Enhancing food security through the exchange of techniques & technology in Cuquila, Mexico

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2017 McBurney Fellows
McGill Institute for Health and Social Policy

IHSP
Institute for Health and Social Policy

Project Overview

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Fellowship Duration: 2 months

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Fellowship Duration: 2 months

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Fellowship Duration: 1 month

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About the McBurney Fellowship Program

Through McGill's Institute for Health and Social Policy, the McBurney Fellowship Program supports students in international service programs related to health and social policy in Latin America. McBurney Fellows serve abroad in organizations working to meet the basic needs of local populations. One key aspect of this fellowship is its mandate to make a significant contribution to improving the health and social conditions of poor and marginalized populations through the delivery of concrete and measurable interventions. Students and their mentors identify issues, make connections with local organizations, and develop a strategy for the fellowship. The views expressed in this document are the opinions of the fellow, and do not necessarily reflect the opinions of the IHSP.

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Fellowship Rational

Background Context

The Mixteca Alta region sits on the eastern edge of the Mexican state of Guerrero and the western edge of the state of Oaxaca. As Roge (2014) says, "this region is both a political entity and a part of the larger geographical area predominated by the Mixtec people." The landscape is mostly mountainous and due to its high elevation (much of it above 2000 meters), the Mixteca Alta is primarily classified as a subtropical dry winter climate (Cwb) according to the Köppen-Geiger system, although it lies within the tropics (Kottek et al. 2006). Most precipitation occurs from June through September, with a mid-summer decrease (Magaña et al. 1999). The highest average temperatures are in April and May, before the heaviest summer rains, and frosts are common from October through March at higher elevations (Roge, 2014).

As Perez (2016) noted, there are few perennial rivers, and most agriculture relies on the rain and nearby springs, seasonal rivers, and streams. Despite these challenges, the rugged high mountains and narrow valleys of the Mixteca Alta have been intensively farmed and modified for over 2,000 years (Blomster 1998; Kowalewski et al. 2009; Leigh et al. 2013; Spores 1969).

The first hilltop cities of the Mixteca Alta region date back to 300 B.C.E. The establishment of these cities represented a radical change in settlement location, the emergence of social stratification, and large-scale investment in terraces, urban planning, and construction (Perez, 2016). Ronald Spores (1969) proposed that terraces developed in early Mixtec cities that were built on defensive hilltops in the Late Formative period (300 B.C.E.) as a way to produce food within their protected territories (Perez, 2016).

By the Postclassic period (900–1521 C.E.), the Mixteca Alta was among the many densely populated areas of Mesoamerica where dozens of communities, locally known as ñuu and yuhuitayu, competed for power and traded with each other (Kowalewski et al. 2009; Spores and Balkansky 2013). At the point of Spanish contact, the Mixteca Alta had an estimated 700,000 inhabitants who intensively farmed and terraced most of the available land (Cook and Borah 1968; Romero Frizzi 1996; Perez 2016).

For over two millennia, terracing was an important food-producing and soil-conserving technique that, according to the archaeological record, was effective, long lasting, and closely linked to the

development of Mixtec complex societies (Perez, 2016). However, during the Colonial period, the Mixtec landscape underwent drastic changes. As a result of disease epidemics, 80–90 percent of the indigenous population perished (Cook and Borah 1968). Colonial towns were built, but mostly in flat locations in valleys or lowlands, following grid-like layouts, which consequently replaced hilltop cities. Thus, many terraces were abandoned, fell into disrepair, and contributed to soil erosion. These conditions were then further exacerbated by the introduction of grazing animals (Perez, 2016).

As a result, modern-day families in the Mixteca Alta suffer from a crisis of food production, since the traditional production systems from which they obtained basic grains no longer prove sufficient. The deterioration of natural resources, especially of the soil, results in insufficient yields of basic grains (400-800 kg/ha of maize - wheat and less than 400 kg/ha of bean). Consequently, their age demographic increases due to rapidly escalating emigration by youth to other regions of the country and the world searching for economic opportunity (Boege and Carranza 2009).

Nonetheless, according to the community members in the Mixteca Alta, it is possible to improve their conditions by adopting new techniques and technologies and integrating them with sustainable, traditional farming methods to cope with the hostile environmental conditions they confront. Farmers must obtain productive and training assets in order to learn new techniques, assistance in integrating novel practices with the methods they have used for generations, and ongoing support when confronting practical issues and obstacles that may come up.

Objectives

Therefore, the Spanish and Latin American Students Association of McGill University (SLASA) partnered up with the INAH (Mexican National Institute of Anthropology and History) to support two communities in the Mixteca Alta in obtaining the productive and training assets they need. Our objective was to increase food security in the Mixteca Alta of Oaxaca. We collaborated with two communities from the Nochixtlán and Tlaxiaco Districts of the Mixteca Alta Region: Santa Maria Cuquila and Santo Domingo Tonaltepec.

Dr. Ethelia Ruiz, from the INAH, introduced us to the biologist Donato Ruiz. Donato is a trained biologist and specialist in soil conservation. He trained as an agent for rural development by the FAO[1], INI[2], and SAGARPA[3]. He worked for the COLPOS[4] as a field technician to implement the MIAF technology and has been the municipal president of his community twice. During his time as municipal president, he took actions toward improving the uptake of water for production, implemented protected agriculture, improved the roads for farmers, implemented a project to protect

[1] FAO: Food and Agriculture Organization
[2] INI: National Commission for the Development of Indigenous Peoples
[3] SAGARPA: Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food
[4] COLPOS: Colegio de Posgraduados

their creole seeds, and along with other municipalities, he presented the Geopark initiative to the UNESCO[5].

Donato is native to the Mixteca Alta and is exemplary of the youth migration trend in this area. After completing his studies, he came back to apply his knowledge and improve his community. With all his experience in programs and projects such as PMSL (Sustainable Slope Management Project) and PESA (Strategic Food Security Project), he came up with a modified version of a technology called Milpa Intercalada con Arboles Frutales (MIAF).

Donato presented the MIAF to us as a technique that draws directly from the experience of some communities of the Mixteca Alta in the districts of Nochixtlan, Teposcolula, Tlaxiaco, San Felipe del Agua, Region Mixe etc. The MIAF is an inter-cropped agroforestry system that includes fruit trees that produce fruits of high commercial value. As such, farmers manage to increase their family income substantially, which is difficult to achieve solely through harvesting of the basic grains. In summary, the MIAF is an alternative for small, peasant, and ethnic production units.

To conduct this project, SLASA fundraised, through churro sales and other events, in order to be able to hire Donato and payed for a full year. The reason for this is that when adopting a new technology in agriculture, it is important to receive a year-long accompaniment so that farmers have access to the expert to ask questions in case unexpected situations arise. This increases resilience in the farmer and also allows them to be able to teach the technology in the future. At the same time, we paid for the farmers supplies, since using a new technology is risky for a family whose year-long food supply depends on their crops.

This project is one of a kind, since it is the first time low-income farmers, who use their food for auto consumption, are receiving support to learn new technologies.

This summer, we learned about the traditional farming method as well as this new innovative farming method, MIAF. We worked with 10 farmers who were being taught by Donato of the MIAF technology.

Activities

Farm visit #1: June 21, 2017 at Don Tomas's farm in Santa Maria Cuquila.

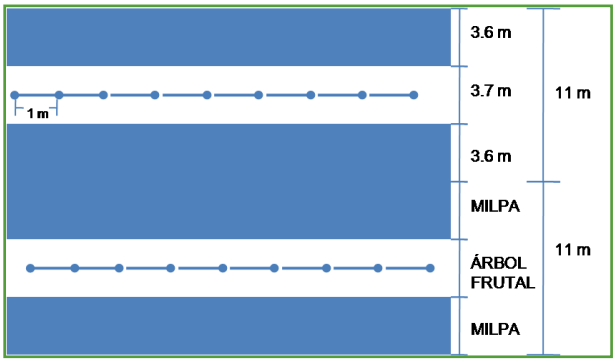
This day was our introduction and we learned about traditional cropping systems and the MIAF from the perspectives of Don Tomas and his family.

There are two rain-fed cropping systems in the Mixteca Alta, which are the cajete maize system (maíz de cajete) and the seasonal maize system (maíz de temporal). The two maize systems differ significantly in their requirements for labor, technology, and social organization (Roge, 2014). Groups of farmers sow cajete maize at the end of the dry season between February and March,

[5] UNESCO: United Nations Educational, Scientific and Cultural Organization

using a two-sided digging tool (pico y coa) to locate residual soil moisture (Roge, 2014). These sowing activities involve much of the community and require coordination throughout the winter months (Rivas Guevara 2008; García Barrios et al. 1991). In contrast, families adopting the MIAF technique individually sow seasonal maize in furrows along with beans and squash at the beginning of the rainy season between May and July (Roge, 2014).

The MIAF is a technology where maize grows and develops along with beans (or other edible legumes) and fruit trees, fostering agronomic interactions between them. This technology meets the expectations of small producers in this micro-region since it incorporates the cultivation of basic grains for autoconsumption (thus increasing food security), and on the other hand, adds both the production of commercially valuable fruit (expanding the family income) and heightened conservation of natural resources through its arrangement and sustainable management of sediment filters. Therefore, the MIAF system successfully recognizes the value of traditional farming practices and innovates upon them in order to meet present dietary, economic, and sustainability needs.



As Figure 1 above shows, the MIAF consists of two contiguous strips, each with a width of approximately 11m. Each of the strips are then divided into three rows -- the middle row is 3.7m wide and the two sides are 3.6m wide. The fruit trees are planted in the center of the first strip (3.7m row). The fruit trees are planted with 1.0m of separation between them. In each lateral fringe of the trees, five rows of maize and associated beans are planted with a distance of 0.70 m between each row, parallel to the row of fruit trees. The first furrow of maize and bean is at a distance of 2.2m from the trunk of the fruit tree on both sides of the row. Corn stubble and/or other plant residues supported by the fruit tree trunks serve to control soil water erosion along the 3.7m rows on the upstream side. This filter is formed every year as the corn stubble and/or other plant residues become horizontally entangled.

At Don Tomas's farm, Donato took a different approach. Here, they planted a row of fruit trees at the end of each terrace and within the terrace they had either one row of maize and one row of beans intercalated or two rows of maize and one of the beans intercalated.

An innovation Donato proposed was that of placing one seed instead of five. Traditional Milpa systems usually contain five plants growing in the same place (see photo). Donato suggested this modification because he believes that placing five seeds only creates competition between the plants, whereas placing one seed creates an ideal environment for the absorption of nutrients and the growth of the stem. He aims to harvest two corns per stem.

Farm visit #2: July 1, 2017 at Donato and Honorio's farms in Santo Domingo Tonaltepec.

On this day we went to Santo Domingo Tonaltepec. Here we met up with three of the farmers we're supporting and learned about the different methodologies used on each farm.

Each farm had topographical and soil differences -- some farmers used brown beans, others used broad beans; some planted one seed while others planted two or more; some used fertilizer, others did not; some had compost while others did not; and some had trees and others did not; some had one-row variability whereas others had every two-row variability.

Flexibility of the strategies is central to the effectiveness of this program. Farmers are not only constantly adapting to constraints posed by the physical environment, but also to dynamic social and institutional circumstances (Eakin, 2000). Resultantly, innovation of agricultural techniques and technology must be dynamic in its nature as well.

Something else that struck me was that locals strive to preserve their creole and traditional seed. They do this because they believe hybrids or genetically modified seeds are not as effective. Farmers claim that their creole seed is already adapted to their environment, does not use as much fertilizer, and is resistant to plagues and droughts. During this farm visit we helped out by weeding out other maize stems, called "hijuelos" (younglings), in the event that the farmer accidentally dropped two seeds instead of one. This is also a novel practice, given that for the farming families "hijuelos" represent additional food on the table. The MIAF technique requires this weeding out in order to reduce competition for nutrients in the ground. Families' willingness to participate in and adopt the MIAF technique, despite this meaning potentially diminished food for their own family, reflects their deep trust in Donato and SLASA.

Farm visit #3: July 5, 2017 at the farm of Don Tomas in Cuquila.

During this farm visit we learned about the fertilizers and mycorrhiza used.

Some farms have farm animals and can make compost. It is only on these farms that families are able to apply compost and reduce fertilizer use. Farmers who cannot make their own compost do not buy it because compost is too expensive and its application is more time-consuming than fertilizer.

In this farm, they are using 18/46 Fertilizer (nitrogen). Don Tomas was hesitant to use fertilizer at first because it wasn't part of his family's tradition, but Donato insisted that it was necessary if he

had no compost. Don Tomas added fertilizer along with the seed when it was first planted. Two weeks later, he again added ammonium sulfate.

Donato proposed that the farmers inoculate the maize and bean seeds with mycorrhiza, which allows plants to absorb nutrients in their environment more efficiently (Miller and Allen, 1992). The mycorrhiza also stimulates the consumption of nitrogen, sulfur, and zinc among others, which protect the roots against infections caused by a variety of soil pathogens (Frioni 1990). Therefore, mycorrhiza can be used as a biocontrol method (Linderman 1994, Duchense 1994).

In this visit we also helped to weed out other plants, to avoid competition amongst the larger stems and the hijuelos.

Farm visit #4: July 10, 2017 at the farm of Doña Aurelia in Santa Maria Cuquila.

On this farm visit we went to Doña Aurelia's farm. She is an older woman who used to work in the US but decided to return to her community and harvest her father's land. Due to her age, she has to hire workers to help her every time she does something. So when we were there, we helped helped her level her peach trees that were drowning due to the rain. On this day we took out the little tree, put more ground underneath, and re-planted.

Farm visit# 5: July 13, 2017 at the farm of Don Tomas in Cuquila.

On this day we met up with Dr. Ethelia Ruiz and the farmers. She gave us a lecture on the history of the Milpa and why the MIAF is done (written in the context portion). She also talked to us about Dr. Alfonso Caso and his contributions to the cause of Indigenous people of Oaxaca. Dr. Alfonso Caso was the archeologist who found tomb Seven in Monte Alban, along with several gold pieces and offerings. He founded the National Indigenist Institute (INI) and thereafter the National Commission for the Development of Indigenous Peoples (CDI).

Farm visit #6: July 15, 2017 at the farm of Don Tomas in Cuquila.

On this day we met up with Donato and the farmers (Doña Aurelia, Don Tomas, and David) to learn about graftage. Donato is preparing the farmers so that in September, when the peach trees are larger, they can use the graftage technique. This is so farmers can grow a bigger and tastier variety of peaches which can be sold for more money. They did not plant this variety from the beginning because they preferred to plant a variety from the region that would adapt better and faster to the soil and topographical conditions.

Challenges and Successes

Description of expected versus actual outcomes

We accomplished everything we set out for and more. We initially thought we would work with six farmers and ended up meeting and working with 10! At the time of this report writing, the harvest seems promising! We have evidence that there are drastic changes from the maize using the traditional system and the maize using the MIAF system.

Note in photo 1 the difference in the width of the stalk and the color. Thus, we are planning to expand the program next year since we have found much enthusiasm from the farmers and the community members.

A challenge for the farmers could be the risk they are taking by adopting a new technology.

Photo 1: Stem on the left is from MIAF, stem on the right is from traditional system. Note the thickness and color.

Questions raised

We worked really well as a team. Jean Yves and Ivan did a really good job in the selection process for this project, because each of us had our tasks and each of us played an important role. We fed off of each other's ideas and energy, we taught each other things, we problem solved together, and more importantly we had fun and became good friends.

The farm visits worked out well too. Donato made sure to answer the simple questions of those who do not have a background in agriculture and also the more complex questions to those who did.

A challenge and a blessing of our trip was the food. The food of Oaxaca is known to be delicious and it was! However for students coming from North America, sometimes the diet of grains, sugar, and lactose could be challenging. Most of us had constipation after the first week and so the second week we decided to eat a bit more healthily. As a team we bought fruits and vegetables and whole grains so that we could have a diet closer to what it is in Montreal.

We are also looking forward to seeing how this technology is taught from farmer to farmer, as the transmission of knowledge could be a challenge in the future.

Training and Mentoring

Before leaving to Oaxaca, Dr. Ethelia Ruiz told us to go to the Templo Mayor in Mexico City. Here we learned about the ancient civilizations that resided in Mexico.

During the internship, we received a history course from Dr. Ruiz on the origins and the trajectory of the Mixtec civilization.

At the farm, Donato explained to us all that was discussed in the "activities" section (above). We discussed the type of soils in the region and the limitations of the governmental programs to support small farmers. He introduced us to his town and his family. We learned about the different initiatives being done there such as a water reservoir, greenhouses, and reforestation.

Training/mentoring from McGill supervisor

Our faculty mentor was supporting us all throughout. Before the internship he gave us articles and books to read and also sent us some relevant podcasts to listen to. More than anything, however, our faculty member raised questions, throughout our stay in Oaxaca, in order for us to improve the project.

What did you learn?

We learned about agriculture, about the Mixtecs, their social fabric, about the life of indigenous people in Mexico, about a different way of living. We questioned development itself and we questioned the government.

Something that struck us in particular was how all of the farmers thanked us and told us that this has never happened before. They have never received this type of support to learn new techniques and technologies. This sounds bizarre given the existence of budgetary designations for government programs dedicated to doing exactly this led by FAO, SAGARPA (Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food), and other government or international agencies. However, the farmers we met told me that they are ineffective. They said that

the workshops they host are sometimes only one day long and that it is not enough for them to learn and understand how to apply the technology. At the same time, these one-day workshops fail to provide follow-up support in case of confusion or mishaps that a farmer could face during the year. Another issue is that some of these programs do not provide funding, so farmers cannot acquire the new technology even if they know how to or want to. They also told us that some politicians pay most of these agencies to ask farmers to vote for them in exchange for the training program and that they do not like this. Finally, another issue is that some agencies expect short-term results, when environmental and adoption of new technologies in fact takes more time. In short, these programs can be inaccessible, dubious, arduous, and sometimes corrupt.

Community Implications and Further Work

Short term benefits include an increased yield of maize for the winter thus improving food security of the farmers and their families for the next year. Food Security directly impacts the health of the poor and marginalized groups that we were working with.

One of the long term benefits will be visible once the peach trees are grown. These will be able to yield fruit to sell to the market, thus improving the food and economic security of the family. This, in turn, also improves the economic situation of the town they live in, as they will have a higher purchasing power.

Another long term benefit would be realized if the farmers we worked with this year will be able to teach others of this technology. We hope that through a ripple effect, more farmers learn about the MIAF and thus more farmers will begin to have healthier soils, higher yields of maize, and yields of fruit for the market.

When Jean and Ana return in December/January they will host a reunion for all other farmers who are interested. In this meeting we would invite the farmers that we worked with this year to speak about their experience and also to make links with those who are willing to take the risk to embark on this journey to adopt a new technology.

How might your fellowship make a difference for the people you worked with?

Many of the people we worked with told us that us being there and us believing in them made them believe in it themselves too. We are empowering them and in return they are empowering us as well.

People outside of the community would care because most are farmers as well, thus most of them would like to improve their methods and obtain higher yields. What stops them from changing their techniques right now is that a technical failure means less (or no) food for their families. It is not a risk they are willing to take, which is why it is crucial that the farmers we're working with right now can share success stories at the end of the season.

What would the next steps be to translate your findings into policy action (if not already happening)?

In terms of policy action, we would need to help create a policy to improve food security in rural communities. This includes unlocking government funding for projects such as the one we did, hire experts to be able to expand the project, and also to create new ones. As we have already discussed, one of the major constraints that existing programs face is their short-term orientation – learning, adopting, and constantly adapting an agricultural technique is not a matter of a single day or even an entire season. Another issue that needs to be improved within existing government policy is ignorance about local culture and customs. Characteristic of communities in the Mixteca Alta is a tight-knit social fabric and a strong adherence to traditions. Expecting people who have been cultivating the same land for decades (if not centuries), using the same techniques their parents and grandparents used, to quickly and willingly accept novel technologies presented by outsiders is completely out of touch with local realities.

Another thing would be to improve the existing programs that SAGARPA and FAO offer so that they include small farmers as well.

Program Evaluation

How did this fellowship further your academic or career goals?

This fellowship was a highly enriching experience that taught us a wide variety of things we can and will apply to projects in the future. From small things such as how to make a fire to boil water, to big things such as answering how we can prevent soil erosion with fruit trees. Each project that we work on will be easier because now we have more knowledge on what to expect and a better understanding of how to maximize our efficiency as a team on the ground.

What did you value most about the fellowship?

We valued the conversations with the community, the food, the amazing views, the beautiful hikes, the late night talks, the stars, the children, and the tranquility of being surrounded by this vast jungle.

It was incredibly gratifying to be so well received in a space that is so clearly tight-knit and closed off to outsiders. Adopting the Mixtec way of life, per se, was as challenging as it was rewarding. Coming from major cities, as most of us do, we became unaccustomed to chatting with those around us and cementing relationships with people simply because you share the same surroundings, environment, and community. It was wonderful to spend time with locals, learn about their ways of life and their families, and share with them what our own lives and customs are.

Any advice for future fellows?

Bring mosquito repellent and also maybe it would be helpful to read about the Mixtec culture. Other than those two things, fellows should come with an open mind and a willingness to work

hard and also with prior knowledge that the living conditions are tough but that the work is the most rewarding.

How useful was it to interact with other fellows?

Wonderful. We are such a great team and we did such a good job, it went splendidly. Back in Montreal it is funny to see everyone in their city life, however, now we have a strong bond from this incredible experience.

Was your project part of a larger/ongoing program? If so, what are the next steps?

No it was not, but we are looking for ways to expand on this project. Our next step is to look for funding. We would use the funding to scale up this project.

Funding would be for three things:

1) Re-hiring Donato for another year to work with 20 new farmers and also to train the experienced farmers how to teach the technology to others.

2) Funding for a master´s or PhD student to improve the project itself. The student should work with the farmers and the community to create a Theory of Change, an impact pathway, and a plan to scale up. The student would also develop a strategy to include a gender sensitive and nutrition sensitive aspect to the project. This would also include a policy plan which would be in collaboration with FAO and SAGARPA.

3) Bring in more students to learn about life in Oaxaca, the Mixtecs, agriculture, and question development.