatility appear to be analogous to the exponents in a critical phenomenon, in the sense that they appear to be related in interesting ways of maximizing stock market space for the holding life of the stock within the market.

$$\text{Max}|E_{t_p}| < E_{t_p} \quad (17)$$

$$\text{Max}|E_{t_n}| < E_{t_p}$$

$$\text{Max}_\Delta |\varphi| \leq \lim_{p \rightarrow \infty} E_{t_p} = \rho$$

$$|\pi_n(z) - f(z)| = |R_p(z) - Z| = |Z| |R_p(z) - I| \quad (18)$$

The algorithm of a Fractal [Mandelbrot, M., G. Turchetti: 1981] is the plot of the values of the orbit in order. That is, it is the graph of the points that maximizes all the possibilities of iteration of the prices $(0, x_0), (1, x_1), (2, x_2), \dots$ when many points are represented by the market prices, the order can be valued by drawing lines that connect successive points by their range.

$$R_p(z) \leq I + \varepsilon_n \quad (19)$$

$$x_t = T(t\psi(x_t) + (1-t)x_t), \varepsilon (0,1)$$

This is one of the most common ways to visualize the temporal patterns [Frame, M., Mandelbrot, BB: 2009] of stock prices and it is obtained first by dividing the range (maximum price / minimum price) represented vertically to be compatible with the iteration of the holding price³.

Each point of the orbit belongs to some box (or period of time- K_0), and as follows in the orbit (market trend- $K_0(n+1)$) [Mandelbrot, M., G. Turchetti: 1982], increases each point on the horizontal line and gives us an approximate measure of the amount of time in holding that spends in the orbit of each price region.

Minifractalize: Delete with logarithms the price ranges to a fractal form, decreasing its volume of operation in the market and size but keeping the purchase or sale of shares identical $((\psi - I)q \leq 0, \text{Min } \forall_x \varepsilon F \text{Min}(T)$

Dephractalize: Minimize or maximize until the externalities of financial risk are lost at a fractal price due to lack or collapse of the elements of bookkeeping within the market $K_0 = \{q\}$

Maxifractalize: Add buy and sell movements to an initial fractal form until the price and operation volume increase, keeping the stock market operation the same $K_{n+1} = (K_n \cup T(K_n) \cup \psi(K_n))$

Conclusions

All the tools used in this article have a single purpose: to detect and measure price trends to establish and manage buying and selling operations within a certain BMV market, so we use geographic systems (with their respective degrees), together with the shares that are in the holding.

All real complex systems generally exhibit scale invariance, that is, their behavior does not change due to rescaling [Mandelbrot, M: 1975] of the variables that govern their market price dynamics $K = \overline{U_n K_n}$

$$||x_t - p|| = T(t\psi(x_t) + (1-t)x_t) - T_p||$$

The stochastic price path becomes unstable, this is where multifractals outperform the informal Euclidean representation [Frame, M., Neger, N: 2008]. While with the Euclidean premise it is not possible to answer many questions about price prospecting phenomena and its positive or negative recursion is possible to represent an infinite number of irregular, non-linear shapes [Mandelbrot, M: 1981], being suitable to represent prices about the shares $\leq t(\psi(x_t) - \psi(p)) + (1-t)(x_t - p) + t(\psi(p) - p) \leq t_p + (1-t)||x_t - p|| + t(\psi(p) - p) ||x_t - p|| \leq \frac{1}{1-p} ||(\psi(p) - p)||$

Limiting the limit in k (0) - COVID19 Ex Post:

$$\lim_{k \rightarrow \infty} (\psi(q) - q, J(x_{n_k} - q)) = \Gamma$$

$$\Phi(||x_{n_k} - \bar{x}||) \leq \Phi(||t_{n_k}(\psi(x_{n_k}) - \psi(\bar{x})) + (1-t_{n_k})(x_{n_k} - \bar{x}) + t_{n_k}(\psi(\bar{x}) - (\bar{x}))||)$$

$$\leq \Phi(||t_{n_k}(\psi(x_{n_k}) - \psi(\bar{x})) + (1-t_{n_k})(x_{n_k} - \bar{x}) + t_{n_k}\delta_k + t_{n_k}(\psi(\bar{x}) - (\bar{x}))||)$$

$$\leq (1 - (1-p)t_{n_k})\Phi(||x_{n_k} - \bar{x}||) + t_{n_k}\delta_k + t_{n_k}(\psi(\bar{x}) - (\bar{x}))$$

Regarding the narrowing of its limits in the price range, we obtain:

³ If we get all the ranges of stock prices.

$$\int_{-p}^p f(x) \cos \frac{m\pi}{p} x dx = \frac{a_0}{2} \int_{-p}^p \cos \frac{m\pi}{p} x dx$$

$$\sum_{n=1}^{\omega} (a_n \int_{-p}^p \cos \frac{m\pi}{p} x \cos \frac{m\pi}{p} x dx + b_n \int_{-p}^p \cos \frac{m\pi}{p} x \sin \frac{m\pi}{p} x dx)$$

$$\lim_{k \rightarrow \infty} \Phi \left(\left| x_{n_k} - \bar{x} \right| \right) \leq \limsup_{k \rightarrow \infty} (\delta_k + (\psi(\bar{x}) - (\bar{x}), J_\phi(x_{n_k} - \bar{x})))$$

Representation of finite recursion to the Brownian equilibrium [Mandelbrot, B. B: 1967] of stock market operation:

$$n \geq 0$$

$$\left| \psi \Phi(x_n) - x_n \right| \leq (1 + p) - \left| x_n - x_0 \right| + \psi(x_0) - x_0$$

$$\left| x_n - T x_n \right| \leq \left| x_{n+1} - x_n \right| + \alpha_n \left| \psi(x_n) - x_n \right|$$

Representation of finite recursion outside the trading margin without risk COVID-19:

$$n \geq 1$$

$$\left| x_{n+1} - x_n \right| \leq (1 - (1 - p)\alpha_n) \left| x_n - x_{n-1} \right| + |\alpha_n - \alpha_{n-1}| \left| \psi(x_{n-1}) - x_{n-1} \right|$$

$$\left| \psi(x_n) - x_n \right| \leq \left| \psi(x_n) - \psi(x_0) - x_0 \right| + \left| x_0 - x_n \right|$$

$$\begin{aligned} \left| x_n - T x_n \right| &\leq \left| x_{n+1} - x_n \right| + \left| x_{n+1} - T x_n \right| \\ &\leq \left| x_{n+1} - x_n \right| + \left| \alpha_n \psi(x_n) - T x_n \right| \\ &= \left| x_{n+1} - x_n \right| + \alpha_n \left| \psi(x_n) - x_n \right| - T(\alpha_{n-1} \psi(x_n)) \end{aligned}$$

The path of total recursion would be simulated in the Mexican capital market considering the temporality of the COVID-19 risk in Mexico, considered as an important element of current public policy.

References

Mandelbrot B. Rank-size plots, Zipf's law, and scaling.

Mandelbrot B. Global (long-term) dependence in Economics and finance (long _foreword and excerpts from M 1969e, M 1971n, and M 1972c).

Mandelbrot B. (1963). New methods in statistical economics. The Journal of Political Economy, 71, 421-440.

Mandelbrot B. Part IV: The 1963 Model of Price Change. The Journal of Business, 36, 1963, 394-419 & 45, 1972, 542-3 Econometrica, 31, 1963, 757-758. Current Contents, 14, 1982, 20.

Mandelbrot B. (1966) Nonlinear forecasts, rational bubbles, and martingales, Journal of Business: 39, 242-255.

Mandelbrot B. The variation of the prices of cotton, wheat, and railroad stocks, and of some financial rates (1967), The Journal of Business 40, 393-413.

Mandelbrot B. y Wallis J. (1968). Noah, Joseph and Operational Hydrology, Water Resources Research, 4(5).

Mandelbrot B. (1968). Fractional Brownian motions, fractional noises and applications (M & Van Ness 1968). SIAM Review, 10, 422-437.

Mandelbrot B. (1969). Computer experiments with fractional Gaussian noises. Part 1: Sample graphs, averages and variances (M & Wallis 1969a). Water Resources Research 5, 228-241.

Mandelbrot B. M & Wallis. (1969). Computer experiments with fractional Gaussian noises. Part 2: Rescaled bridge range and "pox diagrams" (M & Wallis 1969a). Water Resources Research, 5, 228-241.

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General explanation of the subject and explain why it is important.

What is your added value with respect to other techniques?

Clearly focus each of its features

Clearly explain the problem to be solved and the central hypothesis.

Explanation of sections Article.

Development of headings and subheadings of the article with subsequent numbers

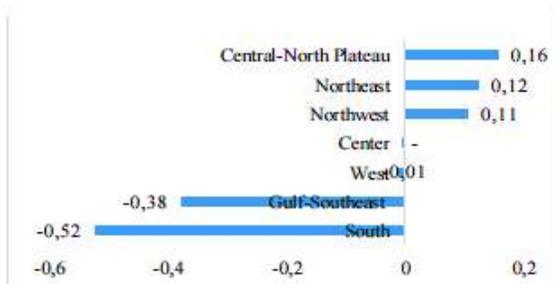
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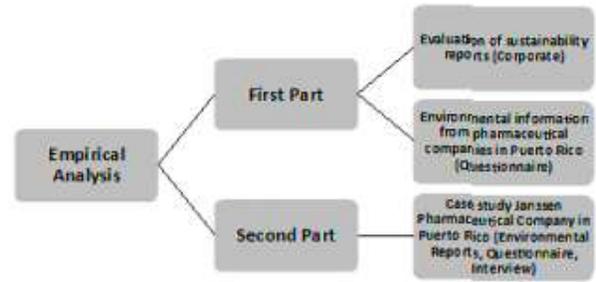


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Modality	Activities of the Value Chain
Financial cooperation	The need for financial resources and the difficulty in finding financing
Technological cooperation	The rapidity in the development of the technology and its complexity
Cooperation in production	The fundamental search for acquiring scale and within-reach economies that permit the reduction of production-associated costs and risks
Commercial cooperation	Seek the following objectives: reduce costs and risks in the commercialization process, penetrate new markets, complete the gamma of products offered, procure access to distribution channels, etc.

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$$Y_{ij} = \alpha + \sum_{h=1}^r \beta_h X_{hij} + u_j + e_{ij}$$

(1)

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Develop give the meaning of the variables in linear writing and important is the comparison of the used criteria.

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The results shall be by section of the article.

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Explain clearly the results and possibilities of improvement.

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