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Coupling Agroecology and PAR to Identify Appropriate Food Security and Sovereignty Strategies in Indigenous Communities

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Coupling Agroecology and PAR to Identify Appropriate Food Security and Sovereignty Strategies in Indigenous Communities

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This article discusses the potential of coupling participatory action research (PAR) with agroecological principles to address food insecurity in indigenous communities. It argues that combining these two approaches can lead to culturally and environmentally appropriate, context-oriented strategies to empower community members and strengthen community food sovereignty and food security. This article draws on a recent study of Mayan communities in the Yucatán State, Mexico, and demonstrates the strengths of an agroecologically focused PAR approach in addressing local challenges faced by rural communities in their struggle to become food sovereign and secure, but its weakness when it comes to influencing policy overarching structures threatening community food sovereignty.

KEYWORDS agroecology, participatory action research, food security, food sovereignty, Yucatán

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INTRODUCTION

Food security remains a major challenge for indigenous communities. As noted by the Food and Agriculture Organization (FAO 2010a), “[i]ndigenous peoples are disproportionately impacted by environmental degradation, politico-economic marginalization and development activities that negatively impact their ecosystems, livelihoods, cultural heritage and nutritional status” (7). Indigenous communities in Mexico are no exception. According to a report by the National Council for the Evaluation of Social Development Policy ([CONEVAL] 2010), indigenous populations face higher risk of nutritional deficit, often do not consume a variety of foods in the recommended quantities or at the suggested frequency, and face greater obstacles in accessing food. Concurrent to this phenomenon has been the continued loss of traditional indigenous production systems, which are noted as resilient systems that contribute to fomenting food security through their focus on biodiversity and resource conservation (Thrupp 2000). While this trend can be traced back to Spanish colonization over 500 years ago, it has been deepening in the last century and particularly in the more recent era of globalization. Political regimes over the last century, dating back to the Mexican Revolution in 1910, have increasingly disrupted indigenous production systems in an effort to impose a “modern way of life” with the aim of establishing a more “homogenous society.” Furthermore, they have used rural production as a vehicle through which to exert political and social control over indigenous communities. With the introduction of market-based rural and agricultural development strategies, particularly those that embrace the industrial model of production, traditional production systems are increasingly threatened and are disappearing at much more rapid rates, a process that has deepened with recent globalization trends. Despite these trends, more isolated indigenous communities, like the Mayan communities of the Yucatán Peninsula, have been able to retain their agricultural heritage through the conservation of their traditions and culture and the creation of viable hybrids of traditional and introduced technologies.

This article examines a recent case study of indigenous Mayan communities in Yucatán, Mexico, undertaken by the Community Agroecology Network and Intercultural Maya University of Quintana Roo (UIMQRoo) and funded by the Kellogg Foundation. The study employed a methodology of participatory action research (PAR), which allowed for the tailoring of data collection and analysis to the context of the study area and the needs of the communities being studied by involving community members in the research process, to: a) to measure the extent of food insecurity and identify factors that either strengthen or weaken food security in these communities and b) Identify with community members culturally and environmentally appropriate strategies that build on existing institutions and promote local, sustainable food systems. In this article, we have the following objectives:

First, we examine the findings of the study to establish the degree of food security in the study area and identify factors that hinder the ability of these communities to achieve community food security. The findings, as will be explained below, indicate that various factors contribute to the dependence of these communities on nonlocal sources of income, challenge traditional production and food cultures, and hinder their ability to develop sustainable, locally based food systems. Second, we explore the value and usefulness of PAR approaches for both identifying and strengthening practices that are culturally and environmentally appropriate and strengthen community food security. In particular, we argue that coupling a PAR approach with a focus on agroecology promotes the broader goals of revitalizing traditional production and food cultures and strengthening community food sovereignty,¹ which is necessary to achieving food security.²

We begin by providing a brief discussion of agro-industrial production versus agroecological production before presenting an extensive treatment of our research methodology, focusing on the benefits of coupling a PAR approach with an agroecological focus. We then provide an overview of the study area and a summary of the data collection and analytical framework before turning to a review of the findings, paying particular attention to the factors that serve to hinder these communities from developing sustainable food systems that are focused on local production and consumption. We continue with a discussion of the strategies developed via the PAR process with community members of the study area and elaborate on how the PAR process combined with strategies rooted in agroecology promote the rescue of traditional production and food cultures and strengthen food sovereignty, thereby strengthening community food security. We conclude with some final remarks.

AGRO-INDUSTRIAL PRODUCTION VERSUS AGROECOLOGICAL PRODUCTION

There is growing consensus that the agro-industrial food system model has thus far failed to render effective results and has rather been particularly destructive, especially for rural communities and smallholder farmers (Gliessman 2007). The industrial model focuses on highly intensive, high input production to maximize yields using monocultures, modified seeds (e.g., hybrid and genetically modified varieties), mechanized labor, and fossil fuels in conjunction with market-based approaches to agricultural and rural development. Much of the existing evidence suggests that these practices are not sustainable over the long term either ecologically or socially. The environmental costs have been extreme and include soil erosion, decreased soil fertility, and a decline in overall productivity over the long term; a decline in overall biodiversity and, more specifically, the genetic diversity of

food crops; widespread pollution from the increasing use of agrochemicals; increased demand for precious fresh water sources, which the industrialized model requires to sustain yields; and has also contributed to climate change not only through the alteration of the Earth's soils (thereby increasing the production of ozone-depleting gases by soils) but also through its dependence on fossil fuels for agrochemical production and mechanized labor (Rosset and Altieri, 1997; Clay 2004; Rosset 2006; Gliessman 2010). The social costs have been dire: industrial agriculture has threatened local livelihoods through the restructuring of agrifood systems under the rubric of market-oriented development, especially in recent decades (see McMichael 1994). The subordination of food production to the market imperative has resulted in disembedding economic relations between people and land as the distance between sites of production and consumption continues to expand (Friedmann 1993, 220). This is also evidenced by the deepening global division of labor between the global North and South that has resulted in subordinating production in the South to the demands of the global market through export-oriented development models (McMichael 2003, 70–71).³ As local and national regulation decreases in favor of market mechanisms, power over the agrifood system is increasingly concentrated in the hands of market players, particularly agribusinesses and other transnational corporations involved in food production, processing, and distribution, and out of the hands of local producers and consumers (McMichael 2003).⁴

The agro-industrial food system model has served to further marginalize rural communities and deepened the process of “de-peasantization,” defined both as “the erosion of an agrarian way of life” (Vanhaute 2010, 6) and as “the phasing out of a mode of production to make the countryside a more congenial site for intensive capital accumulation” (Bryceson 2000, as cited in Bello and Baviera 2009, 27). According to McMichael (2008), de-peasantization results from “the combined pressures of evaporation of public support of peasant agriculture, the *second* green revolution (privatized biotechnologies and export agricultures to supply global consumer classes), market-led land reform, and WTO trade rules that facilitate targeting southern markets with artificially cheapened food surplus exports from the North” (209). Related to these factors are other challenges to maintaining traditional food and production cultures, which include a shift away from the use of traditional crop varieties to cash-crops for export (Ghosh 2010), the associated introduction of genetically modified organisms—either voluntarily or involuntarily (see McAfee 2003, on genetic pollution of native maize varieties in Oaxaca, Mexico), and the influx of imported foods into local communities that are culturally inappropriate (see Friedmann 2005, 257). Furthermore, the standardized approach of the industrial model fails to value the diversity of practices that are reflected in traditional agricultural systems, which are the product of specific cultural traditions adapted to local environments. Finally, the subordination of traditional production systems to the industrial approach

serves to weaken the ecological integrity of rural communities. This is particularly important in light of the high level of environmental impact of industrial agroecosystems (as noted above) and the relatively low level of environmental impact of traditional systems (Altieri and Koohafkan 2008).

In contrast, as Altieri and Toledo (2011) explain, “[a]groecological initiatives aim at transforming industrial agriculture partly by transitioning the existing food systems away from fossil fuel-based production largely for agroexport crops and biofuels towards an alternative agricultural paradigm that encourages local/national food production by small and family farmers based on local innovation, resources, and solar energy” (588). So far these initiatives, as well as those to protect and encourage traditional systems, show much promise as an alternative to agro-industrial systems as they encourage genuine food security, especially for the most vulnerable communities. Research shows that agroecological systems can be just as if not more productive than agro-industrial systems (Altieri and Toledo 2011) and have been shown to increase yields (Pretty 2003; Pretty et al. 2006, as cited in De Schutter 2011; Government Research Office for Science 2011). Furthermore, agroecological production is more resilient to climate change and climatic disturbances and disasters (Holz-Giménez 2006; Altieri and Koohafkan 2008) and more energy efficient (Gomiero et al. 2008), both of which are key factors in the contemporary era of energy and climate change debates. Altieri and Toledo (2008) deepen the relationship between sovereignty and resiliency by arguing that, “Agroecology provides the principles for rural communities to reach food sovereignty [sic] but also energy and technological sovereignty within the context of resiliency. . . . Agroecology provides the principles to design resilient agroecosystems capable of withstanding variations in climate, markets, etc., while ensuring the three broadly but inter-linked sovereignties” (607). Much of the success of agroecological initiatives is owed to the emphasis on agrobiodiversity, which results in reduced vulnerability, high genetic diversity, and the need for fewer inputs. Agrobiodiversity is also key for enhancing the variety of foods available to local people for consumption, thus, contributing to nutritional diversification (Pretty 2003) through both subsistence agriculture and market distribution, which, in turn, strengthens livelihood resiliency (Toledo et al. 2008).

APPROACH: COUPLING PAR AND AGROECOLOGY TO IDENTIFY APPROPRIATE FOOD SECURITY STRATEGIES

Participatory Action Research (PAR) emerged in the context of the rise of poststructural social theories. According to Kindon et al. (2007), PAR “involves researchers and participants working together to examine a problematic situation to change it for the better” (1). PAR treats all participants as competent agents in a collaborative process, incorporating multiple

perspectives with a community into the creation of new meanings based on reiterative reflection and action (Kindon et al. 2007, 14), essentially challenging dominant epistemologies of knowledge. These principles are rooted in critical social science theories and practices, especially feminist poststructuralism and feminist political ecology, as well as emancipatory community-based research processes developed in the 1960s and 1970s in Brazil and contemporaneously in Africa, India and other parts of Latin America.

Although PAR's early roots extend to post-World War II researchers, most narratives of PAR origins identify the point of conceptual identification of PAR as beginning with the work of Paulo Freire in Brazil in the 1960s and 1970s to develop methodologies of popular participation in processes of knowledge creation and social transformation, especially the creation of consciousness of injustice and of using collective consciousness to inform action. Kindon et al. describe contemporaneous efforts in India that continued and revised the ideas put forth earlier by Mahatma Gandhi to draw on local knowledges and narratives to resist colonial rule. A second wave of PAR took place in the 1980s in the context of international development; community and rural development contexts continue to be a major focus of PAR researchers and researchers. Those that add "participatory" to their "action research" projects signal a commitment to the legacies of Freire, Gandhi and other early PAR practitioners to "political commitment, collaborative processes, and participatory worldview" (Kindon et al. 2007, 10). The approach is rooted in a cyclical process of looking, reflecting, acting, and sharing between the investigators and the communities involved, resulting in a process of knowledge production in which reflections about actions are constantly monitored and reintegrated into actions in a dialogic process (Bacon et al. 2005). As Mendez et al. (2010) argue, the value of PAR approaches is that "they are done with the participation of communities, produce relevant and necessary data, and facilitate capacity building and support networks" (371).

In work related to rural livelihoods, participatory research has had several manifestations and issues. Participatory Rural Appraisal (PRA), which can be defined as "a family of approaches and methods to enable rural people to share, enhance, and analyze their knowledge of life and conditions, to plan and to act," has many approaches within its family, including activist participatory research, agroecosystem analysis, applied anthropology, field research on farming systems, and rapid rural appraisal (RRA) (Chambers 1994a, 953–956); thus, it can be considered a kind of umbrella family of methodologies. PRA parts from its counterpart of RRA in that it is focused on local ownership of the research process, and the designing of actions stemming from local analysis of the problems and issues identified, while RRA is a methodology more related to donor elicitation and extraction of information, according to Chambers (1994a). The valuing of the analytical ability of rural peoples and peasants is a tenet of PRA (Chambers 1994b) that informs the present study, as well as some of the

methodologies PRA traditionally uses, including “They do it” (in which subjects themselves perform the research), stories and case studies, sharing of information and ideas, and especially livelihood analysis (Chambers 1994a). Chambers emphasizes that in participatory research, there are different ways that “participation is used”—it can be a cosmetic label used to give a positive face to the work being done without involving real local ownership of the project; it can also describe a co-opting process in which participants contribute their time to an outside-led project process; or it can be an empowering process in which the “we” describes project beneficiaries actively involved in decision making (Chambers 1994c).

PAR research still reflects an ideology; it still contains a power dynamic. PAR practitioners are engaged not only in research but also in the fluid processes of negotiating their own place as subject–object in the process. The researcher, even as one actor participating in the reflection–action dialectic, is still the researcher and has a modicum of control over the process given her role as a bringer of information, resources, connections and contacts, and embodiment of historical legacies. Her necessary goal of completing a project to earn a degree or publish a paper also shapes the process to a degree that cannot be ignored. Complicating the PAR process further—especially in the context of a project with a funder and multiple stakeholders—are power relations associated with agendas that donors, researchers, farmer organizations, and other actors may have. A PAR researcher needs to be cognizant of these things, and that very cognizance is a legacy of feminist thought; the process of identifying the specific mechanisms of power and acting on them is a challenge to the dominant hierarchy of value (Sprague 2005, 8).

Our study used a PAR approach within the field of Agroecology. Agroecology is defined as “the application of ecological principles to the design and management of sustainable food systems”⁵ (Gliessman 2007, 1) and includes the “integrative study of the ecology of the entire food system, encompassing ecological, economic and social dimensions” (Francis et al. 2003, 100). In practice, agroecology emphasizes the creation of productive and resource conserving agroecosystems that are “culturally sensitive, socially just, and economically viable” (Altieri 2002, 7; Altieri, 1995). Traditional farming systems are a fundamental source of instructional knowledge for developing agroecological principles and practices as many of these systems have evolved and developed over centuries and display multiple characteristics that attest to their deep relationship and knowledge of the environments in which they were born. A commonly cited example of an enduring, traditional, polycultural system is that of the genetically diverse Mayan *milpa* where beans, corn, and squash are grown and symbiotically interact alongside other crops like chile. Adding to the agrobiodiversity and resilience of these systems is the dynamic interactions driven by both human and natural selection, which foster the creation of new varieties adapted to the environmental context (Isakson 2009).

Agroecological practices promote long-term sustainability precisely because they aim to mimic the original interactions of the natural environment of the area in question (Gliessman 2007). They accomplish this through combining traditional and indigenous knowledge with aspects of modern science and technology, emphasizing “biodiversity, recycling of nutrients, synergy among crops, animals, soils, and other biological components, and regeneration and conservation of resources” (Altieri et al. 1998, 1). Enhancing agrobiodiversity is a key aim of agroecology, and this is not only fostered by increasing the genetic diversity of plants but also by appropriately integrating multiple species of animals, from which important, ecologically sound sources of fertilizer, pest control, and labor can be derived. Agrobiodiversity contributes to the need for fewer inputs, thus, conserving natural resources, and enhances soil fertility.

But agroecology is not only about mimicking the natural environment—it is also about how humans engage with the agroecosystem through their livelihoods. As stated above, agroecology refers to the entire food system, including economic and social aspects. It emphasizes the diversification and conservation of economic resources, empowering local people to be both stewards of and experts on their communities, and seeks to enhance human health and strengthen culture.⁶ It favors small-scale, local production and consumption systems that add to the self-reliance of local communities (Altieri and Toledo 2011).

Like PAR, classic research in agroecology also emphasizes the value and necessity of participatory methods of investigation (see Thrupp 2000; Bacon et al 2005; Holt-Giménez 2006; Altieri and Nicholls 2008; Wilson 2011) as these methods have proven to be beneficial in facilitating the adoption of agroecological approaches to agricultural production and development (Thrupp 2000; Bacon et al. 2005). Of related importance is the emphasis of agroecology and also food sovereignty on the value of traditional and indigenous knowledge as a foundation from which to strengthen local agricultural and food systems.⁷ PAR methods are appropriate to research not only in agroecology but also other related areas, such as food security, indigenous practices, and food sovereignty, precisely because they maintain the integrity of local knowledge by involving farmers and community stakeholders in the research process, thereby empowering communities to be stewards of their own community development (which is a key principle of agroecology⁸). Furthermore, PAR allows for the tailoring of the research agenda, data collection, and analysis to the context of the study area and the needs of community stakeholders.

Agroecological methods are increasingly positively linked to strengthening food security (Altieri 2002, 2009; De Schutter 2011). This is in part because of agroecology’s multidimensional approach to production that emphasizes environmental health, socioeconomic wellbeing, and cultural preservation. This is particularly important for rural communities where the

bulk of the world's hungry and malnourished reside (FAO 2010b), the majority of which are involved in agricultural and food production.⁹ De Schutter (2011) points out that one of the greatest challenges will be achieving food security for the world's poorest, especially small scale farmers in the global South. He argues the benefits of agroecology as a vehicle through which to strengthen food security among small-scale farmers, specifically its focus on empowering small farmers by revaluing their knowledge and participation as experts; its potential to increase incomes of rural farmers with less dependence on external inputs, thereby reinvigorating rural economies; diversifying local agricultural production, which leads to more nutritional diversity; and enhancing environmental sustainability "by delinking food production from our reliance on fossil energy (oil and gas) . . . [and] mitigating climate change, both by increasing carbon sinks in soil organic matter and aboveground biomass, and by reducing greenhouse gases (GHGs) through direct and indirect energy use" (DeSchutter 2011, 235). In particular, the traditional knowledge of these small farmers and their diversified techniques of agricultural production that have survived for generations without contributing to the grave environmental degradation that has been quickly realized in only 50 some years of industrial practices is extremely valuable for strengthening the knowledge base of agroecology and agroecological methods, and creating more sustainable food systems that can ensure food security for rural and urban communities alike.

In light of the benefits of agroecology and specifically traditional agrobiodiversity for (local) food systems, we argue that coupling the PAR approach with an emphasis on agroecology yields stronger research results that: a) are the product of involving farmers in the development of the study, interpretation of the data, and identification of strategies joining indigenous with Western knowledge to address the complex causes of food insecurity and b) lead to the development of more sustainable, effective, context-oriented, and culturally and environmentally appropriate strategies for strengthening food sovereignty and enhancing community food security because of their joint focus on local knowledge and practices.

In the PAR model used in the study, we emphasized the revitalization of traditional production systems and food cultures, which we see as critical for increasing agrobiodiversity. Agroecological principles were incorporated at each step of the research process. As will be discussed in more detail below, the PAR research process privileged a prominent role of community members in designing and carrying out data collection, interpreting the collected data, and formulating culturally and environmentally appropriate solutions to the problems that were identified. Data collection sought to capture a number of critical indicators of food security and sovereignty and agroecological practices, and strategies were developed in partnership with community members that focused on enhancing agroecological practices from farm to table within the communities that would contribute to

strengthening long-term agricultural sustainability, food sovereignty, and food security.

OVERVIEW OF THE STUDY

Study Area and Sample

The study area included 22 indigenous Mayan communities located in 13 municipalities in the state of Yucatán, Mexico (Figure 1). According to

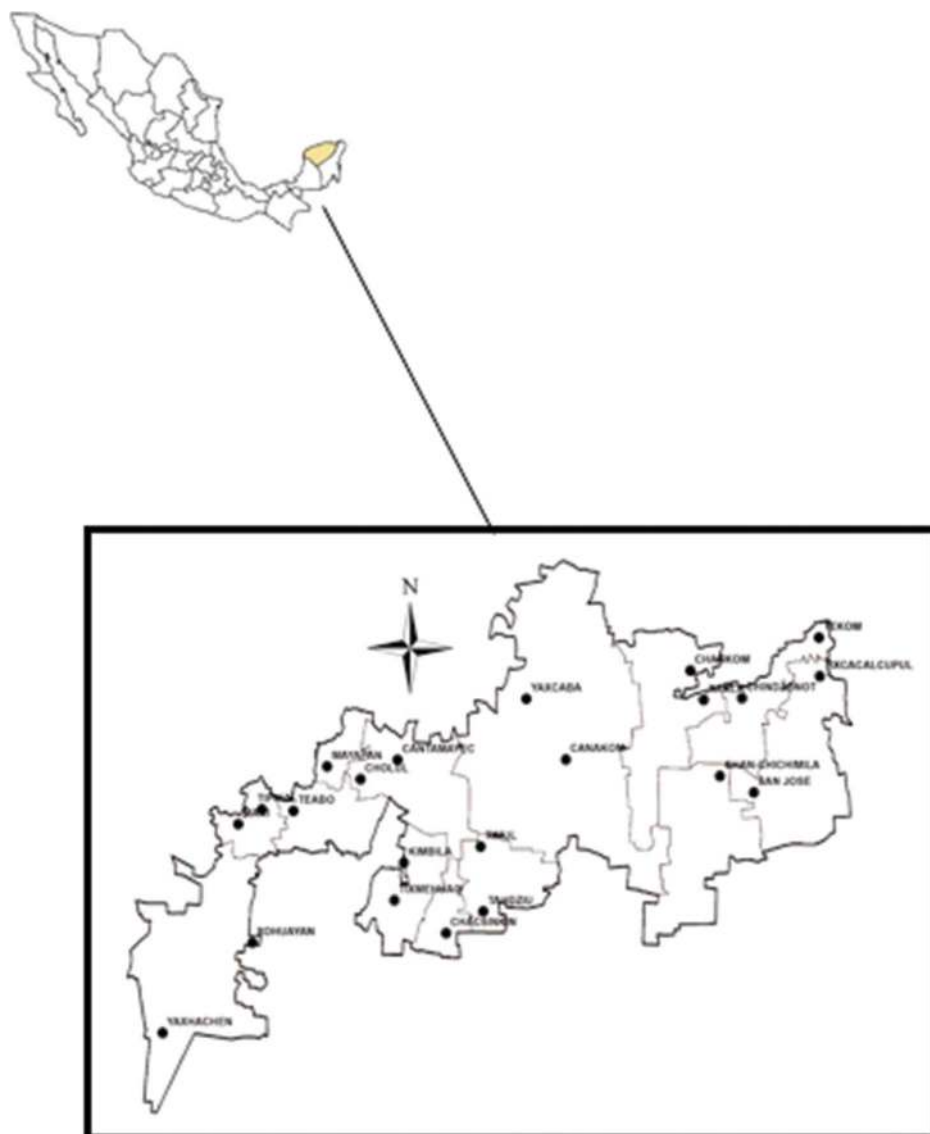


FIGURE 1 Location of study area (color figure available online).

Bracamonte et al. (2002), 59.2% of the population over the age of five identifies themselves as indigenous. Although the state's economy is largely based on tourism and trade, agricultural production is highly important for rural communities. The traditional practice of the *milpa* is a common form of production in indigenous communities and is based on a land distribution system known as the *ejido* system in which small-scale, subsistence farmers share collective usufruct rights of the land. However, these indigenous communities are increasingly faced with challenges to maintaining their traditional way of life. In particular, rural families are turning to more intensive commercial production, which is encouraged by government policies that focus on market-based agricultural development, creating an incentive to abandon the *milpa*. Given the lack of economic alternatives in the communities, and the ever-increasing need to subsidize life in the modern economy through monetary means, there are enormous pressures that encourage high levels of urban-rural and north-south (both nationally and internationally) migration, creating a labor shortage in the *milpa*, according to study participants, as many working-age youth migrate out.

Statistics also indicate that food security challenges in the Yucatán are related to poor nutrition rather than hunger. The high rate of nutritional risk noted for Yucatán is particularly pronounced among indigenous communities, where rates of malnutrition for children under the age of five are among the highest in Mexico (CONEVAL 2010). High levels of obesity are also noted in the Yucatán among both children and adults of both sexes (CONEVAL 2010), and in 2006 an average of 74% of the population of adults in Yucatán were classified as overweight or obese. We can juxtapose this against the fact that child and adult mortality rates are quite high—in particular, the state has the second highest rate of child mortality out of 31 states in Mexico (Duran and Mendez 2010), the 5th highest rate of adult female mortality, and the 8th highest rate of adult male mortality in Mexico.

Survey research was gathered in the summer of 2011 in 22 communities located in 13 municipalities in the Yucatán State that belong to the *zona maicero* (corn growing region). This area is largely comprised of indigenous communities whose principle economic activity is subsistence agriculture. The Kellogg Foundation included the primary population and political centers, known as *cabazeras municipales*, for each of the 13 municipalities, in the study as well as smaller outlying communities. All the selected communities have as their principal economic activity small-scale, subsistence production, and are rated high for marginality based on the Human Development Index which takes into account housing and access to health and education.

As per the FAO's Special Program for Food Security sample size formula, a sample size of 6% was used for communities with under 2,000 residents, 5% was used for communities with between 2,000 and 5,000 residents, and

2.3% was used for communities with over 5,000 residents. Most of the communities fell into the categories of under 2,000 residents or between 2,000 and 5,000 residents with only one community having over 5,000 residents. For purposes of analysis, the 22 communities included in the study were divided into three regions (Table 1) based on the predominant type of soil found in these communities, which was the most distinguishing factor among the communities as all shared similar characteristics for rainfall and vegetation and also similar socioeconomic, cultural, and demographic characteristics.

PAR Methodology: Research Design, Methods, and Analytical Framework

PAR design varies from study to study and from community to community due to its context-oriented approach and the variety of actors participating in a study. In our study, which was led on the ground by the Intercultural Maya University of Quintana Roo (UIMQRoo), community leaders and members were identified by researchers in during initial outreach visits to the communities, and these stakeholders were involved in most steps of the research process. However, one basic tenet of PAR is the shared development of the research agenda by researchers and stakeholders. It is recognized that in

TABLE 1 Three regions of the study by community and municipality

	Community	Municipality
Region I	Chaksinkin	Chacsinkin
	Yaxhachén	Oxkutzcab
	Xohuayán	
	Tahdziú	Tahdziú
	Tixmehuac	Tixmehuac
	Kimbilá	
	Canakom	Yaxcabá
Region II	Chankom	Chankom
	Xanlá	
	Chikindzonot	Chikindzonot
	Chan-Chichimilá	
	Maní	Maní
	Tipikal	
	Mayapán	Mayapán
	Timul	Tahdziú
	Teabo	Teabo
	Tekom	Tekom
Tixcacalcupul	Tixcacalcupul	
Region III	San José	
	Cantamayec	Cantamayec
	Cholul	
	Yaxcabá	Yaxcabá

this particular study, the overall research agenda—measuring and characterizing the causes of food insecurity in 22 indigenous Maya communities, was defined from the outset by the donor (the WK Kellogg Foundation), CAN, and UIMQRoo as a local institutional partner. Participation from the community took place prominently throughout the rest of the study and in the identification of strategies: First, during initial focus groups, researchers, and students introduced the study to community leaders and members, and explored the nature of challenges to food insecurity in the region. These initial experiences helped frame the design of the rest of the study, its instruments and participation in other processes to come later in the research cycle. Mayan students at UIMQRoo, many from the very communities participating in the study, conducted the family level surveys on production, food preparation, economy, and consumption, as well as in-depth interviews that served as case studies. After data collection, community leaders and members then participated in workshops in which the preliminary results of the data were shared with them, and interpretations of the problematic presented by the data were discussed and agreed upon, their interpretations integrated into the analysis, and strategies were proposed to address the collectively identified problems. Strategies were also informed by similar participatory research and experiences in FSS facilitated by CAN in small-scale subsistence farming communities in Nicaragua and Mexico in the last three years. As mentioned above, the primary methods of investigation included survey research, participatory workshops and focus groups, and in-depth interviews with community members.

The analytical approach of the study coupled indicators of food security with indicators of food sovereignty with the objective of gaining a more comprehensive understanding of the complex factors that affected the ability of these communities to realize community food security. The rationale behind blending these two concepts lies in the distinction between the two: while food security represents a set of goals to achieve, food sovereignty represents a framework for achieving them (Windfuhr and Jonsén 2005). This is further explained by Pimbert (2008) in the following: “The mainstream definition of food security, endorsed at food summits and other high-level conferences, talks about everybody having enough good food to eat each day. But it doesn’t talk about where that food comes from, who produced it, or the conditions under which it was grown” (50). The FAO (2008) recognizes four dimensions of food security, which include availability, access, utilization, and stability, which are described in Table 2. The logic behind this is that by fulfilling these dimensions, food security will be achieved.

Food sovereignty is concerned with *how* to achieve goals of food security and proposes a set of mechanisms to do so. Since the term food sovereignty was coined in 1996 by Vía Campesina, peasant communities and organizations, civil society organizations, academic and research institutions, and international institutions have all participated in numerous regional

TABLE 2 FAO's Four Dimensions of Food Security (Adapted from FAO 2008, 1)

Availability	Denotes the physical availability of food and is determined by the level of food production, food reserves, and the food trade.
Access	Refers to the economic and physical access to food and is determined not only by the availability of food but also the income of individuals, the prices of food, and markets.
Utilization	Refers to the biological ways that the body makes the most of the nutrients in food; satisfactory utilization is the result of good care and feeding practices, food preparation, diversity in the diet, and the distribution of food among members of the household.
Stability	Connotes the stability of the other three dimensions over time, which implies the uninterrupted availability, access, and utilization of food with potential disruptions being caused by a variety of climactic, political, and social, and economic factors.

and international meetings and conferences to further develop the concept. Windfuhr and Jonsén (2005) identified 10 common elements of most definitions of food sovereignty, which include the following:

- priority of local agricultural production to feed people locally;
- access of smallholder farmers, pastoralists, fisherfolk and landless people to land, water, seeds and livestock breeds and credit. . .;
- the right to food;
- the right of small holder farmers to produce food and a recognition of Farmers Rights;
- the right of consumers to decide what they consume, and how and by whom it is produced;
- the right of countries to protect themselves from under-priced agricultural and food imports;
- the need for agricultural prices to be linked to production costs and to stop all forms of dumping. . .;
- the populations' participation in agricultural policy decision making;
- the recognition of the rights of women farmers who play a major role in agricultural production in general and in food production in particular;
- agroecology as a way not only to produce food but also to achieve sustainable livelihoods, living landscapes and environmental integrity.

Thus, by examining indicators of food security, we gained an understanding of the extent to which these communities were food insecure, and by including indicators of food sovereignty, we were able to identify the factors that contributed to either strengthening or hindering food security in these communities. The indicators used to analyze the findings of the study are described in Table 3. The first four of these reflect the dimensions of food security, while the final six relate to food sovereignty.

TABLE 3 Analytical framework: indicators of food security and sovereignty

Availability	Refers to the uninterrupted supply of food in the required quantity and quality (nutritious and safe). Sources include national production, food reserves, and food aid.
Access	Signifies that the entire population can acquire food without interruption, which depends on the purchasing power to buy food if they do not produce it, the existence of infrastructure and transportation systems to enable the transfer of food, and other adequate food distribution channels.
Consumption	Indicates that individuals have the knowledge required to choose foods with high nutritional content, the best combinations of food, and exercise hygiene in the handling, preparation, and preservation of foods.
Biological advantage	Means that people have the necessary health conditions to benefit from the nutritional content of the foods they eat. This implies health conditions, safe water, and basic sanitation.
Agricultural production systems and agroecological practices at the local level	Refers to both the creation and strengthening of production systems at the local level to feed people living in these areas and emphasizes the establishment of sustainable agroecosystems that take into account the complex interactions between all components of the agroecosystem.
Local access to productive resources	Refers to all the resources necessary to sustain production at the local level and includes access to land, water, seeds, and compost/fertilizer.
Role of gender in agricultural production and food preparation	Refers to the division of labor between men and women in food production and preparation. The goal would be gender equity in the division of labor; shared roles increases capacity for production and healthy preparation.
Preservation of indigenous knowledge	Implies the importance of preserving indigenous knowledge, traditions, and value systems in the processes of food production and preparation.
Food self-sufficiency	Means that communities have the capacity to produce all the food required to sustain them.
Community participation	Refers to the civic participation of community members, including opportunities to participate in community projects, community decision making, and initiatives to strengthen community relations as well as other forms of community engagement.

FINDINGS

The following section details the major findings of the study and specifically highlights the factors that prevent these communities from becoming food sovereign and food secure. Of the ten indicators, we only found that one was approaching satisfactory, and this was the availability of food in the communities. Biological advantage, the development of locally based production systems that incorporate agroecological principles, local access to productive resources, preservation of indigenous knowledge and culture, and community participation were only partially satisfied. Food self-sufficiency was largely unsatisfactory.

TABLE 4 Eleven strategies to promote food sovereignty and security in the study area and their links to agroecological principles

Strategy	Actions	Objectives	Links to Agroecology
Seed bank	<ul style="list-style-type: none"> • To have projects for the investigation and documentation of the seed varieties, with emphasis on local and traditional seeds • Storage and distribution of seeds 	<ul style="list-style-type: none"> • Rescue of and accessibility to seeds, especially in times of crisis 	<ul style="list-style-type: none"> • Enhance agrobiodiversity • Conserve genetic diversity • Preserve cultural heritage
Climate change adaptation	<ul style="list-style-type: none"> • Establishing alternatives that help mitigate the effects of climate change on the natural environment of the community as: <ul style="list-style-type: none"> - reforestation practices - rational use of the slash, fell, and burn (<i>rosa/tumba/quema</i>) 	<ul style="list-style-type: none"> • Create and care for natural reserves 	<ul style="list-style-type: none"> • Enhance agrobiodiversity
Strengthening local knowledge and self-management training	<ul style="list-style-type: none"> • Find effective ways of raising backyard animals to avoid predation of the plants of the parcel. • Form groups to manage projects with appropriate authorities and NGOs. • Train farmers to have better practices and fire control in the process of slash, fell and burn. • Strengthen the production of fruit and patio animals (birds and small animals). • Project Ka'anche to plant onions, cilantro, etc. • Promote crop associations. • Farmer to farmer teaching systems • Implement an intensive, deep and long-term program on self-organization and facilitation in the processes of decision making 	<ul style="list-style-type: none"> • Reinstatement of traditional practices that help improve the efficiency of agricultural production systems • Establish a system of social and cultural networks to manage and resolve long-term field problems of small scale in the community. 	<ul style="list-style-type: none"> • Enhance agrobiodiversity • Strengthen communities • Promote multi-directional transfer of knowledge • Use indigenous/traditional knowledge and practices • Promote local control over local practices

- Transportation
 - Implement a public transportation system with a variety of times and every day in strategic communities that allows easy access for all communities and access to established markets
 - Promote the improvement of transport systems from the maize field to the market
 - Communities and producers have a system of efficient and reliable transportation to meet their needs of FSS (nutrition and access to markets)
 - Economic viability
- Implement small scale demonstration gardens with irrigation
 - Implement small scale pump irrigation projects by organizing small groups of farmers.
 - Biological control of pests.
 - Products without synthetic chemicals.
 - Work with crop diversification and crop rotation.
 - Work on the development and improvement of organic fertilizers from local natural resources.
 - Farmer to farmer teaching systems
 - Establishment of production models based on "better practices".
 - Improve production
 - Conserve natural resources
 - Minimize toxics
 - Ecologically appropriate cropping systems
 - Management of pests and plant disease through ecological means
 - Recycle nutrients
 - Promote multi-directional transfer of knowledge

(Continued)

TABLE 4 (Continued)

Strategy	Actions	Objectives	Links to Agroecology
Research, training and assistance	<ul style="list-style-type: none"> Farmer to farmer teaching systems Research in FSS and identification of local best farming practices for the reevaluation and revalidation of traditional strategies and diversification of jobs in the agricultural sector. 	<ul style="list-style-type: none"> Development of a space to encourage synergies between traditional knowledge and diverse practices for implementing FSS 	<ul style="list-style-type: none"> Teach agroecology and sustainability Promote multi-directional transfer of knowledge
Evaluation and monitoring	<ul style="list-style-type: none"> Implement a Monitoring and Evaluation tool that fosters and measures results based on data, facts, and changes in behaviors and values associated with the principles of FSS 	<ul style="list-style-type: none"> Implementation of the components and actions in an effective manner and that enables long-term adjustments to achieve the objectives of the project as a whole 	<ul style="list-style-type: none"> Use long term strategies
Water	<ul style="list-style-type: none"> Encourage rainwater collection in the plot and in the maize field. Training on water care. Implementation of micro-irrigation systems.. 	<ul style="list-style-type: none"> Efficient use of water 	<ul style="list-style-type: none"> Conserve resources
Production systems and their components	<ul style="list-style-type: none"> Identify and disseminate best practices, in production systems on a small-scale Work with organic fertilizers Implement practices involving community systems of local germplasm conservation in both the parcel and in the milpa. To promote microcredit accessible to producers Counseling and long-term management for existing programs and credits in agricultural production 	<ul style="list-style-type: none"> Lower production costs 	<ul style="list-style-type: none"> Use indigenous/traditional knowledge Economic viability Recycle nutrients Enhance agrobiodiversity

- Young adults and the creation of space for their incorporation into community activities and access to economic opportunities
- Integration of youth in agricultural systems.
 - Training young people as disseminators of knowledge of traditional farming systems in their communities.
 - Young people as implementers in microbusiness production projects:
 - Linking agricultural products and backyard animals with established and alternative markets
 - Manufacturing of organic fertilizers, with raw materials from natural resources in the community.
 - Identify and disseminate best practices in production systems of a small scale.
 - Consulting and management (medium to long term) for existing programs and credit applicable to agricultural production.
 - Implement an intensive, deep and long-term self-organization and facilitation, in the processes of decision making.
- Revalorization of traditional foods and their preparation
- Systematization of traditional food and traditional ways of food preparation
 - Revaluation campaign of traditional foods at the local and regional level that government institutions incorporate as part of education and health programs.
- Establish spaces that provide development alternatives to youth in the community, as a way to avoid out-migration, and for revaluing cultural, productive and social practices
- Economic viability
 - Preserve cultural heritage
 - Promote multi-directional transfer of knowledge
- Preserve cultural heritage
 - Use indigenous/traditional knowledge
 - Enhance human health
-

Availability

The primary source of food for families in the study is subsistence production from the *milpa*, *solar/patio*, and *parcelas*. Production from these sources, however, does not sustain the families year round. On average, only about 6% of the families can subsist from their own production, while the vast majority (60%) can subsist for less than 6 months of the year and 29% can subsist for more than six months but not a full year (see Figure 1). This is, among other factors, attributed to production being inconsistent throughout the year with May to November as the most productive months. Secondary sources of food include local markets. A small percentage of harvests are sold commercially, which indicates that there is a marginal amount of locally produced food available in markets.

Access

The great majority of families in the study area report problems acquiring food (82% on average). Of those reporting difficulty acquiring food, 74% reported that it was because of lack of money. In order to circumvent the economic difficulty in acquiring food, families of the study utilize various means by which to access food, including: borrowing money (52%), buying food on credit (38%), and trading food with other producers (10%). In addition to these means, remittances from family members working outside the communities provide an economic means of obtaining food. Annual food expenditures are disproportionately high when compared with other annual expenses and represent, on average across the three regions, 41% of total annual expenditures. Approximately 85% of the families in the study receive economic subsidies from national government programs (*Procampo* and *Oportunidades*) and represent the principal source of income for an average of 27% of those surveyed. (The highest percentage—44% on average across the regions—reported agriculture as their primary source of income.) Furthermore, obtaining food from markets is often problematic as not all foods required by the family can be purchased, food prices are higher, and accessing markets can often mean having to leave the home community, thus, necessitating the added expense of travel, which can also be problematic given the often poor conditions of local roads.

Consumption

The diets of families in Region I of the study were examined and the results demonstrated that two-thirds of those surveyed eat a diet balanced between fruits and vegetables, cereals and tubers, and legumes and animal proteins.

About one-third of those surveyed eat a disproportionate amount of cereals and tubers and legumes and animal proteins, thus, showing deficiency in fruit and vegetable consumption.

Biological Advantage

The main focus of this indicator was the availability of potable water, to which almost 100% of the population reported having access. Access to potable water is particularly important for the prevention of waterborne illnesses.

Agricultural Production Systems and Agroecological Practices at the Local Level

Some promising practices to strengthen local production systems and agroecological practices were observed and these included the practice of the *milpa*, a preference for obtaining foods locally, the exchange of foods between families, and the sale of foods produced in surplus or not consumed by the producer in great quantities. However, significant obstacles were observed in the data regarding production:

- production, while diverse in terms of the variety of crops, is concentrated in the production of six: corn, beans, squash, *chile*, chickens, and eggs (see Figures 2–4);
- limited use of irrigation and compost and fertilizer;
- protein production is largely limited to poultry, eggs, and swine, and, with the exception of Region 3, less than half of the population produce these protein sources (see Figure 4);
- reported decline in soil fertility and overall agricultural productivity;
- decreased practice of maintaining *solares* and *patios*;
- inefficient transport systems that make transporting harvests from *milpa* to home and *milpa* to market problematic;
- migration to urban areas, tourist areas, and northward results in the loss of labor (most families rely on family members to work the *milpa*);
- focus of government policies on commercial production and market-led growth that pose challenges for developing local food systems and maintaining tradition practices and food cultures; and
- dependence on chemical fertilizers and pesticides.

Furthermore, participants in the participatory workshops and focus groups reported the following problems associated with production in the *milpa* or the *solar*, some of which echo the above: local production and the

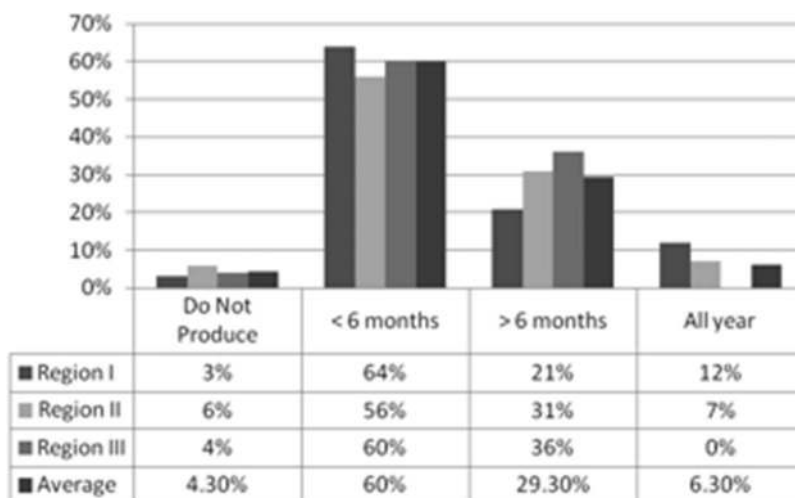


FIGURE 2 Food self-sufficiency through subsistence production in the study area.

dissemination of local knowledge, infrastructure, crops, access to water, climate change, transportation systems, and access to local productive and economic resources.

Local Access to Productive Resources

While access to land was significantly high for those surveyed, with an average of 79% of families having access to land and 97% of those with access possessing the land, access to other productive resources was quite limited. This was particularly reflected by the following:

- the limited access to water for irrigation (only about 9% of those surveyed have access);
- despite a culture of seed saving, many varieties are not saved, thus, necessitating an added expense; and
- the limited extent of fertilizer and compost use suggests inadequate availability or access.¹⁰

Important to note here is that participants reported that the duration of droughts has been longer in recent years and the duration and intensity of rains has lessened.

Role of Gender in Agricultural Production and Food Preparation

The data revealed that gender roles remain fixed along traditional lines with 95% of men in charge of milpa production and 94% of women managing

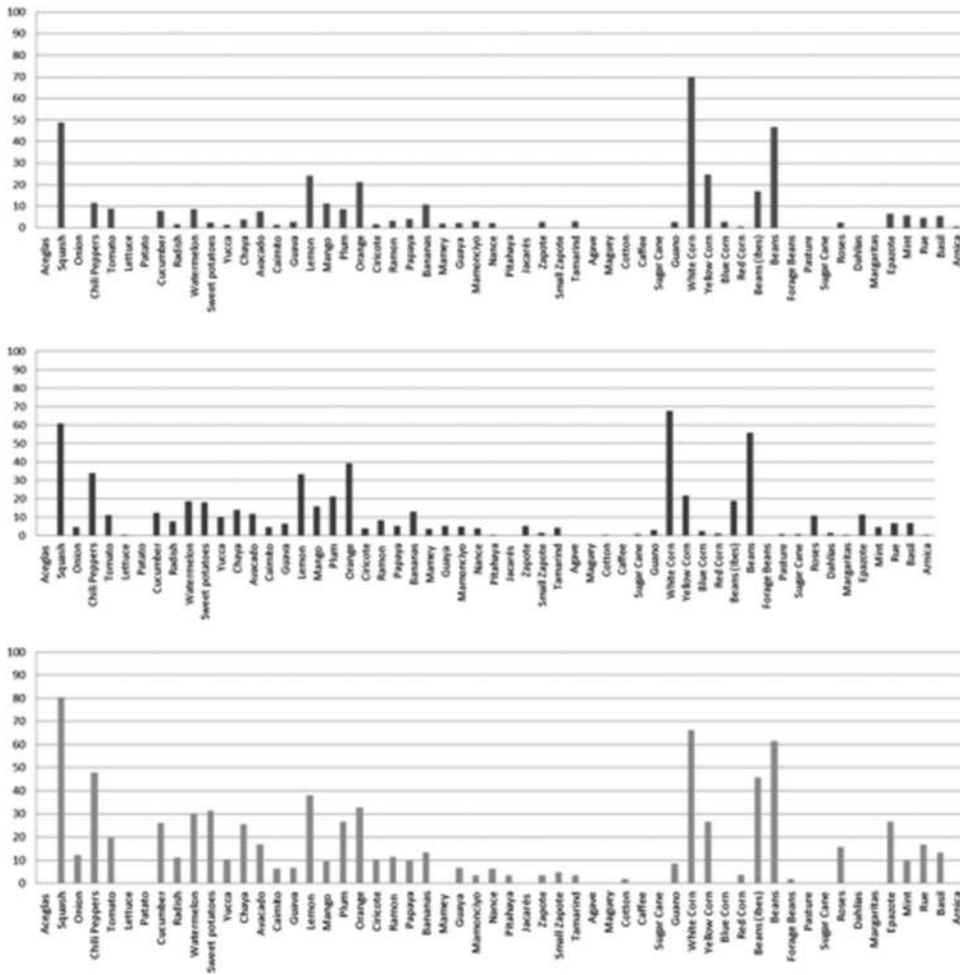


FIGURE 3 Percentage of population producing crops in each of the three regions of the study (listed in order of Region I, Region II, and Region III).

food preparation and *solar* production. This indicates a heavy workload for women, which would influence their choices in foods they prefer to prepare (towards processed foods or those that are easier to prepare) as well as the types and quantities of plants and animals they choose to cultivate in the *solar*.

Preservation of Indigenous Knowledge and Culture

The most important challenge here is the rural-urban migration of young adults 25 and under due to lack of employment or education opportunities in their communities, which weakens community ties and opportunities to broaden cultural knowledge at a very crucial time in the lives of these

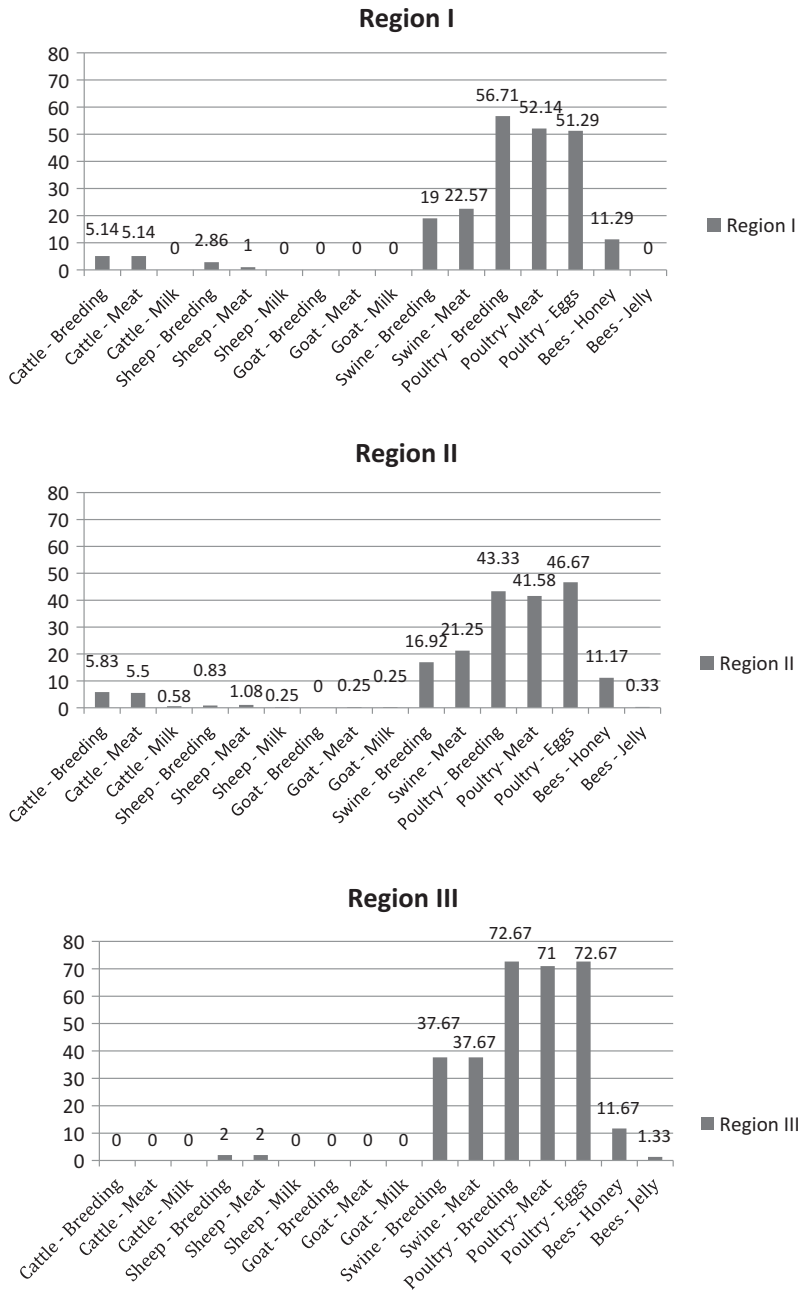


FIGURE 4 Percentage of population with animal production by population in each of the three regions of the study site.

young adults. Two promising sources to strengthen youth engagement with their communities include economic opportunities offered by civil society organizations and government-sponsored programs to promote indigenous culture and language. It is also important to mention the critical role that

UIMQroo is playing in fostering community-youth engagement: part of the mission of the university is to educate indigenous maya students from these very communities with skills and intercultural knowledge that then equips them to create opportunities for continued employment and engagement in their own communities, instead of succumbing to the overwhelming trend of migration to cities or to the United States.

Food Self-Sufficiency

We noted above that most families in the study area are not able to produce the food they require throughout the year. This is particularly problematic in light of decreased soil fertility and agricultural yields in recent years.

Community Participation

Spaces of community participation across the three regions of the study include the *ejidal* for men (44% participation rate), which is an organization that governs the *ejidos* or lands that were redistributed to peasants during land reforms, *Oportunidades* program committees for women (39% participation rate), and local churches and religious organizations (16% participation rate). Community participation by young adults remains limited. On a positive note, civil society organizations have been particularly active in creating new spaces for the participation of women and young adults with the introduction of programs focused on entrepreneurship and production.

DISCUSSION

Our findings indicate that the communities of the study area are partially satisfying the indicators of availability, access, consumption, and biological advantage. Although the families in the communities are not able to produce enough for their own consumption, food is available for purchase. Access to food is slightly more compromised due mostly to economic reasons. Most participants reported difficulty in accessing food due to financial reasons. However, they take advantage of strategies to circumvent these difficulties by borrowing money, buying food on credit, and trading food with other producers. Government assistance, presumably, also assists with the procurement of food in times of scarcity, of which 85% of the population receives some form. The issue of accessing markets is notable, particularly in terms of the state of local infrastructure. Our indicators of consumption reveal that most people do have a balanced diet, though a third of the population has a diet disproportionately low in fruit and vegetable consumption. Finally, while other indicators of health were not measured, almost

all the families reported having access to potable water, which significantly decreases chances of illness through waterborne disease as contaminated water is a serious threat to the health of residents of rural communities. Thus, a reading of the data through these four indicators shows marginal food insecurity in these communities.

What is particularly problematic here, however, is the high level of dependence these communities have on outside sources of assistance. This is most clearly evidenced by the vast number of families that receive aid from government agencies and also by the incidence of rural-urban and south-to-north migration, which points to the lack of opportunities to foster economic security and sustainable local livelihoods in these communities. The indicators of agricultural production and agroecological practices at the local level and access to productive resources further shed some light as to the reasons why these communities are struggling to meet their necessary food and nutritional requirements. As communities that rely on subsistence agriculture as their primary means of economic livelihood, their agricultural production systems are in distress. As the data shows, there has been a reported decline in the agricultural productivity of the land, soil fertility, and the duration and intensity of rains, all of which are critical to sustaining production over the long term. Furthermore, while the majority of families have access to land, access to other critical local resources to sustain production is compromised, specifically water for irrigation, fertilizers, and seeds. From an agroecological perspective, several other factors are problematic, all of which undermine agrobiodiversity, and these include the use of chemical fertilizers and pesticides, which contribute to environmental pollution and negatively impact human health; the concentration of production in a small number of crops and livestock; the limited use of composts, manures, intercrops, fallows, rotations and other techniques to enhance fertility; and the challenges facing these communities in terms of cultural preservation. The limited development of local distribution systems and the infrastructure needed to support them is a final factor to consider.

There is a further dimension to this situation and that regards government policies and sponsored programs. As noted above, government policies largely favor the expansion of commercial agriculture through a market-based approach that does not emphasize the importance or value of neither traditional subsistence agriculture nor community-based agriculture and food systems. Furthermore, the two main government programs through which community members receive assistance, as mentioned above, are *Procampo* and *Oportunidades*. While *Oportunidades* is a government program that provides economic assistance to individuals and families, *Procampo* aims to assist all *ejidatarios*, those who individually possess a parcel of communal public land (*ejidos*), by providing agricultural assistance. For example, it benefits corn producers by assisting them in purchasing chemical fertilisers and herbicides as well as providing economic aid. These policy and

program initiatives serve to further deepen the socioeconomic, ecological, and cultural crises that communities like those in our study are experiencing. As previously discussed, policies that encourage commercial production through a pure market-based approach tend to damage ecological integrity, marginalize small farmers and rural communities, and threaten peasant cultures. Furthermore, based on the results of this study, these initiatives have failed to provide these communities with an economic, environmentally, and culturally sustainable solution to achieving food security. Rather they have served to create deeper dependence on outside resources for sustenance, thereby disempowering people and preventing them from exercising control over their own communities and livelihoods. It is here that agroecological and food sovereignty principles carry their greatest promise and weight, and coupling PAR with these principles can assist in identifying strategies can better serve farmers' and communities' needs.

STRATEGIES IDENTIFIED THROUGH PAR TO PROMOTE FOOD SOVEREIGNTY AND FOOD SECURITY

In developing strategies to promote food sovereignty and food security in the study area, we again drew on a PAR approach coupled with agroecology that emphasized the importance of the cultural identity and traditions of the community members in the study area. Strategies were developed along four parameters, which reflect both strengths and challenges in the communities of the study area and were as follows:

1. implement proposals to improve agricultural production systems based on a more efficient use of natural resources in the environment and social organization to enable community members to profit from their production systems;
2. identify better ways to use social capital and traditional knowledge of communities in the study area;
3. identify elements that incorporate the ideas, knowledge and ways of working of the youth of the community to promote entrepreneurship and use this dynamic to avoid, as much as possible, labor migration;
4. identify strategies to optimize home gardens and animal husbandry in order to strengthen the family and the role of women, in particular, as the organizers of family nutrition.

Eleven strategies were developed by UIMQRoo with the input of community leaders and members. Input was generated through focus groups that reflected on the findings of the study and generated sets of proposed actions that participants thought would address the problems identified through

the study. Table 3 contains a summary of these strategies, their actions and objectives, and how they link to agroecological principles. As can be noted, the devised strategies focus on enhancing ecological integrity and economic viability at the farm and community levels, and also have a strong focus on cultural preservation and revitalization, which we argue is essential for ensuring meaningful long-term food security in these communities and empowering community members to assume proactive roles in the design and implementation of community development strategies.

CONCLUSIONS AND IMPLICATIONS

By taking a PAR approach, we were able to partner with community members in our study area to develop a meaningful research design and data collection process, address issues in their communities that were relevant to their circumstances, and benefit from their input regarding the preliminary and final results of the study. Combining an agroecological focus with the PAR model had the added benefit of orienting our focus on issues and indicators of the causes of food insecurity that might have otherwise been overlooked had we not adopted this approach. One of the key common features of PAR approaches and agroecology is their focus on empowering people and communities. Specifically, the methodology led to the identification of local best agroecological best practices and a strategy to disseminate them horizontally among farming families using a farmer-to-farmer methodology promoted by the organization Campesino-a-Campesino; this is a strategy that promotes food sovereignty by valuing local knowledge and empowering its usage, with the idea of diminishing dependence on outside inputs like subsidized agrochemicals. A second strategy identified through this process that might have been overlooked through another approach, is the focus on building spaces for youth leadership in the dissemination of local knowledge, the creation of knowledge hybrids, and initiatives to promote rural entrepreneurship. This strategy aims to address the interrelated problems of lack of economic opportunity for youth in their communities, youth outmigration, and the loss of traditional knowledge through the active engagement of youth in creating knowledge hybrids and viable economic activities that support traditional agriculture while integrating new elements.

There are, however, strong apparent weaknesses of the approach as it was implemented. Apart from investigating the roles of stated government programs in the communities, we did not analyze the evolution of public policies focused on food security, nor did we attempt to directly engage neither government agencies nor organizations that work to influence policy. Influencing political structures and policies is an integral part of food sovereignty, which argues for the implicit participation of citizens

in the formulation and implementation of food and agriculture policies in their territories, whether local, departmental, or national. The link between food sovereignty and food security is an issue that is currently being taken up by political representatives in Mexico and is embodied in the proposal for the draft law on planning for agricultural food and nutrition sovereignty and security, which is currently before the Mexican Senate. This follows the important constitutional reforms finalized in October of 2011 that guarantee the right to food in Articles 4 and 27 of the Mexican Constitution. Both of these developments echo other developments in the Latin American region to not only recognize a constitutional right to food but to also introduce framework laws to implement the right to food (De Schutter 2012). The research stakeholders, however, were limited by the donor organization from engaging directly in influencing policy (it was a condition of funding); the inherent separation of political structures and bodies from the research process in this process limited the types of change that the PAR process could promote to those that could be manifested at the level of the farm and the group of families in the study.

Implications of this Research

The developments outlined above are important steps for Mexico in light of the history of public policies that have served to further marginalize rural communities, specifically indigenous communities, and it offers new hope for the deeper inclusion of rural voices in the construction of policies that will ensure the ability of these communities to make significant contributions, narrow the political-economic disparity that exists between these communities and their national counterparts, and serve to revalue their voices and cultural contributions. Signs of further encouragement are evidenced by the participation of the National Union of Regional Autonomous Peasant Organizations (UNORCA) and other civil society organizations in the final drafting of the right to food proposal and efforts to lobby the proposal through congress (Acedo 2011). Projects such as this one, conducted in partnership with rural communities with the explicit objective of empowering people, have the potential to serve as fruitful experiences to inform future policymaking, encourage citizen participation, and present a model through which to inform the design of rural development strategies that addresses the unique and valuable characteristics of diverse communities, if they can better engage with organizations taking action to influence national and international policies that affect food security and sovereignty. Without engaging with political processes and challenging traditional models of agricultural subsidies that weaken rural economies, approaches combining PAR with agroecology will be limited in the scale of change they can affect.

NOTES

1. Food sovereignty is defined here as the “the right of people to produce, distribute and consume healthy food in and near their territory in an ecologically sustainable manner” (Altieri and Toledo 2011, 588). Food sovereignty is a framework that was coined by the transnational peasant movement, La Vía Campesina, and it explicitly calls for the transformation of agricultural systems to reflect agroecology (see, e.g., Vía Campesina, 1996, n.d; Windfuhr and Jonsén 2005; Pimbert 2009).

2. The definition of food security adopted here is that of the FAO (2010b), which states that food security “exists when all people, at all times, have physical, social and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (8).

3. As Thrupp (2000) explains, one effect of this reorientation of agricultural systems towards export-oriented, market-led development is the homogenization of cultivated varieties, thereby limiting biodiversity in agroecological systems. She further points out, “Although people consume approximately 7,000 species of plants, only 150 species are commercially important, and about 103 species account for 90 percent of the world’s food crops” (269). See also Sauerborn (2002).

4. Several other facets of agrifood system restructuring are noteworthy. First, the effects of food aid and “dumping” have created and deepened food dependency in the global South (McMichael 1998) by artificially lowering food prices in such a way that local producers find themselves unable to compete (Rosset 2006). Furthermore, the recent phenomenon of “land-grabbing” by global financial and investment corporations for the purposes of biofuel and export-agricultural production has only served to further marginalize local populations from land and impact livelihoods (see Bello and Baviera 2009; Zoomers 2010; Rosset 2009, 2011). Last, speculation on agrifood commodities as a result of financial deregulation, one of the cornerstones of the neoliberal approach, has also deepened the crisis of local livelihoods (Ghosh 2010).

5. Altieri (2009), citing Gliessman (1998) (see also Altieri 1995; Altieri and Nicholls 2005), further explains that it is premised on “enhancing the habitat both aboveground and in the soil to produce strong and healthy plants by promoting beneficial organisms while adversely affecting crop pests (weeds, insects, and nematodes)” (3).”

6. See <http://www.agroecology.org>

7. Vía Campesina (n.d.) argues, “[t]ruly sustainable peasant agriculture comes from the recovery and revalorization of traditional peasant farming methods, and the innovation of new ecological practices” (6).

8. See http://www.agroecology.org/Principles_List.html, particularly the section on “Empower People.”

9. See <http://www.fao.org/hunger/en/>

10. Noteworthy is that in Region 1 of the study, 75% of those surveyed report using fertilizer while in Regions II and III less than 25% report using this resource.

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