ZAPOTEC COMMUNITY ACTIONS
BUILDING HEALTHY WATERSHEDS AND
SUSTAINABLE LIVELIHOODS IN OAXACA,
MEXICO

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ABSTRACT

Watershed management in poor countries has been a top-bottom process. It is usually imposed without input from either local inhabitants or interest groups. By contrast, the Global Environmental Management Education Center’s (GEM) Local Capacity Building for Healthy Watersheds Model is a community-based, citizen-empowering, participatory approach. Under a GEM grant from the U.S. Agency for International Development (USAID) via its Training, Internships, Exchanges and Scholarships (TIES) program, this GEM model was used to help indigenous Zapotec communities in the Sierra Norte of Oaxaca, Mexico build capacity in water monitoring and microenterprise development for sustainable livelihoods and healthy watersheds.

This work featured two sections: Phase I Assessment and Phase II Implementation. The assessment of priority community needs and training to establish water quality and quantity monitoring for characterizing the upper reaches of the Rio Grande watershed was completed in Phase I activities during 2005-2007. Training workshops to plan and implement solutions to community priority needs were conducted in 2007-2008 by the GEM Phase II team. The purpose of this thesis research is to describe the implementation activities of this GEM TIES project and to evaluate the adoption of the GEM capacity building model in participating communities. Training of trainers and citizens through a participatory process as well as small microenterprise pilot projects are featured. Records of training workshop participation and post-workshop survey of participants are used as indicators of adoption of the GEM model and evaluating corresponding success.
It is expected that communities will initiate new regional watershed management plans that will incorporate the principle of inclusion of local stakeholders in decision-making and action. In addition to conducting Phase II training workshops for 856 participants, the GEM TIES project Phase II team produced seven “How to” manuals and five business plans for grant applications by Zapotec entrepreneurs and cooperatives. The GEM model represents a process that was embraced and launched successfully in the region.

While much work remains to complete all components of the model in an adaptive approach through future efforts by the watershed inhabitants, local capacity and a local network were developed to start the planning process. By empowering local citizens in sound and appropriate microenterprise ventures that represent economic opportunity using natural resources in a sustainable and culturally acceptable way, the applied research and training conducted through this Masters degree study responded to local priorities identified by the Zapotec communities. Over the long term, the capacity building achieved holds promise for healthy watersheds and sustainable livelihoods in the Sierra Norte.
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Chapter 1. INTRODUCTION

1.1. Justification and Background

Fresh and sufficient drinking water is a critical challenge in impoverished Oaxaca, a southern state of Mexico rich in cultural diversity and biodiversity. Clean water and sustainable livelihoods for indigenous Zapotec communities in the Sierra Norte region is the focus of an international project of the Global Environmental Management Education Center (GEM) at the University of Wisconsin-Stevens Point (UWSP) and Mexican institutional partners. Concurrently, citizen and professional capacity building of Mexican nationals is another product of this GEM project for long-term, sustained action to promote and maintain the health of the Upper Rio Grande Watershed and income generation for the indigenous communities. The United States Agency for International Development (USAID) supports this effort via its Training, Internships, Exchanges and Scholarships (TIES) Program to build human resource capital in Mexican nationals while addressing critical priority areas identified jointly by USA and Mexico.

The purpose of this partnership project is capacity building for healthy watersheds and sustainable livelihoods in the Sierra Norte region of Oaxaca. The four-year project, which is currently in its fourth and final year, is organized in two integrated phases. The first phase was assessment of the watershed, including baseline water quality monitoring and community-based priorities for improved watershed health and income-generating opportunities. The second phase is implementation of community-led actions contributing to safe and clean drinking water and increased job opportunities in this
impoverished region. A GEM-developed local capacity building model for healthy watersheds provides the framework for strong local, participatory action.

International cooperation as an effort to solve social inequalities has been a common approach traditionally as a full interventionist act by external consultants, donors, and others. The recipients of these well-meaning actions ultimately are often limited to passive roles. In this passive context such external technical assistance programs may be more likely to result in disappointment or failure after the short-term cooperative project is completed and departed from the area. In such cases, little to no local capacity was built in the local human resource base to help define, design, implement and sustain citizen-led initiatives in their local communities according to their shared vision.

The common assumption is that people limited by and suffering from social marginalization are not able to see their own situation and therefore unable to help in the process to correct these inequalities and marginalization. Managers refer to this approach as a ‘top-down’ mindset of technical assistance. The TIES program features higher education as a tool to train human resources that will help to develop a better approach to fight social inequalities. Its conception is more holistic and designed to build capacity through empowerment in a participatory, integrated ‘bottom-top’ approach.

GEM partnered with three universities in Mexico: Instituto Tecnologico y de Estudios Superiores de Monterrey (ITESM), Instituto Tecnologico del Valle de Oaxaca (ITVO), and Univesidad Autonoma Chapingo (UACH), along with one non-governmental organization, Estudios Rurales y Asesoria Campesina (ERA), to build capacity in indigenous Zapotec communities of Oaxaca. The partnership features a ‘bottom-top’
approach of proactive, grassroots public participation and ownership coupled with professional, technical and policy input as needed, and thus the project combines TIES program goals with those of GEM. Helping local citizens plan and implement practical solutions to local natural resource problems worldwide towards sustainability, GEM utilizes strong service-learning opportunities integrating local knowledge and hands-on experience of community participants with the technical skills and proficiency of GEM staff members, students, and institutional partners overseas in a side-by-side working collaboration of respect, team-building, and empowerment.

The selection of Oaxaca for this applied research project is not arbitrary. Oaxaca is one of the richest states of Mexico in biodiversity and ethnic heritage; paradoxically, however, it leads Mexico in many poverty indicators such as illiteracy, lowest income per capita, and emigration rates. In many ways Oaxaca is a perfect example of the duality of Mexico—a wealthy Northern region with large industrial farming and diverse industry such as petrochemical and steel production in contrast to a poor Southern region with smallholder farming and lack of high-tech industry and commerce. By historical reasons Oaxaca has many municipalities that divided to the point of fragmentation of indigenous social groups. Today struggles for political power divide communities in political managerial units such as “municipios” and “agencias de policia.” Beneath this sociopolitical fragmentation is the identity of common ethnic heritage and language that identifies several groups dispersed across the State (INEGI, 1995).

The selected project site in Oaxaca was the Upper Rio Grande Watershed (URGW) in the Sierra Norte region, a sparsely populated Zapotec area in the mountains to the northwest of Oaxaca City. The region is mostly temperate forest with pines in the
higher elevations and mixed pine-oak in the lower levels. Farming in this steeply sloped mountainous terrain is not recommended due to high erosion potential, but many plots have been cleared and planted for subsistence agriculture. Because the region is a natural forest the major economic activities are related to timber extraction and non-timber forest products.

The land tenure regime is very different from the rest of the country, where half of the national territory is under the “ejido” administrative regime, while in the Sierra Norte the more ancient “communal” (community-owned) regime is retained and predominates. The main difference between “ejido” and “communal” is that ejido lost its condition of being community-owned after the amendment of the Article 27 of the Mexican Constitution in January 1992 and all “ejidos” are now divided into individual allotments. It is important to mention that the “municipio” is a geopolitical administrative unit and it is the smallest such unit according to the Federal Republic system of government in Mexico. However, one “municipio” can include more than one population center or community, which is common particularly in rural areas where the number of communities within one “municipio” could be larger than 50. The municipal authority manages all governmental affairs within its territory except for agrarian affairs, which are exclusively managed by the “Comisariado de Bienes Comunales” (Council of Community Owned Land) and each community has its own comisariado. While there is only one single municipal president there will be as many “comisarios” as there are villages or communities with land under communal regime. While the municipal president and cabinet members are elected by secret ballot in regulated elections, the
members of the “comisariado” are appointed per open vote in a community’s general assembly.

The population in the study area is mainly Zapotec and they are fully bilingual in Zapotec and Spanish. Although the indigenous Zapotec are an integrated ethnic group they are divided by political boundaries and their approaches to natural resources management may differ in certain instances based on these geopolitical units. The social structure of the Zapotec people has been hierarchical through a ruling class historically, however, the decision-making process was not only the responsibility of a king but sanctioned by a council of priests (similar to a council of elders). This type of social structure survived for a long time, even after the arrival of the Spaniards. However, since their territory had been fragmented by the federal government, the definition of community was gradually changed to a political unit, the municipality. Civic management in the Sierra Norte area has been conducted on a municipal basis and no real large-scale regional management has been carried out. Moreover, belonging to an ethnic group has been replaced by belonging to a municipality. There are some efforts to restore the ethnocentric sense of unity in a broad aspect of indigenous knowledge and cultural pride. Such a regional view may emerge with growing importance in attempting to plan and manage for a healthy watershed as a region.

GEM has developed a capacity building model that empowers local citizen stakeholders with a strong and proactive participatory role in the process of identifying needs and priorities, formulating plans, making decisions, and taking responsibilities in implementing, monitoring, and adapting proposed actions. The GEM Local Capacity Building for Healthy Watersheds Model (see Chapter 3) has been piloted successfully in
at least ten nations in real-world projects worldwide by many professionals in the field. The model features a participatory, community-based ‘bottom-top’ approach, with a strong component of human resource development concurrent with TIES goals. It is the very first of its kind in this area of Oaxaca.

During the previous three years a series of steps led by GEM helped citizens in Sierra Norte communities to complete an initial diagnosis of water resource quality and quantity as well as to identify what local capacity training is needed. By recovering the sense of indigenous community and belonging to a territorial unit that goes beyond political boundaries and developing new social networks with the local inhabitants this project is exceeding its goals. The Zapotec communities are accomplishing integration in a major territorial unit in this area with GEM’s help. Over the previous two years they have demonstrated willingness to look for common goals and a better management of their natural resources for a sustainable future together.

This GEM TIES Healthy Watersheds and Sustainable Livelihoods project in the Sierra Norte of Oaxaca was divided in two complementary research components, a Phase I assessment focused on baseline water quality assessment training and community-based priority setting for desired sustainable livelihoods. This assessment phase, which was conducted during 2005-2007 by a GEM master’s degree student at UWSP, generated the baseline diagnosis through citizen-trained water monitoring groups that informs and empowers local decision makers and members of the communities to know the conditions of their watershed. With this knowledge together with GEM public participation training efforts each community established the priorities in which it chose to work in implementing a sustainable future through a shared vision.
The Phase II component, which is the subject of this GEM master’s degree work, focuses on implementation of the Phase I priority recommendations developed by Zapotec communities participating in the project. The application of practical solutions to problems that the inhabitants have deemed important to address represents a management milestone in the area because never before have the inhabitants been consulted to ask what challenges they face, what knowledge they possess, what ideas and plans they would like to include in developing a list of priorities for envisioning and empowering their ownership in designing a sustainable community for posterity. The final goal is to develop new microenterprise approaches to natural resource management that enable the local populations to generate incomes while protecting natural capital in perpetuity. Actions towards job creation are important in order to promote strong, more self-sufficient communities, with much reduced need of community members to emigrate for employment elsewhere.

Community-based management options are intended not only to be socially active, but also environmentally friendly and economically viable. One of the key elements is to promote common, long-term benefits for actions on a large scale, such as regional watershed and landscape. Any member of the community can obtain a clear understanding of pressing local challenges and envision how these challenges might impact not only his or her family in particular, but also many more neighbors and community members as a whole. The implementation of solutions requires a major commitment from all. Additionally, the productive activities that can provide jobs and income must be well-planned and sustainable. Because the major consensus finding during Phase I was that water is diminishing in quantity and quality, some actions were
started right away, such as roof rainwater catchment system training and citizen water quality monitoring groups training. However, there were other socio-economic issues of high priority identified for Phase II implementation by the local citizens: solid waste management, sustainable agriculture, payment of environmental services, and ecotourism. While the first two are health related, they all reflect the need to generate local jobs and income within the area that will allow people to remain in their indigenous home region and to earn money for a decent life without disruptive emigration.

1.2. Research statement

The purpose of this study is to help indigenous Zapotec communities within the upper reaches of the Rio Grande watershed in the Sierra Norte de Oaxaca improve watershed health for a safe drinking water supply and to implement local income generation for sustainable livelihoods through application of the GEM local capacity building model.

1.3. Objectives

This overall research statement will be achieved through four specific objectives:

Objective 1. **Participatory training in capacity building.** To evaluate capacity building in the participating communities by:

- Training and observing the planning process for citizen-action groups that are implementing steps to address one or more of the priority needs in Obj. 2;
- Estimating the level of technical capabilities acquired by the participants and the process of sharing these new skills and knowledge with others;
o Training and observing whether citizen groups are developing management and business plans for implementation during and beyond the project.

**Objective 2. Implementing practical pilot projects.** To facilitate training of local citizens empowering them to take action on priority needs to improve watershed health and sustainable livelihoods, putting their new knowledge to use in practical pilot projects that will continue beyond the life of the project in:

- Water quality monitoring and watershed management
- Roof rainwater catchment
- Solid waste management
- Sustainable agriculture (including trout production)
- Ecotourism
- Payments for ecosystem services

**Objective 3. Support and develop local economies.** To identify local microenterprises that generate jobs and income and to facilitate developing business plans to help local citizens implementing new microenterprises.

**Objective 4. Case study of GEM local capacity building model in Sierra Norte.** To assess the adaptability and acceptance of the GEM local capacity building model as a management tool for healthy watershed and sustainable livelihoods in citizen-based community development in a case study.
Chapter 2. LITERATURE REVIEW

2.1. Location of study area

Geologically, Mexico is part of the North American tectonic plate along with Canada and the United States of America (USA). Oaxaca is one of 31 states of Mexico, located in the southern and Pacific side of the country below the Tropic of Cancer (23.5° N latitude) (see Figure 1). Therefore, Oaxaca is in the tropical zone with low variation of sunlight seasonally throughout the year.


Oaxaca is the fifth largest state in Mexico with a total territory of 93,952 km² and according to the most recent national census in 2005 it ranks tenth in population with a total of 3,506,821 (INEGI, 2005). Within Oaxaca the Sierra Norte region is located in the northeastern portion between the parallels 16° 45’ 30” N and 17° 43’ 23” N and the meridians 95° 04’ 22” W and 96° 49’ 39” W. The mountainous Sierra Norte region has an expanse of 12,700 km² covering the districts of Ixtlán, Villa Alta and Mixe mainly, but
also parts of Teotitlan, Cuicatlan, Etila, Centro, Choapan, Tlacolula, Yautepec, and Tehuantepec (see Figure 2). It has 126 municipalities within its territory (Yescas, 2004).

![Figure 2. Oaxaca geo-cultural regions (left). Administrative districts within Sierra Norte region (right). Source: INEGI, 2005.](image)

The upper micro watershed of the Rio Grande in the Sierra Norte (see Figure 3) has a total extension of 38,744 hectares (Jimenez Bañuelos, 2007) and it includes nine municipalities: Ixtlán de Juarez, Natividad, San Juan Chicomezuchil, San Juan Evangelista Analco, Capulalpam de Mendez, San Miguel Amatlán, Santa Catarina Lachatao, Santa Maria Yavesia, and Santiago Xiacui. There are seventeen rural Zapotec population centers within the Sierra Norte of interest to this thesis research.

The Sierra Norte region is a typical mountain landscape with a mixed forest of pines and oak, some pines are even natives of Oaxaca region such as “Yaga-laga-Xe” (Zapotec name) (*Abies oaxacana*) and the Oaxacan pine “chalmaita” (*Pinus oaxacana*). The highest peaks in the Sierra Norte are Cerro Pelon 3,270 meters over the level of the sea, Neveria 2,950 meters, Cuajimoloyas 2,850 meters and Campanario 2800 meters (Yescas, 2004).
The weather varies with elevation and topography, but in general is consistent with temperate montane and a precipitation regime of wet to very wet according to the Köpen classification system C(m) and C(w). Rainfall occurs predominantly in summer and the highest temperature is reached after summer solstice; therefore, the complete classification is Cwag with variants attributed to elevation (Yescas, 2004; Calixto, 1992).

Jimenez Bañuelos (2007) developed an isohyetal chart with values ranging from 500 millimeters (mm) to 800 mm of total annual precipitation for the year 2007. Calixto (1992) reported higher values and Yescas (2004) reported an average estimated from his model of 1,100 mm annual total, and Martinez (2008) reported 1,115.6 mm for Capulalpam in the year 2007.

### 2.2. Target population

The State of Oaxaca is very diverse in ethnicity and in the Sierra Norte territory there are three different indigenous groups: Zapotec, Chinantec, and Mixe. The largest group is the Zapotec who are distributed mainly in the districts of Ixtlán and Villa Alta. The
Zapotec language in this area deviates somewhat from the traditional core and it is known as the “Serrano” subgroup. The Chinantec language is spoken in some parts of the Ixtlán district, too. Similar to yet distinct from Zapotec language, the Chinantec subgroup in the Sierra Norte is known as “Yolox.” A local Mixe dialect is spoken in small areas of the Villa Alta district that is not possible to assess if it differs from the core Mixe spoken in the major Mixe district of Oaxaca (Montes, 1989).

The Zapotec group, the target population of this thesis research, inhabits the Ixtlán district, including the municipalities of Ixtlán de Juarez, San Juan Chicomezuchil, San Juan Evangelista Analco, Capulalpam de Mendez, San Miguel Amatlán, Santa Catarina Lachatao, and Santiago Xiacui (see Figure 4). Communities as administrative units are categorized as I “Municipio” (municipality), II “Agencia Municipal” (municipal agency), and III “Agencia de Policia”, which translates literally as “police station” as its origin is from an antique Spanish form of civil administrative management (see section 2.2.1). The political categories used to describe population levels are as follows: “ciudades” (cities), “villas” (villages), “pueblos” (towns), “rancherias” (ranches), and “congregaciones” (congregations). These follow a descending order based on population levels. The minimal political category to be considered for an administrative municipality is town. A town is a population center with a minimal permanent population of 2,000 inhabitants (Sanchez, 1998). “Cabecera Municipal” (county seat) for a municipality is where the mayor and cabinet have their offices and it can be a city, village or a town. The importance of clarifying these terms is economic because the smallest administrative unit and structure recognized by the federal government of México is the municipality. Communities existing within municipalities depend on the municipality for access to
federal funds for local purposes. The communities that do not serve as cabecera municipal that are part of this study are La Neveria and Benito Juarez within Santa Catarina Lachatao; Llano Grande and San Antonio Cuajimoloyas within San Miguel Amatlan; and San Andres Yatuni within Santiago Xiacui.

![Map of Distrito Ixtlan](image)

**Figure 4. Municipalities within Ixtlan District participating in GEM TIES project.**

### 2.2.1. Zapotec cultural and political history

The Zapotec people comprise the largest and most important ethnic group in the Sierra Norte study area of this research. Recorded Zapotec cultural history goes back at least to 1000 AD with the foundation of Teotitlan. However, some controversy exists in the accuracy of this statement because most of the historical records consist of indigenous “codices” of ideographic records represented by inscriptions on clay tiles or rock. From the time of the arrival of the Spaniards to Oaxaca in 1494, many codices were destroyed or lost as part of the Christianization process (Montes, 1989; Sanchez, 1998). The time of settlement of the Zapotec in the region is postulated to be around 800 AD during the rule
of Zapotec King Zaachila, when as part of the expansion of the Zapotec dominion at that time, urban development was initiated in the Villa Alta district (Sanchez, 1998).

The Zapotec social structure in those times featured two classes: (1) a dominant upper class with kings, priests, and army and (2) a lower class consisting of farmers and handcrafters. The Zapotec are an agrarian society with its calendar based on agricultural seasons. Its land tenure regime was community ownership. As such, the entire community participates in survival efforts to cultivate and preserve the land for communal production of corn (*Zea maiz*), beans (*Phaseolus vulgaris*), chili (*Capsicum* sp.) and squash (*Cucurbita* sp.), the major staple crops of their diet. Small allotments where people grew herbs, flowers, fruits, etc. were owned by individuals, but these plots could not support the basic food needs of the owner’s family. Rather, these smaller gardens were complementary to the food crop supply from the larger communally managed fields. Some of the remnants of this structure are the communal land tenure regime and “tequio”, a form of collective work that was mandatory to each member of the community for the benefit of the entire community (Sanchez, 1998).

Historical records after the arrival of the Spaniards in 1494 indicate that the Zapotec people were already well established in the area, that they were at war with the Aztecs, and in 1498 the Zapotecs from the Sierra Norte were defeated. With the arrival of the Spaniards after the fall of Mexico City, the Zapotec rulers pledged loyalty to the Spaniards in 1521. The Zapotec were recruited to fight enemies of the Spaniards in the Mixtec region (Cohen, 1999). In 1525 local Zapotec rulers were baptized as Christians and they were granted permission by Hernan Cortez to rule in the name of the Spanish Crown. This began the process of Christianization of the region (Montes 1989). In 1558
the first Dominican order was established in the Sierra Norte region, which increased the rate of Christianization in the area (Montes, 1989).

Christianity brought new forms of government and a new social order to most of the Mexican territory. However, in the Sierra Norte region the changes were minimal, because of the distance from major trade routes. Two particular forms of exploitation were important during colonial times. One was the “encomienda”, a reward to a Spaniard citizen for his services to the crown entitling a profit paid as tribute from one or several villages under his supervision. The second was the “repartimiento” by means of the “concesion”, where the mayor of a Spanish province in the New World had the duty to the crown of collecting taxes and bringing civilization to the new dominion. The mayor could not control a large territory, so he divided his province into smaller administrative units and distributed those to a Spanish citizen or a Mexican local ruler (“hace un repartimiento”). The persons that received the territory were called “concesionarios” because they were bestowed the concession for management, administration, and taxation of the concession territory on behalf of the crown. These concesionarios served as representatives of the crown, but they had no right to profit as reward for services so they charged a fee for their work.

These two forms of local government were intended to administer the geographic dispersion of the inhabitants. A resulting effect was the clustering of the previously dispersed non-nuclear villages, given the remote location and rugged topography of the landscape. This change brought the typical colonial conformation of towns and cities with a central plaza, a governmental building and a church. The symbols of a new
hierarchical civil-religious order started with this corresponding architectural design (Gonzalez, 2001).

The new structure of government introduced by the Spaniards was the “ayuntamiento y cabildo”, or municipality and cabinet. The small communities of the Sierra Norte adapted rapidly to this system and it is still in use today. However, this was not a smooth transition but an imposed regime that fractured the Zapotec society. New office positions for local government in the Sierra Norte were “gobernador” (mayor), “regidor” (councilman), “alcalde” (judge), “mayor” (police chief), “escribano” (scribe), and “fiscal” (priest servant) (Gonzalez, 2001). From the use of these titles, particularly “mayor” and his assistants “alguaciles” (deputies) who were in charge of collecting taxes in the territory, today local authorities from small communities that are not the cabecera municipal are called “agente de policia” and the towns “agencias.”

Despite the Spanish quest for silver and gold, mining was not as important in the region as in other parts of Mexico during colonial times. The major economic activity was production of cotton (Gossypium hirsutum) and cochineal (Dactylopius coccus), an insect that produces a natural red dye (Gonzalez, 2001). These two products were the most common trade goods that came from the Sierra Norte during the colonial times of 1521 to 1810. After the independence of México from Spain in 1921 the social structure in Oaxaca did not change much, due to its isolation and the constant power struggle in Mexico City. The consolidation of a federal republic as form of government and the institutionalization of the municipality and states as geopolitical and administrative units in 1968 are probably the only significant changes in the Sierra Norte as practices today.
2.2.3. Demographic features of the Sierra Norte communities.

According to “Instituto Nacional de Estadística Geografía e Informática” (INEGI, 2005) (translated as National Institute for Statistics, Geography and Databases), Oaxaca is considered the fifth largest state by territory in México. Oaxaca is ranked tenth by total population with 3,522,000 inhabitants; however, it is third in the number of migrants to the USA. The communities from the Sierra Norte that participated in the GEM Phase II Implementation reported the following numbers (see Table 1) in the most recent census conducted by INEGI in the year 2000 (INEGI, 2005).

<table>
<thead>
<tr>
<th>Name</th>
<th>Administrative category</th>
<th>Population</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>San Juan Chicomezuchil</td>
<td>Municipality (county seat)</td>
<td>281</td>
<td>122</td>
<td>159</td>
</tr>
<tr>
<td>San Juan Evangelista Analco</td>
<td>Municipality (county seat)</td>
<td>412</td>
<td>199</td>
<td>213</td>
</tr>
<tr>
<td>Capulalpam</td>
<td>Municipality (county seat)</td>
<td>1,210</td>
<td>527</td>
<td>683</td>
</tr>
<tr>
<td>San Miguel Amatlán</td>
<td>Municipality (county seat)</td>
<td>288</td>
<td>147</td>
<td>141</td>
</tr>
<tr>
<td>Cuajimoloyas</td>
<td>Municipal agency</td>
<td>637</td>
<td>307</td>
<td>330</td>
</tr>
<tr>
<td>Llano Grande</td>
<td>Police agency</td>
<td>70</td>
<td>36</td>
<td>34</td>
</tr>
<tr>
<td>Santa Catarina Lachatao</td>
<td>Municipality (county seat)</td>
<td>151</td>
<td>64</td>
<td>87</td>
</tr>
<tr>
<td>Benito Juárez</td>
<td>Municipal agency</td>
<td>318</td>
<td>161</td>
<td>157</td>
</tr>
<tr>
<td>La Neveria</td>
<td>Police agency</td>
<td>77</td>
<td>33</td>
<td>44</td>
</tr>
<tr>
<td>Santiago Xiacui</td>
<td>Municipality</td>
<td>280</td>
<td>121</td>
<td>159</td>
</tr>
<tr>
<td>San Andrés Yatuni</td>
<td>Municipal agency</td>
<td>TOTAL</td>
<td>3,724</td>
<td>1,717</td>
</tr>
</tbody>
</table>


From Table 1 Capulalpam, which is also a county seat, is the community with the largest population at 1,210 residents. Llano Grande, which is the lowest category police agency has the smallest population, and the proportion of males and females favors women with 7.8% more women than men. However, communities like San Juan
Chicomezuchil, La Neveria, and Capulalpam have 20% more women than men. In contrast, communities like San Miguel Amatlán, Benito Juarez and Llano Grande are almost equal in gender proportion. Therefore, some communities are oriented towards emigration more than others.

The important aspect of this emigration process is that the Mexican and by extension the Oaxacan does not necessarily pursue permanent settlement in the USA, which is different from Europeans or other nationalities that travel from far away to reside permanently in the USA. The Oaxacan migrant does not consider the USA as his ultimate residency but rather as an opportunity to earn money and increase future earning power (see Table 2) (Cohen, 1999).

Table 2. Number and length of trips of Zapotec people from San Ana Teotitlan into the USA

<table>
<thead>
<tr>
<th>Length of stay (years)</th>
<th>One trip</th>
<th>Two trips</th>
<th>Three trips</th>
<th>Four or more trips</th>
<th>Sub-total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 6 months</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>12.5</td>
</tr>
<tr>
<td>Less than 1 year</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15.0</td>
</tr>
<tr>
<td>1 - 1.9</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>14</td>
<td></td>
<td>35.0</td>
</tr>
<tr>
<td>2 - 2.9</td>
<td>2</td>
<td>1</td>
<td></td>
<td>3</td>
<td></td>
<td>7.5</td>
</tr>
<tr>
<td>3 - 3.9</td>
<td>3</td>
<td>2</td>
<td></td>
<td>5</td>
<td></td>
<td>12.5</td>
</tr>
<tr>
<td>4 - 4.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 - 5.9</td>
<td>2</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td>5.0</td>
</tr>
<tr>
<td>6 - 6.9</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>2.5</td>
</tr>
<tr>
<td>7 - 7.9</td>
<td>2</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td>5.0</td>
</tr>
<tr>
<td>8 - 8.9</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>2.5</td>
</tr>
<tr>
<td>9 - 9.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 or more</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>2.5</td>
</tr>
<tr>
<td>Sub-total</td>
<td>11</td>
<td>10</td>
<td>16</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>%</td>
<td>27.5</td>
<td>25.0</td>
<td>40.0</td>
<td>7.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Percentages in Table 2 show that in this particular survey sample respondents did not attempt long trips. The largest percentage is for trips with a length of 1 to 1.9 years.
and the second largest percentage is less than one year. The number of trips category with the highest total is “Three trips” followed by “One trip”. Moreover, the local community ties that are retained- even with the community organization and the duties that are not enforced by law, but by tradition and identity as members of their community such as tequio and mayordomia and church-related festivities- are common for Zapotec migrants. Zapotec migrants use some of the remittances to pay for tequios and mayordomias, which clearly distinguish these Mexican migrants from those of other ethnic heritages.

From Table 3 “Ritual expenses” refers to commitment for mayordomias, and those expenses surpass” Health care” expenses and “Land” purchases. There is an implicit acceptance to making these remittances upon return, and a returning resident to the Sierra Norte could be held accountable for not fulfilling this duty.

Table 3. Remittance uses in Oaxaca’s Central Valley

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Number of households (Total = 419)</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No remittances received</td>
<td>60</td>
<td>14.3</td>
</tr>
<tr>
<td>Daily expenses</td>
<td>182</td>
<td>43.4</td>
</tr>
<tr>
<td>Home construction/renovation</td>
<td>71</td>
<td>16.9</td>
</tr>
<tr>
<td>Education</td>
<td>27</td>
<td>6.4</td>
</tr>
<tr>
<td>Purchase of domestic items</td>
<td>16</td>
<td>3.8</td>
</tr>
<tr>
<td>Ritual expenses</td>
<td>8</td>
<td>1.9</td>
</tr>
<tr>
<td>Healthcare</td>
<td>6</td>
<td>1.4</td>
</tr>
<tr>
<td>Purchase of agricultural/farm goods</td>
<td>2</td>
<td>0.5</td>
</tr>
<tr>
<td>Business start-up and expansion</td>
<td>27</td>
<td>6.4</td>
</tr>
<tr>
<td>Land</td>
<td>7</td>
<td>1.7</td>
</tr>
<tr>
<td>Other</td>
<td>13</td>
<td>3.1</td>
</tr>
</tbody>
</table>

2.2.4. Economic features of the Sierra Norte communities

It is a common assumption that the communities of the Sierra Norte are agriculturally oriented. Jimenez Bañuelos (2007) indicates that 47% of the population is engaged in agriculture, farming and/or fishing. The Oaxaca Sustainable Development State Plan (SDSP) for the years 2004 to 2007 indicates that agriculture employs 54% of the total population but only generates 18.9% of the gross domestic product (GDP) (Oaxaca State Government, 2004). Zarate (2006) indicated that the daily salary for an agricultural laborer earns a minimum of 80 pesos (just over 6 USD using current exchange rates) and a maximum of 100 pesos (7.50 USD). However, most of the work in the fields is unpaid because it is performed by family members.

The vast majority of the agricultural plots are for subsistence agriculture and only a few crops are grown commercially. The SDSP confirms this, as 48% of the population works in agriculture but do not receive any remuneration. This diagnosis presents a very bad situation: the Oaxaca workforce averages 6.1 years level of education, while Mexico City it averages 10.2 years. Therefore, the Oaxaca workforce does not qualify for many of the better paying jobs in large urban areas and they work occasionally for pay from another farmer. A United Nations report (2002) characterized economic sectors in detail for San Antonio Cuajimoloyas, which identified from richest to poorest occupations in the following order: merchants and restaurant owners (2.5%) followed by professionals (teachers and others) (2.5%), then farmers who complement their income with another economic activity in descending order farmer-baker (20%), farmer with a horse-drawn plow (40%), farmer-migrant (10%), and farmer-scavenger (25%). It is important to
highlight that farmers—no matter what subcategory—account for 95% of the total population.

The SDPS report states that approximately 250,000 Oaxacans leaving the state every year (Oaxaca State Government, 2004). The System of Information for Migration of Oaxaca (SIMO) website describes the emigration from urban areas of Oaxaca at 17.2% of the total and from non-urban regions at 82.8%. Therefore, the vast majority of migrants from Oaxaca come from rural towns. In the Sierra Norte the emigration situation may be quite unique (see section 2.2.3.) However, the relevance in the economic sector is how much external remittances are part of the cash flow in the communities of the Sierra Norte. There are no official data. Cohen (1999) speculates that most of the money is used for everyday expenses and not to initiate economic ventures.

In order to resolve this duality of low income locally or high income opportunity elsewhere, the recent changes in natural resources management is helping to generate jobs and incomes that keep inhabitants in their own land. For example, the Pueblos Mancomunados water bottling plant employs 60 full-time positions to women; and ecotourism facilities in that community will require maintenance and a full-time front desk clerk and other service employees.

There are alternatives in the Sierra Norte that do not exist in other places, such as federal and state governmental subsidies which are another major source of income. Grant applications to these sponsors favor marginal groups according to policies to combat marginalization of minorities. Those elements offer Sierra Norte an advantageous starting point for microenterprises by indigenous people and women.
2.3. Capacity building

2.3.1. Participatory GEM local capacity building model for healthy watersheds

As defined in the proceedings of a GEM-hosted international conference (Spangenberg et al., 2004), “capacity building” is the provision of knowledge and skills that will allow stakeholders to take responsibility for planning, allocating, and eventually managing, monitoring and controlling the resources in their watershed. The GEM model for local capacity building for healthy watersheds is presented in section 3.2. It is intended as knowledge-based tool that can be adapted broadly. Key factors are that the model should be driven by the local inhabitants and stakeholders within a legal and policy framework and that fits best in rural settings for small watersheds where the principal river does not exceed 100 km in length. This small scale allows local citizens to meet each other and to feel identified as part of a group with a common cause. As a working methodology, the GEM model has been successfully deployed in ten nations worldwide.

A healthy watershed is one in which the resources are being used in a sustainable manner for the optimum benefit of the stakeholders including economic and social benefits, while minimizing the environmental impacts. The GEM model also plans an exit strategy; in this case the final point is to develop a watershed management plan, in which local citizens develop, implement and evaluate the plan. When they feel strong ownership of the plan and as elements of the plan are designed and implemented with accumulated experience, external technical specialists and sponsors may no longer be required. Local wisdom exists from which further local capacity can be extended.

The GEM model aims to trigger action where capacity building initiates a process of assessment, construction of scenarios, development of management work plans and
implementation of actions with constant self-evaluation and adaptation. However, this process is not a linear progression and can start at almost any of the stages described above. It is flexible and adaptive to local customs, cultures and conditions.

2.3.2. Public participation

There are many approaches to community empowerment and public participatory action, and the many factors involved in the success of working methodologies and cultural issues should not be underestimated (Ensernik et al., 2007). Modern societies are dynamic and Zapotec people are no different. They even travel internationally to seek economic opportunity for better incomes, and this exposure conditions their response to new alternatives. An important aspect during the initiation of the capacity building process is to identify the dynamics within a socio-cultural group and to observe how they react to new frames, norms and routines, because sometimes the promise of a better future is not sufficient to stimulate change or to attract strong, well-formed socio-cultural groups (Ensernik et al., 2007; Bonnell and Koontz, 2007).

Once the initial identification of the participants is achieved then the networking starts; it is during this stage when the challenges of assembling a group of diverse background and interest are faced (Bonnell and Koontz, 2007). Linking interests can be a relatively easy task and usually ends up with formation of work groups or boards to facilitate tasks the group decides to perform. These groups can be enriched if the members are professionals and they genuinely represent the interest of their organizations. The same strength turns into a weakness when natural, individualistic tendency of members pushes for proposals of action for their self-interests, their new
position in a group limits effective action. Usually this can be overcome by adopting an informal and situational leadership style, where more than one person can act as leader according to the moment and challenge at hand (Bonnell and Koontz, 2007). This organizing step is important because cooperation and buy-in facilitated through effective organization is needed to sustain commitment for success.

The use of a participatory process has become a new panacea and everybody has his or her own approach in methodology. A common mistake is the scope of the project, where individuals struggle to make attractive broad-scale and long-term enterprises relevant to stakeholders without recognizing or addressing more pressing day-to-day concerns (Bonnell and Koontz, 2007).

The organization must be capable to link local efforts with counterparts in government agencies and with potential sponsors. While the government will be the regulator and supervisor of actions over the long-term, sponsors will start the process with the resource that is assumed to be scarce. Institutions are more reliable over long periods of time and laws are the only way that society has to enforce an action (Singer and Caldas, 2007; Bonnell and Koontz, 2007).

2.3.3. Microenterprise and business planning development for sustainable livelihoods

The US Small Business Administration (SBA) web site indicates that any business plan is always a work in progress and there is always room to improve. It also indicates a series of elements that should be part of the final document: Executive Summary, Market
Analysis, Company Description, Organization & Management, Marketing & Sales
Management, Service or Product Line, Funding Request, Financials, and Appendix.
Chapter 3. METHODS

3.1. Overview

This thesis research methodology is oriented to build capacity in indigenous Zapotec communities striving for healthy watersheds and sustainable livelihoods per Objective 1 (“Participatory training in capacity building”). The GEM Local Capacity Building Model serves as the basis for the working methodology used, which has been deployed successfully in many cases overseas and in Wisconsin by GEM and its partners (Spangenberg, et al., 2004 and Phillips, et al., 2007). In the GEM project in Oaxaca, Mexico, the capacity building occurs through two principal mechanisms: practical training workshops and business planning workshops. An evaluation instrument of the effectiveness of the practical training workshops was designed to obtain feedback from participants for quality control and training improvement.

3.2. GEM local capacity building model

The GEM local capacity building model for healthy watersheds, which relies on public participation and a bottom→top approach, is depicted in Figure 5. To achieve local watershed management objectives identified by community members of the watershed successfully, this model requires a long-term citizen commitment well beyond the limited time frame of a two-year master’s degree program or a four-year grant project. In fact, the model is designed to empower citizens through local capacity building so that the community plans and implements actions for healthy watersheds and sustainable livelihoods themselves.
Figure 5. GEM local capacity building model for healthy watersheds. Source: Phillips et al., 2007.
For this project, the strategy for success in local capacity building was divided into Phase I assessment and Phase II implementation efforts. This M.S. thesis, which focuses on Phase II implementation training activities, addresses the model component of “implementing/sustaining actions” primarily, with “monitoring” and “assessment” components tracked per the implementation steps undertaken. The “developing a watershed management plan” component of the model is an ongoing, local process that is a regional work in progress. The GEM TIES project has been about increasing awareness of the importance of healthy watersheds and building capacity in the local communities to empower them subsequently to plan and carry out their own watershed management plan for the upper reaches of the Rio Grande watershed in the Sierra Norte.

Special emphasis in Phase II work is training to support selected microenterprise opportunities for sustainable livelihoods in the Sierra Norte to fulfill Objectives 2 (“Implementing practical pilot projects”) and 3 (“Support and develop local economies”) of this M.S. thesis. The methods utilized in Phase II work are described subsequently in sections 3.3 and 3.4 below. This M.S. thesis is the companion to previous Phase I assessment work addressing the model components of “Assessment,” “Setting Objectives,” and “Development of Watershed Management Strategies” completed by fellow researcher Clarisa Jimenez as documented in her recent M.S. thesis, Public participation and capacity building for healthy watersheds in the upper Rio Grande of the Sierra Norte, Oaxaca, Mexico (Jimenez Bañuelos, 2007). The “developing a watershed management plan” component is an integration of the results of Phase I and Phase II capacity-building activities to be performed together by the communities within the watershed.
3.3. Practical training workshops

In this second stage (Phase II implementation) the focus is on capacity building to enable Zapotec citizens in the upper Rio Grande watershed ultimately to develop a regional watershed management plan and sustainable livelihoods. During the initial stage (Phase I assessment), the local citizens of Sierra Norte communities participating in the project identified five high-priority areas to resolve the most important concerns in their region. These areas were: Water resource quality and quantity, Ecotourism, Solid Waste Management, Payments for Environmental Services, and Sustainable Agriculture.

To help with the capacity-building process in providing local skills and capabilities necessary to tackle these priority areas, a group of four potential GEM extension specialists from Oaxaca were selected for professional training by GEM and its Mexican university partners. These Mexican nationals completed one semester of graduate-level coursework at Monterrey Tec, the Autonomous University of Chapingo, or the Institute of Technology for the Valley of Oaxaca that was pertinent to the priority areas identified by the Zapotec communities. Subsequently, they received one-month of intensive training conducted by GEM staff at the University of Wisconsin-Stevens Point where they prepared materials for the practical training workshops to be conducted with Zapotec participants in the Sierra Norte. During their time at UWSP a four-day cycle was dedicated to each one of the priority areas. The first day a GEM staff member presented key elements for each topic, including a list of pertinent assigned readings. The second day a group discussion took place to elaborate technical and instructional points to be made. During the third day resource materials were collected or generated for developing the workshop presentations in Oaxaca. When the overview of all topics was concluded
Each person was assigned to one specific technical content area, and the materials collected and generated were incorporated into PowerPoint presentations. Also, a draft work schedule was developed for the Phase II GEM extension specialists’ team in Oaxaca for the remainder of the year. Prior to their return to Mexico, each GEM extension team member presented his/her PowerPoint slideshow to their peers and GEM staff for final adjustments and additions. These slideshows were used in the initial workshops in the Sierra Norte communities.

These newly trained GEM extension specialists, who were selected locally with the help of GEM’s partner institution in Oaxaca, Estudios Rurales y Asesoría, A. C. (ERA), carried out practical training workshops in the Sierra Norte from July 2007 to September 2008. The role of the Phase II M.S. degree candidate was to coordinate the plans and activities of the GEM extension specialists and to supervise their work in the field.

Once back in the Sierra Norte region, a fifth GEM extension specialist was invited to join the group to add continuity linking Phase I and Phase II activities. This professional was a member of the Phase I GEM extension specialists’ team. Her initial task was to maintain community contacts and to introduce the Phase II extension team to the communities, as well as to establish contact with newly elected local authorities in the different communities of the Upper Rio Grande watershed area. The latter activity proved to be a major task because the traditions and customs vary from community to community, e.g. some of the participating communities are ‘municipios’ on a three-year election cycle, and others are population clusters such as villages or communities that select an informal authority for one, two or three years as determined by the local general
assembly within the village or community. Some of the communities change local authorities annually while others elect their leaders to office every two or three years.

The Phase II GEM extension team conducted practical training workshops, surveys of water quality, and solid waste sampling (see Chapter 4 for detailed descriptions of results and outcomes). Recruitment of workshop participants was accomplished in two ways: (1) through contact with local authorities in participating communities for building capacity and microenterprise development, and (2) through existing organized groups in need of specialized training in micro-enterprise development in the Sierra Norte. The practical training workshops included citizen-based water quality monitoring, roof rainwater catchment systems, sustainable agriculture production including trout, tomatoes, and mushrooms, ecotourism development, waste resource management, and payments for environmental services.

The workshops were offered first in those communities that showed interest during Phase I. The slideshows prepared at UWSP were featured during the initial training sessions, which were intended to review priorities and spark interest and to generate new expectations from the group, if any. Also during the initial session a group discussion was carried out to define the needs and objectives for the next follow-on workshop sessions. Some workshops were conducted in chronological succession, such as trout farming and tomato production. These workshops were hands-on experiences while others were oriented to generate awareness and to promote alternatives, such as the solid waste management workshops. The workshop materials and additional literature review were used to develop training manuals that were compiled by the GEM extension members, edited by the M.S. degree candidate, and printed by the GEM TIES project for
future use and reference. These technical manuals were distributed to all participating communities in the Sierra Norte, Oaxaca. Local interest groups were formed or consolidated and the process of capacity building was started successfully.

For evaluation purposes, a survey instrument was designed to obtain feedback from the workshop participants. The Institutional Review Board (IRB) for human subjects on the UW-Stevens Point campus reviewed and approved a questionnaire used to solicit responses by participants of the practical training workshops (see Chapter 4 for survey results).

3.4. Business planning workshops

In the summer of 2008, the Phase II M.S. degree candidate planned and conducted five business planning workshops in the Sierra Norte to help local citizens develop microenterprise skills for increased jobs and income potential via sustainable livelihoods. Five entrepreneurs were identified by the GEM extension specialists in the region. During the initial contact, the idea of cooperative, income-generating work was discussed to assist them in the consolidation of collaborators in potential micro enterprises.

Because the major obstacle for entrepreneurs is the lack of economic resources to start any business activity, the citizens’ interest for GEM assistance focused on training to help develop applications for grants or seed money from federal agencies, particularly the Ministry of Agriculture and Fisheries (SAGARPA, the acronym in Spanish). The SAGARPA application process involves a long, complicated list of required documents that the people of the region do not know how to develop, especially business plans.
Usually the Zapotec communities hire a professional to complete the applications for federal grants.

The Zapotec community members identified training in business plan development as the top priority for the microenterprise workshops to be facilitated by the M.S. degree candidate. Once it was decided that SAGARPA was the targeted federal agency, then the SAGARPA business plan format was used for the microenterprise training activities. A PowerPoint slideshow was developed with all the information and elements required by SAGARPA, which was presented by the M.S. degree candidate during the first training session. A second meeting was scheduled with the entrepreneur(s) corresponding to each of the microenterprises of interest. During the second meeting a detailed interview was conducted using leading questions pertinent to the SAGARPA application presented in a slideshow in order to obtain as much information as possible from the viewpoint of the client.

To access information on market fluctuations, price ranges, and volumes of production, the Mexican Ministry of Commerce web site was consulted for historical data. When data from regional Oaxaca markets were available, that information was used. However, in the absence of information available specifically on Oaxaca markets, historical data were derived from the Mexico City regional market. While the extrapolation of marketing data from Mexico City to Oaxaca may not be perfect it was the only information readily available. It does provide a basis for initial analysis, especially in terms of seasonality of optimal and marginal prices. Also, due to extra transport cost, the prices of agronomic products are typically higher in Oaxaca compared to Mexico City.
The business plans were developed following the SAGARPA outline (see Table 4). Microsoft Excel was used to compute profitability expressed as net present value, NPV (in pesos) and internal rate of return, IRR (%) for each microenterprise venture. It is expected that the five business plans developed during the summer 2008 will be used in SAGARPA applications to be submitted by the communities in February 2009.

Table 4. Writing a business plan according to 2008 SAGARPA operating rules

<table>
<thead>
<tr>
<th>I. ORGANIZATIONAL DESIGN</th>
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<tbody>
<tr>
<td>1.1. Internal design</td>
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<tr>
<td>1.1.1. Proposal of value</td>
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<tr>
<td>1.1.2. Principles of the organization</td>
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<td>1.1.3. System of internal control</td>
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<thead>
<tr>
<th>II. COMMERCIAL DESIGN</th>
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<tbody>
<tr>
<td>2.1. Market analysis</td>
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<tr>
<td>2.1.1. Analysis of the product</td>
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<td>2.1.2. Analysis of the consumer</td>
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<td>2.1.3. Analysis of the competition</td>
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<tr>
<td>2.1.4. Analysis of prices</td>
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<tr>
<td>2.1.5. Commercial pathways</td>
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<tr>
<td>2.2. Demand</td>
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<tr>
<td>2.3. Commercial strategy</td>
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<tr>
<td>2.3.1. Channels of commercialization</td>
<td></td>
</tr>
<tr>
<td>2.3.2. Product/Price</td>
<td></td>
</tr>
<tr>
<td>2.3.3. Geography of the market</td>
<td></td>
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<tr>
<td>2.3.4. Promotion</td>
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<tr>
<td>2.3.5. Supply of raw material</td>
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<thead>
<tr>
<th>III. TECHNICAL DESIGN</th>
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<tbody>
<tr>
<td>3.1. Location</td>
<td></td>
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<tr>
<td>3.1.1. Description of the site</td>
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<tr>
<td>3.2. Size</td>
<td></td>
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<tr>
<td>3.2.1 Capacity of production</td>
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<tr>
<td>3.3. Project design</td>
<td></td>
</tr>
<tr>
<td>3.3.1. Productive process</td>
<td></td>
</tr>
<tr>
<td>3.3.2. Equipment</td>
<td></td>
</tr>
<tr>
<td>3.3.3. Raw materials</td>
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<tr>
<td>3.3.4. Workforce</td>
<td></td>
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<tr>
<td>3.3.5. Infrastructure</td>
<td></td>
</tr>
<tr>
<td>3.3.6. Packing, storage, and distribution</td>
<td></td>
</tr>
<tr>
<td>3.3.7. Operational cost</td>
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</tbody>
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<table>
<thead>
<tr>
<th>IV. ADMINISTRATIVE DESIGN</th>
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<tbody>
<tr>
<td>4.1. Organizational chart of the company</td>
<td></td>
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<tr>
<td>4.2. Planning and management</td>
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<tr>
<td>4.2.1. Plan of work</td>
<td></td>
</tr>
<tr>
<td>4.2.2. Register of work hours</td>
<td></td>
</tr>
<tr>
<td>4.2.3. Registries of production</td>
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</table>
Through facilitation by the GEM Phase II M.S. degree candidate, business planning materials were developed for the SAGARPA applications in the following potential microenterprise ventures: egg production; greenhouse production of tomatoes, cucumbers and “chilis de agua”; watercress marketing and sales; fresh trout farming; and a community restaurant for enhanced ecotourism (see Appendices A through E for details of each business plan).

For Objective 4 (“Case study of GEM local capacity building model in Sierra Norte”), an overview of summary highlights of the project and lessons learned in applying the GEM local capacity building model to the Sierra Norte are presented in Chapter 5 as a brief case study.
Chapter 4. RESULTS

4.1. Capacity building

Capacity building is a key element of the GEM TIES Healthy Watersheds and Sustainable Livelihoods project in the Sierra Norte de Oaxaca in two ways. The first applies to training M.S. degree students and graduate level non-degree students from Mexico in watershed management and microenterprise development. The second is training citizen participants to help assess water quality and identify priority issues in their watershed and communities (Phase I Assessment), and to help implement priority projects selected by Zapotec communities related to monitoring and maintaining water quality and quantity as well as designing and launching microenterprises for income generation in the Sierra Norte (Phase II Implementation). The results presented mainly in this section fulfill Objective 1, “Participatory training in capacity building.”

For Phase II implementation efforts in this GEM project (the focus of this thesis), work featured building capacity in one M.S. degree student as the Phase II coordinator and five graduate level students from Mexico as GEM TIES extension specialists. Technical and outreach capacity was achieved through the M.S. student (the author of this thesis) who learned and applied team-building and supervisory skills as well as business planning approaches for microenterprise development. Technical and outreach instructional capacity in water quality and quantity monitoring, roof rainwater catchment, solid waste management, sustainable agriculture, trout production, and ecotourism was accomplished in a train-the-trainers approach for developing the GEM TIES extension specialists.
Capacity building in local citizens was accomplished through practical workshops conducted by the GEM TIES extension specialists and M.S. student in the subject areas identified above. During this Phase II citizen training effort, 52 workshops in the Sierra Norte were conducted by the five GEM TIES extension specialists within six months (July 1-December 31, 2007). Two of the extension specialists continued work in 2008 and conducted an additional 13 workshops. Also, the M.S. student facilitated five business plan development workshops in the Sierra Norte during the summer 2008.

The total number of Phase II workshop participants was 856 (see Table 5). This capacity building achievement greatly exceeded expectations and original goal of 200 participants trained during this project in its entirety. By adding the 142 participants during Phase I assessment to the 856 participants trained during Phase II implementation, a grand total of 998 local citizen participants benefited from GEM TIES workshops—almost a five-fold advantage in empowering the indigenous Zapotec people. Workshop participant feedback was collected via a questionnaire survey with results presented in section 4.4, which also contributes to fulfilling Objective 1 of this thesis.

Table 5. GEM TIES Phase II implementation workshop participants by gender and age

<table>
<thead>
<tr>
<th>Content Area</th>
<th># Trainees</th>
<th>Trainees (% total trained)</th>
<th>♀(#)</th>
<th>♂(#)</th>
<th>♀(%)</th>
<th>♂(%)</th>
<th>♀ + ♂ &gt;25 years old</th>
<th>♀ + ♂ ≤25 years old (%)</th>
<th>♀ + ♂ &gt;25 years old (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainable agriculture</td>
<td>285</td>
<td>33.29</td>
<td>236</td>
<td>49</td>
<td>27.57</td>
<td>5.72</td>
<td>226</td>
<td>59</td>
<td>26.40</td>
</tr>
<tr>
<td>Solid waste management</td>
<td>387</td>
<td>45.21</td>
<td>280</td>
<td>107</td>
<td>32.71</td>
<td>12.50</td>
<td>252</td>
<td>135</td>
<td>29.44</td>
</tr>
<tr>
<td>Roof rainwater catchment</td>
<td>30</td>
<td>3.50</td>
<td>2</td>
<td>28</td>
<td>0.23</td>
<td>3.27</td>
<td>24</td>
<td>6</td>
<td>2.80</td>
</tr>
<tr>
<td>Trout production</td>
<td>24</td>
<td>2.80</td>
<td>0</td>
<td>24</td>
<td>0.00</td>
<td>2.80</td>
<td>17</td>
<td>7</td>
<td>1.99</td>
</tr>
<tr>
<td>Ecotourism</td>
<td>25</td>
<td>2.92</td>
<td>14</td>
<td>11</td>
<td>1.64</td>
<td>1.29</td>
<td>10</td>
<td>15</td>
<td>1.17</td>
</tr>
<tr>
<td>Water quality</td>
<td>69</td>
<td>8.06</td>
<td>36</td>
<td>33</td>
<td>4.21</td>
<td>3.86</td>
<td>21</td>
<td>48</td>
<td>2.45</td>
</tr>
<tr>
<td>Business plans</td>
<td>36</td>
<td>4.21</td>
<td>23</td>
<td>13</td>
<td>2.69</td>
<td>1.52</td>
<td>36</td>
<td>0</td>
<td>4.21</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>856</strong></td>
<td><strong>100</strong></td>
<td><strong>591</strong></td>
<td><strong>265</strong></td>
<td><strong>69.04</strong></td>
<td><strong>30.96</strong></td>
<td><strong>586</strong></td>
<td><strong>270</strong></td>
<td><strong>68.46</strong></td>
</tr>
</tbody>
</table>

Note: 142 Phase I trainees + 856 Phase II trainees = 998 trainees for GEM TIES project grand total.
The data in Table 5 are presented according to the format required by the USAID sponsor, in which training participants are recorded by gender (female or male) and two age categories (below 25 years and 25 years or above). The frequency and structure of training workshop sessions was determined by the needs and availability of the community members. Some workshops were conducted in sequential sessions over cycles of two or three weeks as was the case for sustainable agriculture, specifically for tomato production. Other workshops were performed as a series of training needs, and some of the workshops were intended to promote awareness in any of the seven content areas listed on the first column of Table 5.

As part of this process the GEM TIES extension specialists developed and distributed seven “How to” training manuals in Spanish to the seventeen communities of the upper Rio Grande watershed:

- Agricultura Sustentable en Comunidades de la Sierra Norte de Oaxaca (Sustainable Agriculture in the Sierra Norte Communities of Oaxaca)
- Captacion de Agua de Lluvia como Alternativa para Afrontar la Escasez del Recurso (Roof Rainwater Catchment as Alternative to Address Water Scarcity)
- ¡Más Claro Ni el Agua! (Water Quality).
- Manual Básico para el Cultivo de Trucha Arco Iris (Oncorhynchus mykiis) (Rainbow Trout (Oncorhynchus mykiis) Farming).
- Manual para el Pago de Servicios Ambientales (Payments for Ecosystem Services).
- Manual para el Manejo de Residuos Sólidos (Solid Waste Management).
- Manual para la Modificación de Senderos Interpretativos en Ecoturismo (Interpretive Signage for Ecotourism and Hiking Trails).
4.1.1. Training by content area

In fulfilling Objective 2, “Implementing practical pilot projects,” training in content areas identified by citizens as priorities were conducted (section 4.1.1). The percentage of trainees that attended Phase II workshops and/or training sessions by content area of interest in the Sierra Norte is presented in Figure 7.

![Figure 6. Percentage of Phase II trainees assorted by workshop content area of interest (n = 856).](image)

From Figure 6 it is readily observed that the content area most well-attended by workshop participants was solid waste management (45%). Sustainable agriculture attracted the second highest participation (33%), followed by attendance at workshops on water quality and quantity having the third most participants (12%). The remaining three categories of business plans, ecotourism and trout production combined for 10% of workshop participation. Rainwater roof catchment training is included in the water quantity and quality category. Payments for ecosystem services training was not performed because it was provided by another GEM project in San Andres Yatuni.
Solid waste management and water quality were the two areas that the GEM TIES extension specialists with extended contracts had acquired professional training and for which workshops were conducted in 2008. These two extension specialists were also proficient in sustainable agriculture and they conducted two additional workshops in sustainable agriculture in 2008. In the particular case of Capulalpam, the people of this community were interested in solid waste management for aesthetics and tourism because they were actively seeking a particular designation from the Ministry of Tourism as “Pueblo Magico” (Magic Town). This designation would help boost the community’s popularity as tourist destination. A series of conditions that the Ministry enforces and promotes among those designated as magic towns; one of the conditions is adequate solid waste management. The goal of the people from Capulalpam was to fulfill the aesthetic requirement of the Ministry, but they achieved a larger goal by helping improve the local environment through initiating a comprehensive solid waste management plan adapted to broader, long-term goals for a healthy watershed.

Sustainable agriculture has two implicit values that attracted a large number of workshop participants in this content area of interest. One is that in the Sierra Norte agriculture is recognized as a promising economic activity because it can provide income-generating jobs and help the local economy. The second is that learning how to grow crops using sustainable approaches also makes it possible for a family with low income and a small piece of land to grow their own food to help offset food expenditures and possibly sell excess to further help the family’s cash flow. While most of the other workshop sessions were in the form of lectures and presentations, sustainable agriculture workshops were carried out in greenhouses and fields for practical training exercises.
This was made possible through the generosity of several community members allowing visitors access to their facilities and property for the GEM TIES field training activities.

Section 4.2.1 addresses sustainable agriculture per business planning for specific agriculturally related microenterprise ventures such as tomato, trout, and egg production as an integral part of the capacity building process. Later, section 4.1.3 addresses capacity building efforts in water and waste characterization. The efforts described in sections 4.2.1 and 4.1.3 contribute to fulfilling Objectives 1, 2 and 3 of this thesis.

4.1.2. Training by location

While every effort was made to cover as many communities as possible for GEM TIES training workshops in the Sierra Norte, logistical challenges such as availability of and commitment from the local authorities, citizen trainees and confirmation of available meeting facilities limited the ability to carry out the training sessions in all Zapotec communities participating in the project. However, this restriction was not considered substantial and is possibly moot, as the number of workshop participants exceeded project goals by a large margin (see Section 4.1). The distribution of the Phase II workshop trainees by community is depicted in Figure 7.
Two communities accounted for two-thirds of workshop participants and were almost equally active during the training sessions—Lachatao (35%) and Capulalpam (34%). Similarly, a second grouping of communities represented the next largest participation—San Juan Chicomezuchil (12%) and Amatlán (10%). The rest of the communities in which workshops were conducted ranged from 1 to 3%. Out of seventeen communities in the Sierra Norte initially contacted by the GEM TIES extension agents, ten actively participated in the project. Of these ten, the four communities highlighted above account for more than 90% of the total participation. Lachatao was involved with sustainable agriculture and solid waste management, the two most popular areas of interest. Capulalpam authorities were promoting solid waste management and at the Mexican equivalent to the Parent Teacher Association convocation the GEM TIES extension agent who was invited to provide solid waste management training was strongly supported by the local authorities. Unlike in the USA, parent-teacher
conferences are mandatory in Mexico, which allowed the extension agent to have workshops with attendances of 60 and 100 people consisting of parents and teachers. San Juan Chicomezuchil was very actively focused on solid waste management and sustainable agriculture in 2008, and Amatlán citizens participated mainly in water quality and quantity, and sustainable agriculture workshops.

4.1.3. Demographics of the training participants

The training workshops were offered at no charge in the venue communities openly and without any conditions for registration. The only requirement of workshop participants was to provide their gender and age in terms of two categories ≤ 25 years old and >25 years old (participant names were not recorded). Figures 8 and 9 summarize those demographics and indicate that both attributes were skewed considerably towards females and the older age category of citizens.

![Figure 8. Gender composition of workshop.](image)

![Figure 9. Age of workshop by two trainees categories.](image)

Female participants exceeded male trainees by almost a ratio 3:1 and similarly, there were almost three times as many persons above 25 years of age than those under 25.
years of age participating in the workshops. There is one major explanation for this result and that is emigration. While some of these communities are really small (even lower than 100 inhabitants), the impact of emigration is more accentuated with a population consisting primarily of children, women, and elderly men. The most productive constituency group of the workforce, which is represented by males between 18 to 40 years of age, is employed largely outside the region in heavily populated Mexican cities or the USA.

4.2. Business plans for potential microenterprises

This section 4.2 and Appendices A through E present results in fulfilling Objective 3, “Support and develop local economies.” During the summer of 2008 five microenterprise ventures were chosen within the Sierra Norte region to showcase and facilitate business plan training. Specifically, five training sessions were offered to provide technical assistance to help Zapotec entrepreneurs and cooperatives complete applications for grant funds from the Ministry of Agriculture and Fisheries in Mexico (SAGARPA, acronym in Spanish). Although these microenterprise ventures are promising and some of them are operational already to some extent, the business plans helped them organize and present their business concepts clearly and succinctly for greater probability of success in securing start-up funds from SAGARPA and for optimal management and operations of their businesses.

In direct correlation with the second most popular area of interest as described in section 4.1.1 (see Figure 7), four out of five business plans facilitated by the GEM TIES project in the summer of 2008 were related to sustainable agriculture activities (i.e.,
chicken farming for egg production; trout farming; tomato, cucumber and chili production; and watercress marketing and sales). The other business plan was for a restaurant as a subproject of a large ecotourism project development. Even in the latter microenterprise, it is based on locally available food from sources practicing sustainable agriculture (see Appendices A through E for details).

The SAGARPA grant application takes something between six months to one year to complete and learn the outcome. Sometimes even when it is granted, then comes the problem of liquidity from SAGARPA that can add another six months. Nevertheless, the effort to connect inhabitants of the Sierra Norte with sponsor agencies is a valuable, and hopefully successful, experience in obtaining venture capital. For capacity building to increase sustainable livelihoods in the Sierra Norte, this business planning training effort helped empower local citizens to design and apply for funds to carry out microenterprise ventures beyond the life of the GEM TIES project. The adaptive management strategy inherent in the GEM Local Capacity Building for Healthy Watersheds Model is central to the five business plans featured here.

All five projects share the same mission—to generate income that helps the local economy. By means of the GEM TIES business planning training and acquisition of skills, they wish to maximize the impact in the local economy by concurrently procuring different sources of sponsorship for their business ventures. It is clear that the business plan training participants had clearly identified the major cause for emigration, which was a lack of job opportunity in the Sierra Norte. By planning and implementing promising microenterprises in the region, the participants hope to generate jobs and increase income-generating capacity in their communities. They want sustainable
livelihoods available locally for increased earnings and so that their young men can return home to live and work with their families and friends in their Zapotec communities and culture.

Of the five microenterprises, the two larger projects are the Analco restaurant featuring indigenous Zapotec cuisine and the Yatuni trout farm, which will cost 265,000 pesos and 345,802 pesos, respectively. These two ventures are promoted at the community (not individual entrepreneur) level with the local authorities as the leaders. The Analco egg production cooperative venture is an expansion project requesting approximately 240,000 pesos from SAGARPA. It is unique because a group of older women, who successfully secured an initial pilot-scale grant two years ago, want to expand their facilities and profits. The two smaller microenterprise venture projects are tomato, cucumber, and chili de agua production in a Capulalpam greenhouse and La Neveria watercress marketing and sales. These entrepreneurial initiatives are driven by interest of proactive producers who desire expanded or more profitable alternatives to their current operations.

4.2.1. Egg Production Microenterprise Development in San Juan Evangelista Analco, Oaxaca

The mission of this microenterprise venture is stated as follows. The entrepreneurial women’s egg cooperative of San Juan Evangelista Analco intends to produce eggs of excellent quality in the region throughout the year. In order to be a constant presence in the market, the group proposes to increase their productive capacity. They also want to coordinate efforts to set up a work calendar that allows eggs to be harvested throughout
the year. Their vision is to become the first egg producers of great volume in the region offering a fresh and economically attractive product to resident consumers of the Sierra Norte based on a constant, dependable production all year round. These women exemplify adaptive management because despite the absence of young men in the local workforce due to emigration, they are engaged in an activity that can be carried out successfully within family units consisting of children, grandparents and themselves. The capacity building process occurs by means of local cooperative training and now they are maturing as entrepreneurs. After receiving an initial investment in this egg production venture from SAGARPA previously, they are now proposing an expansion with a SAGARPA funding request of 603,954 pesos. An internal rate of return (IRR) after three years is projected at 19%, and the net present value (NPV) after those three years will be 104,672 pesos (for details see Appendix A).

4.2.2. Trout Production Microenterprise Development in San Andrés Yatuni, Oaxaca

The mission of this San Andrés Yatuni trout production venture is to further enhance value through the expanded production of trout to customers of the local community-owned restaurant and to provide employment and increased cash flow to the community through these activities. The members of this cooperative envision to expand the production of trout to support continued community growth and sustainable livelihoods. It is important to identify that aside from the profit potential another economic benefit from this microenterprise activity is the generation of local jobs. Moreover, these jobs are in primary agricultural production that has long-range potential instead of services
industry jobs that are often temporary. Although the initial investment request is considerable at 283,600 pesos, an attractive IRR is projected to be 21% with NPV of 58,093 pesos annually after three years to profitability (for details see Appendix B).

4.2.3. Community Based Microenterprise Development for Tomato, “Chili de agua” and Cucumber Production in Capulalpam, Oaxaca

In the case of the Capulalpam greenhouse cooperative, the mission is to be a dependable supplier of quality products that include tomato, “chili de agua” and cucumbers to the community of Capulalpam (there are no plans to sell outside town) while having a positive economic on seventeen families involved in the business. Their vision is to create a successful microenterprise that will consist of trained, responsible members who supply quality products with consistent, dependable production. The profit-making capacity and contribution to building the local economy through this venture is evident. This microenterprise provides sustainable livelihoods for 17 families and much desired products in the local community. As an experienced group with growing greenhouse vegetables successfully, they have received horticultural and business management training, and are now using their acquired skills to generate an income for themselves. This group secured two previous grants for the construction of the greenhouse (one from SAGARPA and another from Secretaria de Desarrollo Rural, SEDER). With excellent greenhouse facilities, technical know-how, and cooperative organization, they are poised for success to produce high quality tomatoes, cucumbers and “chili de agua” for local sales. This SAGARPA funding request from the Capulalpam greenhouse cooperative is
for 29,000 pesos. As the facilities already exist, an IRR of 140% is expected in the first year. Also in the first year, the NPV is 34,182 pesos (for details see Appendix C).

4.2.4. Agricultural Cooperative for Watercress Microenterprise Development in La Neveria of the Sierra Norte, Oaxaca

The La Neveria watercress producers want to form a cooperative venture with the following mission—The watercress marketing and sales cooperative of La Neveria will link watercress producers and final consumers directly not only in Oaxaca City but the entire Sierra Norte region. Their vision is to become a well known, reliable provider of high-quality watercress among high profile consumers in the greater region of Oaxaca City. This is an attempt to organize individual watercress producers into an effective cooperative for more effective marketing and sales with cost savings through cooperative rather than individual efforts. They intend to establish a co-op sales agent to spearhead their new marketing and sales approach. The initial cost request to SAGARPA is 28,200 pesos. An IRR of 89% and a NPV of 30,763 pesos are expected in the first year (for details see Appendix D).

4.2.5. Community Restaurant for Enhanced Ecotourism in San Juan Evangelista Analco, Oaxaca

The community of San Juan Evangelista Analco is in the process of developing ecotourism facilities and the proposed restaurant is one of the many services that will open soon. In an attempt to secure sponsorship and technical assistance currently, they are approaching several different government agencies for funds to subsidize the initial
investment of the restaurant. The mission of the community restaurant microenterprise is stated as follows. The Committee of Ecotourism, representing the best interests of San Juan Evangelista Analco, will establish a restaurant that will celebrate the resources and customs of the community while improving the local economy by offering employment, purchasing local foods, and attracting tourists for purchase of local food and products. Their vision is to be an attractive food option for ecotourists and local travelers who visit the Sierra Norte region, with a reputation for high quality and freshness of locally grown agricultural products as well as excellent customer service.

Of the five microenterprise ventures presented in this thesis, the Analco community restaurant is the most ambitious and potentially high-risk. An initial cost request of 265,000 from SAGARPA is proposed, with other recurrent funds needed because the projected time to profitability is seven years. After seven years, the IRR is estimated at 4% with a NPV of 21,642 pesos. This venture will create six full-time jobs and will purchase food supplies from indigenous producers of Analco, a win-win strategy. The success of this community restaurant will have a great economic impact in the local community and the region (for details see Appendix E).

4.2.6. Prospect of SAGARPA funding

SAGARPA does not always provide money at 100% of the funds requested and sometimes will only offer 50%, 30%, or 25% of the requested amount. Marginalized applicants have priority such as women, indigenous people, elderly citizens, single parents, etc. Other discriminating factors include if the project is for primary production of corn, beans, wheat, and rice, which are given preference because these are staple
crops; or if it is a postharvest process that will add value to the final product; or particular crops important regionally such as pineapples and oranges in the south, and apples and pecans in the north, and so on.

According to SAGARPA priorities, two of the Sierra Norte business plans have favorable chances to be accepted at 100% financial support (Analco egg production and Capulalpam tomato, cucumber and “chili de agua” production) because these groups consist of Zapotec women, which represent indigenous and female constituents. The watercress and trout cooperative ventures also have some advantages to be accepted even if not at the 100% level requested, as both projects are in primary production and represent organized groups rather than individuals. Finally, the most challenging funding request may be the community restaurant because it is considered a services industry venture rather than agriculture (although the restaurant will serve indigenous dishes from ingredients accessed locally via agricultural production). In the latter case, the watercress marketing and sales cooperative has in mind to look for another potential sponsor.

SAGARPA funding applications require a modified version of a typical business plan (see Table 6). While the SAGARPA business plan format lacks some elements such as an executive summary, financial plan with internal rate of return and time to profitability, or land, labor and capital needed for fixed and operating costs, some other elements are embedded in subsections not listed. The formats are similar but not equivalent for the lack of some elements. However, the SAGARPA format is not intended to stand alone as it is submitted with a number of other documents and some of them are repetitive such as Strength-Weakness-Opportunities-Threats (SWOT) and market analyses. It is for that reason that SAGARPA does not require a more extensive
format. Furthermore, SAGARPA does not act like a bank, which makes loans and expects to receive both principal and interest to be paid. Instead, SAGARPA funds are outright grants without any kind of payback.

### Table 6. Comparison of business plan formats

<table>
<thead>
<tr>
<th>BUSINESS PLAN ELEMENTS</th>
<th>Typical American Business Plan</th>
<th>SAGARPA Business Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Executive Summary: Concise summation of the plan’s highlights</td>
<td>1. Organizational design</td>
<td></td>
</tr>
<tr>
<td>2. Vision: Long-term intent, what the firm wants to be</td>
<td>1.1. Internal design</td>
<td></td>
</tr>
<tr>
<td>5. Environmental Assessment: Business climate within its industry and beyond</td>
<td>2.2. Demand</td>
<td></td>
</tr>
<tr>
<td>6. Competitive Assessment: Competitors within and outside its industry</td>
<td>2.3. Commercial strategy</td>
<td></td>
</tr>
<tr>
<td>7. Operational Plans: Specific objectives and pro forma</td>
<td>3. Technical design</td>
<td></td>
</tr>
<tr>
<td>8. Control and Review: Mechanism and schedule for performance evaluation</td>
<td>3.1. Location</td>
<td></td>
</tr>
<tr>
<td>9. Implementation: Procedures for plan’s rollout and change management</td>
<td>3.2. Size</td>
<td></td>
</tr>
<tr>
<td>10. Financing Plan, and Land, Labor, Capital, and Inventory for fixed and operating costs. Internal rate of return (IRR), net present value (NPV), and time to profitability.</td>
<td>3.3. Engineering of the project</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Administrative design</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.1. Organizational chart of the company</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.2. Formats of planning and administration</td>
<td></td>
</tr>
</tbody>
</table>
The five business plans facilitated by the GEM TIES project are pertinent to “Development of Watershed Management Strategies (alternative scenarios)” and “Implementation/Sustaining Actions” components in the GEM Local Capacity Building for Healthy Watersheds Model. This important economic contribution will allow the inhabitants of Sierra Norte to start, continue, or improve productive activities that will generate income and help to reduce emigration. Adaptive management of natural resources, which is a continual process of iterative steps towards sustainability, allows local citizens to live and prosper now and for future generations. This is the crux of the microenterprise activities for sustainable livelihoods in the Sierra Norte region.

4.3. Water and waste characterization

Results presented in section 4.3 are a continuation of Phase I assessment that applies to and extends Objective 2, “Implementing practical pilot projects,” of this thesis.

4.3.1. Baseline water monitoring

Baseline water monitoring was an essential training objective in the Phase I assessment work of the GEM TIES Healthy Watersheds and Sustainable Livelihoods project in the Sierra Norte of Oaxaca (Jimenez, 2007). Although citizen water monitoring training and assessment is not a part of the objectives for this Master’s thesis, several communities expressed desire for training in baseline water monitoring during Phase II. As such, the Phase II GEM TIES extension specialists helped citizen groups formed during Phase I that were interested in further evaluation of their water resources.

Six communities—Cuajimoloyas, Benito Juárez, Llano Grande, Yatuni, Lachatao, and Capulalpam—received field-based training in how to evaluate stream flows in their
vicinities. Data were collected as spot samples in training activities, but these data are insufficient to characterize the baseline conditions. It is up to each of the citizen water groups to organize and collect measurements in time and space to establish baseline data sets useful for discerning long-term changes in water quality and quantity in their watershed. A technical training manual was developed and training workshops performed on roof rainwater catchment systems to address seasonal water shortages common to the region.

4.3.2. Solid waste characterization

A series of garbage surveys was carried out to identify the major solid waste components in different locations of Capulalpam including households, schools, streets, and stores (Figure 10). The importance of this activity was to identify the larger volumes of refuse and corresponding compositions. The major categories used for this training and survey task were organic matter, paper and cardboard, plastic, metal, glass, and “others” (such as fibers, Styrofoam, tin- or plastic- or wax-laminated cardboard containers for juice and milk, diapers, etc.). The Capulalpam citizens anticipated that the data collected could be used to develop a solid waste management strategy to reduce volume and to make it less expensive to collect and recycle or dispose.
As expected most of the volume of the garbage from households is organic and composting on-site will reduce the volume and convert a waste problem into a gardening asset. Stores and schools produce a lot of paper and cardboard waste materials, with schools producing more of these wastes than any of the other categories. This “others” category is for those materials that cannot be recycled easily.

Aside from the solid waste results from schools, perhaps the most surprising discovery was that high volumes mostly come from organic matter, followed by cardboard and plastic. The very least categories of solid waste volumes observed were glass and metal. Any future plan of solid waste management now has a basic diagnosis with which to start. The immediately major benefit could be improvements of the administration and management from the Sanitation Department in the Municipality of Capulalpam. However, the major long-term benefit of new solid waste management approaches for any community in the Sierra Norte will be increased environmental awareness and a healthier environment. The interest in solid waste management within
the community of Capulalpam may be driven by improved aesthetics in order to apply for and receive recognition from the Ministry of Tourism. This recognition will have a strong impact in the generation of income via tourism. The ultimate benefits of an integrated solid waste management plan will be economic, social, and environmental, a win-win-win situation for the community.

4.4. Post-workshop participation survey

Pertinent to Objectives 1 and 2 of this thesis and as part of an integral evaluation of the field work carried out by the extension agents during 2007, an evaluation survey was performed. This survey was submitted to the IRB at the UWSP for its approval and once it was approved was translated to Spanish for its use in Mexico. Both English and Spanish versions are available in Appendix F. The survey was designed to measure three areas of effectiveness, advantages, and areas to improve. Surveys were administered to past GEM TIES training workshop participants on site in Sierra Norte communities by two GEM TIES extension agents. The survey information was compiled with respondents’ names kept anonymous and only using gender and age for grouping purposes. Of 856 workshop attendees, post-workshop surveys were completed by 74 participants during the summer of 2008.

4.4.1. Demographics

The sample population was composed as described in Table 7. It is interesting to observe that previous records of age presented only two age categories (below 25 years of age and 25 years or above). As described in Table 5 there is more detailed information in age
structure that allows further analysis and insight. Although the range of ages is totally arbitrary for the purposes of analysis, it illustrates that the workshop participants were mostly people over 35 years of age. It is evident that the three largest age group categories are clustered consecutively starting with the 36-40 year-olds, then 41-45 year-olds, and 46-50 year-olds. These three age groups account for almost 46% of the total population of workshop participants. The first three younger age groups account for less than 15%. These data are consistent with the results of section 4.1.3.

Table 7. Age range and gender description of population sample

<table>
<thead>
<tr>
<th>Age range</th>
<th>Male</th>
<th>Female</th>
<th>Sub-total</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-20</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>21-25</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>26-30</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>31-35</td>
<td>2</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>36-40</td>
<td>4</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>41-45</td>
<td>3</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>46-50</td>
<td>4</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>51-55</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>56-60</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>61-65</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>66-70</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>71-75</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>76-80</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>81-85</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>86-90</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>91-95</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>25</strong></td>
<td><strong>49</strong></td>
<td><strong>74</strong></td>
</tr>
</tbody>
</table>

As for gender the ratio is almost 2 to 1 favoring females, which is also consistent with the results in section 4.1.3. The most plausible explanation of this unique distribution of workshop participants’ age and gender is emigration. Of course, sampling bias must also be considered, due to vagaries of availability or interest of past workshop attendees to take the survey. Unfortunately, many Zapotec men in the Sierra Norte of
prime economically productive ages are emigrating to other places that offer more and better job opportunities for an income. Emigration of similarly aged women from the region also occurs, but it is in minor proportion compared to men. This generational gap is a factor that impacts negatively the maintenance of Zapotec community life in the Sierra Norte. The improvement of local economies can help to mitigate or possibly avoid this phenomenon that unravels indigenous families and culture.

4.4.2. Effectiveness

This part of the GEM TIES training workshops evaluation was based entirely on the participants’ viewpoints. All questions were coded as multiple choice options and the categories were designed to mutually exclude each other to facilitate tallying and interpreting the results. Figures 11 and 12 display how much knowledge participants perceive they have before and after the training session.

![Figure 11. Self assessment of previous knowledge prior to training workshop (n=74).](image-url)
From Figure 11 an interesting distribution is observed such that most of the respondents assumed that they have a lack of some previous knowledge, but do possess enough knowledge as to not characterize themselves as “ignorant.”

Figure 12. Knowledge gain perceived by participants after training workshop (n=76).

Figure 12 displays the results for the participants’ self-assessment of knowledge gained as a result of attending workshop sessions. It is instructive to note the scale of the Y-axis. The range is very small and most of the respondents selected the two “positive” possibilities, while only a third of the respondents surveyed selected the “little” knowledge gained (i.e., “negative”) option. For those who responded with either of the “negative” options (23 participants), the survey asked them to identify what was the major challenge. Figure 13 describes the major obstacles to gain more knowledge as offered by respondents. According to the survey results, the two major obstacles were the lack of practical, hands-on experience and duration of sessions were too long.
4.4.3. Advantages

According to the survey results, respondents considered the foremost advantage to be that the training workshop sessions were offered conveniently in their communities at no cost. Is this a real advantage for the people? Surprisingly, most of the participants actually attended training sessions in communities other than their own. The survey then narrowed the inquiry to ask how far they were willing to travel and how much they were willing to pay for the workshops.

Figure 14 shows that most of the workshop participants who responded to the survey are willing to travel relatively long distances. This could be explained because the distance from Sierra Norte to Oaxaca City is more than 50 kilometers. GEM TIES workshops were offered in the Sierra Norte, but government agencies commonly hold training sessions in Oaxaca City. Citizens of the Sierra Norte commonly travel to Oaxaca City for day-by-day banking, medical care, shopping, etc. Therefore, willingness to
travel the maximum distance in terms of workshop location does not appear to be an extreme distance or detriment for the respondents.

![Figure 14. Responses on travel distance to attend training sessions.](image1)

In the particular case of money and cost for the training sessions, Figure 15 indicates that respondents chose the least expensive option, but they are still willing to pay if the training session is deemed useful.

![Figure 15. Amount of money survey respondents are willing to pay for workshop training session.](image2)
4.4.4. Areas to improve

Technical assistance from external sources is not new for the people of Sierra Norte. They have means to obtain technical assistance from different providers as shown in Figure 16. Because people in the Sierra Norte are able to hire technical assistance or benefit from non-governmental organizations (NGOs), private volunteer organizations (PVOs) and university projects and other professional subsidies, their assessment of the GEM TIES training work is more significant, as it is neither naïve nor harsh based on first impressions. In Figure 17 the graph depicts the assessment of the GEM TIES extension specialists.

![Provider of technical assistance](image)

**Figure 16.** Technical assistance provided by different sectors in the Sierra Norte (out of 51 responses).
Although almost 70% of the survey respondents approved the work of the GEM TIES extension specialists, a 5% faction considered them badly prepared for the task. In general, the appreciation of the extension specialists’ work is positive and survey respondents did not offer any suggestions to improve in the open questions and comments. The two positive categories add up to 81% approval, 6% is neutral, and only 13% disapprove their work. Again, in general the work carried out by the Mexican GEM TIES extension specialists in the Sierra Norte was outstanding.

Although the work of the GEM TIES extension specialists was very satisfactory, as any activity there is room for improvement and it is clear that people are looking for hands-on activities. The more dynamic the training session, the greater the gain of knowledge was the respondents’ perception. There is no argument that sustainable agriculture is very important economically and environmentally. Nevertheless, it is important to promote the other areas of training because those were identified as high priority by citizens and also can impact the economy positively. Training in the other areas helps raise awareness that all of these elements are interconnected in efforts to
improve and/or maintain healthy watersheds and sustainable livelihoods in the Sierra Norte, Oaxaca.

4.5. Segue from Chapter 4 (Results) to Chapter 5 (Discussion)

The results presented in Chapter 4 featured GEM TIES Phase II Implementation work in the Sierra Norte, Oaxaca. Summaries of meeting Objectives 1, 2 and 3 are presented within a framework of sustainability in Chapter 5. These summaries provide an overview of capacity building and implementation steps towards healthy watersheds and sustainable livelihoods integrated via the GEM Local Capacity Building Model. A concise case study featuring communities of the Sierra Norte and highlighting successes achieved and challenges encountered within this GEM TIES project and beyond is also presented in Chapter 5. This addresses Objective 4, “Case study of GEM local capacity building model in Sierra Norte,” of this thesis.
Chapter 5. DISCUSSION

5.1. Capacity building and pilot activities

With 856 trainees having participated in 70 workshops offered in ten communities of the Sierra Norte during Phase II implementation of this GEM project (adding 142 trainees during Phase I assessment, a total of 998 participants were trained over four years), the capacity building goal of 200 citizens trained has been more than fulfilled. However, the GEM model is not only about training; it also requires and empowers local ownership of the decision-making processes in identifying problems, developing and implementing solutions, evaluating obstacles and achievements, and adapting the management of natural resources for sustainability. Within the five-year scope of this GEM project in Oaxaca, this thesis research covers Years 3 and 4 (Phase II implementation).

The intrinsic relation with the initial Phase I assessment is deterministic in the outcome of this thesis work, as community priorities identified in Phase I were designed as the work focus for Phase II. While all efforts were made to secure the participation of all communities within the watershed, some underlying conflicts of interest existed among some of the communities, which limited participation to ten communities out of the seventeen contacted. Cooperation and integration in territorial units that surpass geopolitical administration units always pose a challenge. The Zapotec citizens of today recognize their ethnic heritage, but do not associate this with territorial integration. Perhaps this is a problem of competition for limited access to economic resources from the federal and/or state governments, or a misleading sense of pride from the place of birth, or even historical animosity from previous conflicts. Whatever the reasons might be nowadays for an apparent lack of a cohesive Zapotec culture in the Sierra Norte, the
process of interconnecting and creating social networks is often challenging, slow and sometimes not linear in any region for groups of people. Additionally, communities with a significant demographic component that emigrates for economic opportunity, which is common for the Sierra Norte, may lack strong social fabric. Finally, dynamic and frequent change in local leadership and elected authorities over short time periods represents a challenge to rural development work. The new leaders and officials must be re-introduced to the project and buy-in and approve work plans, schedules, and goals—starting afresh time and time again.

This project trained more elderly citizens and women than youth and male counterparts in a ratio 3 to 1. This was not intentional, but it does reflect a demographic reality of these communities—most of their workforce and future leaders live outside the Sierra Norte. Given this situation, the best possible scenario might be that wherever those migrants are located the informal, on-the-job training and experience they receive will be complementary to the training conducted by the GEM extension specialists.

Also, there is a bright side to the high gender ratio of females in these communities. With the training that predominantly women participants received and concurrent economic resources from some local sponsors, productive groups of women formed to implement microenterprise ventures for sustainable livelihoods and to monitor water quality and quantity for baseline watershed health. The bond among these women is not only a need for income generation, but sometimes from sharing the temporary absence or permanent loss of a family member (especially a father, husband, brother, or son who provides for the family). This is certainly a cohesive factor that helps facilitate the construction of effective social networks. Women contributed to identifying
community priorities during Phase I, such as organic agriculture. Who could be more receptive of this priority than the person in charge of buying and cooking local agricultural products? And who better to be positioned to conceptualize and act on microenterprise opportunities, too? The answer is women.

Sierra Norte women acquired skills via the GEM project training workshops, and they formed cooperative groups that shared a strong bond. Because women are considered a marginalized group by federal funding sponsors, they are more likely to access money from grants or special projects. Even as this thesis manuscript is being prepared, there are some women groups that have already been awarded grant funds and they are operating small ventures with relative success (e.g., the greenhouse vegetable cooperative in Capulalpam and the egg cooperative in Analco).

The conformation of citizen groups interested in monitoring and protecting their watershed was more evident in Phase one of the GEM project; however, there were additional water monitoring groups trained for water quantity and quality analysis as well as for garbage sampling during Phase II. These capabilities, plus sustainable agriculture and ecotourism, will bring productive changes to livelihoods in the long term. In the short term, benefits are apparent in water quality and quantity. The major change in the economic aspect of the Sierra Norte may be the shifting from agriculture into tourism as the primary income generation activity. Some communities are taking appropriate measures such as planning and developing the strategy to grow little by little allowing themselves to adapt to the new demands of visitor industry services and infrastructure. Capulalpam could be the best example of this transition (see section 5.2.2). In many cases the groups were not newly formed; instead, they were part of a larger structure such
as the CBC or the municipality. It is the use of these well-established structures that may contribute significantly to the success of these cooperative ventures and community actions and to the most rapid deployment of the GEM model as working methodology.

The economy of this region relies largely on remittances from emigrants working in the USA. This factor alone makes it difficult to attract people to alternatives for income generation and concurrent actions toward improved management of natural resources. However, there are exceptional cases such as Pueblos Mancomunados, where there are profitable companies based in the planned harvesting of timber and non-timber products (e.g. water and mushrooms) from their forests. Therefore, this region has a mixture of economic aspirations; a youth cohort approaching entering workforce age and imminent departure to other places for jobs; an organized agricultural sector of producers that have discovered that by joining together cooperatively they obtain better yields and improved markets and sales.

5.2. Sierra Norte case study featuring San Juan Evangelista Analco, Capulalpam, and Pueblos Mancomunados

This case study compares and contrasts three entities within the Sierra Norte study area to present different approaches and solutions needed locally. These local differences represented by citizen-based activities in San Juan Evangelista Analco, Capulalpam, and Pueblos Mancomunados exemplify the adaptive management of the GEM local capacity building model that is needed for success.
5.2.1. San Juan Evangelista Analco

This small municipality has a total population 412 citizens (INEGI, 2005). This population level contradicts the law of 1968 in which it is indicated that any municipality must have at least 2,000 inhabitants (Sanchez, 1998). In Oaxaca, there are plenty of exceptions to or non-compliance of this legality for Municipalities with fewer than the required number of inhabitants receiving federal funds. Sometimes these exceptions exist for historical reasons such as communities that are different from neighbors (e.g., different ethnic groups), or sometimes for accessibility (e.g., if they are located in remote areas then it is better to be designated a municipality even if it has a small population).

Analco is a small community and a designated municipality that faces several challenges. By law Analco should provide a series of public services and maintain infrastructure of an average municipality, including education. The community’s educational infrastructure includes a kindergarten, elementary school, and junior high (latter by telesystem). By Mexican law, mandatory education through the ninth grade level for all citizens is strictly enforced. Analco also has a small clinic for free medical assistance. There is a library, an auditorium, and an office building for the municipal government authorities. In recent years equipment also has been procured, such as a Cat Backhoe tractor, pickup trucks and large trucks for hauling. This community has developed a migrant tradition in the 20th century and the major destinations are the suburbs outside Mexico City, poor neighborhoods within Mexico City and California in the USA.
Previously, Analco has been an agriculture village, and during the times of active mining operations, Analco was the supplier of corn to miners. However, today the agriculture sector is facing a severe crisis in Mexico and the town is looking for alternatives to local income generation. The community reported its economic activities as follows: 68% of its population as farmers, 7% in mining, manufacturing, and construction, 22% in commerce, services and tourism, and 2% other (INEGI, 2005). Analco has a large number of professionals at almost 20% of the population (Eugenia Santiago pers. comm. 2008), which is exceptional because from the community’s adult population there is a good chance that a person elected as Municipal president or any of the positions in the cabinet has earned a bachelor’s degree. This proportional high level of adults with higher education who become elected authorities of the town is fortunate because these leaders are bright and more aware of their rights as municipalities and the opportunities for special programs from the federal and state government. Analco has been improving the quality of life for its citizens over the years, e.g., road improvements, telephone and Internet access, which are examples of the kinds of services that now are accessible to a small rural community that happens to be a municipality.

GEM TIES work with Analco was initiated only in Phase II because in Phase I a strategy of clustered communities was the best for logistics at the time. In an effort to integrate all the communities within the upper reaches of the Rio Grande watershed, the Phase II team invited more communities to participate in the project, such as Analco. The GEM TIES activities in Analco focused on the training and elaboration of business plans in summer 2008. Also, a GEM student ambassador from UWSP was placed in Analco to work on land use planning three years ago. The efforts of the GEM TIES project are
concurrent with other major projects there like the large-scale ecotourism facilities construction. By adding together these complementary efforts, Analco enjoys the advantages of a win-win strategy—building funds for priority construction projects from federal (Mexican) grants and training for capacity building from the GEM TIES project.

Analco is a town that has developed a Land Use Plan that may be useful for future steps towards sustainability. This community is adapting to changes of economic orientation in the region with actions like ecotourism, but Analco remains linked to agriculture in more profitable ways by diversifying activities for sustainable livelihoods like the women’s egg production cooperative venture (see Figure 18).

Figure 18. San Juan Evangelista Analco features (clockwise from upper left corner): land uses of urban spaces and agricultural terraces, municipal building for local governance, community restaurant for ecotourism, and chicken egg production.

5.2.2. Capulalpam

This municipality is the second largest town in the Sierra Norte with a total population of 1,210 citizens (INEGI, 2005) in the district of Ixtlán. As any other community in the Sierra Norte region, the inhabitants of Capulalpam are Zapotec, but there are also some
Chinantec people living there. Capulalpam has a well-developed Land Use Plan, and about 5% of its territory is used for agriculture and another 5% is the urban area, with 70% for timber extraction, and almost 20% is under conservation status (Thome, 2007). Due to this land use management, Capulalpam was certified in 1996 for Good Forestry Practices by the Forest Stewardship Council (FSC) and in 1997 it was awarded with the National Award for Ecological Merit (Thome, 2007).

The directives of the Capulalpam Land Use Plan allow the integration of ecotourism services particularly for the value of protected areas, which make this tourist destination more attractive. Moreover, in the last year, Capulalpam received the designation of “Magic Town” from the Mexican Ministry of Tourism. This is a significant step towards national and international markets for tourism. Mexico is very different from other Latin American countries in that, while in other places foreign tourism represents 40% of the net income for tourist activities, in Mexico it is only 20%, which means that most of the net income for tourism is money from domestic tourists (Thome, 2007). Capulalpam chose to build its visitor facilities slowly and to apply for as many tourism grants as possible, including SAGARPA, Ministry of Tourism, PROCAMPO (a special program of subsidies to help farmers), and CDI (National Commission for Development of Indigenous Communities).

Capulalpam has a well-managed timber operation, sufficient agricultural plots, and a small population size, so why is this community pursuing ecotourism development aggressively? Another exacerbating factor is that there is competition with Pueblos Mancomunados and Ixtlán, the pioneers of ecotourism in the region. Perhaps Capulalpam leaders want to take advantage of the existing federal policy and practice of
encouraging tourism by making federal funds readily available for building tourist facilities. However, there has been no federal support for training in hospitality services, foreign languages for communication with international tourists, and basic business management skills for operating visitor industry operations. This is a challenge that each community with ecotourism development in the Sierra Norte faces. Capulalpam’s approach to entering the visitor industry has been to start with small steps to build slow and steady success (it took almost 11 years since 1997 to attain fully operational ecotourism services there).

Capulalpam’s strategy includes a tacit understanding that tourism will be an important source of income, which may be more clearly understood and acted upon than in Ixtlán or Pueblos Mancomunados. These two competing communities have sources of income from much larger forest holdings and associated timber operations than Capulalpam. Therefore, Capulalpam’s economic orientation and source of income has to come from some activities other than timber production—20% of the population works in a sand and gravel quarry (the major employer in the town) and the remaining cash flow comes from small-scale agricultural products and services. Agriculture is in decline (14% agricultural jobs versus 48% in commerce, tourism and services), so the natural replacement occupations are in the expanding services sector for tourism. The fact that Capulalpam made it a priority to be recognized with the “Magic Town” designation from the Mexican Ministry of Tourism and succeeded in garnering this designation indicates that Capulalpam anticipates significant cash flow from this activity as vital for surviving in an adaptive process of specialization in the Sierra Norte.
The GEM TIES project helped Capulalpam to identify garbage volume and to characterize solid waste components. This information is now being used to develop new strategies for solid waste management, a community-identified priority. This action will help improve aesthetics to attract tourists, which is consistent with Capulalpam’s visitor industry goals and concurrently will result in a cleaner and healthier environment. At the request of the community, GEM TIES staff conducted a series of workshops in solid waste management and environmental education. The GEM TIES Phase II extension specialists also provided training in tomato production and in business planning for the production of greenhouse vegetables to apply for a SAGARPA grant. Capulalpam has elements that can serve as building blocks of sustainability, which for substantive progress will require community vision, planning and dedicated action steps in the future (see Figure 19).

Figure 19  Capulalpam GEM TIES participation (clockwise from upper left corner): visitors at Capulalpam guest house with garden composting, women’s group of tomato producers during summer 2008 business plan training, GEM TIES extension specialist Eugenia Santiago classifies solid waste during garbage sampling, GEM TIES extension specialist Alejandro de la Torres with participants in greenhouse during summer 2007 workshop training, clean and aesthetic river (tributary to the Rio Grande), and beautiful downtown square and church of Capulalpam.
5.2.3. Pueblos Mancomunados

In the Sierra Norte, the first territorial unit that goes beyond the municipality level to regional management is Pueblos Mancomunados, which is the integration of three municipalities: San Miguel Amatlán, Santa Catarina Lachatao, and Santa Maria Yavesía. In total there are eight communities within Pueblos Mancomunados from (1) San Miguel Amatlán (county seat), (2) San Antonio Cuajimoloyas (municipal agency), (3) Llano Grande (police agency), (4) Santa Catarina Lachatao (county seat), (5) Benito Juarez and (6) Latuvi (its two municipal agencies), (7) La Neveria (police agency), and (8) Santa Maria Yavesía (county seat). The combined population of Pueblos Mancomunados is 2,518 inhabitants (INEGI, 2005).

According to its citizens, the historical explanation of why these eight communities became one territorial unit can be traced to a 1598 church codice from Santa Catarina Lachatao and a property title of San Miguel Amatlán in 1615. Jimenez (2007) stated that the reason why they joined may have been to protect each other from bandits. However, for this time in history it is more likely to be the same phenomena that Gonzalez (2001) described—to centralize small, dispersed communities into large territorial units. Moreover, the first official record from colonial times— the property title of San Miguel Amatlán— refers to one municipality with a mayor and subsequent structures for the rest of the communities. It also matches times in history when silver mines were operating in the region (Sigüenza, 1996). In 1910 during the third civil war in Mexico (Revolucion Mexicana), the Zapotec people that lived there joined forces against the federal army called “carrancistas”, for their support to General Carranza. This alliance was for survival, because the path to the Pacific Ocean and the strategic
high ground gave tremendous importance to this part of the Sierra Norte. The inhabitants then were forced to abandon their usual residences and hide in the forest to act as a guerrilla unit and to grow crops in small plots, because their usual plots were occupied or burned by Gen. Carranza’s army.

After this terrible experience, a bond among the people from the Sierra Norte, the “Serranos”, was strong and in 1961 by Presidential Decree, Pueblos Mancomunados was officially constituted under the new agrarian law with a regime of community ownership very different from the ejido form of land disposition promoted after the civil war. The organizational structure of Pueblos Mancomunados is unique (see Figure 20) because it features four levels of governance: (1) General Assembly (maximum authority), (2) Characterized Assembly (similar to an executive board), (3) traditional local authorities: Municipality, Council of Commually Owned Land, and Vigilance Council, and (4) sector-based working committees. This regional government structure and process is mature in that it started in 1961 and by 2008 had five economic ventures (i.e., forestry, non-timber forest products, agriculture, mining and ecotourism) with different degrees of success as described below.
The Pueblos Mancomunados forest sector has acquired an automated sawmill and they currently sell lumber instead of logs with more value-added revenue. Additionally, they have their own tree nursery for growing saplings and their own genetic bank from tree seeds collected locally. In the mining sector, they extract not only silver and gold, but also quarry rocks, paving stones, and sand. The non-timber forest products sector refers to a water bottling plant from their natural springs. Currently, Pueblos Mancomunados provides drinking water under the brand “India Pura” to 4% of the market in Oaxaca City, which represents an average of 2,000 containers of 20 liters every day.

The Pueblos Mancomunados ecotourism sector was a visitor industry pioneer within the entire Sierra Norte region through the construction of tourist facilities in Benito Juarez. Today they have a company brand, “Expediciones Sierra Norte”, and the largest network of over 100 kilometers of hiking paths and horseback or mountain bike riding trails completely equipped with signage for tourists. In the agriculture sector, an agribusiness that dehydrates fruits and herbs for export sales is the latest venture and has already
managed to obtain international certifications (i.e., Kosher Pareve from Israel and Naturland and Bioagri Co-op from USA and Europe, respectively).

While the future looks promising for this kind of regional association of municipalities, in the past several years there have been some frictions, particularly with Yavesía (Jimenez Bañuelos, 2007). Apparently, economic successes have not generated sufficient revenue to keep the association running smoothly. There are transitional dynamics as well. The generation born after 1961 is now reaching positions of power and the spirit that created this joint venture is fading with this new generation. Pursuing money beyond meeting basic need is commonly associated with Western societies, and the indigenous Zapotec culture is assumed to be impervious to this adverse impact. However the human traits of greed and envy, frequently pose a threat to joint ventures that are economically successful. Hopefully the new generation will learn from the elders, but it could be that the elders did not prepare the new generation to take over when they retire. Pueblos Mancomunados still represents the best example of regional management in the Sierra Norte region, but Yavesía seems to be pushing away- even though its territory and population are the smallest- and this separatist action may have a negative impact on social organization and integrated management of Pueblos Mancomunados.

For whatever reason, Yavesía chose not to participate in the GEM TIES project. As its citizens observe success in neighboring communities, perhaps they will re-evaluate their position. The legal status of Pueblos Mancomunados remains as stated in the presidential decree of 1961. The only way that could be changed is by a new presidential decree.
The GEM TIES project was able to work successfully with people from Lachatao, Amatlán, La Neveria, Llano Grande, Benito Juarez, and San Antonio Cuajimoloyas, with Lachatao as the most active and best (many of the workshops were held there) and La Neveria as the one community that participated consistently throughout all Phase I and II programming. The GEM TIES project worked with six out of eight villages of Pueblos Mancomunados that were very receptive and demonstrated much willingness to work together with GEM TIES staff. Pueblos Mancomunados may encounter obstacles such as Yavesia attempt at independence in the way of stated plans and goals for the future, but it has strong roots and will overcome these challenges. As for the GEM TIES project, it was an excellent opportunity to work with most of the communities that form Pueblos Mancomunados in cooperative capacity building (see Figure 21).

Pueblos Mancomunados has been moving towards sustainability with its regional management plan for timber extraction, five economic ventures that generate income and provide stable jobs, and perhaps most importantly teaching by example that good management of natural resources brings better incomes and eventually a healthier watershed for its citizens.
5.3. Conclusions

For Objective 1 (“Participatory training in capacity building”) of this thesis, perhaps the most exciting experiences came from San Andres Yatuni and Capulalpam. San Andres Yatuni received grant funds from CONAFOR (National Forestry Service in Mexico) for establishing a trout production facility. However, the local citizens did not have the proficiency to build and design the trout farm themselves. The GEM TIES staff developed a “How to” trout production training manual and provided training in engineering design of the trout farming facilities and in the production process of trout. The GEM TIES project also facilitated making connections between nearby trout producers with expertise and who agreed to provide fingerlings to the Yatuni trout venture. This is the process of capacity building at its best.
Similarly, in Capulalpam there was already a women’s group that had applied for and received grant funds for a vegetable greenhouse. Again, a GEM TIES extension specialist provided necessary operational training on tomato production in summer 2007. In summer 2008, the M.S. graduate student conducting the Phase II work organized and offered business planning workshops and facilitated the development of the Capulalpam greenhouse vegetable production co-op’s grant application to SAGARPA in February 2009. Another noteworthy experience in Capulalpam was the solid waste management initiative that included garbage sampling. Local authorities now have a more reliable set of information on sources, volume, and composition of their community’s solid wastes, which allows them to make knowledge-based decisions and plans for solid waste management.

For Objective 2 (“Implementing practical pilot projects”), the GEM TIES project did not sponsor pilot projects initiated by local citizens, but the GEM TIES training and technical assistance contributed to the success of these local initiatives, which represent an effective collaboration with shared vision and goals for healthy watersheds and sustainable livelihoods in the region.

For both Objectives 1 and 2, the attendance of citizen participants in the GEM TIES workshops surpassed the project’s training goal by 400% (target was 200 participants trained and the actual number trained was 998 during the GEM TIES project). In the long run, this level of capacity building achieved will help the participating Sierra Norte communities move towards integrated resource management and planning for sustainability through the GEM-facilitated technical capacity in local
citizens and GEM extension specialists, and more significantly through initiating social networks that raise awareness of healthy watersheds and sustainable livelihoods.

For Objective 3 (“Support and develop local economies”), the GEM TIES development of seven “How to” training manuals addressing priority expressed by the Sierra Norte communities in Phase I assessment are readily available resources for microenterprise development. Moreover, the GEM TIES project helped entrepreneurs and cooperatives in the Sierra Norte with five business plans intended to help them subsequently in applying for grant funds to launch or expand microenterprise ventures.

For Objective 4 (“Case study of GEM local capacity building model in Sierra Norte”), the GEM Local Capacity Building for Healthy Watersheds Model was used to initiate an assessment of watershed health in an adaptive, iterative activity of planning and implementation. It was not the goal of the GEM TIES project to engage all communities to create a watershed management plan for the Sierra Norte, but the project did make a positive impact through training and capacity building, as well as initiating a long-term mindset for local action towards sustainability in the upper Rio Grande watershed. A case study was presented for three communities in the Sierra Norte: San Juan Evangelista Analco, Capulalpam, and Pueblos Mancomunados. These communities exemplify the adaptive management of the GEM local capacity building model that is needed for success in the years ahead.

The communities in the upper Rio Grande watershed now are more aware of the current quality of their water supply and they are now working to safeguard their water resources. They are also looking for alternatives for local income generation that are friendly with the environment.
5.4. Recommendations

The regional development of an integrated watershed management plan for the upper reaches of the Rio Grande watershed is one of the most compelling tasks for the local citizens to undertake immediately. The GEM TIES project work was clearly moving in that direction to provide a framework and solid base for future attempts to collaborate on such a plan. Other challenges in the region are to develop more efficient networks with potential sponsors that can help them to consolidate citizen groups for water monitoring and to expand the built capacity and expertise to other parts of the Sierra Norte.

Where possible, it is desirable to recruit local professionals- even from the same town- to help the communities design and implement solutions to their problems. This is not a cultural conflict or an issue of communication or mistrust. This recommendation is based on logistics and knowing what alternatives exist when plans cannot be fully implemented, and what resources exist and how to obtain them to implement shared vision and action based on community priorities.

Finally, the Upper Rio Grande watershed was perfect for applying the GEM model because it is in a rural setting with a small-scale watershed less than 100 km in length. The topography of the Sierra Norte offers a challenge due to accessibility of highways allowing public transportation service to reach small villages remotely located in the mountains; as such, this needs to be considered carefully in clustering geographically subsequent to regional planning collaboration or regional initiatives.
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APPENDICES

Appendix A. Egg Production Microenterprise Development in San Juan Evangelista Analco, Oaxaca

Appendix B. Trout Production Microenterprise Development in San Andrés Yatuni, Oaxaca

Appendix C. Community Based Microenterprise Development for Tomato, “Chili de agua” and Cucumber Production in Capulalpam, Oaxaca

Appendix D. Agricultural Cooperative for Watercress Microenterprise Development in La Neveria of the Sierra Norte, Oaxaca

Appendix E. Community Restaurant for Enhanced Ecotourism in San Juan Evangelista Analco, Oaxaca

Appendix F. Survey Questionnaire for Participants of GEM TIES Watershed Management Training Workshop Sessions in Sierra Norte, Oaxaca (English and Spanish versions)
Appendix A

Egg Production Microenterprise Development in
San Juan Evangelista Analco, Oaxaca
Egg Production Microenterprise Development in
San Juan Evangelista Analco, Oaxaca

I. ORGANIZATIONAL DESIGN

1.1. Internal design

With the support of a productive project financed by SAGARPA, a group of seven women in the community of San Juan Evangelista Analco established chicken coops for laying hens. Although the main product is eggs, this microenterprise also takes advantage of selling poultry meat when the birds are replaced periodically. After a process of practical learning via trial and error, the women of this group have acquired sufficient abilities to plan an expansion. They acknowledge that the process to obtain resources for the desired egg production expansion requires an organized group, rather than each egg producer operating independently and competitively. Each individual member of the proposed egg cooperative has particular talents and needs, and by working together the collective success of their group plan is enhanced. The group is integrated as follows:

   President- Esperanza Valentin Dámaso Aguilar;
   Secretary- Flavia Manzano Perez;
   Treasurer- Agustina Santiago Méndez; and
   Other members- Loremedio Méndez, Eugenia Reyes Méndez, Eufemia Perez Bautista, and Elvia Perez Luna.
The positions are for handling bureaucratic procedures, because these administrative matters are a requirement for the major sponsor agencies in Mexico (see sections 1.1.3.1 and 1.1.3.2). Each partner has a production unit that varies in size and production capacity with day-to-day operations managed independently. In general, the majority wants to double the number of birds, one person wants to maintain the existing number of layers that she has in production but to upgrade and improve facilities, and two others want to initiate egg production as a new income-generating activity in their own spaces. During the first year the production was irregular due to lack of experience; however, the women’s group managed to obtain an annual production estimated at 25,000 eggs and their income was around 29,000 pesos (see section 2.2). Building on the successful launching of egg production in the first stage funded by SAGARPA, this business plan helps facilitate the request for additional resources from SAGARPA in this second stage of egg production expansion with this newly organized group of women entrepreneurs. Zapotec families in the Sierra Norte traditionally keep chickens in their backyards for meat and eggs, but these chickens are not necessarily well nurtured with diet supplements or proper veterinary care which leads to low production of eggs. Furthermore, backyard egg production is inadequate to meet demand.

1.1.1. Proposal of value

Objective: (a) To enlarge, to renovate and to build new a total of seven chicken coops with stage 2 SAGARPA funds (six coops were established during stage 1, with two of these to be renovated) for laying hens in the community of San Juan Evangelista Analco for local egg production and marketing in the Sierra Norte region of Oaxaca; and (b) to
provide sustainable livelihoods for seven local women and their families improving the local economy.

**Mission:** The entrepreneurial women’s egg cooperative of San Juan Evangelista Analco intends to produce eggs of excellent quality in the region throughout the year. In order to be a constant presence in the market, the group proposes to increase their productive capacity. They also want to coordinate efforts to set up a work calendar that allows eggs to be harvested throughout the year.

**Vision:** To become the first egg producers of great volume in the region offering a fresh and economically attractive product to resident consumers of the Sierra Norte region based on a constant, dependable production all year round.

### 1.1.2. Principles of the organization

The principles that govern the women’s egg cooperative are:

- **Organization:** The group structure works to improve management and administration of resources for optimizing production and profitability; in each unit of production individual members are responsible for maintaining a high, consistent standard of quality in their respective units of production.

- **Participation:** The administrative work is performed by those partners who were selected by the group members as President, Secretary and Treasurer. Nevertheless, because all partners will obtain benefits from this joint venture, all partners must be available to spend time as needed in the management process.
Respect: The group is small and local, which provides for frequent, open communication. The members will resolve potential disputes through constructive dialog that allows for honest and genuine critiques.

Tolerance: Group cooperatives, in contrast to independent producers, require a greater tolerance of different viewpoints and a willingness to work as a team towards mutually agreed upon goals; the one tacit agreement is that the partners do not have to be in complete agreement on everything, but majority rules; also, if a member disagrees with the group, the others must be willing to listen and to be fair in considering the issue at hand.

Quality: The quality is a consequence of careful, professional work within the production units and can be measured in terms of productivity: volume of production, hardness of the shell, and/or size of the egg. The nutriment values of an average sized egg are 6.5 grams of protein, 0.5 gram of carbohydrates, and 5.7 grams of fat, with 83 calories and 225 milligrams of cholesterol (SAGARPA, 2007).

1.1.3. System of internal control

1.1.3.1. Members of the Committee

Due to requirements of resource management imposed by the sponsor agency, the group designated three people to lead this process: president, secretary and treasurer. The persons appointed for each position were chosen in common agreement by the group
members and if deemed necessary they can be removed from the position by majority vote of the members.

1.1.3.2. Responsibilities of the group officers (Executive Board)

The position responsibilities for officers of the Executive Board within the group are:

► President (responsible to represent the group with the sponsor agency or government entity; to help in the identification and obtaining of financial resources);

► Secretary (responsible for keeping files and preparing documents and communications);

► Treasurer (responsible for the administration of financial resources and fiscal bookkeeping, including preparing required financial statements, managing the acquired economic resources for benefit of the group).

1.1.3.3. Work place

From the original six chicken coops launched with the previous stage 1 SAGARPA grant, at the moment five members of the egg cooperative have suitable units of production and functionality, four of them want to expand to double the number of birds, two want to renovate their facilities, and one member has a small space destined for and committed to this activity, but she wants to construct a new unit for her birds. All the existing units and those that will be constructed are located within the urban area of the community of San Juan Evangelista Analco (see Figure 1).
1.1.3.4. Process of elaboration

The birds are bought as pullets at two weeks of age and fed with a growth diet for 20 weeks when physiological maturity is reached to initiate egg laying. During the first weeks the hens are irregular in egg production. Once the daily egg production is standardized it is expected that four months of stable production will be achieved, followed by approximately three months of decreased egg production during molting. Aside from the daily feeding and constant water dispensers it is required to open and to close the side windows depending on the climatic conditions of the day.

The chicken coops require regular cleaning and sanitation procedures must be strictly followed (e.g., coop cleaning, vaccination, and removal of ill birds). This can be
done when the birds are freed to enjoy their daily walk outside the coop during daylight hours over a secured, fenced area that can be the family orchard or an agricultural plot.

The production average of 1000 birds in non-intensive farming is 650 daily eggs. Once initiated the productive stage of the birds’ diet must be complemented with calcium to have firm shells that are not easily broken during transport. The system is designed to allow the birds to obtain 50% of their diet from the orchards and the agricultural plots, and the other 50% with commercial chicken feed provided in the feeders inside the coop.

1.1.3.5. Commercialization of products

The present volumes of 25,000 eggs per year have allowed for the total production to be sold within the local community of San Juan Evangelista Analco. There is further demand for eggs in Analco. The bakers of Analco still purchase eggs with other providers because their needs are not met entirely by local supply, and there are more families within and outside the community that would be potential clients for this new expansion. The proposed expansion to increase egg production by 100% (doubling the existing production level) requires marketing and sales expansion to the wider Sierra Norte region, with Ixtlán being the community where the greatest sales of regional product sales occur. An expanded market for eggs in Ixtlán and other communities in the Sierra Norte region exists (see section 2.2).
II. COMMERCIAL DESIGN

2.1. Diagnosis of market

All the eggs sold in the City of Oaxaca and the nearby Sierra Norte region come from outside the state. The City of Tehuacan, Puebla provides 90% of the eggs consumed in the greater Oaxaca City area and the rest come from places as distant as the northern state of San Luis Potosí. The price is elevated not by the production costs or transport, but for being almost a monopoly product of another state. The prices adjust to the interests of the producers in their respective states.

2.1.1. Analysis of the product

The product in this case is eggs. An average egg weighs 60 grams and it is considered fresh if storage is not more than three days and it had never been cooled. Commonly in Mexico, egg production is not industrialized and eggs are the only affordable protein source for many Mexican households, especially in poorer states like Oaxaca. Although the packing of 360 eggs in a large volume box for bulk sales is not uncommon, if the sale is direct to the final consumer the units are typically sold in dozens or kilos, and even individually.

2.1.2. Analysis of the consumer

A small portion of the egg production is for self-consumption to improve the diet among the family members. Then, the consumers of greater demand in the community are bakers who consume almost 50% of the present volumes of production. The other 50%
goes to housewives in the community, who seek a fresh, high-quality product. To a lesser extent some neighbors of bordering communities that know of this women’s egg cooperative are customers. In the future when the planned Analco restaurant starts operations, the women’s egg cooperative is already considered to be the provider of eggs for the restaurant.

2.1.3. Analysis of the competition

Ninety percent of the eggs sold in the City of Oaxaca and the nearby Sierra Norte region are imported from Tehuacan, Puebla. The price of eggs in the region is expensive mainly due to the virtual monopoly of the farms of Tehuacan that sell exclusively to their regional distributors as well as to local distributors and even to the final point of retail sales outlets. Therefore, the imported product goes through three hands before arriving to the final consumer. There is no local producer that directly competes with the Tehuacan egg producers. The remaining 10% comes from egg producers in other parts of the country, who adjust prices according to those set by the farms of Tehuacan, similarly benefitting from the lack of local production of great volume in Oaxaca.

2.1.4. Analysis of prices

According to the Ministry of Internal Commerce web site (http://www.secofi-sniim.gob.mx), the price of eggs at the beginning year ranged from 13.50 to 14.50 pesos per kilo. During the month of September 2008 prices up to 16.30 pesos per kilo were posted on this same site. The estimated inflation rate is 5.1% per year, so the price is expected to increase up to 4 pesos for the month of December 2008. The price of eggs is
monitored by the Central Bank of Mexico as one of the basic staples in the Mexican diet. If prices go beyond estimated inflation rates, a program of subsidies would be setup by the Ministry of Agriculture and the Central Bank. However, to access the subsidies one needs to be registered with the local branch of the Chamber of Commerce and in the National Directory of Egg Producers. Therefore, prices can be manipulated artificially in order to keep them low for Mexican families. This can affect severely the sales price for the Analco women’s egg cooperative at their current low scale of production that would not allow them access to any subsidies. According to the Consumers Board website (http://www.profeco.gob.mx/precios/canasta/home.aspx?th=1), in November 2008 egg prices are 16.14 pesos per kilogram. During the summer 2008, a single-egg price was 1.50 pesos in the Analco community.

2.1.5. Channels of commercialization

At the present scale of egg production in Analco, sales of the total production are performed on site, and there is no need to go out of town to sell. However, if production doubles as proposed, it will be necessary to develop a marketing and sales strategy beyond Analco. Of the seven group members, three women will have 1000 birds, another three women will keep 500 birds, and the remaining woman will have 150 birds. They can arrange their sequential starting as 1000, 500, 1000, 500 and so on to ensure egg production throughout the year; the person with the small flock can start at any time. There will be overlaps during production, but this arrangement will prevent gaps in production as well as prevent having peaks of production with excessive supply that would force the egg price to drop. In the eventuality of not selling all eggs to local
bakers, housewives and neighboring communities (Atepec y Jaltianguis), the alternative marketing strategy is to sell the excess supply at the Ixtlán farmers’ market on Mondays. Inexpensive bus service runs from San Juan Evangelista Analco to Ixtlán on Mondays and Fridays, therefore, public transportation will be available. Hiring a person with a vehicle to sell from town to town is a possibility, but most unlikely because prices are arbitrary according to the person. Additionally, the women’s egg cooperative will set a calendar for delivering fresh eggs to the proposed Analco restaurant.

2.2. Demand

From their own experiences these producers identified the local bakers as the largest consumer of eggs. During the previous year bakers consumed almost 50% of their egg production totaling approximately 25,000 eggs. The remaining 25,000 eggs were sold and consumed locally. Once standardized, their new potential of production will be around 72,394 eggs per month or 201 boxes of 360 eggs. Bakers could consume up to 90 boxes and another 20 boxes could be sold in town, which would leave 91 boxes (around 23 boxes per week) to sell in Ixtlán. Ixtlán is the closest and larger population center with approximately 2,000 inhabitants in the urban core area and 7,188 persons in the entire municipality (INEGI, 2005). These consumers could readily absorb the 23 boxes per week of increased supply from the Analco women’s egg cooperative.

2.3. Commercial strategy

Locally the Analco egg ladies are well known and the bakers appreciate their product. However, when they go to Ixtlán they must clearly set themselves apart by letting the
people know that the eggs are fresh, high quality and have never been cooled, and produced on non-intensive farms locally in the Sierra Norte area. Looking for potential distributors in Ixtlán is also an option. Some kind of agreement could be reached 10 to 20 cents per egg is a deal that can be afforded. It is important to connect with the people that have access already to convenience stores to inform them of this alternative, local, fresh, high-quality product availability. As such, promotion in mass media with this volume of production is probably not worthwhile, but a flier could be a cheap option in printing 1000 fliers of half letter size with one single ink will cost about 700 pesos.

2.3.1. Commercialization

Because the sales are intended to be local, there is no elaborate distribution structure needed. However, if the planned increase in volume of production warrants them to go regional, then Ixtlán should be considered their major distribution point. Oaxaca City is not an option due to high ground transport costs that would raise the final sale price to non-competitive levels.

2.3.2. Product/Price

The selling price of eggs in November 2008 was 16.30 pesos per kilo and 1.50 pesos per egg. Although the price per egg is more profitable, in order to sell large volumes they must be sold in bulk per kilo. This bulk market includes sales to the bakers in San Juan Evangelista Analco. The price per egg corresponds to existing local sales in the community.
2.3.3. Plaza

The selling locations will be in San Juan Evangelista Analco and neighboring communities for most of the production (see section 2.1.5). If necessary to market regionally, the product will be transported and offered in the greater Ixtlán area (Ixtlán, Guelatao, and Capulalpam).

2.3.4. Promotion

The only promotion that can be afforded by this small group might be printed fliers for distribution in the farmers market at Ixtlán on Mondays.

2.3.5. Supplies

For most of the construction materials needed for the chicken coops are readily available from commercial companies based in Ixtlán. Some more specialized supplies such as feeders and supplemental foods most likely will be purchased in Oaxaca City; wood for poles and tables is free for members of the community (they just pay a fee for sawing and processing). Pullets are purchased via a distribution agent through SAGARPA.

III. TECHNICAL DESIGN

3.1. Location

The seven units of production can have more than one chicken coop at each location and they will be dispersed throughout the town. Four of them will be in the backyards and/or orchards of the seven women of the Analco egg cooperative; the other three will be
established in agricultural plots in the outskirts of the town. Figure 2 shows the locations of the seven chicken coops.

**Figure 2.** Aerial orthophoto of San Juan Evangelista Analco. Red circles indicate where the chicken coops are on household lands; blue circles indicate chicken coop locations on agricultural plots. Source: Google Earth.

### 3.1.1. Macro and micro location

The macro location is a hill side with high elevation (2,650 m) and very steep as shown in Figure 2. Micro location may vary accordingly to each member’s needs, but a general assumption is that the chicken coops will be established within surroundings of different (mostly introduced) crops and fruit trees (see Figure 3). The natural vegetation includes pine and oak trees and small perennial bushes as well as seasonal herbs. There is temperate weather, but due to sun exposure on south-facing hillside aspects it is slightly
warm particularly during summer. There is no need for artificial light due to relatively consistent natural light regimes during the entire year.

3.1.2. Description of the site

The chicken coops are not fixed to any particular dimensions, although it is recommended to have three birds per square meter (or up to six birds with careful maintenance). Because each group member has a different size backyard and/or orchard, the coops will be located in flat areas that will allow building a coop of quadrangular shape with access to a larger open area that will be fenced. This area has no restriction in

Figure 3. Proposed distribution of elements in production modules for egg-laying facilities. Source: SAGARPA, 2007.
shape or even terrain. For health and sanitation reasons, it is necessary that the selected areas for constructing the chicken coops have good drainage. Four coops will be within residential areas at the homes of the owners and the rest will be in agricultural plots. At the homes a variety of fruit trees exist such as peaches, pears, figs, etc., and there are also some ornamental flower bushes, and medicinal and food herbs. For the agricultural plots there are traditional crops such as corn, squash, beans and alfalfa.

3.2. Size

The group has already 1,900 birds and their expansion will include 2,750 more birds. Therefore, the total flock will be 4,650 birds. The largest and most common chicken coop will hold a total of 500 birds and most of the calculations in this business plan are based on that size; although one partner only needs a coop for 150 birds. She must adapt calculations to this reduced size.

3.2.1. Capacity of production

Once all chicken coops are constructed and the birds became of productive age, the maximum level of production is estimated at 72,394 eggs per month. However, during the first year only seven months will realize production. The group plans initial production in the fifth month of 20,183 eggs and it will end with 64,935 eggs in the twelfth month. During this first year an average of 41,067 eggs per month will be produced.
3.3. Engineering of the project

Seven new chicken coops will be built in the locations described above (see sections 3.1.1 and 3.1.2). Although each chicken coop will be built accordingly to the needs of each member and the availability of space, there are elements necessary to each coop for laying eggs and feeding system (see Figure 4). These new coops will be added to those that this group already has erected. The production levels that are estimated are the sum of new and old chicken coops.

![Figure 4. Internal design of chicken coop.](image)

3.3.1. Process of production

Once the chicken coops are built, the production process is simple and straight-forward.

Pullets at three weeks of age are introduced into the coops and everyday they are released
into the fenced area to feed themselves and exercise. Additionally, feeders located inside the coops will provide up to 50% of the daily diet, and fresh water is also supplied inside the coop. When the chickens reach maturity at 20 weeks of age, the nesting area is set up to allow the chicken to lay eggs. Daily activities of the chickens are morning release to the fenced enclosure and roosting in the evening. The opening and closing of the side windows should take place in the fall and winter. There is a calendar for sanitation activities such as cleaning the chicken coops, vaccinations, eye droplets, external applications of anti-parasitic powder, and antibiotics dissolved in the drinking water to protect from diseases. Once egg laying production has started, all eggs will be collected manually for packing, storage and sale. The chickens will be replaced every two years or 1.5 years, accordingly with production decay ratio. The meat of the harvested hens beyond egg bearing is sold locally for extra income.

3.3.2. Necessities of production equipment

There are no additional equipment needs beside basic cleaning tools, e.g., brooms, rakes, shovels, and wheel barrels to clean and carry out the manure, which is used for compost.

3.3.3. Necessities of raw material and other supplies

The pullets will be purchased at the beginning of each new cycle of production. The food is a commercial poultry feed mix that supplements 50% of the daily diet, with the birds foraging for the remainder of their food needs. Sanitation and health products, cardboard boxes and trays complete the list of needs.
3.3.4. Necessities of direct and indirect manual labor

Chicken farms require work everyday, but not enough for a full-time job because the activities are spread over the day and they are not physically demanding. Even pre-adults and seniors of the family can readily perform these activities.

3.3.5. Infrastructure necessities

The two major requirements are the chicken coop and a peripheral fence to protect the flock. The chicken coop must be furnished with feeder, water dispatchers, laying nests and side-to-side windows. Additionally, there is a need for a storage space for the feed.

3.3.6. Requirements for the packaging and commercialization

The traditional transport boxes for 360 eggs as well as cardboard egg cartons can be purchased from a cardboard distribution store in Oaxaca, or they can be made from recycled used boxes available from local convenience stores.

3.3.7. Costs

The estimated cost for a chicken coop of 150 square meters (15 x 10) with 0.8m of brick wall, windows of wood and roof of fiberglass sheets are calculated to be 19,314 pesos. This coop is designed for 500 birds with a load of 1 bird per 0.3 square meters. The cost per pullet is 13 pesos per bird (500 birds = 6,500 pesos). The cost of poultry feed supplements for 50% of the diet annually is described in Table 1.
Table 1. Cost of commercial food mix for 50% of the diet calculated for 500 birds per year

<table>
<thead>
<tr>
<th>Item</th>
<th>Days of use</th>
<th>Sacks per year</th>
<th>Price (pesos/sack)</th>
<th>Sub total (pesos)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starting mix</td>
<td>30</td>
<td>28</td>
<td>205</td>
<td>5,740</td>
</tr>
<tr>
<td>Growing mix</td>
<td>120</td>
<td>113</td>
<td>180</td>
<td>20,340</td>
</tr>
<tr>
<td>Laying mix</td>
<td>220</td>
<td>206</td>
<td>182</td>
<td>37,492</td>
</tr>
<tr>
<td><strong>Total cost</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>63,572</strong></td>
</tr>
</tbody>
</table>

Health products in total will add 4,000 pesos per year for 500 chickens.

Additional equipment for cleaning and maintenance will be another 2,000 pesos per year.

Because this plan is for an expansion of seven coops to accommodate 2,750 additional chickens, the cost for the entire group is summarized in Table 2.

Table 2. Summarized cost for seven coops (6 x 500) + (1 x 150)

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (pesos)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicken coops</td>
<td>125,541</td>
</tr>
<tr>
<td>Food commercial mixes</td>
<td>402,623</td>
</tr>
<tr>
<td>Pullets</td>
<td>35,750</td>
</tr>
<tr>
<td>Health products</td>
<td>25,340</td>
</tr>
<tr>
<td>Additional equipment</td>
<td>14,000</td>
</tr>
<tr>
<td>Promotion</td>
<td>700</td>
</tr>
<tr>
<td><strong>Total cost</strong></td>
<td><strong>603,954</strong></td>
</tr>
</tbody>
</table>
IV. ADMINISTRATIVE DESIGN

4.1. Organizational chart of the company

An organizational chart for the Analco women’s egg cooperative is presented in Figure 5. The group has defined roles for officers and selected members to perform these functions (see section 1.1 and its subsections).

![Organizational chart](image)

Figure 5. Organizational chart of proposed Analco egg production cooperative.

4.2. Formats of planning and administration

Joint planning of production levels, prices and marketing is conducted by the members of the group. For administration of the Analco women’s egg cooperative, the responsibilities of the officers on the executive board are provided in section 1.1.3.2.

4.2.1. Plan of work

If all members of the group agree, they should manage to start sequentially during the first year to maintain constant production with minimal fluctuation and remain present in the market all year long. The proposed sequence is described in Table 3.
Table 3. Proposed calendar for sequence starting

<table>
<thead>
<tr>
<th>Month</th>
<th>Starting flock (# birds)</th>
<th>Constant flock (# birds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td>2</td>
<td>500</td>
<td>750</td>
</tr>
<tr>
<td>3</td>
<td>500</td>
<td>1,250</td>
</tr>
<tr>
<td>4</td>
<td>500</td>
<td>1,750</td>
</tr>
<tr>
<td>5</td>
<td>500</td>
<td>2,250</td>
</tr>
<tr>
<td>6</td>
<td>500</td>
<td>2,750</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>2,750</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>2,750</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>2,750</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>2,750</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>2,750</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>2,750</td>
</tr>
</tbody>
</table>

4.2.2. Registries of production

Each member should keep a record of production in a notebook in order to improve her production and to identify critical points during production. Copies of this information should be collated by the Secretary and kept on file.

4.2.3. Inventories

Each member is responsible to report to the Treasurer their initial inventory and how the money was spent in order to present reports if required to SAGARPA.

4.2.4. Book of accounting

Because this egg production microenterprise activity is considered basic primary production in agriculture, the government does not tax this activity. However, as per good management practices a record of sales and expenses should be kept by each member, with copies on file with the Treasurer, to allow them to prevent shortage of cash and unnecessary expenses.
V. MICROENTERPRISE FUNDING REQUEST AND

PROFITABILITY AT-A-GLANCE

5.1. SAGARPA funding request

Year 1: 201,331 pesos

Year 2: 40,040 pesos

5.2. Profitability elements

- Costs: Total cost = 603,954 pesos
  - Fixed costs:
    - Chicken coops = 125,541 pesos
    - Additional equipment = 14,000 pesos
  - Operating costs:
    - Commercial poultry feed mix = 402,623 pesos
    - Pullets = 35,750 pesos
    - Health products = 25,340 pesos
    - Promotion = 700 pesos

- Price
  - 1.5 pesos per egg
  - 16.30 pesos per kilo of eggs

- Revenue (# units X price)
  - Annual production 1st year = 205,335 pesos
    - Sold by egg (36,000 x 1.5) = 54,000 pesos
Sold by kilo (9,407.5 x 16.3) = 153,342 pesos

Total potential income = 207,342 pesos

- Annual production 2nd year = 868,725 pesos
  - Sold by egg (36,000 x 1.5) = 54,000 pesos
  - Sold by kilo (46,262.5 x 16.3) = 754,079 pesos
- Total potential income = 808,079 pesos

- Time interval to profitability
  - 1.5 years

- Profitability (Net Present Value, NPV and Internal Rate of Return, IRR %)
  - NPV = 104,672 pesos
  - IRR = 19 %

REFERENCES


Procuraduría Federal del Consumidor (Profeco) web site


Sistema Nacional de Informacion e Integracion de Mercados (SNIIM) web site

Appendix B

Trout Production Microenterprise Development in
San Andrés Yatuni, Oaxaca
I. ORGANIZATIONAL DESIGN

1.1. Internal design

Through proactive initiatives of the “Comisariado de Bienes Comunales” (CBC), new projects of economic growth in the community of San Andrés Yatuni have been developed. A communal restaurant on the crossroads from the entrance to the town and the Road Ixtlán to Zogocho, as well as a local trout farm are examples of these efforts to stimulate the local economy. With the support of a grant from the “Comision Nacional Forestal” (CONAFOR) in 2007 the CBC built and began operation of a small trout farm in San Andrés Yatuni, Oaxaca. Today, the new CBC, which rotates members usually in periods of three years, continues this operation with the CBC acting as manager and administrator of the trout farming venture. The present business plan is a proposal for the construction and operation of expanded trout farm facilities, based on early success and expected increase in trout consumption in the future.

1.1.1. Proposal of value

Objective: To expand trout production from the current 600 fish per year to 5,700 fish per year with an average weight of 300 grams for direct sale to a local restaurant in an effort to improve the local economy by adding jobs and cash flow into the community.
Mission: To further enhance value through the expanded production of trout to customers of the local restaurant and to provide employment and increased cash flow to the community through these activities.

Vision: To expand the production of trout to support continued community growth and sustainable livelihoods.

1.1.2. Principles of the organization

The principles that govern the CBC are:

- Organization: The CBC is appointed in General Assembly of “comuneros” and its fundamental task is the administration and monitoring of the community lands. The responsibilities include the implementation and oversight of projects chosen by the assembly.

- Participation: The administrative work is responsibility of the CBC; however, the construction work for the facilities expansion proposed will be completed by contracted manual labor (“tequio”).

- Respect: The CBC will be respected as the immediate authority in the venture; nevertheless, the General Assembly is the ultimate decision-making body. An atmosphere of cordiality and respect within the CBC and the rest of the community is expected.

- Tolerance: The members of the CBC will be required to make a serious commitment to the work required.
Quality: The CBC will show no bias on the basis of color, nationality, or social class towards any person.

1.1.3. System of internal control

1.1.3.1. Members of the Committee

The CBC consists of a president, secretary, treasurer.

- President, Camilo Cruz Jimenez- responsible to direct and to coordinate the works;
- Secretary, Trinidad Martínez Martínez- responsible for preparing and filing documents; and
- Treasurer, Francisco Martínez Méndez- responsible for the handling and administration of financial resources, as well as accounting registries.

1.1.3.2. Responsibilities of the Committee

Responsibilities of the committee include:

- Represent the best interests of San Andrés Yatuni and to serve for the period determined by the General Assembly;
- Implementation and oversight of projects chosen by the General Assembly;
- Management of resources; and
- Provide correct and consistent reporting to the General Assembly.
1.1.3.3. Work place

The proposed expansion of the trout farm will be located in an area away from the original trout farm. The new location, near the entrance of the community, will provide a greater volume of water, which permits pools of greater capacity (Figure 1). The plan is for the construction of three new ponds that together can raise 3,000 trout per growing cycle; each growing cycle takes approximately 8 months. The fish are moved from pond to pond during this period. Eventually, it will be possible to have growing cycles occur concurrently, on average trout spent three months in each of the first two ponds and two months in the third pond, which will allow for yet further increases in production per year.

Figure 1. Road and tourist features in Sierra Norte, Oaxaca; blue oval indicates San Andrés Yatuni.
1.1.3.4. Process of elaboration

Construction of the trout farm expansion will follow guidelines similar to those of the original trout farm. The new CBC has consulted with the previous CBC to learn from the training received in regard to the construction of the original trout farm. The original training came from the supplier of the fingerlings (Raa Betutdha trout farm in Ixtlán) who is also willing to provide technical assistance with the expansion plan. In addition to building three new trout ponds to expand production, other quality control measures are to be added, such as monitoring water temperature, pH, oxygen content, and removal of dead and ill fishes.

1.1.3.5. Commercialization of products

The trout will be sold directly to local restaurants. One restaurant is currently operating aside the Ixtlán-Zogocho road at km 29 in the detour to San Andrés Yatuni, and another is planned in close proximity to the location of the proposed trout farm in San Andrés Yatuni. Production above what the restaurant can utilize will be sold to the public on site.

II. COMMERCIAL DESIGN

2.1. Diagnosis of market

In the highlands of the Sierra Norte, one trout farm produces over 70% of the total trout for sale in the region—the Raa Betutdha trout farm located in Ixtlán (Guillermo Martinez pers. comm., 2008). The primary buyer of trout from Raa Betutdha is the restaurant Shoo
Bettou located in Ixtlán about 29 km from San Andrés Yatuni. Tourist development in the area should increase demand for fresh trout for other developing restaurants, including the one in San Andrés Yatuni. The advantage the expansion project is that the restaurant targeted as the main buyer of the trout is located in a high-traffic area where ecotourism is becoming more and more popular for an increased market of diners.

2.1.1. Analysis of the product

The trout will be raised to maturity from fingerlings in a series of three ponds; the process from fingerling to market is reached in an average of 8 months. For commercial sale, the trout must weigh an average of 300 grams and 30 centimeters in length, and must have a healthy appearance. A product over this weight and length is undesirable because it adds excessive cost to production as well as to meal price. The rainbow trout is readily accepted as a specialty dish, rich in protein and vitamins, served in local restaurants catering to ecotourists as well as local clientele.

2.1.2. Analysis of the consumer

The primary market for the trout will be the restaurants in the Sierra Norte region because there is very limited means economically and in terms of infrastructure for transporting the product to any additional market areas at this time. These restaurants are seeking a fresh, nutritious product that will appeal to the local clientele as well as health conscious ecotourists. Product will also be for sale to the general public on site.
2.1.3. Analysis of the competition

The Raa Betutdha trout farm located in Ixtlán is the primary competition producing approximately 15,000 fishes per year. Other small trout farms producing less than 1,000 fishes per year exist in the Sierra Norte region. The demand for fresh trout is expected to increase with the current development of ecotourism in the Sierra Norte region. The expanded trout farm facilities proposed for San Andrés Yatuni would supply additional product to developing restaurants and for on-site sales to local residents.

2.1.4. Analysis of prices

Trout, as most fish, varies seasonally in price from 80 pesos up to 120 pesos per kilo fresh weight. Easter and December-January are holiday periods where demand is anticipated to be highest and the best prices are paid for the product. Optimal profitability occurs when the trout production cycle is coordinated to match peak demand months.

2.2. Demand

The clean, cold water emanating from the upper reaches of the watersheds in the Sierra Norte mountains provide an excellent medium and conditions for trout production, and the planned growth of ecotourism in the area will support continued demand for fresh trout in the Sierra Norte region. The ecotourist facilities in Ixtlán attracted 10,000 visitors in 2007 and Capulalpam reported 6,000 occupants in their new facilities from January to July 2008 (Diego Perez Sanchez pers. comm., 2008). This is a growth rate of 60% from the previous year. Other facilities are in construction, so it is possible to expect similar ratios and numbers of visitors in 2009 and 2010. Restaurants, eco-cabins
and other facilities for ecotourism activities are currently under construction in the region and fresh, local food products will increase in demand for the incoming consumers, as well as for local residents.

2.3. Commercial strategy

2.3.1. Channels of commercialization

The trout will be sold directly to local restaurants described above, as well as to the public on site. While the target market is for their local restaurant and on-site sales, Raa Bethuda has indicated that it will purchase all production in bulk prices. This adds an element of financial security to the venture.

2.3.2. Product/Price

The prevailing price for fresh trout of approximately 300 grams weight and 30 centimeters length can vary from 80 pesos per kilo up to 120 pesos by kilo depending upon season of year (see section 2.1.4 above). Rainbow trout (*Oncorhynchus mykiis*) is an exotic species in Mexico introduced for purposes of fish farming (Figure 2). This species has been adapted successfully to a large geographical range and can be produced in the state of Mexico, Veracruz, Michoacán and Oaxaca. The Mexican consumer seems to appreciate its flavor and it is willing to pay handsomely for a specialty dish of trout. Rainbow trout is in the range of price of some indigenous sea fishes such as huachinango, but for freshwater farm fish, it is preferred over carp, catfish and tilapia.
2.3.3. Plaza

The expansion of the trout facilities for San Andrés Yatuni will offer a greater supply of fresh trout to the restaurants being constructed in the Sierra Norte region as part of the ecotourism initiatives sponsored by the government.

2.3.4. Promotion

The product of fresh trout will be marketed directly to local restaurants in the Sierra Norte. The restaurants will be contacted and interest cultivated. Contracts may be drawn up to indicate what product preferences each restaurant needs, when it needs it, and what the cost will be. Contracts with restaurants will help the trout farm manage its supply and lock in selling prices for a particular season or duration. If there is product in excess of what the restaurants need, that product will be offered to the public at a per kilo cost. All products will be sold on site.

2.3.5. Supply of raw material

Fingerlings are purchased from the Raa Betutdha fish farm in Ixtlán. Pelleted feed is purchased at dealers in Oaxaca. With this expansion, it is possible that the economy of
scale would be large enough for the farm to qualify for discounts from the distributor. This will directly impact production costs (see Table 1 in section 3.3.7).

III. TECHNICAL DESIGN

3.1. Location

The current trout farm is located near the road to Zogocho at km 28.5 about 300 meters from the entrance to the community of San Andrés Yatuni. The expansion is located at a lower elevation near the entrance to the town because of greater access to a quality water supply (see Figure 3).

![Figure 3. Hydrology network in San Andrés Yatuni, map generated by GEM team Phase I; red oval indicates the site selected for expansion. Source: Jimenez Bañuelos, 2007.](image-url)
3.1.1. Description of the site

The town is located in a forested mountainous area with mostly pine trees at an elevation of 2,534 meters. The slope is pronounced at approximately 40 degrees. The area has a moderate, slightly cooler temperature regime with seasonal minimum and maximum temperatures of 8 degrees C in winter and 22 degrees C in summer. Precipitation averages 9.5 centimeters annually, with most rainfall occurring during the summer months. These climatic conditions are agreeable to trout production. There are many different clear freshwater streams with constant flow and high quality water supply adequate for the proposed trout farm expansion.

3.2. Size

The expansion of the farm had been planned for three ponds of 4, 5 and 6 cubic meters. These ponds will allow for production of 3,000 commercial size fish per cycle.

3.2.1 Capacity of production

Assuming (1) the maximum number of fish that can be accommodated in the starting pond at any time is 3,000, (2) expected mortality rate of 15%, (3) starting pond residence time is 3 months periods, and (4) regular production cycle averages 8 months, then the capacity of production per year is 5,100 fish. This capacity can yield a potential production of 7,650 trout per year.
3.3. Engineering of the project

3.3.1. Process of production

The production of trout begins with the purchased fingerlings. The fingerlings are placed in the smallest in a series of three ponds. All ponds require a supply of fresh and cool water; since trout live naturally in well-oxygenated streams the ponds must simulate water movement and therefore must have a constant flow. Once the fingerlings are placed in the pond a source of food is necessary. In natural streams trout will feed on insects, larvae. Crustaceans (scud), and other fish; however, in concrete ponds the food is provided in pelleted form.

The feeding occurs up to ten times a day during this initial stage. Pellets of small size are sprinkled in the water for consumption by the fingerlings. Due to stress, competition and manhandling during this stage, the mortality rate is estimated at 10%. After the fingerlings grow to about a weight of 150 grams they need to be moved to a larger pond otherwise there will not be enough room for a healthy population and the quantities of dissolved oxygen in the water will not be sufficient for the needs of the now juvenile fish.

Changing ponds also means additional stress to the fish and the chance of loss. Diet is adjusted so that pellet size and composition are modified as the biomass ratio changes as the trout became larger. At this stage, trout transform less food into biomass and the feedings are reduced to four a day. Protein is reduced and fiber is augmented as
trout grow larger. The final pellet size incorporates a lot of carrot fiber to saturate the fish with carotenoids, which will give the traditional pinkish color to the meat.

Fish are moved to the final pond when they reach a weight of 230 grams. During the final stage, the feedings are reduced to two feedings per day; early morning and late afternoon. Once the fish weigh 300 grams and are approximately 30 centimeters in length, they are harvested. The fish are harvested manually by net and sorted for sale.

3.3.2. Equipment needs

Equipment necessary for trout production include nets, wet suits, tools for maintenance; thermometers, water testing supplies, cleaning supplies and replacement parts for the PVC piping. Buckets, medium size containers, for live fish transport, and ice coolers for freshly dead fish storage and transport are needed.

3.3.3. Supply needs

Considering raw material as anything that is consumed but not considered equipment, the first and foremost important material is the fingerlings of 2.5 cm to start the productive cycle. The second necessity is food in the form of pellets. Trout can transform, on average, 20% of food into wastes during the growing cycle. A 300-gram trout would require 1,500 grams of food. The trout will require a constant supply of fresh, cool, well-oxygenated water. Pellets will be purchased in monthly trips to Oaxaca City.
3.3.4. Manual labor needs

Feeding will be the major daily task and it is a one-person activity for the entire farm. The beginning fingerling stage in the first pond requires up to eight feedings per day, four feedings per day during the median stage, and two feedings per day in the final stage. Maintenance includes checking that the water flow is free of obstacles and no death or ill fish remain in the pond, cleaning the wall and bottom parts of the pond is carried out once or twice a week with a brush or a broom. When the fish are moved between ponds, the pond is cleaned with soap and a powerful oxidant. The moving and cleaning processes may take additional manpower, as well as harvesting and selling. Security of the facility will be important because of its location away from a populated setting and may be accomplished by a watchman or using a guard dog.

3.3.5. Infrastructure

Commercial trout farms require a set of three ponds. The ponds that will be used in the proposed facility are circular ponds with water supply from gravity fed PVC pipes with lateral holes allowing aeration to the pond and central drain to a control valve to regulate flow. The initial pond is the smallest with a diameter of 3 meters. The second and third ponds will be 4 and 5 meters in diameter. All three tanks have a depth of 1 meter. To collect the water, drainage pipes will be designed to divert water from streams into stream meshes and sand traps to eliminate solids from the water. Eventually, a storage facility for the pellets and the equipment, as well as office space, will complete the needs for infrastructure. On-site sales will be conducted from the original pilot facilities aside the road Ixtlán-Zogocho for easy access and area for parking.
3.3.6. Packaging requirements

The trout will be sold on site and will require minimum packaging that includes ice and plastic containers or bags to maintain freshness.

3.3.7. Costs

Costs shown in Table 1 include expenditures for the fingerlings, food, and labor based on average monthly expenses, as well as capital construction costs for three fish farm tanks. The fingerlings are a one-time input cost per cycle. In Table 2 the estimated income is depicted, sales to restaurant by individual fish are estimated to be 88% and the remaining 12% are for sale in bulk.

<table>
<thead>
<tr>
<th>Table 1. Cost of production during first year with two cycles</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Items</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Three ponds construction</td>
</tr>
<tr>
<td>Fingerlings</td>
</tr>
<tr>
<td>Pellets for fingerling trout</td>
</tr>
<tr>
<td>Pellets for juvenile trout</td>
</tr>
<tr>
<td>Pellets for harvest-size trout</td>
</tr>
<tr>
<td>Transport</td>
</tr>
<tr>
<td>Maintenance materials (PVC, valves, mesh nets, etc.)</td>
</tr>
<tr>
<td>Cleaning and disinfecting supplies</td>
</tr>
<tr>
<td>Salaries</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2. Estimated income for the first year of operations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of fish</strong></td>
</tr>
<tr>
<td>4,500</td>
</tr>
<tr>
<td>600</td>
</tr>
</tbody>
</table>
IV. ADMINISTRATIVE DESIGN

4.1. Organizational chart of the company

This is a CBC operation and structured under the leadership described in Figure 4. No additional organization was formed to manage this venture, as only two employees will need to be hired.

![Organizational chart of the San Andrés Yatuni trout farming venture.](image)

4.2. Formats of planning and administration

The administration of the profits will be carried out by the Treasurer and it will be reported to the General Assembly routinely. During the initial years the venture is expected to generate two full-time positions. After the third year when profitability is reached (see section 5.2), the General Assembly will decide the future use of the profits.
4.2.1. Plan of work

The most important seasons for fish sales are April (Easter) and December (Christmas). Therefore, it is important to start one cycle in March for harvest in December, and the other cycle to start three months later in June for harvest at Easter time in the next year. The proposed sequence can be adjusted if weather affects growth rates or if another important marketing window emerges.

4.2.2. Registries of production

Records of harvest should be kept in a notebook in order to estimate next cycle rates of mortality. This plan estimates a 15% mortality rate. Best management practices and proper care can reduce mortality and increase profits. However, the opposite can occur also; for example, there are no measures to control sudden epidemic disease situations other than to eliminate the entire stock. Accurate records not only help economic management, but stimulate improved production practices.

4.2.3. Inventories

There are three different sets of maintenance operations required: (1) young fingerlings in the starting pond, (2) juvenile trout in the intermediate pond, and (3) harvesting market-sized trout in the third pond. Each one requires different pellet sizes and flows of water; inventories of pellet quantities must be accurate to reduce the number of purchasing trips to Oaxaca City. This responsibility is shared between the maintenance
employee and the Treasurer, with one responsible for production operations and the other for purchasing and accounting.

4.2.4. Book of accounting

Because this is a venture of the CBC the accounting books must be kept up-to-date and available for any “comunero”, who is a member of the General Assembly, to review by the Treasurer. Additionally, the President must supervise this fiscal operation regularly. As a primary activity, maintaining accurate financial records are not mandatory by federal law, but the General Assembly of comuneros requires them for proper accounting and auditing.

V. MICROENTERPRISE FUNDING REQUEST AND PROFITABILITY AT-A-GLANCE

5.1. SAGARPA funding request

Year 1: 283,600 pesos

5.2. Profitability elements

- Costs (fixed and operating)
  - Fixed cost
    - Construction three new ponds = 180,000 pesos
  - Operating cost
- Fingerlings 3,000 x 2 cycles = 12,000 pesos
- Pellets for fingerling trout 9 sacks x 280 pesos x 2 cycles = 5,040 pesos
- Pellets for juvenile trout 51 sacks x 280 pesos x 2 cycles = 28,560 pesos
- Pellets for harvest-size trout 50 sacks x 280 pesos x 2 cycles = 28,000 pesos
- Transport to Oaxaca City for supplies 4,000 pesos x 2 cycles = 8,000 pesos
- Maintenance materials 2,000 pesos x 2 cycles = 4,000 pesos
- Cleaning and disinfecting supplies 1,000 x 2 cycles = 2,000 pesos
- Salaries 8,000 pesos x 2 cycles = 16,000 pesos
- Total first year = 283,600 pesos

- Price (per unit)
  - Per fish = 50 pesos
  - In bulk per kilogram (approximately 3 fishs) = 80 pesos

- Revenue (# units X price)
  - 4,500 fish x 50 pesos = 225,000 pesos
  - 600 fish ≈ 200 kilograms x 80 pesos = 16,000 pesos
  - Total = 241,000 pesos

- Time interval to profitability
  - Three years

- Profitability (Net Present Value, NPV and Internal Rate of Return, IRR %)
- NPV = 58,093 pesos
- IRR = 21%

REFERENCES


Appendix C

Community Based Microenterprise Development
for Tomato, “Chili de agua” and Cucumber
Production in Capulalpam, Oaxaca
Community Based Microenterprise Development
for Tomato, “Chili de agua” and Cucumber
Production in Capulalpam, Oaxaca

I. ORGANIZATIONAL DESIGN

1.1. Internal design

Currently, Capulalpam has a community-based organization consisting of fifteen women and one man who, as a group, have received economic grants to construct a greenhouse and train members of their cooperative in the production of organic tomatoes. The current initiative is to write a business plan outlining the need for additional economic grant funds to help the operation diversify its products and increase production during peak pricing periods.

1.1.1. Proposal of value

Objective: To grow tomato, “chili de agua”, and cucumbers on a rotating basis in the existing greenhouse to maximize profits by growing products in the corresponding peak profit seasons.
Mission: To be a dependable supplier of quality products that include tomato, “chili de agua” and cucumbers to the community of Capulalpam (there are no plans to sell outside town) while having a positive economic on seventeen families involved in the business.

Vision: To create a successful microenterprise that will consist of trained and responsible members who supply quality products with dependable, stable production.

1.1.2. Principles of the organization

The principles that govern the community-based greenhouse organization in Capulalpam are:

- Organization: The group structure works to improve management and administration of resources for optimizing production and profitability. In each respective unit of greenhouse vegetable production individual members are responsible for maintaining a high, consistent standard of quality. All partners will be responsible for equal amounts of physical labor. If necessary, all partners will be assessed equal capital inputs.

- Participation: The administrative work is performed by those partners who were selected by the group members as President, Secretary and Treasurer. Nevertheless, because all partners will obtain benefits from this joint venture, all partners must be available to spend time as needed in the management process.

- Respect: The group is small and local, which provides for frequent, open communication. The members will resolve potential disputes through constructive dialog that allows for honest and genuine critiques.
Tolerance: Group cooperatives, in contrast to independent producers, require a greater tolerance of different viewpoints and a willingness to work as a team towards mutually agreed upon goals. The one tacit agreement is that the partners do not have to be in complete agreement on everything, but majority rules. Also, if a member disagrees with the group, the others must be willing to listen and to be fair in considering and resolving the issue at hand.

Quality: The quality is a consequence of careful, professional work within the production units and can be measured in terms of productivity and quality attributes such as appearance, freshness, taste, and customer satisfaction.

1.1.3. System of internal control

1.1.3.1. Members of the committee

The group designated three people to lead the group: President Antolina Tereza Vásquez Bautista, Secretary Isaura Julieta Martínez Pablo and Treasurer Maria Teresa Jiménez Fabián. The persons appointed for each position were chosen in common agreement by the group members, and if deemed necessary they can be removed from the position by majority vote of the members.

1.1.3.2. Responsibilities of the group officers (Executive Board)

The position responsibilities for officers of the Executive Board within the group are:
➢ President (responsible to represent the group with the sponsor agency or government entity; to help in the identification and obtaining of financial resources);

➢ Secretary (responsible for keeping files and preparing documents and communications);

➢ Treasurer (responsible for the administration of financial resources and fiscal bookkeeping, including preparing required financial statements, managing the acquired economic resources for benefit of the group).

The working hours will be registered in a notebook of activities and those will be reported previously to the ordinary meetings. The efficiency and performance of the work during a productive cycle will be evaluated when finalized in order to compare planned results against obtained results. Assuming that all members participated in technical training from a professional consultant, then production problems that appear can be faced in agreement with jointly developed solutions.

The production process is simple and it is always progressive: preparation of seeding bed and/or trays, land sowing and/or preparation in flowerpots, transplanting, growing, harvesting, storage, transport and sale.
II. COMMERCIAL DESIGN

2.1. Diagnosis of market

The primary market of consumers in Capulalpam is augmented by the populations living near the community who buy local products. Tomato and cucumbers are not currently produced commercially in sufficient quantities in the region. “Chili de agua”, a local variety of chili similar to bell pepper in size and texture but very spicy, is produced locally but is not available year round. These products are currently transported from the Oaxaca to Capulalpam (74 km) to be sold in the local farmers markets and convenience stores. The price and quality of these products fluctuate during the various growing seasons. There is another greenhouse in the community, but the output has been marginal and undependable so it does not pose a large threat to this project.

2.1.1. Analysis of the product

Tomato, cucumber and “chili de agua” produced under greenhouse conditions are of better quality than those produced outdoors. Their nutrient and water requirements are satisfied in timely manner with irrigation systems and composts, manures and chemical fertilizers. Pest and disease management is also more efficient in enclosed areas. The varieties grown are selected to obtain the greatest possible yield. The tomato is the “saladette” type, which is in the highest demand in the region. This product has a greater shelf life not only because of its superior quality but because of less handling, transportation and storage needs with locally grown produce. Long periods of storage speed up the maturation because of the ethylene accumulation. Cucumbers from
greenhouses are larger in size and higher in productivity. As for “chili de agua” the yield is much greater in a consistent greenhouse environment because a greater number of blossoms are able to reach maturity mainly because of lack of stress relating to moisture and plant nutritional needs.

2.1.2. Analysis of the consumer

With a total population of 1,313 citizens (INEGI, 2005), Capulalpam is the second largest population center in the Sierra Norte region. The typical diet within the community of Capulalpam, like many others in the Sierra Norte region, is based on corn, beans, rice, potatoes and chili peppers. This is usually complemented with vegetables such as the tomato, carrot, cabbage, lettuce, peas, “quelites” (a wild amaranth that grows naturally in agricultural plots). Chicken, fish, goat, and occasionally beef are included in the diet as family budgets allow. Given its versatility for use in salads, soups and main courses, tomatoes are one of the most important components in the local diets.

2.1.3. Analysis of the competition

The main competition is from the growers in Oaxaca who transport tomato and other vegetables to Capulalpam to sell to convenience stores or in the farmers market. There is one other local greenhouse that produces tomatoes, but the production is sporadic and the product quality is low.

2.1.4. Analysis of prices

The prices of tomato, cucumber and “chili de agua” vary during the year depending on availability from the outdoor producers in the states of Sinaloa and Morelos. These states
In recent years drought and plagues have drastically affected the national production. In order to document the prices, historical data were retrieved from the National System of Information and Integration of Markets (SNIIM) of the Mexican Secretary of Economy. The historical data can be reviewed at http://www.secofi-sniim.gob.mx/nuevo/. There are no existing data for the market in Oaxaca so the compiled data came from Mexico City and other nearby regional markets like Puebla and Veracruz. The historical series are presented in Figures 1, 2 and 3.
between weeks 2-7 and 36-43. The prices historically have ranged from 3 to 16 pesos 
8, 11-16, 28-32 and 44 to the end year. The lowest prices are indicated in the periods

Figure 1 shows that historically the best prices for the tomato are during weeks 1-

Figure 23. Historical series of the price of the cucumber in regional distribution centers.
From SNIIN Secretariat of Economy, 2008.

Figure 24. Historical series of the price of poblano chili as similar for chili de agua. From SNIIN Secretary of Economy, 2008.
per kilo, but in 2008 minimum and maximum prices were 4 and 14 pesos per kilo, respectively.

Cucumber pricing does not have as much variability. Except for unusual events, it fluctuates generally between 3 and 8 pesos. The highest prices are observed in the periods between weeks 1-10 and 17-34 and the lowest prices are as of week 35. The prices for 2008 have varied between 4 and 10 pesos, mainly staying in the 8 pesos price range.

The price of “chili de agua” in 2008 varied between 8 and 13 pesos per kilo. For most of the year the price was at 10 pesos per kilo. The historical peaks in the prices are around the end of the year.

2.1.5. Channels of commercialization

The produce will be sold locally and there are no plans to transport the product outside of Capulalpam. The greenhouse is not easily accessible so there will be no sales directly from the greenhouse, but rather direct sales will occur from the house of a group member who is centrally located in the community. The members will be responsible for delivery to the point of sale. They can transport the produce themselves in small loads or with animal carts pulled by donkeys or mules.
2.2. Demand

The demand for fresh vegetables, especially tomato, is constant all the year. With 1,313 inhabitants in Capulalpam (INEGI, 2005) and average families consisting of 5 people and considering that each family consumes a kilogram of tomatoes per week, approximately 14 tons of tomatoes will be consumed each year by the population of Capulalpam. The demand for “chili de agua” is very similar, because the consumption is very generalized and it is common in the diet of the region. There is less demand for cucumber, calculated at approximately 5 tons. The demand of the populations bordering Capulalpam will have an upward impact on these calculations, but were not used for this estimation as no export sales are anticipated.

2.3. Commercial strategy

The primary commercial strategy will be to have a point of sale located within the community where the produce will there will be a consistent supply of quality produce available to walk-in customers. Word-of-mouth strategy is planned to be effective marketing because of the large social network the partners can tap. Owners of restaurants and vendors will be contacted to establish a regular sales schedule while promoting the fact that the produce will be of high quality and have consistent availability.

2.3.2. Product and price

It has been explained previously that the price of the produce is highly influenced by the large production in and the supply to the market from Mexican states other than Oaxaca. It has been determined that pricing at a higher rate than the general market because of
higher product quality would not be effective in Capulalpam. The population in the sales area discriminates based exclusively on price. Pricing will be related to the set point of the marketplace.

2.3.3. Plaza

The sales area will remain in the Capulalpam community. The production from the current greenhouse facility will be sufficient to supply this area with quality produce on a regular schedule. It is not estimated that there will be additional produce to expand the market into other regions.

2.3.4. Promotion

The common mechanisms of promotion in this community are a local sound system that repeats a message at whichever times are desired by paying a small fee of 10 pesos. Handcrafted posters can help to identify the point of sale within the community and a thousand small flyers can be printed for 700 pesos at a print shop in Oaxaca.

2.3.5. Supply of raw material

The greenhouse is already constructed and the necessary supplies are the hybrid tomato seed that has a cost of one peso per seed. Similarly, hybrid cucumber seed can be bought commercially with a cost of 50 centavos per seed. In the case of “chili de agua” there is not a commercial variety and the seeds must be selected from “chilis” from the region, which is readily achieved. Fertilizers and pesticides will be purchased commercially; manures and compost can be acquired locally.
III. TECHNICAL DESIGN

3.1. Location

The community of Capulalpam is 74 kilometers northeast of the city of Oaxaca (see Figure 4) in one of the zones of higher elevation at 2,040 meters with steep slopes in the indigenous Zapotec region of the Sierra Norte, Oaxaca.

![Capulalpam map](image)

Figure 4. Sierra Norte map, with Capulalpam highlighted in red.

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3.1.1. Macro and micro location

The greenhouse is located in the outskirts of the urban area in the southeastern part of the community within a depression (see Figure 5). There is a small stream that serves as a water source. The place is the flattest part of the depression and although there is no real road it is possible to drive a vehicle to the greenhouse facility.

Figure 26. Location of the greenhouse (red oval) in the Capulalpam urban area. Source: Google Earth accessed Nov. 15, 2008.
3.1.2. Description of the site

3.2. Size

The greenhouse is 600 m² and it was designed with high ceilings, zenithal ventilation, anti-aphid screen and double door for access.

3.2.1. Capacity of production

Under heavy industrial production schemes the yield estimated by square meter for tomato in two cycles per year is 30 kg/m², for the given surface it could be estimated 18 tons of tomato in two cycles per year or 9 tons with only one cycle. The greenhouse in Capulalpam divides its total surface in three sections: tomato, cucumber and “chili de agua”. Therefore, the annual yields for the three vegetable crops are estimated as follows: tomato at 4.5 tons per year in one cycle; cucumber at 2.5 tons in one cycle; and “chili de agua” 2 tons in one cycle. The starting of each crop cycle is described in section 3.3.

3.3. Engineering of the project

The greenhouse is already constructed and most of the members of this group have already received training. As such, the crux of this project is tomato, cucumber and “chili de agua” production. The total area of the greenhouse must be divided into three sections and each section will be dedicated to one crop. Because cucumbers represent a different botanical family, it will be better if the cucumber crop lies between the tomato and “chili de agua” crops to help reduce pest and disease transfer. Based on variability of price shown in section 2.1.4, cucumbers can be planted all year round and tomato seed beds
can start in September with tomato harvest and sales after week 44. “Chili de agua” can start in February with seed beds and go to the market around week 24.

### 3.3.1 Process of production

The crops have basically the same horticultural process: prepare seed beds, transplant seedlings, grow and maintain plants to fruiting, harvest fruits, handle packing including short-term storage, transport, and sales. It is important to know all the nutrimental requirements and provide supplements as needed, as well as administer effective pest management. This does not mean to use pesticides heavily, but to avoid conditions that are more favorable for pest populations to increase rapidly. Harvesting, storage and transport play major roles because handling is an influential factor to final appearance and therefore quality.

### 3.3.2 Necessities of production equipment

Typical greenhouse tools for horticultural maintenance and cleaning, a pump for irrigation and pesticide applicators are the only equipment required.

### 3.3.3 Necessities of supplies

Seeds, fertilizers, pesticides, manure, boxes and bags for storage and sale are the supplies needed. Most of these supplies will be purchased in Oaxaca City, and if possible from local suppliers in the Sierra Norte.
3.3.4. Necessities of direct and indirect labor

All the greenhouse work will be carried out by the members of the group. Crop care and maintenance are top priority and include daily activity of visual inspection with appropriate intervention and irrigation. Particular activities are conducted with certain frequency such as elimination of weeds, fertilization and pest control. Harvesting, post-harvest handling, transport and sales are performed at the end of the productive cycle.

3.3.5. Infrastructure necessities

The greenhouse is already constructed and the other major need is an irrigation water supply and a small storage unit.

3.3.6. Requirements for the packaging and commercialization

Wooden boxes with a capacity of 20 kilograms are usual for bulk sale of fresh vegetables. Plastic bags are more common for single kilogram portions sold to final consumers. Finally, rigid plastic containers such as buckets are very convenient for inside handling and transport.

3.3.7. Costs

The estimated costs for the operation of the greenhouse with three crops and one cycle per year are listed in Table 1. Costs refer only to growing the crops and furnishing an irrigation system.
Table 1. Estimated cost for three crops under greenhouse conditions

<table>
<thead>
<tr>
<th>Items</th>
<th>Price by unit (pesos)</th>
<th>Cost (pesos)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tomato seeds</td>
<td>1</td>
<td>600</td>
</tr>
<tr>
<td>Cucumber seeds</td>
<td>0.5</td>
<td>200</td>
</tr>
<tr>
<td>Chili de agua seeds</td>
<td>0.15</td>
<td>150</td>
</tr>
<tr>
<td>Fertilizers</td>
<td>250</td>
<td>750</td>
</tr>
<tr>
<td>Manure</td>
<td>8 m³</td>
<td>1,200</td>
</tr>
<tr>
<td>Electricity</td>
<td>200 per month</td>
<td>2,400</td>
</tr>
<tr>
<td>Pesticides</td>
<td>various</td>
<td>2,000</td>
</tr>
<tr>
<td>Flyers</td>
<td>1000</td>
<td>700</td>
</tr>
<tr>
<td>Buckets, boxes and bags</td>
<td>various</td>
<td>3,000</td>
</tr>
<tr>
<td>Rakes, shovels, scissors, etc.</td>
<td>various</td>
<td>2,500</td>
</tr>
<tr>
<td>Promotion via local sound system</td>
<td>10</td>
<td>500</td>
</tr>
<tr>
<td>Irrigation system</td>
<td>300 m²</td>
<td>15,000</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td><strong>29,000</strong></td>
</tr>
</tbody>
</table>

IV. ADMINISTRATIVE DESIGN

4.1. Organizational chart of the company

As mentioned previously the Capulalpam greenhouse group has an executive board for administrative affairs and procedures (Figure 6).

![Organizational chart for the Capulalpam greenhouse cooperative.](image)
4.2. Formats of planning and administration

4.2.1. Plan of work

In the cropping sequence, the initial crop will be “chili de agua” followed by cucumber and then tomato. Following the suggested calendar in section 3.3, there are considerable horticultural activities to be performed during the entire year and hopefully the crops will be available at the best windows of opportunities for profit.

4.2.2. Roll of activities

All members are required to work in a by-weekly rotation and members can negotiate their times. For management purposes it will be important that one person serves as the president, and any other person within the group appointed as foreman in a supervisory capacity to distribute daily work activities and follow up by means of reports and visual inspection.

4.2.3. Registry of production

The record of yields and final volumes of sales should be recorded by the treasurer. These registers will help insure fair and equitable distribution of the profits. Because agricultural activities are tax free there is no need to report income to the federal taxation authority.
V. MICROENTERPRISE FUNDING REQUEST AND PROFITABILITY AT-A-GLANCE

5.1. SAGARPA funding request

Year 1: 29,000 pesos

5.2. Profitability elements

- Costs (fixed and operating)
  - Fixed cost
    - Irrigation system = 15,000 pesos
    - Rakes, shovels, scissors, and pumps = 3,000 pesos
    - Total = 18,000 pesos
  - Operating cost
    - Tomato seeds = 600 pesos
    - Cucumber seeds = 200 pesos
    - Chili de agua seeds = 150 pesos
    - Fertilizers = 750 pesos
    - Manure = 1,200 pesos
    - Pesticides = 2,000 pesos
    - Electricity = 2,400 pesos
    - Buckets, boxes and bags = 2,500 pesos
    - Flyers = 700 pesos
    - Promotion spots in local sound system = 500 pesos
Total = 11,000 pesos

- Price (per unit)
  - Tomato = 8 pesos per kilogram
  - Cucumber = 7 pesos per kilogram
  - Chili de agua = 8 pesos per kilogram

- Revenue (# units X price)
  - Tomato = 4,500 kg x 8 pesos/kg = 36,000 pesos
  - Cucumber = 2,500 kg x 7 pesos/kg = 17,500 pesos
  - Chili de agua = 2,000 kg x 8 pesos/kg = 16,000 pesos
  - Total = 69,500 pesos

- Time interval to profitability
  - One year

- Profitability (Net Present Value, NPV and Internal Rate of Return, IRR %)
  - NRV = 34,182 pesos
  - IRR = 140 %

REFERENCES


Sistema Nacional de Informacion e Integracion de Mercados (SNIIM) web site

Appendix D

Agricultural Cooperative for Watercress

Microenterprise Development in La Neveria of the

Sierra Norte, Oaxaca
Agricultural Cooperative for Watercress

Microenterprise Development in La Neveria of the

Sierra Norte, Oaxaca

I. ORGANIZATIONAL DESIGN

With clean, cold water in nearby mountain streams of the Sierra Norte de Oaxaca, the community of the La Neveria has specialized in watercress production of excellent quality. Despite the positive attributes of the product and the fact that it is a specialty herb with relatively good yields, watercress producers within the community have been facing a constant problem—the lack of a clear marketing strategy to sell. Because most of the time the La Neveria watercress producers saturate the market and compete against each other, the product cannot attain the best price. This problem has been one of the motivating reasons to form a small cooperative dedicated exclusively to marketing and selling their product with increased benefit to all members in the city of Oaxaca and if possible in other cities of the region.

1.1. Internal design

There are eight families that produce watercress in the community of La Neveria. As a matter of principle, the formation of a watercress cooperative is desired that allows each member to continue to manage watercress collection individually from existing
harvesting locations, but in coordination with other members of the cooperative for marketing and sales. The administrative structure features an executive board of President, Secretary and Treasurer. Because the sole purposed of this cooperative is improved marketing and sales of watercress product, one sales agent can be hired or one person from the group appointed by mutual decision of the entire group.

1.1.1. Proposal of value

Sales to intermediaries or middle men force the producer to sell at inferior prices even though the watercress product is of high quality. This is because the intermediary is traditionally the one who imposes the price. The other disadvantage of individualized selling is that producers have to travel to Oaxaca City. It is a race against time to maintain the product in optimal appearance and freshness for sale. Additionally, every day that the producer spends in the city results in losses due to expenses for room and board. The integration of a watercress cooperative would solve these two problems. With strategic planning, the group can expand harvest season and obtain a better price by having a permanent presence in the market (and by eliminating middle men). Also, the cooperative will allow exploring potential markets for other vegetables that could be produced within the La Neveria community for further income generation. The enhanced value to be derived from developing a watercress cooperative in La Neveria is summarized below.

Objective: To work together collaboratively in a La Neveria watercress cooperative to improve income by direct marketing and sales to the final consumer.
Mission: The watercress cooperative of La Neveria will link watercress producers and final consumers directly not only in Oaxaca City but the entire region.

Vision: To become a well known, reliable provider of high-quality watercress among high profile consumers in the greater region of Oaxaca City.

1.1.2. Principles of the organization

The organization is governed under the ethical principle of improving sales and prices for its members. It also tries to avoid any practices that rule against the benefit of the producers in the market. All members of the cooperative will have rights and obligations in common agreement as established by rules according to the statutes of foundation. It is also accepted that President, Secretary and Treasurer will be selected by the members to serve as leaders. It is expected that members will respect their decisions. At the end of terms of office proposed to be one year per term, new officers will be chosen by vote of the members on the basis of personal merits.

1.1.3. System of internal control

In the process of establishing the watercress cooperative as a legal organization membership rules and a book of statutes will be developed. The statutes will prevail in the forms of internal organization. For those cases where the statutes are not applied, the entire cooperative will make a decision by general agreement or by voting with majority rule.
II. COMMERCIAL DESIGN

Because the total population of La Neveria does not exceed 100 persons, the market for fresh watercress in the community is limited. Traditionally, sales are made in the markets of the Oaxaca City. Some La Neveria producers have tried to sell watercress to restaurants and hotels, but their efforts have been sporadic and largely ineffective. This cooperative will need one person full time dedicated exclusively to manage watercress marketing and sales for all members.

2.1. Diagnosis of market

The Oaxaca City area is famous as a tourist destination. European and American tourists customarily enjoy consuming fresh watercress in salads, sandwiches, and as a condiment. The average Mexican does not consume fresh watercress in great amounts. Therefore, the restaurants and hotels where the tourists take meals in Oaxaca City would have to be the primary marketing and sales target. Previously, all watercress sales have been accomplished on an individual producer basis. This proposal to market and sell through a La Neveria watercress cooperative is the first attempt to work together cooperatively for improved profitability.

2.1.1. Analysis of the product

Watercress (*Rorippa nasturtium-aquaticum*) is an herb of strong acid flavor that is consumed in fresh salads, soups or sandwiches. It is considered a leafy vegetable and as with many other herbs the part that is mostly consumed are the leaves and some juvenile
sprouts. It is considered a good source of iron, calcium and folic acid, in addition to vitamins A and C. It is especially appreciated by consumers in the UK and Asia. The traditional form of sale is by the bundle of 30-50 sprigs. The quality is not only measured in freshness, but also by the fact that this watercress is irrigated with clean, cold water from mountain springs and streams, which virtually eliminates any health risk associated with its production or to its consumption.

2.1.2. Analysis of the consumer

Although watercress is more appreciated by foreigners in the region, there is a sector of the Mexican population that consumes this herb. Foreign tourists and expatriate residents are typically not the direct consumer, but hotels and restaurants catering to these clients are the primary market and customer. The Mexican consumer will be attended in small plazas scattered around Oaxaca City.

2.1.3. Analysis of the competition

One of the benefits of this cooperative is to eliminate the competition among the watercress producers of La Neveria. It is hoped that a large majority, if not all, watercress producers in La Neveria will choose to join the cooperative for economic benefit. Even in the eventuality that not all producers from La Neveria became members of this cooperative, there is the option to buy from them at a preferential price. This type of sale will be as close to fair trade value as possible. Profits can be used to pay the cooperative’s sales agent or to create a trust fund to buy a small vehicle for the cooperative.
2.1.4. Analysis of prices

The presentation of fresh watercress is in bundles and prices vary through the year. Most of the production peaks in the months of July and August and during those days the best quality watercress of the entire annual production is harvested. Ironically but understood through supply and demand principles, the price is the lowest at 2 pesos per bundle during the peak production interval and the price rises during the rest of the season when watercress becomes less available reaching a maximum price of 5 pesos per bundle.

2.2. Demand

Because all watercress production from La Neveria will be pooled and marketed collectively, new clients of large volume should be targeted for sales. Today, demand is primarily from the small market plazas in Oaxaca City. The potential demand is restaurants and hotels that have a large number of clients from Europe or USA, and particularly new restaurants that sell exclusively vegetarian menus and fresh, unprocessed food. These businesses will have more interest in a specialty herb and the important fact that La Neveria watercress is a natural, hygienic crop harvested fresh in the Sierra Norte using clean, clear mountain water for irrigation.

2.3. Commercial strategy

Production will be sequential and then pooled and processed by the cooperative for sale in Oaxaca City or other locations pending the marketing plan. No individual members will deal with sales; instead, the co-op sales agent will be responsible for all marketing and sales. If necessary, the cooperative may purchase watercress from any other
producer from the community who is not in the cooperative. One single offer from producers of La Neveria will allow the sales agent to promote and offer a unique, consistent product that stands apart from others.

2.3.1. Channels of commercialization

The cooperative will be the only sales outlet. Producers will submit their fresh watercress product to the cooperative. The Treasurer will record individual volumes and the co-op sales agent will market and sell the product in Oaxaca City and elsewhere if deemed profitable. In the initial stage, transportation could be carried out by rented vehicle; later the cooperative could purchase a small four-cylinder pickup truck. The cooperative will dictate the priorities for sales and obviously the volume will be larger. Thus, a marketing plan that identifies potentially new customers for expanded sales will be developed. After harvest times throughout the year, the production will be concentrated and then the sales agent will take it to Oaxaca City and to other markets if determined feasible and promising to sell it.

2.3.2. Product/Price

Watercress price is variable due to normal market fluctuations in supply and demand. However, the purpose of this cooperative is to reduce costs of sales and to expand total sales. For example, maybe the price will be the average 2 pesos per bundle, but now only one individual will be conducting the marketing and sales for all the producers with a realized savings of 7/8 of associated transport, room and board expenses in Oaxaca City.
or elsewhere. For the purposes of calculation in this plan the average price was fixed at 2 pesos per bundle all year round.

2.3.3. Plaza

This is a crop that is exclusively for income generation; the watercress production can only be sold externally beyond La Neveria because the production level is much larger than what the local population needs or can consume. The most obvious place that can consume the co-op’s levels of production is Oaxaca City.

2.3.4. Promotion

The cooperative should acquire means of reliable communication to offer potential clients a simple, convenient way to order. Because land line telephone access is not available in La Neveria and cellular phone signals are too weak, alternative customer communication access such as a cell phone with radio capabilities or a member in the community that works in Oaxaca City to receive text messages from a pager for subsequent transmission to the co-op. Business cards with all the possible options for communications must be printed and distributed to potential customers by the co-op sales agent. Flyers with information about the crop quality, volumes of production by season of the year, clean water used for irrigation, and place of production also must be printed and posted. Small promotional samples must be delivered to all potential clients and even tours to the community watercress plots could be offered. For the small profile consumers a calendar of attendance for small market plazas should be developed in order to inform customers when there will be watercress from La Neveria. An alternative is to
look for routes of delivering in residential areas of Oaxaca City using perhaps the routes of water deliveries by the drinking water company of Pueblos Mancomunados in the Sierra Norte, as La Neveria is a partner of this water supply company.

III. TECHNICAL DESIGN

3.1. Location

La Neveria is a small community in the Lachatao municipality of the Sierra Norte region, Oaxaca (see Figure 1). It is located in the furthestmost eastern part of the Lachatao municipality and thereby it has quick access to Oaxaca City via Tlacolula or by another dirt road via Teotitlan del Valle that connects with this highway.
3.1.1. Macro- and micro-location

Most of the watercress cooperative producers are along the main road in the La Neveria community and they use the same source of fresh water. An innovation in the production system is the use of shade screens to reduce sun exposure to maintain cool temperatures conducive to watercress production (see Figure 2).
3.1.2. Description of the site

As many other places in the Sierra Norte the landscape is a mixed forest of oak and pine. However, La Neveria is one of the coolest areas with frost as early as October and as late as March. The relatively humidity is also higher than any other places in the Sierra Norte and the elevation is nearly 3,000 meters above sea level.
3.2. Size

Each co-op member has differently sized plots for watercress production, but in general it can be assumed that the total production area adds up to approximately 0.75 ha. All of the plots are clustered along the main road of La Neveria.

3.2.1. Capacity of production

The entire community produces 5,000 bundles of fresh watercress per week at the peak during the four months of July to October, followed by a substantial decline in production until March for a total of nine months of production typical to the operation. Therefore, rough estimates suggest production levels of 10,000 bundles at peak months and 18,000 for the rest of the year’s harvest. The grand total annually is estimated at 28,000 bundles of watercress.

3.3. Engineering of the project

The La Neveria watercress cooperative is an administrative body that will concentrate the yields of all the members for marketing and selling via one single co-op sales agent. If possible, the cooperative will buy all bundles from those residents of La Neveria who are not members of this cooperative. The cooperative will not dictate any rules for production techniques to its members. Its function is to enhance income, e.g., design a calendar for sequential harvesting allowing the natural peaks to be absorbed by the market and distributing sales revenues during the low off-months. This calendar will be submitted to the entire cooperative and all members must agree to its terms, and if necessary any adjustment will be made with the consent of all members. The president,
secretary and treasurer will not have a salary, but the sales agent will be provided a salary and a fund for sales trip expenses as well as for promotional costs.

3.3.1. Process of production

Each member will manage production according to his or her own interest and operational practices. It is only required by the cooperative to adjust to the calendar that all members should respect. Nevertheless, the general scheme of production consists of soil preparation, setting up the frame for shade screens, planting, installing and maintaining shade screens, weeds control, pest control, and harvesting.

3.3.2. Equipment needs

The cooperative needs to improve the means of communication with customers. This critical marketing and selling issue could be resolved by sharing with local authorities the use of their cellular telephone which is connected to a radio. Another solution would be to establish exclusive contracts with potential providers of radio and telecommunication services in the community. In the future a vehicle used exclusively for the cooperative could be acquired, but this represents a significant cost and maintenance. An alternative is to pay fuel expenses co-op members. To keep the watercress fresh an ice cooler is needed for transport to market.

3.3.3. Supply needs

The sole objective of this cooperative is to reduce cost of sales expenses and to increase income from expanded watercress sales. Marketing and sales promotional materials
needed to realize co-op goals. Therefore, a recurrent need and cost will be business cards and flyers.

3.3.4. Necessities of direct and indirect manual labor

One person should act as co-op sales agent for at least nine months of production, with year round work activities associated with developing and maintaining customers being preferable for optimal results. Once the co-op production calendar is set the sales agent’s annual work plan will developed. Forty days of work with salary are assigned for marketing and selling per producer. By multiplying those days for 8 producers it is a total of 320 days. The number of days with salary and paid expenses cannot go over 160 days; if this occurs then there will be little difference with or without the cooperative. It will be a decision of the entire cooperative to decide to make the co-op sales agent position a rotating one with a person appointed within a period of time, or if they prefer to hire a person for a part-time or full-time job for this important function.

3.3.5. Requirements for the packaging and commercialization

Bundles of 30-50 sprigs are tied simply with cotton thread. Large volumes are usually transported in plastic bags or wood boxes, but there is not a standard or a significant difference in final appearance of the fresh watercress for sale. It is important to sell the watercress within a short period of one of two days after harvest to maintain freshness and quality.
3.3.6. Costs

The estimated cost of sales under current conditions is 48,480 pesos. This cost component is almost 45% of the total costs estimated at 94,608 pesos. This cost includes 60 working days at 80 pesos per day, 3,500 pesos for supplies such as thread, bags, wooden boxes, scissors, and knives (87.50 pesos per working day); and 38,400 pesos for transport to Oaxaca City and room and board (40 trips x 8 members at 120 pesos per trip). The savings will be in travel expenses because only the co-op sales agent, and not each member, will be travelling. If a vehicle is eventually purchased by the cooperative, then the cost of the vehicle plus associated registration, operation, and maintenance expenses will be incurred. The proposed promotional cost will be business cards (100 cards at 300 pesos), flyers (1,000 flyers at 700 pesos), and free sample bundles (1,000 bundles at 2 pesos each).

IV. ADMINISTRATIVE DESIGN

4.1. Organizational chart of the cooperative

The executive board will be appointed by the cooperative members via majoring vote and the co-op sales agent will be under the supervision of the executive board (see Figure 3).
4.2. Formats of planning and administration

4.2.1. Plan of work

The cooperative will be formed by all producers that wish to improve their income from sales and voluntarily elect to become members of the cooperative. Nevertheless, the cooperative must regulate its members in the calendar of the production so there is no direct competition between its members. Therefore, all members must follow the calendar of work that the sales agent and the executive board prepares and submits to members for review and agreement. Penalties for not fulfilling this agreement should also be discussed and agreed upon with all members. Finally, all members must agree in the scheme of payment for the marketing and sales expenses incurred by the co-op sales agent. A principle of proportionality should prevail where the members with the larger yields should pay more than the member with lower yields. If this scheme is not accepted, then an alternate option might be for the cooperative to set a fee per bundle and in this fashion all members know how much the cost for sales will be.

4.2.2. Roll of activities

If the cooperative decides to appoint one of its own members as sales agent, then it is important that this position as well as the executive board became rotating positions, and that before one person serves in that position again all other members have had opportunity to serve or decline to serve previously. It is suggested that the time to hold executive positions could be one year term as minimum and three years as maximum.
4.2.3. Registries of production

This La Neveria watercress cooperative business plan is based on estimations of personal information derived from interviews conducted with watercress producers in the community. However, there are no previous records of yields, prices and cost for watercress production and sales in the Sierra Norte. For improved business operations, it is suggested that each co-op member should keep a record of costs to help them to improve their own internal management. Additionally, it is recommended that a record of yield in their plots must be kept by each member as well as by the treasurer for all members because this information is vital for the design of the calendar of activities for the next year.

4.2.5. Inventories

The treasurer and sales agent must keep and update inventory of watercress bundles for sale and potential bundles for the next scheduled harvests in order to obtain an accurate estimate of supply available to meet potential demand.

4.2.6. Book of accounting

As any other agriculture activity in primary production, this watercress cooperative is not taxed by the Mexican government and a book of accounting is not required by law. However, for purposes of administration within the cooperative, the treasurer must keep accurate and detailed accounting records to measure the economic success of the cooperative’s microenterprise.
V. MICROENTERPRISE FUNDING REQUEST AND PROFITABILITY AT-A-GLANCE

5.1. Funding needs

Year 1: 28,200 pesos for associated expenses for marketing and sales only; each watercress cooperative member is currently responsible for covering all other costs of production.

5.2. Profitability elements

- Costs (fixed and operating)
  
  - Operating cost scenario 1 without cooperative
    
    - 60 working days x 80 pesos = 4,800 pesos
    
    - Supplies for 60 days x 87 pesos = 5,250 pesos
    
    - 40 trips to Oaxaca x 8 members x 120 pesos = 38,400 pesos
    
    - Total = 48,450 pesos
  
  - Operating cost scenario 2 with cooperative
    
    - 60 working days x 80 pesos = 4,800 pesos
    
    - Supplies for 60 days x 87 pesos = 5,250 pesos
    
    - 60 trips to Oaxaca x 1 sales agent x 120 pesos = 7,200 pesos
    
    - 100 business cards = 300 pesos
• 1,000 fliers = 700 pesos

• 1,000 free promotional watercress bundles = 2,000 pesos

• Total = 20,250 pesos

• Price (per unit)
  o Estimated average price = 2 pesos per watercress bundle

• Savings from marketing and selling via the cooperative
  o 28,200 pesos

• Time interval to profitability
  o 1 year in both scenarios (scenario 1 without cooperative for sales as now exists; scenario 2 with the cooperative selling as a group with co-op sales agent)

• Profitability (Net Present Value, NPV and Internal Rate of Return, IRR %)
  o NPV = 5,127 pesos and IRR = 23 % for scenario 1
  o NPV = 30,763 pesos and IRR = 89 % for scenario 2

REFERENCES


Appendix E

Community Restaurant for Enhanced Ecotourism
in San Juan Evangelista Analco, Oaxaca
Community Restaurant for Enhanced Ecotourism in San Juan Evangelista Analco, Oaxaca

I. ORGANIZATIONAL DESIGN

1.1. Internal design

Ecotourism initiatives that include a restaurant, trout farm and cabins in the community of San Juan Evangelista Analco began in 2006 with the support of a grant from the National Commission of Development of the Indigenous Communities (CDI) for 1,500,000 pesos. A local Committee of Ecotourism (CE) made up of municipal authorities was formed to manage the ecotourism funds along with the Comisariado de Bienes Comunales. Currently, the trout farm has been established, the cabins are being constructed, and the restaurant is almost completed. This business plan outlines the restaurant component detailing daily operations and funding needed for start-up operations. The form used is the Mexican SAGARPA form which is the standard form for business funding requests to the government.

1.1.1. Proposal of value

Objective: To establish a restaurant that offers indigenous cuisine featuring local products and to offer a platform for direct sales of regional products to ecotourists and local residents with a goal to generate growth for the local economy.

Mission: The Committee of Ecotourism, representing the best interests of San Juan Evangelista Analco, will establish a restaurant that will celebrate the resources and
customs of the community while improving the local economy by offering employment, purchasing local foods, and attracting tourists for purchase of local food and products.

**Vision:** To be an attractive food option for ecotourists and local travelers who visit the Sierra Norte region, with a reputation for high quality and freshness of locally grown agricultural products as well as excellent customer service.

### 1.1.2. Principles of the organization

The principles that govern the Committee of Ecotourism are:

- **Organization:** The Committee of Ecotourism is appointed by the General Assembly, which is composed of the entire population of the community. The primary function of this committee is the execution of the plans and programs of work as requested by the General Assembly.

- **Participation:** The administrative work is the responsibility of the members of the committee; however, they will need the participation and support of the Municipal Authority and the “Comisariado” to successfully complete the requested projects. Physical work on the projects will be carried out by contracted labor or by the forms of communitarian work that is accustomed in the community (“tequio”).

- **Respect:** A working relationship will be fostered between the Committee of Ecotourism, the Municipal Authority and the “Comisariado”. The Committee has authority to act but the Municipal Authority and the
“Comisariado” will be consulted on important matters with the General Assembly having the final word overall.

➢ Tolerance: The members of the committee will be required to make a serious commitment to the work required by the position.

➢ Quality: The committee will show no bias on the basis of color, nationality, or social class towards any person.

1.1.3. System of internal control

The section describes the restaurant’s system of internal structure, responsibilities and control.

1.1.3.1. Members of the ecotourism committee

The Committee of Ecotourism consists of three people at the current time and can be increased by the General Assembly, if desirable:

➢ President, Vicente Antonio Santiago- provides leadership to the committee and communicates with the General Assembly;

➢ Secretary, Inocencio Méndez García- responsible for writing, organizing and filing documents related to the projects; and

➢ Treasurer, Abel Manzano Cruz- responsible for the management and administration of the financial resources.

1.1.3.2. Tasks within the ecotourism committee

Responsibilities of the Committee on Ecotourism include:
➢ To represent the best interests of San Juan Evangelista Analco and to serve for the period determined by the General Assembly;

➢ To attend meetings sponsored by agencies and other institutions;

➢ To inform the General Assembly of changes in the laws and regulations that regulate ecotourism activity;

➢ To direct the activities of planning, execution and evaluation;

➢ To report to the authorities and the General Assembly; and

➢ To apply for any sponsorship necessary to obtain economic for benefit of the community.

1.1.3.3. Work place

The stunning views from the dining room of the restaurant in San Juan Evangelista Analco offer this proposed project a unique location and attraction for ecotourists staying at the nearby cabins where there are no cooking facilities. The restaurant will provide an authentic Zapotec dining experience that includes a historically inspired building design that utilizes traditional construction materials and built by local craftsmen. The restaurant will provide traditional Zapotec fare cooked on wood stoves. The combination of location, atmosphere, and good food will make this restaurant a unique destination and dining experience.

1.1.3.4. Process of elaboration

The restaurant will feature traditional Zapotec dishes authentically cooked on a wood-burning stove. Trout from the local trout farm will be featured on the menu, but will not
be the signature dish of the restaurant. The restaurant’s culinary signature will feature
daily specials instead of a menu-based selection and several dishes will be prepared daily
with a rotating menu. This plan will offer a variety of well prepared Zapotec cuisine that
will offer a daily variety to the ecotourist and locals as well as being a ready product for
consumption.

1.1.3.5. Commercialization of products

The restaurant is the only point of sale for fresh, local cuisine.

II. COMMERCIAL DESIGN

2.1. Diagnosis of market

The Sierra Norte region does not currently have restaurants to fulfill the demands of
ecotourists and other visitors who are seeking local cuisine in an authentic setting that
uses traditional cooking methods and construction materials in a historically-inspired
building design. This restaurant provides the only opportunities in the immediate area for
commercial food production. The plans for expansion of the cabins are encouraging for
future increased demands of the restaurant.

2.1.1. Analysis of the product

The restaurant will provide an authentic Zapotec dining experience inspired by delicious,
local cuisine served in a facility that reflects indigenous architecture and comfort. The
attractive and unique setting, style, and food of the proposed restaurant, which will be the first of its kind in the Sierra Norte region, offers an excellent opportunity for generating local employment and income in construction, food production and food service while concurrently strengthening indigenous Zapotec cultural preservation. These represent products desired by discerning ecotourists and help local citizens with sustainable livelihoods.

2.1.2. Analysis of the consumer

The primary client base of this restaurant will be the ecotourist that will be staying in the nearby cabins and who are interested in the local cuisine and culture. Other consumers will be visitors to the community, one stop drivers, as well as local residents.

2.1.3. Analysis of the competition

The closest competitor is called “Shoo Betto” located in Ixtlán, which is about a 20-minute drive. This restaurant specializes in trout dishes. Analco’s restaurant differs from the one in Ixtlán in that Analco’s restaurant will offer more than only trout dishes and it is an indoor facility. There are some small stands along the road that sell food, but they are designed for take-away food products and do not offer a seated dining experience.

2.1.4. Analysis of prices

There will be one price for a typical meal that will include soup or rice, main course, beans and tortillas. Drinks and dessert items as well as a la carte purchases are separate. Local prices for a comparable meal are 30-45 pesos. Initial pricing has been set at 35
pesos per meal. Because there is no previous knowledge in potential customer magnitude, prices are not based on initial costs (see Table 1); rather, they are based on annual estimations for full-time operation with a continuous supply of customers from the ecotourism facilities. This initial pricing of 35 pesos also allows the meals to be affordable for local residents and travelers as well as ecotourists as the restaurant’s reputation is established. Because the cabins are not fully completed at this time, it is important to appeal to local clientele in the near term. Prices are forecast to increase as the tourist market develops to a price range of 45-50 pesos.

Table 9. Estimated annual costs for Analco restaurant over next seven years

<table>
<thead>
<tr>
<th>Year</th>
<th>Total cost in pesos</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>350,000</td>
</tr>
<tr>
<td>2010</td>
<td>240,000</td>
</tr>
<tr>
<td>2011</td>
<td>260,000</td>
</tr>
<tr>
<td>2012</td>
<td>260,000</td>
</tr>
<tr>
<td>2013</td>
<td>260,000</td>
</tr>
<tr>
<td>2014</td>
<td>260,000</td>
</tr>
<tr>
<td>2015</td>
<td>260,000</td>
</tr>
</tbody>
</table>

2.2. Demand

Demand for the services of the restaurant will peak during the traditional tourist season in the summer as well as weekends and holidays. Local clientele will be a staple of the business during the off season. The estimation is an average of 25 customers per day in the low season and 50 customers daily for the high season. This estimation is based on the reported data by the Ministry of Tourism of occupied rooms in Oaxaca City in 2003 for which the annual total that year was 719,539 (Mexican Ministry of Tourism, 2008). Also, according to an employee of the EcoturIxtlán facilities (only 8 km from Analco) Diego Perez Sanchez (pers. comm., 2008), there were an estimated 10,000 Sierra Norte
visitors in 2007. It is also assumed that it will take time to build the clientele to take advantage of these tourist numbers. Table 2 depicts an average of 14 customers per day during the first year, 20 customers per day during the second year, and 31 customers per day during the third year of operation.

2.3. Commercial strategy

This section presents components important to the ultimate success of the restaurant enterprise.

2.3.1. Channels of commercialization

The restaurant is located in the entrance of San Juan Evangelista Analco and has a maximum capacity of 48 clients. The client capacity could be doubled if the patio space was utilized. The current furniture is only for indoor use and additional furniture would need to be purchased for the patio use. The current parking space can accommodate as many as 15 vehicles and two large buses, with future development plans for the entire complex to have parking space for an additional 75 vehicles. The grant sponsor that provided funds to date for the restaurant will offer space on its web site and 300 flyers in glossy color on quality paper. Advertising is free from the community radio station Radio Guelatao (see section 2.3.4 for more details). Complementary to these efforts is the installation of informative blue road signs along the highway to Ixtlán, which are also provided by the grant sponsor, as well as two billboards donated by a professor from the Universida Autonoma Metropolitana.
2.3.2. Product/Price

The average cost of a meal soup or rice, main course, beans and tortillas at local restaurants is 35 pesos. It is a price that the local population can bear and that will attract local clientele. Initial costs will be heavy for the first three years with estimated losses; however, price cannot exceed 35 pesos because this is a regional price and to be competitive the restaurant must be at the same price. Once a solid and loyal clientele is built, then price can be adjusted based on the superior quality of the product and production cost. Table 2 and section 5 feature additional descriptions of pricing. The restaurant should consider the possibility of selling alcohol in order to increase profits.

2.3.3. Plaza

The restaurant plans to attract patrons from the local area as well as the area of Ixtlán and the people of Oaxaca City (see Figures 1 and 2). By offering a unique experience in a unique setting combined with fresh, local food and superior service, the restaurant will strive to become a dining destination for this geographical area.
Figure 1. Road access to San Juan Evangelista Analco from Oaxaca City Mexico Highway 175.

Figure 2. Map of San Juan Evangelista Analco. The blue dashed oval indicates the restaurant location; the red star identifies the access road to the community and restaurant from Highway 175.
2.3.4. Promotion

Promotions will include road signage near Oaxaca and in the deviation of the highway of Tuxtepec. An aggressive radio campaign on Radio Guelatao will tell of the beautiful scenery and the fresh, flavorful food served at the San Juan Evangelista Analco restaurant. The Ministry of Tourism will also promote the restaurant in its publications and website. The costs of these forms of promotion will be borne by the CDI and the Ecotourism Project, as has been accomplished with other communities in the region. Currently under the large Ecotourism Project, which is managed by the same Ecotourism Committee, the signage will be provided by CDI along with web advertising on their website and 300 glossy color flyers. Radio Guelatao is community owned and does not charge for airing promotional spots.

Inexpensive promotional items such as key holders, wristbands, wood bottle openers carved with the name of the restaurant including travel directions may be given out initially to promote word of mouth and repeat business. The cost for these promotional items will range from 5 pesos for key holders and wristbands to 8 pesos for each bottle opener.

2.3.5. Local food procurement

The focus of the proposed restaurant is to incorporate many local food supply chains to supply the basic food stuffs of the restaurant including: fresh vegetables, eggs, bread, tortillas, chicken, fish, and special herbs and spices. Other staples like oils, grain, flour, salt, pepper, rice and other fresh vegetables that are not obtained in the community will
have to be bought in weekly trips to the Oaxaca City as well as beverages and any additional supply of cleaning and toiletry products.

III. TECHNICAL DESIGN

3.1. Location

The restaurant is located in the entrance to the town one kilometer from the community and three kilometers from the deviation of the highway to Ixtlán. San Juan Evangelista Analco is a municipality and belongs to the district of Ixtlán, in the Sierra Norte region of the state of Oaxaca (see Figure 3).

Figure 29. Orthophoto of San Juan Evangelista Analco urban area and access road from Highway 175 (red star); the blue dashed oval indicates the location of the restaurant. Source: Google Earth.
3.1.1. Description of the site

The physical location of the restaurant is in a clearing on a slope in a montane forest of pine and oak. It is near two freshwater springs, but only one was derived to supply water to the trout farm and the restaurant. Although the restaurant will fulfill the Official Mexican Norm of sanitation and healthy food preparation, the licensing from this norm does not require the restaurant to meet any drinking water standards. Of course, restaurant customers expect to be provided safe drinking water, which will be the case. Initially, the area for parking will be near the entrance of the restaurant once the construction of all the ecotourism development facilities are completed; additional parking spaces will be constructed along the north side of the road. The facilities are built in traditional “adobe” (mud bricks) and the roofing is wood framing (see Figure 4) with fiberglass slides that simulate traditional clay tiles. The outside space will have a hard floor of concrete with finishing of rustic tiles.

Figure 30. Interior and exterior of the restaurant during construction, summer 2008.
3.2. Size

3.2.1. Capacity of production

Full capacity at the restaurant is single seating for 48 customers. The size of the building, 216 m³ and the furniture, 8 round tables with 6 chairs per table (funded by the current CDI funds) dictate the customer capacity. This single seating can be repeated multiple times daily, but the goal is to have 50 seatings per day in Year 3 of operation.

Table 2 shows the estimated cost and the number of customers per year. It also predicts a maintained growth resulting in 50 clients per day in high season in Year 3 and sustained over subsequent years.

<table>
<thead>
<tr>
<th>Year</th>
<th>Average clients per day</th>
<th>Total sales in pesos</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>14</td>
<td>176,750.00</td>
</tr>
<tr>
<td>2010</td>
<td>20</td>
<td>252,000.00</td>
</tr>
<tr>
<td>2011</td>
<td>31</td>
<td>395,500.00</td>
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<tr>
<td>2012</td>
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<td>2013</td>
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<td>395,500.00</td>
</tr>
<tr>
<td>2015</td>
<td>31</td>
<td>395,500.00</td>
</tr>
</tbody>
</table>

These calculations provide a conservative estimate of the growth of the client base and the losses that will occur until the customer base is established and the start-up costs are realized.
IV. ADMINISTRATIVE DESIGN

4.1. Organizational chart of the company

The organizational chart of the restaurant starts with the General Assembly of San Juan Evangelista Analco and proceeds to the committee president, secretary, and treasurer who all provide oversight to the restaurant employees (Figure 5).

![Organizational Chart]

Figure 5. Organizational chart of the proposed Analco community restaurant.

4.2. Formats of planning and administration

4.2.1. Plan of work

The restaurant must obtain the required licenses for operation from the Ministry of Health and to know the “Norma Oficial Mexicana” NOM-093-SSA1-1994, practices of hygiene and health in the food preparation. Education of the staff on these regulations will be necessary to fully comply with, and obtain, these licenses.
The restaurant will be open every day of the year. Its schedule on regular days will be Monday through Friday from 7:00 A.M. to 8:00 P.M., and on holidays and weekends from 8:30 A.M. to 8:00 P.M. Consequently, it will be required that the cooks will be there from 5:30 A.M. to 7:30 P.M.; food servers from 6:30 A.M. to 8:30 P.M. and general assistants from 5:30 A.M. to 9:00 P.M. In order to fulfill this workday the following labor schedules are suggested:

- Cook first shift 5:30 A.M. - 1:30 P.M. with one hour break
- Cook second shift 11:30 A.M. - 7:30 P.M. with one hour break
- First food server shift 6:30 A.M. - 2:30 P.M. with one hour break
- Second food server shift 12:30 P.M. - 8:30 P.M. with one hour break
- General assistant first shift 5:30 A.M. - 1:30 P.M. with one hour break
- General assistant second shift 1:00 P.M. - 9:00 P.M. with one hour break

There will be an overlap of the shifts to provide a better transition to the next shift and to create local job opportunities for different families and supply an additional workforce for peak business loads. The committee will oversee, evaluate, and modify the schedule as necessary.

The work will be divided as follows: the cook of the first shift is responsible to prepare the breakfasts that will be offered in the morning; in addition he (or she) will start the preparations for lunch. The cook of the second shift will finish preparations for lunch and fully prepare the evening meal offering. Both cooks will prepare jointly the list of food to be procured that will be required on a weekly basis, closely managing the
inventory on a daily basis. The cooks will also be responsible for inspecting the produce and storing it properly.

The responsibility of the food service staff in the restaurant is to set up the tables, chairs, place settings; be knowledgeable about the dishes being served; transmit orders between the customer and the kitchen; and serve the food in a courteous, efficient, and hygienic manner. The second shift person will also be responsible for the above-mentioned quality food service plus closing the establishment and cleaning the floors.

The first shift general assistant will be responsible for opening the switch for the electricity, opening the gas passage, as well as unlocking the door for the staff entrance. This person will be the dishwasher, and also will inspect the kitchen to make sure utensils are clean and ready for use. This person will also assist the cook. Another obligation of the assistant is to inspect the toilets and make sure that they are clean and well stocked. Periodic checks during the day will be necessary to maintain a high standard of cleanliness. The duties of the second shift general assistant will be similar, but this person will close up by turning off the electricity and gas connections as well as locking the facility at closing in the night.

The duties of cashier will be assumed by rotating each member of the Committee and include the responsibility of the cash register including having proper change on hand as well as processing the payments of the customers and recording the transactions.
This person will also need to reconcile the receipts against the cash in the register at least once a day.

![Working hours of personnel chart]

**Figure 31.** Restaurant employee daily work schedule.

### 4.2.2. Register of work hours

Each employee will be required to register for work by using a punch clock system upon arrival and departure from work (see Figure 6).

### 4.2.3. Registries of production

Daily customer receipts will log the productivity of the restaurant and assist in identifying peak times and needs to be addressed.

### 4.2.4. Inventories

The members of the committee will oversee the restaurant inventories including: stationary items such as furniture, linens, and dishware, as well as food inventories and electrical and gas usage. They will check with the cooks to confirm adequate food supply is stocked on a weekly basis.
4.2.5. Accounting records

The “Sociedad de Producción Rural con Responsabilidad Limitada” (SPRRL) is a legal template that can be used for the restaurant accounting. There will be a need to hire a public accountant to oversee the accounting records of the business. A professional accountant will charge 600 pesos for monthly consultations to review and reconcile the books and up to 3,000 pesos for preparing annual accounting reports to the Ministry of Treasury.

V. MICROENTERPRISE FUNDING REQUEST AND PROFITABILITY AT-A-GLANCE

5.1. SAGARPA funding request

Year 1: 265,000 pesos
Year 2: 74,050 pesos
Year 3: 51,600 pesos
Year 4: 91,900 pesos
Year 5: 91,900 pesos
Year 6: 91,900 pesos
Year 7: 91,900 pesos

5.2. Profitability elements

- Annual costs (fixed and operating)
o Fixed cost
  ▪ Silverware, china, kitchen utensils and equipment, table cloths = 11,000 pesos

o Operating cost
  ▪ Salaries = 180,000 pesos
  ▪ Food procurement = 48,000 pesos
  ▪ Energy (electricity and butane gas) = 14,400 pesos
  ▪ Cleaning supplies = 3,600 pesos
  ▪ Toiletry supplies = 4,800 pesos
  ▪ Contingency expenses = 3,200 pesos
  ▪ Total annual costs in first year = 265,000 pesos

• Price (per unit)
  o Current price per full meal in the region = 35 pesos

• Revenue (# units X price)
  o Estimated clients first year 5,050 x 35 pesos per meal = 176,750 pesos

• Time interval to profitability
  o Seven years

• Profitability (Net Present Value, NPV and Internal Rate of Return, IRR %)
  o NPV = 21,642 pesos
  o IRR = 4%
REFERENCES


Ministry of Tourism México web site:

Appendix F

Survey Questionnaire for Participants of GEM TIES Watershed Management Training Workshop Sessions in Sierra Norte, Oaxaca

[English and Spanish versions]
Survey of Watershed Management Training Sessions Conducted by GEM TIES Project in Sierra Norte, Oaxaca, Mexico

The purpose of this questionnaire survey is to evaluate the effectiveness of the GEM TIES training workshops conducted in Sierra Norte communities during the past year. Participation in completing this survey is voluntary. Thank you for your time and assistance.

1. Target group

Gender  ____F  ____M  Age____  Main activity______________________________

2. How many training sessions did you attend?

____1  
____2  
____3  
____4  
___5 or more

3. Which of the areas listed below was/were addressed by the training session (check all that apply)?

____Sustainable agriculture  
____Trout production  
____Water quality  
____Solid waste management  
____Ecotourism  
____Rainwater catchments  
____Payment of environmental services

4. Do you have previous knowledge in the area(s) you attended in #3?

____Yes  ____No  
If yes, how much do you know about it (mark one choice below)?

____Expert-“well above average”  
____Advanced-“above average”  
____Proficient-“average”  
____Some, but not much-“less than average”  
____Nothing, it’s new to me-“no previous knowledge
5. How much did you learn in the training session(s) you attended?

___Extensive new knowledge gained
___Much
___Little
___Nothing

(If you checked “Little” or “Nothing” in #5, which factors were most influential in your response? Rank order your responses with “1” meaning most influential, “2” as next most influential, etc.)

___Session too long
___Complicated language
___Not enough material
___Not adequate interaction with audience for questions and/or discussion
___Not enough small group break out discussions
___Not enough hand-on activities
___Too many new concepts in one single session
___Meeting room difficult for seeing and/or hearing easily
___Meeting room uncomfortable (not enough chairs, dark, hot, wet, etc)
___Other

6. Do you usually attend training sessions in your hometown?

___Yes ___No

7. Are you willing to travel to another village to attend a training session?

___Yes ___No  If yes, how far are you willing to travel to attend a training session (mark one choice below)?

___0 km
___1-10 km
___11-20 km
___21-30 km
___31-40 km
___41 km or more

8. Do you usually attend free training sessions?

___Yes ___No
9. Are you willing to pay for a training session?

___Yes  ___No  If yes, how much would you pay to attend a training session
(mark one choice below)?

0 pesos  1-50 pesos  51-100 pesos  >100 pesos

10. Do you usually deal with technicians for solving problems related to the areas before
mentioned?

___Yes  ___No  If yes, please categorize them as:

_____Professional for hire
_____Federal government field agent
_____State government field extensionist
_____Municipal technician
_____Special project technical staff (like NGO or university) not sponsored by the
government
_____Other __________________________________________

11. How do you assess the technician that offered the training session(s) you attended?

_____Expert in this field- “well above average”
_____Very knowledgeable, advanced- “above average”
_____Knowledgeable, proficient- “average”
_____Some basic knowledge- “less than average”
_____Poor knowledge- “not capable in this field”

12. Would you recommend to others in your community to take the training session(s) if
they are offered again?

___Yes  ___No  Please explain your answer: ____________________________

13. Would you be able to put in practice the new knowledge and skills gained in this
training session(s)?

___Yes  ___No  If not, please indicate which reason prevent you from doing so?

_____Lack of basic space (no landowner)
_____Lack of infrastructure (i.e., greenhouse, trout pond)
_____Lack of access to initial capital
_____Not enough knowledge gained to initiate a venture
_____Other __________________________________________
14. Do you consider that you have a better chance of success in future ventures by teaming up with other peers?

___Yes    ___No     Please explain your answer:__________________________

15. Were you comfortable when people were arguing priorities for these training sessions?

___Yes    ___No    If not, please explain:_______________________________

16. Are you willing to work with people from another nearby community?

___Yes    ___No    If not, please explain:_______________________________

We greatly appreciate your help in completing this survey. Thank you.
Encuesta de las sesiones de entrenamiento ofrecidas por el Proyecto GEM TIES en la Sierra Norte, Oaxaca, México

El propósito de esta encuesta es evaluar la efectividad de los talleres GEM TIES de entrenamiento ofrecidos en las comunidades de la Sierra Norte el año pasado. La participación en esta encuesta es voluntaria. Gracias por su tiempo y apoyo.

1. Identificación de grupo

Genero  ___F     ___M     Edad_____     Actividad__________________________

2. ¿En cuantas sesiones de entrenamiento participo usted?

___1
___2
___3
___4
___5 o más

3. ¿En cual de las áreas abajo mencionas la(s) sesión(es) de entrenamiento se desarrollaron (seleccione todas las que apliquen)?

___Agriculturas sustentable
___Producción de trucha
___Calidad del agua
___Manejo de desechos sólidos
___Ecoturismo
___Captura de agua de lluvia
___Pago por servicios ambientales

4. ¿Tenia usted algún conocimiento en el área(s) en la(s) que usted participó en la pregunta #3?

___Si  ___No     Si respondo si, ¿que tanto sabia al respecto ( marque una opción de las abajo mencionadas)?

___Experto-“mucho muy arriba del promedio”
___Avanzado-“solo arriba del promedio”
___Suficiente-“promedio”
___Algo, pero no mucho-“menos que el promedio”
___Nada, esto es nuevo para mi-“ningún conocimiento previo”
5. ¿Cuánto aprendió usted en la(s) sesión(es) de entrenamiento en la(s) que participó?

___ Extenso nuevo conocimiento adquirido
___ Mucho
___ Poco
___ Nada

(Si seleccionó “Poco” o “Nada” en #5, ¿qué factores fueron los de mayor influencia para esta respuesta? Asigne orden en sus respuestas si hay más de una con “1” como la de mayor influencia, “2” como la siguiente en orden de importancia y así sucesivamente)

___ Sesión demasiado larga
___ Lenguaje complicado
___ Material insuficiente
___ Interacción inadecuada con los participantes para preguntas y/o discusión
___ Poco o ningún trabajo en grupos pequeños para facilitar la discusión
___ Poco o ninguna actividad práctica
___ Demasiados conceptos nuevos en una sola sesión
___ Salón del taller difícil para escuchar y/o ver
___ Salón del taller incomodo (pocas sillas, oscuro, caluroso, húmedo, etc.)
___ Otra

6. ¿Usted usualmente participa en sesiones de entrenamiento en su localidad?

___ Si  ___ No

7. ¿Está dispuesto a viajar a otra localidad para asistir a una sesión de entrenamiento?

___ Si  ___ No  Si respondió sí, ¿qué tan lejos viajaría para atender la sesión (marque una opción de abajo)?

___ 0 Km.
___ 1-10 Km.
___ 11-20 Km.
___ 21-30 Km.
___ 31-40 Km.
___ 41 Km. o más

8. ¿Usted usualmente participa en sesiones de entrenamiento gratuitas?

___ Si  ___ No
9. ¿Esta dispuesto a pagar por una sesión de entrenamiento?

___ Si      ___ No

Si respondió si, ¿qué tanto pagaría usted por una sesión de entrenamiento ( marque una opción de abajo)?

0 pesos           1-50 pesos           51-100 pesos           >100 pesos

10. ¿Usted usualmente recurre a técnicos para solucionar problemas relacionados con las áreas antes mencionadas?

___ Si      ___ No

Si respondió si, por favor asigne una categoría:

______ Profesionista contratado
______ Agente de campo del gobierno federal
______ Extensionista de campo del gobierno estatal
______ Técnico del municipio
______ Personal de algún proyecto especial (ONG o universidades) sin patrocinio del gobierno
______ Otro

11. ¿Cómo califica al técnico que realizó la sesión(es) de entrenamiento en la(s) que participo?

______ Experto en la materia- “muy por arriba del promedio”
______ Avanzado conocimiento extenso- “arriba del promedio”
______ Suficiente conocimiento- “promedio”
______ Conocimiento básico- “por abajo del promedio”
______ Conocimiento pobre- “no capacitado en la materia”

12. ¿Recomendaría a otros en su comunidad participar en esta(s) sesión(es) de entrenamiento si se volviera(n) a ofrecer?

___ Si      ___ No

Por favor, explique su respuesta:

13. ¿Es usted capaz de poner en practica el conocimiento y las habilidades adquiridas en esta(s) sesión(es) de entrenamiento?

___ Si      ___ No

Si respondió no, por favor indique el motivo por el cual esto no ocurre

______ Falta de espacio (no es propietario de ningún terreno)
______ Falta de infraestructura (ejemplo: invernadero, estanques para trucha)
______ Falta de acceso a capital de inversión
______ El conocimiento adquirido no es suficiente para iniciar un negocio
______ Otro
14. ¿Considera que tiene mayores oportunidades de éxito en futuros negocios si se asocia con otros compañeros?

___Si   ___No   Por favor, explique su respuesta:

15. ¿Se sintió cómodo debatiendo con otras personas las prioridades del taller?

___Si   ___No   Por favor, explique su respuesta:

16. ¿Esta dispuesto a trabajar con gente de otras comunidades vecinas?

___Si   ___No   Si respondió no, por favor explique:

Apreciamos mucho su ayuda en la respuesta a esta encuesta. Muchas gracias.