Building climate change resilience with coffee smallholder producers by extending organic practices to staple crops

Final Report

Submitted to the Organic Farming Research Foundation

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Grantee name: Campesinos Ecológicos de la Sierra Madre de Chiapas (CESMACH)

Grant lead: Dr. Alejandra Guzmán Luna

Farmer/Researchers: Rosa López Valentín, Marelí Domínguez Gómez & Andrew Gerlicz

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1. Project Summary

Back in 2017, a Participatory Action Research (PAR) team led by the University of Vermont started a process to better understand the root causes of the annual food insecurity season experienced by families from the organic coffee cooperative. We found that the milpa system, the traditional and organic polycrop based on maize, beans and squash, was a key activity to significantly reduce food insecurity, along with (organic) coffee productions and beekeeping. In a regional context with high abandonment rates of milpa systems and

organic coffee grows, as well as an increase in organized crime presence in the area, many farmers had to migrate to the USA.

This is the reality in which we launched this new PAR process phase, in which we focused on the milpa system revitalization in four communities, pushing forward organic alternatives by following participatory methodologies and analyses, as well as co-designing educational and experimental plots. Across the board, we support awareness in community processes of the potential of farmers' livelihoods as a dignified way to prevent the abandonment of agriculture activities. Since CESMACH cooperative was experiencing an exceptionally challenging moment, it was not possible to establish the educational and experimental plots. However, we guided workshops and community reflection to offer the community alternatives to revitalize their milpas system on their own. Working together with children and youth, this project generated three short documentaries that raise awareness about the critical role of the milpa. We also generated a documentary and a farmer comprehensive poster in that direction, that has been widely disseminated locally and regionally in other cooperatives, as well as among national and international audiences. We will continue our own collaboration with CESMACH by providing assistance to their process of revitalizing the milpa system and overcoming food insecurity.

2. Topic Introduction

After three years of PAR process, the team (scholars and non-scholar members) thought we had discovered the key for organic coffee producers of CESMACH in the Highlands of Chiapas to finally overcome the well-known food insecurity season in the Mesoamerican region

(Caswell et al., 2013; Dodd et al., 2020; Fernandez & Méndez, 2019). We found that 72% of all CESMACH farmers suffer, on average, 2.5 months of food insecurity per year, but we also found that those families that practiced beekeeping and staple crop production alongside organic coffee production reported significantly fewer scarcity months (Anderzén et al., 2020). Our team also advocated for beekeeping in 2021[1], so the next step was to focus our effort on revitalizing staple crop production under the organic milpa system (based on corn, beans, and squash), since the PAR team identified a trend of abandonment in the region. This goal was perfectly aligned with the national context in which the Mexican government seeks to ban glyphosate use by 2024, the most used chemical input applied all around the country. In the words of a farmer regarding his reasons for abandoning the milpa: "CESMACH does not allow us to keep growing milpa if we use (chemical) fertilizers. But without them, we won't get anything because the (staple) crops are used to them". Since chemical inputs are habitually used in milpa/corn monocrop production, producers commonly associate success in these agricultural systems with such inputs. However, since these substances can contaminate coffee plots, organic inspectors have penalized families when they detect evidence of those substances, even outside of coffee plots. On some occasions, families have lost their organic certification, which takes several years to recover. To avoid penalization, many families abandon the production of staple food and, as a result, become dependent on industrially produced foodstuffs.

[1] Anderzén and collaborators won a found of from the Apis Found Project, University of Vermont to study the ecological, economic, and social importance of bees in CESMACH. https://www.uvm.edu/news/gund/buzz-gund-institute-launches-four-apis-fund-projects

Coffee is the backbone of the socio-ecological system in the highland region of Sierra Madre del Sur in Chiapas, Mexico. There, the landscape is a mosaic of forest patches and agricultural crops among which coffee is, by far, the most prominent, generating various ecosystem services and connecting the otherwise fragmented landscape (Schroth et al., 2009). These systems have been widely recognized as producing one of the most sustainable agricultural commodities which can effectively integrate farmers livelihoods and conservation goals, especially in the context of a changing climate (Altieri et al., 2015; Perfecto & Vandermeer, 2010; Tscharntke et al., 2005). Coffee is the main income resource of families (Anderzén et al., 2020), a productive activity that constitutes more than 70% of farmers' land use (Guzmán Luna et al., 2022). In cultural terms, families always highlight the attachment they have to coffee as a core component of their lives. However, coffee dependency makes the whole system highly vulnerable in many ways. First, coffee production is highly sensitive to climate change, which may imply the reduction by almost 50% of the suitable area and coffee bean quality, an attribute that has been critical to coffee's profitability among smallholders (Bunn et al., 2015; Schroth et al., 2009). Second, coffee prices remain highly volatile despite the premiums earned through organic and other certifications (e. g. Fair Trade) (Bacon, 2010).

At the light of the summer of 2021, when this proposal was first drafted, more vulnerabilities have been raised in these communities' reality. The first one is the trend of abandoning organic coffee plot management due to the perception that certification rules were hardening. In addition, coming from a source external to the coffee socio-ecological system, there has been an increase in the presence of organized crime groups (Cartel Jalisco

Nueva Generación & Cartel de Sinaloa)[2], who regulate, among other aspects of everyday life, our free transit and that of farmers in the region. All these vulnerabilities led to the increase of farmers' migration to the USA, most of them undocumented, in vulnerable conditions. We believe that on average one in five families has at least one member who has migrated in the last two years.

Despite the apparently hopeless scenario (or because of it?), CESMACH communities hold the critical asset for reversing the current trend and can exist as "lighthouses" (Nichols and Altieri, 2018). These key communities or producers are inspirational examples for other farmers from traditional agricultural systems as local and practical models of smallholder sustainability and resilience. These experiences brought the PAR team to build this project in which we sought to take the next step in building up the resilience of the whole coffee system in the face of climate change vulnerability, enduring food insecurity, deepening coffee income dependency, and organic management abandonment, migration, and insecurity by attending to the conflict that arose between organic coffee production and the cultivation of the milpa system, while showing mainly the youth how farmers' livelihoods can be a dignified livelihood option. To be successful, during this process we had to adapt to the changing situations and increase of threats that prevented us from achieving our goals by incorporating innovative pedagogical tools that allowed, on the one hand, to

[2] The following link offers examples of news articles covering this
https://www.proceso.com.mx/nacional/estados/2023/8/29/el-cjng-autor-de-la-emboscada-de-seis-miembros-del-cartel-de-sinaloa-en-siltepec-chiapas-313824.html
https://www.chiapasparalelo.com/noticias/chiapas/2023/08/aseguran-camionetas-abandonadas-por-el-crimen-organizado-en-la-concordia/

generate deep and provocative reflections, and on the other hand, practical lessons, always with the organic milpa system revitalization as starting point and end goal.

3. Objectives Statement

Following our PAR approach, the project objectives are:

1) To conduct a participatory diagnosis of the challenges faced in organic production of milpas/corn and beans monocrops with an emphasis on substituting for non-organic inputs through agroecological practices. On the other hand, we continued our collective reflection among the communities and families regarding food security building, as well as the role played by local resources and knowledge.

2) To co-design and establish experimental and educational plots to test agroecological alternatives to chemical inputs in milpa system production. Experimental and educational plots generate specific and multiple outcomes. First, they test traditional practices and innovations relevant to organic transitions in a respectful and meaningful way. Second, the feasibility of these practices is grounded in the local scale of production and the current balance of labor in local livelihoods. This feasibility test is crucial to their applicability to the rest of the communities and families in the cooperative. Third, recommendations that emerge from these plots are based on empirical evidence of substituting for non-organic inputs and agroecological practices in milpa plots among different treatments. Fourth, these plots catalyzed and legitimized learning processes that follow the Farmer-to-Farmer pedagogy, an educational tool in which some key farmers, acting as “lighthouses”, shared their experience with certain successful agricultural practices. This legitimacy has spillover

effects for future efforts to improve agricultural practices in the region and strengthens local adaptive capacity.

3) To systematize the results and disseminate them to different audiences to bring to scale and inspire the organic transitions among smallholder coffee farmers. The audience for such information was CESMACH farmers, other smallholder coffee cooperatives in the region, and the national and international scholar community.

As we carried out a response to the challenges that came up during this project, we incorporated an additional objective:

4) To support awareness within the community processes of the potential of farmers' livelihoods as a dignified livelihood to prevent the abandonment of agricultural activities due to migration or the threat of organized crime. Focusing mainly on youth and young adults, we emphasized the feasibility of farmers' livelihoods from an economic, cultural, and social perspective.

4. Materials and Methods

The call to participate in this project was socialized among the 42 communities affiliated with CESMACH. In coordination with the CESMACH team of facilitators, four communities (8 to 22 families per community) were selected out of those who expressed interest, trying to cover a gradient in their geographic distribution as well as diversity of trajectories in their milpa system practices. In July 2022, the project was launched in coordination with the

"healthy soil" team[3], a parallel PAR project in the coffee plots. In Table 1 we made a summary of the key PAR activities carried out for the achievement of multiples goals.

Table 1 Activities, dates those were carried out and the goals covered by them.

Activity	Dates	**Objectives**			
		Participatory diagnosis	Co-designing of educational plots	Systematization and dissemination of results	Awareness on the dignity of farmers' livelihoods
Launch and informative meetings	July, 2022	✓			✓
Characterization of experimental plots workshop	August, 2022	✓	✓	✓	✓
Community film workshop for youth	August-Early September, 2022		✓	✓	✓
Maize Fair	End of September, 2022			✓	✓
Experience exchanges F-to-F	October, 2022			✓	✓
Milpa system workshops	November, 2022 – July 2023		✓		✓
Milpa Fair	June, 2023			✓	✓

[3] "Towards a regional vision for agroecological soil management in the coffee landscapes of Mesoamerica: Weaving scales". Gund Catalyst Project, University of Vermont focus on investigating and promote soil health as a means to protect crop yields, livelihoods, and the environment in CESMACH and ASOBAGRI, a coffee cooperative in Guatemala.

1. Launch and informative meetings (n=4) carried out in the communities that expressed interest in participating in this project. The goal was to reflect on the need to revitalize the milpa system for the sake of the families and nature, to increase awareness of the activities and commitment demanded by this project was asking from them. The families agreed to participate in the first one-year phase of the transition towards the revitalization of the (organic) milpa system and to offer one plot (440 mt^2) per community to be used for experimental and educational proposes.
2. Characterization of experimental plots workshop (n=4). These workshops had two moments. First, each community analyzed soil samples from coffee plots and milpas. Farmers and the PAR team discussed the properties of each soil, their productive vocation, as well as methodological strategies to improve and protect their fertility. We also reflected on the relationship between soil health, milpa production, food, and human health. Second, the PAR team and the families went to visit the proposal plot for educational and experimental purposes. There, the PAR team and the community identified the plots' history, environmental features (e. g., microbiota, vegetation, topography, landscape), challenges, and leverage points for the milpa system revitalization process.
3. Community film workshop for youth. Seventeen children and teenagers between the ages of 8 and 23 , originating from the four participant communities, attended the three-day workshop led by Espora Media[4], a non-profit organization that advocates for

[4] https://www.esporamedia.com/somos

community cinema. Since youths are very attracted to audiovisual tools, we use them to raise awareness of the need to revitalize the milpa system. The workshop brought together theoretical/reflective and practical tools for the creation of videos in a community setting, addressing the knowledge and stories involved in the milpa system. In addition to watching other community films, assistants received training for audiovisual production, from the scriptwriting to the final edition using regular cell phones.

4. Maize Fair. Two fairs were celebrated in the fresh corn season in two communities (e.g. Puerto Rico and Nueva Independencia) to which families from the other two communities were invited. Traditionally, this is the season when families gather to visit milpas and eat corn on the cob as celebration of the coming harvest. In the context of this project, each fair was organized with the community, so they had a different program depending on each community's interests. What joined them together was the visibility and celebration of the culinary tradition linked to corn.
5. Experience exchange following the Farmer to Farmer pedagogy in two different events. By the first one, the core PAR team described in the first page of this report assisted the IV International Encounter of Participatory Action Research (October 21-23, 2022) in Xalapa, Veracruz with the goal of learning from other experiences in Latin America and make stronger the PAR process with CESMACH. The second event was a three-day Experience exchange (October 24-26, 2022) that took place in Ixhuatlán del Café, Veracruz. The core PAR team, three female farmer participants in this project, and two staff members of CESMACH visited FemCafe, an agroecological and feminist coffee

cooperative. During this visit, the exchange of experiences focused on: 1) coffee commercialization, 2) productive diversification, 3) food security and sovereignty, 4) gender and leadership in the cooperatives, and 5) family care and emotional health from the farmers' perspective.

6. Milpa system workshops. The PAR team carried out workshops in each of the four communities, deepening in the comprehension of soil structure based on the forest soil (November, 2022), milpa phenomenology (March, 2023), and selection and improvement of *in situ* corn (July, 2023). With the technical team of CESMACH the PAR team led a soil chromatography workshop (May, 2023). This is an affordable methodology for broad soil analysis that the cooperative may carry out in the future.
7. Milpa Fair. Between the harvest and sowing season, we carried out two milpa fairs to which the other communities were invited. Fair programs were designed in coordination with the host community/ies. Both fairs had in common the presentation of and dialogue around the youth's shorts, filmed in the workshop (n=3), traditional food, and native corn, beans, and squash seeds for exchange for the coming season.

6. Project Results

The results achieved by this project are presented along each of the four objectives, highlighting when a result met two or more objectives.

Participatory diagnosis. The diagnosis of the four plots potentially used for educational and experimental community milpas systems was carried out in one visit to the plot and with the presence of entire community. Except for one, all the plots had been used for different purposes for decades, mainly as milpa or pasture, all of them with

agrochemical use. Based on the background of each plot, soil evaluation, as well as the intensity, history and type of chemical inputs reported as used there, we made a general evaluation of each plot.

Table 2 Background of educational and experimental plots.

Community	Altitude	Background	General evaluation
Lagunita	1, 535 masl	Since 2019, when it was bought, beans have been planted with an intensive use of agrochemicals. It contains fruit trees donated by CESMACH.	Damaged
Matasanos	1, 402 masl	Plot with no history of having been used in agricultural activities. Recently changed the land use from forest.	No damaged
Nueva Independencia	852 masl	In previous decades there were many trees in and near the land, they planted milpa of native seeds without agrochemical inputs. In 1998, a hurricane "spoiled" the soil. Currently there are trees and they have planted corn with the help of agrochemicals.	Severely damaged
Puerto Rico	1198 masl	The land was destined to be pasture and then was at rest due to natural disasters. Now there is a pond with fish next to a milpa with agrochemicals.	Damaged

Farmers were aware of the history and features of their plots. As one owner, a rural professor in Lagunita community, said: “The land is very eroded, burned and with a lot of herbicides. You can tell because the color of the undergrowth is yellowish”. Owners narrated the history, and offered some hints of processes and time frames of when chemical inputs were introduced in the region: “30 years ago my cousin from Jaltenango first started

to come [5] , and he told me '*why don't you put fertilizer (chemical) in it, they sell it there'* (…). Then 20 years ago came the burning (herbicide)".

Co-design of educational plots. The analyses, awareness, and capacity building of the components in the co-design of an educational and experimental plots were covered in different activities (Table 3). It is worth mentioning that the CESMACH technical team offered members training in organic input elaboration that was considered in this project's workshops. Therefore, we analyzed technical alternatives for milpa plots based on the knowledge and training that farmers already had from their organic coffee production (organic inputs, live or dead erosion barriers) and each plot's specific features such as sun exposure or slope.

Table 3 Components of the different educational and experimental plots analyzed in the different activities

Component	**Activity**
Integral soil health	Characterization of experimental plots workshop Chromatography of soils
Native seeds	Milpa fair Selection and improvement of *in situ* corn workshop
Management during the cycle	Milpa phenomenology
Landscape matrix of the plots	Characterization of experimental plots workshop

Systematization and dissemination of results. As part of our general objective of revitalizing the milpa system in the region, we created material to spread the reflection and awareness within and beyond the four communities we worked with in this project.

[5] Nearest city from the communities and commercial center

For this matter, this project created audiovisual and visual materials relevant for farmer communities.

In terms of audiovisual products, children and teenagers that attended the community film workshop generated three short films. Those materials were projected in the milpa fair to prompt community reflection on the importance of the revitalization of the milpa system and were shared with CESMACH staff to be disseminated among the members. The short films were translated and subtitled in English and uploaded to YouTube with more than 120 reproductions. The short films are:

1. Maíz Matazano (4:16 min). https://www.youtube.com/watch?v=1O5HgSSLgOQ
2. Somos Milpa (3:36 min). https://www.youtube.com/watch?v=UkbU6cNUxiE&t=6s
3. Semilla de vida (4:39 min). https://www.youtube.com/watch?v=pIWB1hTl_Ew&t=27s

As for visual materials, we are in the process of completing a poster (Figure 1.) that integrates the threats posed by the current trend of coffee system simplification and milpa abandonment, in contrast with all the benefits and value of the agroecological approach, as the PAR team has pushed forward since the beginning of our process in 2017. This poster will be the result of a participatory process between CESMACH staff and the PAR team.

Figure 1 Poster used as popular education tool to show the threats posed by conventional agriculture in a socio-ecological coffee system.

Awareness on the dignity of farmers' livelihoods

In all the activities we developed during this one-year project, we highlighted the dignity of the farmers' livelihoods as a transversal issue. Farmers characterized the potential of each plot based on the natural vegetation, soil features and the plot's history. As one elder farmer said after a long dialogue: "There is productivity in every plot". Regarding the milpa system revitalization, the general conclusion of the actual thread can be summed up in the words of one female teenager: "they said that the milpa has been around for ten thousand years, how can it be that just in the last 20 or 30 years, more or less, they say that, if they

don´t add chemicals the milpa doesn´t grow anymore? It's a very odd thing. I think since they started adding fertilizers, they started to harm the seeds, the corn, and the soil, so that it no longer produces (…) I know that the process will be a bit… long, but in the end, we will have a good harvest, we will nourish the soil"

7. Conclusions and Discussion

Late spring and early summer of 2023 was a hard time in the communities we were working with because of the perception of a strengthening of certification standards and an increase in the presence of organized crime in the region: both situations pushed many farmers to migrate to the USA. This context directly affected our project. On the one hand, two communities decided not to continue with the setting up of the educational and experimental plots when most of the CESMACH members from their communities left the organization due to issues not related to this project. On the other hand, an owner of one of the potential educational and experimental plots, who was also a moral leader in his community, migrated to the USA leaving us no possibility of continuing to set up the plot. As the PAR team, we agreed that there was a need to slow down the seven-years PAR process for the sake of the team's safety and because CESMACH had other priorities. We are confident in our PAR process and trust the relationship we built with CESMACH and its farmer families' members will flourish in the future.

8. Outreach

In addition to the three short films developed by children and teenagers from the communities, this project generated a 20-minute documentary about the perception of farmers regarding the milpa system in the region. “It’s still possible”, as the documentary was named (Figure *2*), was distributed among CESMACH staff and family members, as well as with a broad population linked to the Institute for Agroecology, University of Vermont. Additionally, it was part of the 5th edition of the FiccTerra[6], an international community film festival that takes place in Mexico.

[6] https://www.ficcterra.org/

Figure 2. Poster of the documentary "It's still possible" with the slogan: Farmers' perspectives on the traditional milpa in the Sierra Madre of Chiapas.

When finished, around early November (Figure 1), the poster will also be widely disseminated among CESMACH members and used for further alliances with coffee cooperatives (see Leverage resources section).

For scholar audiences, these project findings had been presented in the Ecological Society of America conference that took place in Portland, Oregon (2023). A deeper analysis is included in the paper currently being prepared: "*The paradox of organic farmers who eat conventionally. Reflections on contradictions and challenges faced by organic coffee*

producers in the South of Mexico". The manuscript is being led by Dr. Guzmán Luna, PI of this project, and will be submitted to the Journal of Rural Studies early next year.

9. Financial accounting

Organic Farming Research Foundation Research Grant: Final Financial Report			
Coordinator name: Alejandra Guzmán Luna			
Institution/Organization Name: CESMACH			
Expenses			
Item	**Budgeted Amount**	**Amount Spent**	**Detail**
Field coordinator salary	$4, 950.00	$7,632.65	12 months; $636 USD/month
Andrew Gerlicz and facilitators team's salaries	7250.00	$0.00	No need to pay
Administrative expenses	$765.30	$664.28	Administrative expenses, payment to the cooperative's accountants and bank commissions. This Item was not considered in the original budget
Stipends for documentalists	$1, 400.00	$3,593.11	1. Community film Workshop 2. Film, documentation, editing and translation/subtitling of the documentary "It's Still Possible"
Graphic designer	$1, 400.00	$432.85	Design and elaboration of a comparative poster (Figure 1)
Fringe benefits	$2, 969.75	$0.00	
Educational and experimental plots rent and inputs	$700.00	$0.00	
Vehicle maintenance and fuel	$0.00	$718.00	Fuel and maintenance for the cooperative's truck used for fieldwork
PAR team's travel expenses	$800.00	$428.00	Transportation and lodging of the project coordinator and PI
Focus groups	$250	$2,812.00	Workshops, and visits to the communities

Corn and Milpa Fairs	$0	$1,571.53	Attendees' transportation, food, and materials
Experience exchanges FtoF	$1,346.73	$2,117.58	
Closing event	250.00	$0.00	
TOTAL	**$19, 969.75**	**$19, 970**	
First Payment amount received: $19, 970 USD			

Justification for variances: Please summarize and provide justification for any variances between budgeted and actual expenses. This includes explanation for funds not spent, or how expenses beyond what were budgeted were covered.

- The change of adscription of Alejandra Guzmán Luna from University of Vermont to Universidad Veracruzana and not needing to hire Andrew Gerlicz implied a saving for the fringe benefits as well as for international travel. New affiliation also implies new responsibilities for the PI, so the project hired Rosa López Valentín as field coordinator.
- Administrative expenses were not originally considered in the budget.
- The increase in the budget for the documentalists was mainly due to the number of visits made to the communities to shoot and the following edition of the material. The community film workshop was also not originally considered.
- The original designer who has done the work in the cooperative was unable to collaborate, so we redirected the budget to the documentary filmmakers and made a simpler poster.
- Educational and experimental plots were not established

10. Leveraged resources

No additional funding or resources of this grant were leveraged as a result of this grant. However, the PI of this project will start a collaboration with the Institute of Agroecology (IfA), University of Vermont early next year with 50 coffee cooperatives in Chiapas. This project will be led by Heifer International and financed by the Darwin Initiative. The project aim is that "Local communities and other stakeholders have sustained improvement in policy and practice that results in gains for biodiversity and associated reductions in multidimensional poverty". The alliance of Dr. Guzmán Luna and IfA will oversee the agroecological training of the technical team of the coffee cooperatives. We aim to

incorporate CESMACH's team to continue our PAR process and the agroecological assistance in the region.

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12. Photos

Photo 1 Take off and informative meeting in Lagunita community with the PAR team and the community members.

Photo 2. PAR and community visiting educational and experimental plot in Nueva Independencia community.

Photo 3 Healthy soil workshops. First, analyzing organic soil structure at Puerto Rico community. Down left and right, soil “testing” and analyzing proprieties at Matasanos and Lagunita communities, respectively.

Photo 4 Images from the community film workshop at Matasanos community. Left. Some attendees practicing recording imagen and audio with their cell phones and using semiprofessional lightening. Right. Community films projection as part of the workshop.

Photo 5 Milpa and Corn fairs. Left, kitchen at the Corn fair. Right, three farmers attending Milpa fair. Two of them are showing the native bean seeds shared to them by other attendees.

Photo 6. Sharing our findings and experiences. First, PAR team presenting our findings of the whole process (2017-2022) at the IV International Encounter of Participatory Action Research. Second, CESMACH staff and farmers visiting FemCafe cooperative at Veracruz, Mexico. Third, Dr. Alejandra Guzmán Luna sharing the PAR process at the 2023 ESA Annual Meeting.