ABSTRACT

Matlatzinca Interpretative Path and Food Landscape (MIP) is a landscape project implemented in Matlatzinca Valley, Mexico. This project is built in partnership with local inhabitants of the town who participated in planning workshops and expressed interest in improving the connection between cultural preservation and their daily life. The main objective is to provide a plan that can help the preservation of endemic food and culture of the Matlatzincas, while also protecting the environment and providing a source of income for the local population. In addition, it offers a full-package experience for visitors that includes: a tour, traditional food, lodging in a traditional cabin, and the opportunity to interact with local Matlatzincas.

Matlatzinca Interpretative Path and Food Landscape (MIP) Social Touristic Project

By Luis A. López-Mathamba, Luis M. Peña-Lévano, Dr. Humberto Thome-Ortiz, and Dr. Cesar Escalante

Introduction

Thousands of years ago, many cultures flourished and grew across Latin America, becoming the basis of many important cities and nations. Nevertheless, only a few of them have survived until now. This is the case of the Matlatzincas, a powerful ancient nation that lived around 3000 BC and formed the basis for the culture and economy of the current state of México. Many Matlatzincas are currently settled in a small town in México called San Francisco Oxtotilpan (SFO) in a region located next to the Toluca volcano (Borboa, 1999; CDI, 2009; and Granados-Flores & Ramírez, 2011).

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Despite being conquered by Spain and other pre-Spanish empires (e.g., the Aztecas), the Matlatzincas were able to keep their traditions, which are now considered as a valuable national patrimony. In addition, they have preserved their native agricultural practices and the endemic forest and plantations (CDI, 2009). Thus, SFO's landscape presents a unique variety of traditional foods and plants that are not found in any other place in the world.

However, several sociocultural developments have evolved in recent decades, partially changing their traditions. The modern Matlatzincas face several challenges: (i) fewer people are interested in speaking the native language, (ii) they face challenges in selling their endemic food products, mainly because they are relatively unknown to the market, (iii) the preservation cost of traditional houses of the ancestral Matlatzincas is high, and (iv) soil erosion decrease land productivity; among many others. These reasons suggest the need for a program that can help to preserve their cultural tradition and promote their local food and tourism in a manner that is economically beneficial to their population and environmentally-friendly at the same time (López-Mathamba, 2015).

Landscapes

A landscape, in socioeconomic terms, is a unit of area that possesses a unique "organic quality" (i.e., vegetation, culture, fauna, etc.) defined in a determined area, with physical and cultural relations with other landscapes (Sauer, 2006). Thus, landscapes are considered a primary source of rural tourism for many towns. Additionally, they interplay with different agricultural activities as well as with the native population tradition (Naveh, 1998; García, 2004).

Interpretative and food landscapes are two prominent examples of a landscape. The first one is an organized plan that intends to facilitate visitors' access to the natural culture and environment, and provides them with recreational and educational services. Likewise, food landscapes promote the development of endemic foods while being environmentally sustainable. Both then also become sources of income for the population through tourism and sale of local food (López-Mathamba, 2015).

The Matlatzincas

The descendants of the Matlatzincas inhabit SFO, a small town located next to the Toluca volcano which also possesses natural forest cover and cropland. Their main activity is agriculture and is mainly developed by men. Women traditionally take care of the home and children, although they support their husbands at the seeding and harvesting period. The main crop is maize for self-alimentation. They also grow other endemic traditional crops (i.e. beans, barley, etc.) and collect fungi from the forest. In addition, they have developed beneficial drinks such as "pulque", which is rich in probiotics (INAH, 1982; Lopez-Mathamba, 2015).

Objective

Our current study, called Matlatzinca Interpretative Path and Food Landscape (MIP) is a landscape project implemented in Matlatzinca Valley, México.[1] This project is built in partnership with collaborators from three universities: Universidad Autónoma del Estado de México (UAEM), Purdue University, and the University of Georgia (UGA). Our main objective is to provide a plan that can help the preservation of endemic food and culture of the Matlatzincas while also protecting the environment and providing a source of income for the local population. In addition, it offers a full-package

experience for the visitors that includes: a tour, traditional food, lodging in a traditional cabin, and the opportunity to interact with local Matlatzincas.

This study produces two important contributions: (i) it updates the information about Matlatzinca culture, botanic diversity, and native food products, and (ii) it also proposes and implements a beneficial project for the habitants of SFO by creating an interpretative landscape from which they profit through agriculture and tourism while at the same time preserving their traditions and culture.

This article focuses on an agritourism project for a cultural unit outside the US and provides an important blueprint for a more effective and wholistic implementation of an agritourism business venture, especially in the US. The Agricultural Marketing Resource Center cited the role of agritourism in providing income diversification and enhancement benefits to US farms, especially to smaller farms. Data from the 2007 and 2012 US Censuses of Agriculture show the industry's impressive growth between those years (USDA-NASS, 2007, 2012). In 2007 the industry generated $546 million gross revenues attributed to 10,249 farms while in 2012 the revenues and the number of involved firms increased $674 million and 13,334 farms. The US agritourism industry continues to grow and become an important income source for many farms, especially smaller ones. This article can provide insights on strategies to effectively blend the preservation of cultural and social traits of communities with an economic agenda, in order to improve the survival and overall viability of small farm businesses and their communities.

MIP and the Interest of the Community and Institutions

The local community was previously looking for strategies to preserve its tradition and started a project to build touristic cabins called Cultural Center Matlatzinca (CCM). However, CCM didn't include interpretative or food landscapes, specific plans for cultural or environmental preservation, or a strategy to attract tourists. For these reasons, the inhabitants were very interested in collaborating with to develop the MIP proposal.

Our team consists of environmental and agricultural economists, agroindustry engineers, and tourism specialists from UAEM, Purdue University, and UGA (figure 1). We present MIP as a project for the Matlatzincas to promote tourism, transfer knowledge to future generations, and advertise their local food while (i) preserving the local cultural aspects and traditions and (ii) being economically profitable and environmentally sustainable. This is done to improve the integration of tourism and environmental conservation in México. It also promotes the local food industry of Matlatzinca while developing an inventory of the region's beneficial indigenous plants and fungi.

Thus, MIP is a proposal of our team together with the local inhabitants, who participated in the planning workshops and expressed interest in improving the connection between cultural preservation and their daily life. Likewise, this project is based on the empirical scientific evidence presented in the 2015 study of Luis López-Mathamba and Thomé. It includes the rules and suggestions for the implementation of the MIP, encompassing the monitoring, maintenance, and the

principles to produce positive environmental impacts. It also recommends guidelines for the conservation of the nature paths and sustainable agriculture. Likewise, due to its cultural and environmental importance for rural communities in México, the project has attracted interest from different institutions. Thus, the materials for the touristic cabins have been financed by the Mexican National Commission for the Development of Native Population, an institution committed to the preservation of native culture. This project is also looking to enjoin the efforts of the Ministry of Tourism and Development of México to promote and advertise the Matlatzinca culture, food and tourism; as well as faculty members in other universities with expertise in such areas as hydrology and civil engineering to enhance the analysis of the study.

Lopez-Mathamba (2015) Research

The MIP research is based on the scientific study of Luis López-Mathamba and Dr. Thomé, which has been accepted in the Autonomous University of State of México (UAEM). MIP is presented as a proposal for the Matlatzincas to preserve their culture, promote tourism, advertise their local food and conserve the environment. This collaborative proposal is attractive because it does not only preserve the ecosystem but also generates income and employment for the locals, and it can help them with their rural development. Interpretative paths for tourist and food landscape were designed to provide guidelines to avoid damages to the natural ecosystems while (i) allowing the preservation of existing trails and (ii) controlling soil erosion by using hedgerow plants that boost the agricultural production. It also promotes the local food industry in Matlatzinca while developing an inventory of the endemic plants and fungi, including their benefits. The local food system then was evaluated through an ethnobotanical index to calculate its cultural importance. The rules and proposed implementation of MIP – including monitoring, maintenance, and the principles to produce positive environmental impacts – are included in the proposal. MIP also incorporates the Leopold Matrix (to measure environmental impact) and guidelines for the conservation of the nature paths and forest management.

Data and Development of MIP

In order to successfully implement this project, prerequisite conditions were to (i) gather enough information about the Matlatzincas cultural aspects including an inventory of local plans and fungi; and (ii) provide enough orientation and training to the inhabitants so they can effectively use the MIP plan. The development of MIP followed a process with five main steps:

(1) Data collection;
(2) Inventory and cost calculation of the tour paths;
(3) Development of the proposal;
(4) Implementation of the project; and
(5) Follow-ups and evaluation/improvement of the plan.

The schedule of the activities for the extension and the research programs are listed in table 1.

Data Collection

The database was collected by Luis López-Mathamba, in collaboration with the local inhabitants of SFO under the guidance of Dr. Thomé. The interviews and meetings with the locals were generally conducted on Saturdays during participative planning workshops from 2013-2014 (Table 1). The initial target population was 15

people who were local permanent residents, older than 35 years old, and who seek to preserve ancestral traditions (i.e., language, typical customs, and food recipes). The data record quantitative and qualitative information from the Matlanzincas in the following aspects: alimentation, ethnobotanical and ethno-fungi information, details of the rural geography, current erosion, and possible side-effects of increasing tourism demand (i.e., damages in soil erosion and supply shortage due to increased demand for native products, among others).

Several methods were used to gather this data: ethnographic methods, surveys, interview to the inhabitants, and identification of the ethnic flora and fauna. This information is valuable because it represents the intellectual capital of the region. Likewise, we surveyed potential tourists in order to evaluate their willingness to pay and the services to offer.

Inventory and Cost Calculation

(1) *Inventory*: We collected samples of the plants and fungi according to the information provided by the locals. The inhabitants also participated and helped with field work (figure 2).

(2) *Cost analysis*: We gathered the information of the unitary cost of every ingredient on the list of food recipes, quantity of material and labor wages required to build the cabins, and the wages for the potential tourist guides. With these values, we were able to calculate the costs of the food recipes, cabins, and the tour package. There are two options for the tour package: "agricultural land" path (i.e., cropland and agricultural production area covering a distance of 3.5 kilometers over 1.5 hours); and the "mountain" path (i.e., through the forest and mountains for a distance of about 8.3 kilometers over 3.5 hours).

Supply and demand analysis – In order to determine the potential optimal number of tourist customers, we estimated the potential supply and demand. For the supply determination we used the maximum capacity sustainable formulation for each tour path proposed by Lopez-Mathamba (2015), which considers the distance of the tour, number of visits per person, minimum space required per visitor and between groups, erosion factor, accessibility level (i.e., slope and difficulty in walking through some places of the path), precipitation, and other climate factors. The estimation was 20,040 visitors/year or 1,336 groups/year, using 8 and 4 groups of 15 visitors per day for the agricultural land and mountain path, respectively. The potential demand was determined through surveys according to the willingness to pay above the breakeven point. Thus, the price was determined using an inverse linear demand function.

Development of the Proposal

Using the information collected, we developed:

(1) *The food landscape*, which recorded the endemic plants and fungi consumed by the locals. It also includes the cultural impact of each food as well as the recipes to prepare the plates. In addition, the ethnobotanics and ethno-fungi reports describe the benefits of each food.

(2) *The interpretative path*, which determines the tools that the community will use to promote the tourism and generate economic income/employment while being environmentally sustainable. Among these tools are building of the traditional residences, creation of the tours, testing endemic plates, preparation of the touristic activities, writing of educational pamphlets, procedures to receive and host the potential tourists, and elaboration of the local food menu. We met with the local people in interactive planning workshops to gather constant

feedback on our progress. Reports were provided in each workshop.

Additionally, the interpretative path also included the guidelines for environmental conservation (e.g., implementation of hedgerows to avoid soil erosion and forest management) and food sustainability (e.g., appropriate harvesting of endemic plants and funguses, analysis of the seasonality of the plants, storage, etc.). It also classified the ecological habitats (i.e., ecotopes) depending on the slope, type of soils, production (forest or agricultural production), and elevation, among others.

(3) *The estimated accounting cost calculation*. This document displays the average annual investment that should be generated from tourism activities in order to breakeven and the potential annual profits depending on a target (30%) profit margin and potential first year demand. The complete documentation and description of the costs can be found in Lopez-Mathamba and Thomé (2015). The accounting cost of MIP (Table 2) was calculated at $527,975. Table 3 shows a target population estimated at 177,257 annually, with a standard price of $250/person/visit (i.e., considered $300/person/visit when the food is included in the total tour cost, which is calculated externally).

Implementation of the Program

We implemented the interpretative landscape path through a training program that consisted of workshops and seminars. We provided reports of the potential earnings, descriptions of the plan while also teaching them the techniques and tools to promote tourism and remain environmentally friendly. The tourist guides were also prepared at this step. We also participated in their activities and offered constant monitoring and guidance.

In order to analyze the effectiveness of the guidelines, we brought visitors to test the tour by using Social Laboratories of Rural Tourism (SLRT) tool developed by Dr. Thomé (2014). The SLRT uses potential focus groups of 10-15 people to test the quality of the attractions and provide recommendations for future improvements. The main attractions successfully evaluated were: Cerro Blanco Mountain, Toluca volcano, baths in temazcales (i.e., saunas with natural herbs), educational walks to show the forest, flora and fauna, and food prepared by the locals.

Follow-ups and Evaluation of the Implementation of the Plan

In order to evaluate the effectiveness of the extension program, we have monitored their agricultural and tourism activities, profits, quantity of tourists, and surveys that record the tourists' satisfaction. We also have organized bimestrial meetings to observe the progress of the joint project's implementation. Likewise, we analyze if the results are undertaken as expected, or if we need to make adjustments.

We expect to continue to monitor progress for the first two years to evaluate the project's progress, paying attention to the expansion potential, environmental impacts, cultural transmission, and the ensuing economic development impact, among others. We also expect to provide further suggestions with respect to techniques to make it more environmental friendly, such as providing suggestions for recycling methods and techniques to minimize climate change impacts. Likewise, according to the bimestrial results we are offering suggestions on improving agricultural techniques (e.g., harvesting methods, soil treatment), tourist services, and preservation of the local food (e.g., rotation of plants),

among others. In the meetings we also ask if they have any comments to enhance the project.

In addition, we will evaluate the first two years of the program in order to observe the financial and economic impacts. We will then extend and extrapolate the benefit-cost analysis for the next 18 years with the goal of expanding the project and obtaining financial support from governmental programs (table 4 shows the 20-year plan, including the first two years of operation). According to our results, the project is highly profitable because our target is below the maximum supply capacity and the potential demand. Thus, we expect to expand the project doubling the number of tourists at the end of year 5.

Sensitivity Analysis

We also consider sensitivity analysis to observe the robustness of our project. Among the variables that are accounted for in the financial sensitivity analysis are changes in tourist demand, profit margins, visitors, ticket prices, and equipment. We use Monte Carlo simulation for the analysis. A total of 10,000 simulations were run for the analysis. The variables were assumed to follow a normal distribution with a standard deviation equivalent of five to ten percent of the mean depending on the variable.

According to the variation of the variables in the simulations, there must be 1,261 and 2,492 annual visitors to cover the annual costs of the tour expenses. The expected distribution of visitors to break even is skewed to the right. This distribution is much lower than the potential demand, which shows the robustness of the project. Likewise, a 30 percent profit margin requires an average of 2,227 visitors per year (with a confidence interval between 1,640 and 3,240 visitors per year). In terms of groups, 15 people per group, between 110 and 216 groups per year (i.e., a mean of 149 groups per year) would be required. This is equivalent to 2 to 4.4 groups per week (with an average of 3 groups per year) to cover the tour cost and administrative expenses and earn a 30 percent profit margin.

With respect to the projected 20-year plan (figures 3-5), considering that the variation of prices and costs do not exceed 20 percent of deviation (and a normal distribution), the project is expected to have positive net present value (NPV) of about $MX 700 thousand pesos (with a NPV in a range of $MX 550 – 698 thousand at a 90% confidence interval), which shows that the project is safe and robust with a high confidence of providing a positive NPV.

Likewise, the internal rate of return (IRR) of the project (148%) is significantly higher than the 30 percent expected return that was proposed by the local participants. This means that, even increasing the discount rate, the project is likely to provide positive returns. In addition, the benefit-cost ratio shows that is likely to earn $MX 5.6-6.0 for each peso invested (an average of $MX5.84 earned/$MX invested).

Thus, all the basic financial indicators show that, under the circumstances and variations described, the project during a 20-year period can generate positive returns for the local inhabitants and shows as a good option in which to invest and even expand, i.e., double the quantity of touristic cabins in the fifth year of project implementation. The revenues could even increase more if governmental institutions provide financial support for the expansion of the project.

Summary and Conclusions

This proposed extension program offers an important, significant benefit of upholding, enhancing, and aiding in the rural development of an endemic community, which is the last group of direct descendants of the Matlatzincas that represent an important cultural legacy. It helps to preserve the food and interpretative landscapes of the endemic town while also being environmentally sustainable and generating a source of income and employment for their inhabitants.

Thus, this project has laid out a blueprint for overcoming important challenges that the Matlatzincas were facing. With the touristic plan:

(i) indigenous food products can be sold;
(ii) people are motivated to keep their traditions while generating income at the same time;
(iii) additional money can be spent in preserving the traditional houses that are among the attractions; and
(iv) they reduce the problem of soil erosion.

This article offers some useful insights on agritourism business implementation strategies that may be useful to small farms in the US. As the agritourism industry has flourished in recent years in the US (USDA-NASS, 2007, 2012), the effect on business survival and viability of smaller farms cannot be understated. The USDA census data reflect that a number of smaller farms with gross receipts of less than $25,000 have now migrated to the next higher revenue class that has grown from 3,637 farms to 4,518 between 2007 and 2012 (USDA-NASS, 2007, 2012). The income diversification and revenue enhancement effects of agritourism could have been one of the important drivers of growth for those expanding small farms.

All told, more than just marveling at favorable growth rates and positive changes brought about by an expanding agritourism industry, this article has clearly demonstrated that the implementation of agritourism projects needs to carefully consider social and cultural issues. After all, a truly satisfying business endeavor is one that is not just fixated on profit generation, but also able to strike a balance between economic and non-economic goals.

Endnote

1 In México the project is called Sendero Interpretativo del Paisaje Alimentario Matlatzinca [SIPAM].

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Figure 1. Organization of the team

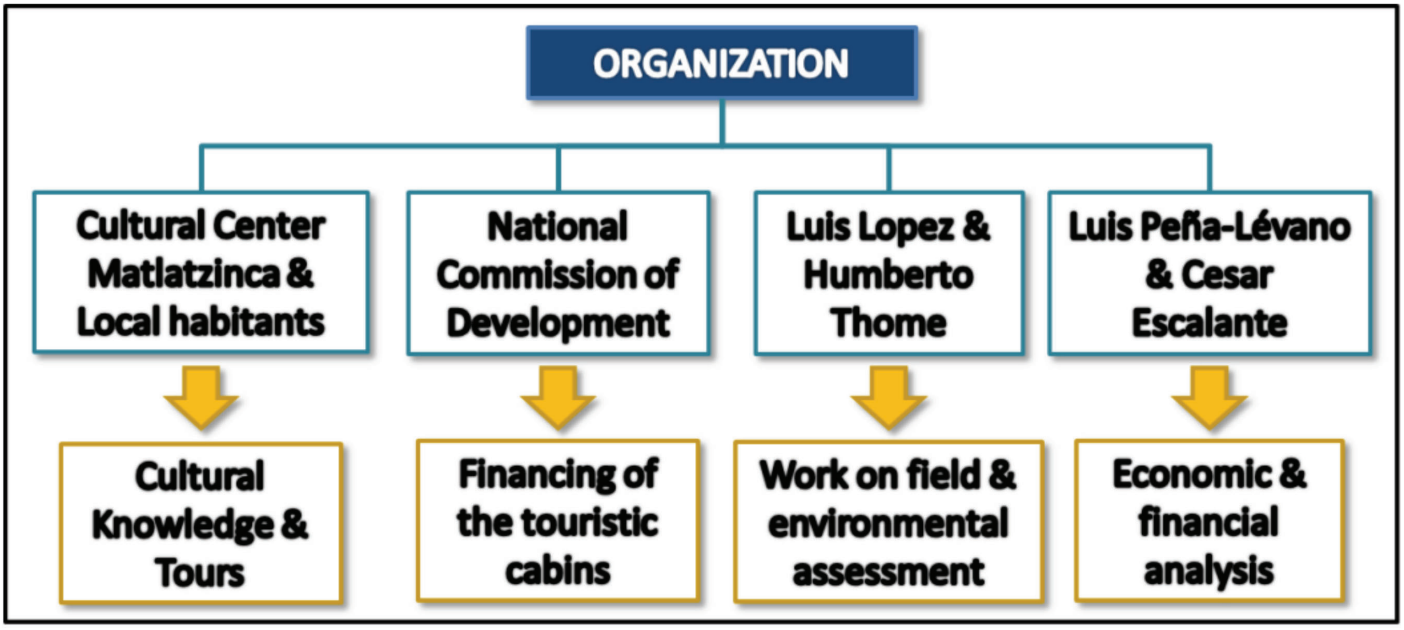


Figure 2. Work field on sample collection for inventory

Figure 3. Sensitivity analysis on VAN (30%)

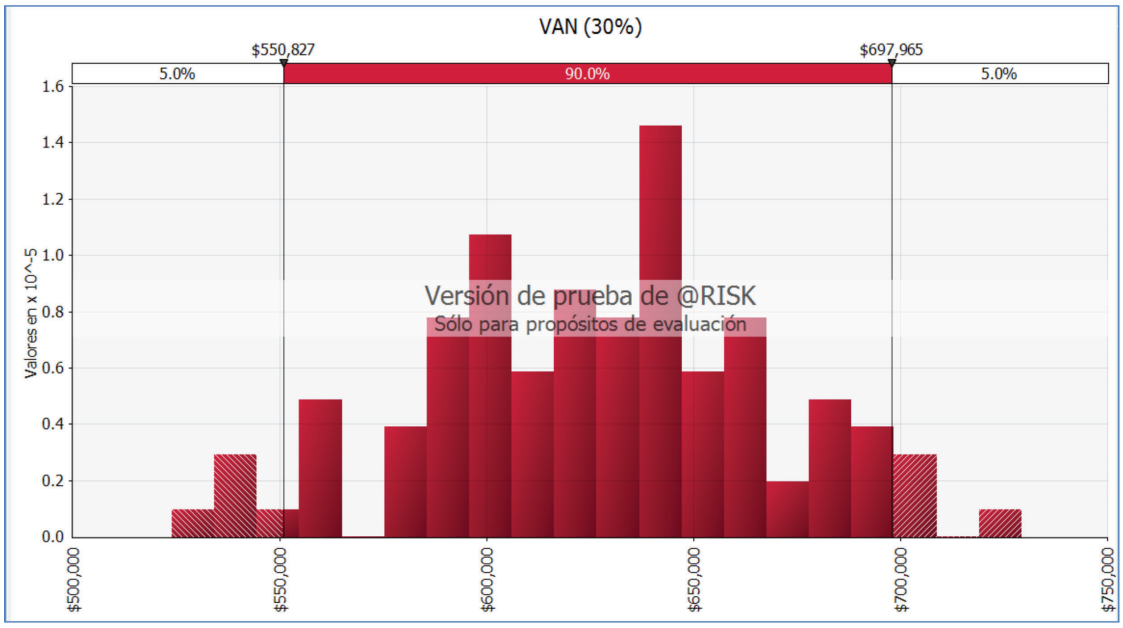
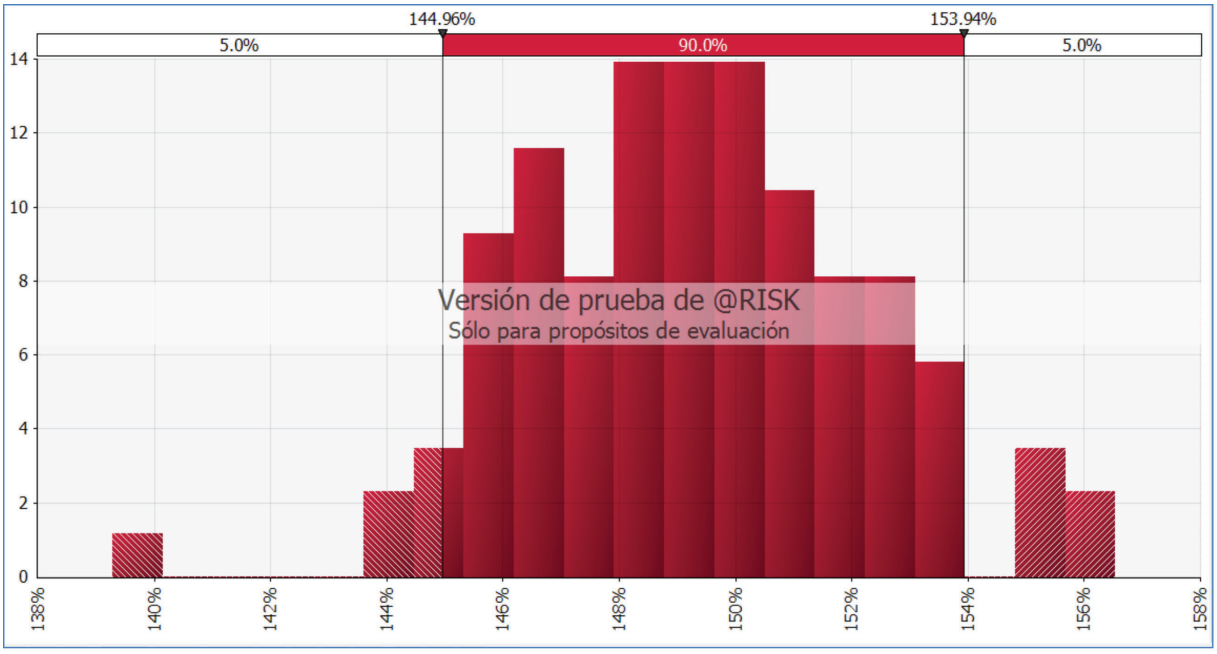


Figure 4. Sensitivity analysis on Internal Rate of Return (IRR)



Figures 1-3 were made using @Risk software through 10,000 simulations varying prices, input cost and projected demand.

Figure 5. Sensitivity analysis on Benefit-Cost analysis

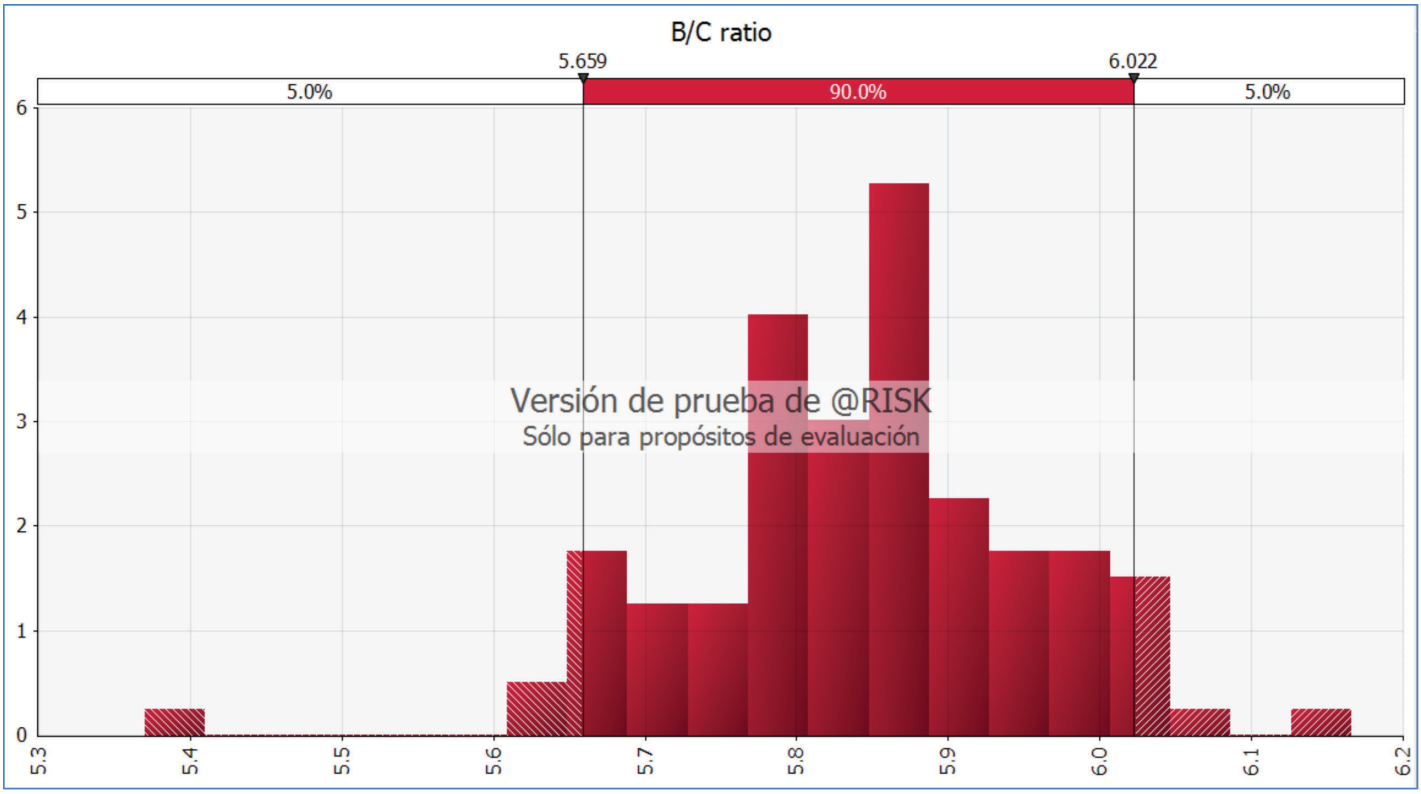


Table 1. Set of activities per quarter (2013-2016) for the extension and research program

Activity	2013		2014				2015				2016			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Elaboration of the food landscape														
Construction of the landscape and borders definition														
Definition of plants and analysis of their distribution														
Visits to San Francisco Oxtotilpan														
Work field on ethnobotanic and ethno-fungi collection														
Planning of the food landscape and the interpretative path														
Administration and rules of use of the paths														
Cost calculation to breakeven and potential annual profits														
Design of the food landscape and the interpretative path														
Design and elaboration of the path														
Connection of the interpretative path with local food														
Analysis of the environmental impacts														
Operation of the food landscapte and the interpretative path														
Workshops and participative planning														
Social Laboratory of Rural tourism														
Diagnostic of the region and geographic delimitation														
Inventory of attractions														
Follow-up of SIPAM and long-term proposal														
Monitoring and conservation of the path														
Evaluation of tourist surveys														
Benefit-Cost Analysis cost for the next 20 years														
Meetings of the goals achieved with the locals														
Implementation of the improvements														

Note: Green color squares mean the step is completed. Yellow is on process of being completed. Each square represents a quarter of a year

Table 2. Cost of the MIP project (in $ Mexican Pesos)

Description	Quantity	Cost/unit	
Installation cost of the project			**110350.00**
- Workshop for the tourist guides	15	5600	84000.00
- Workshop in First Aid	31	850	26350.00
Building			**19200.00**
- Ecologic bath and installation	3	2400	7200.00
- Screen/partition	6	2000	12000.00
Administrative costs			**274147.60**
- Water	12	100	1200.00
- Electricity	12	300	3600.00
- Tourist guide	3	23142	69426.00
- Maintenance and cleaning	3	23142	69426.00
- Secretary	1	36783.6	36783.60
- Treasurer	1	31929	31929.00
- Administrator	1	36783	36783.00
- Insurance for the visitors	1	25000	25000.00
Office equipment			**80597.40**
- Computer	1	5999	5999.00
- Printer	1	1000	1000.00
- Desk	2	1000	2000.00
- Chairs	6	300	1800.00
- Radios	14	4985.6	69798.40
Advertisement			**15000.00**
- Internet service	12	350	4200.00
- Web page (ellaboration)	1	4300	4300.00
- Maintenance of the web page	1	1500	1500.00
- Tryptych	10000	0.5	5000.00
Depreciation cost			**28679.48**
Total expenses			**527974.48**

Table 3. Calculation of the tour cost and breakeven analysis (in $ Mexican pesos)

Calculation for the tour cost		
- Total expenses		527974.48
- Building		19200.00
- Office equipment		80597.40
Variable/recovery cost		428177.08
- Profit margin	30%	128453.12
- Total tour cost		556630.20
Target population		**177257**
Proposed price per tourist		**250.00**
Required visitors		
- For Breakeven		1712.71
- For Breakeven and Profit margin		2226.52
- Groups per year		148.43
Groups per week		**2.97**

Table 4. Projected cash flow of the 20-year financial plan (in $ Mexican Pesos)

Description	**Year 0**	**Years 1-4**	**Years 5**	**Years 6-20**
Installation cost of the project	$ (110,350)		$ (110,350)	
Building and installation	$ (19,200)		$ (19,200)	
Annual expenses		$ (369,745)	$ (608,994)	$ (608,994)
Annual depreciation		$ (28,679)	$ (57,359)	$ (57,359)
Annual Revenue		$ 556,630	$ 1,113,260	$ 1,113,260
Gross Profit		$ 158,206	$ 316,411	$ 316,411
Net Cash Flow	$ (129,550)	$ 186,885	$ 373,770	$ 373,770
VAN (30%)	**$ 704,957.37**			
TIR	**1.48**			
B/C ratio	**6.44**			

Note: This cash flow includes the first two years (2015-2016) and the projected 18-years