A Contra corriente
Una revista de estudios latinoamericanos

Vol. 17, Num. 2 (Winter 2020): 69-88

When History Is Now:
History and Sustainability in Rural Nicaragua[1]

Michael Smith

Ithaca College

"Now, if you do not want to bother with doing it in the kitchen, you go to the mill and grind your tortilla [flour]. Before it was only the mortar and pestle, and if it was only the mortar and pestle … look, our life was hard! And I say to the girls today, all you have to do is send it to the mill and you have your dough."
María Eugénia, 88 years old

"Where we lived there weren't wells. We didn't have water because there was tremendous deforestation . . . so we had to wait [at the spring] in order to get one bucket of water. We had to wait three hours sometimes, and sometimes we had to sleep [at the spring] to hope for a little bit of water."
Reyna, 49 years old

"Back then, we didn't know about electric light; that was only known in places with large populations, in the cities. I remember when we didn't have access to electricity. We lighted with lamps . . . We also had *ocote* (pine pitch), there was *ocote* here in abundance, but now if I go to look for a little piece of *ocote* to light a fire I'm not going to find one."
Manuel, 67 years old

[1] The author wishes to thank the United States Fulbright Program for funding much of the research for this project, as well as the people of Sabana Grande, Nicaragua, for their generosity, their resilience, and their friendship. They are truly co-authors of this essay.

Introduction

Food. Water. Energy. Along with shelter these constitute the most fundamental of basic human needs. The abundance or scarcity of any of these can become lodged in memory, a marker of life lived in more or less comfort. The elemental character of each—food coming from the earth, water, fire—renders more visible the general environmental context of that life. The reminiscences above each speak to a time not so long ago in the community of Sabana Grande, Nicaragua, when daily existence constituted a nearly constant struggle to overcome environmental challenges, some geophysical, some human-induced, all creating harsh living conditions that seemed unyielding: generalized water scarcity compounded by drought and deforestation, rudimentary energy supplies for cooking and lighting, manual labor required for every quotidian task from hauling water to grinding maize to harvesting and threshing beans. Such conditions were not uncommon in much of Latin America two or more generations ago. Indeed, they are not uncommon in many places today, including in other parts of Nicaragua. But in Sabana Grande the shift from a rudimentary subsistence-based existence to one defined by significant progress toward many of the key U.N. Sustainable Development Goals (SDGs) has occurred with dizzying speed (United Nations, 2015).

In the span of less than a generation, electrical energy from solar panels and now, predominately, from a national grid, has arrived. There are more than 10 water pumps in the community, though many are now unused since the municipal government installed a piped community water system in 2016. All of the houses are constructed with adobe or concrete block, most with either metal or tile roofs. When the rains fail, as they did in 2013 and 2014, poor harvests and hunger can be an issue, but the specter of starvation has lifted. Energy. Water. Food. Shelter. These are the most elemental of needs, the needs which connect people most elementally to their environment.

These are also central elements of the quest for sustainability in the twenty-first century, though there are diverse perspectives on both the word and concept of sustainability (e.g. Moore, 2016, Karlsson, 2016).[2] So what does a sustainable future look like for Sabana Grande? How might cooperative, participatory, reciprocal

[2] Moore and his collaborators in this volume (now in its second edition) explore the variety of ways that sustainability is a recursive cultural practice contingent on context, and that attempts to craft a normative definition of sustainability are both futile and counterproductive. Karlsson suggests that a metaphorical understanding of what is meant by the term sustainability is essential for it to mobilize action.

collaborations serve the goals of sustainable development in this part of the world and promote new forms and mentalities about production and consumption, especially at the local level? And how are women emerging as leaders in the transformation of their communities and the world of the twenty-first century, something the creators of the Drawdown project rank as essential to mitigating climate change (Hawken, et al., 2017)? My work as a historian and environmental humanist in Sabana Grande speaks to these issues, which are among those that inspired this special issue of *A contracorriente*.

In this essay I argue that Sabana Grande, Nicaragua, serves as a useful model for what the quest for sustainability in rural Latin America might look like. This argument is based on participatory and historical research with community members about both change and continuity in their relationships with water, energy and food. The changes have generated an ongoing community-wide reflection about the ways technology mediates relationships with these most elemental dimensions of human existence. Collaborations with each other and with visitors from outside the community have helped shape a widely shared sense that sustainability depends both on thoughtful adoption of new technologies and on the careful curation of local wisdom about managing human-environment interactions. Sustainability also depends upon resilience in the face of the unpredictable, a lesson learned over many decades of severe privation—and one learned in the present in confronting the vicissitudes of climate chaos, political instability, and economic uncertainty. And the organizing work that has facilitated these collaborations has produced another key ingredient to sustainability not only in Latin America but also around the world: the empowerment of women.

History and Grassroots Sustainability: Questions and Methods

I first arrived in the community in 2013, drawn there by reports from a colleague about a solar energy collaboration with community members he had been coordinating for several years (Martin, et. al, 2006). It was an opportunity to spend a sabbatical semester observing and participating in the sustainable development projects in Sabana Grande that have garnered international recognition: a United Nations SEED prize in 2008, a Hogan Lovells (also U.N.) Community Solar Innovation Award in 2018, and a prominent profile in Al Gore's *24 Hours of Reality* broadcast in late 2017.

I found that many of the questions I was asking during that first sojourn there focused on the past. I wondered what things were like before these development initiatives began in the late 1990s, especially the ways people generated energy, cultivated food crops, and collected and used water. As I heard people lament the way

rainfall had become less predictable, I wondered how the climate had changed more generally in a place where, as in many parts of the world, precipitation in the best of times falls only during the rainy season (May-October). I pondered the historical impact of the Pan-American Highway; the stretch that runs right through the community was built in the 1960s (with Alliance for Progress[3] funding). I returned to Sabana Grande in 2017 to try to answer these questions with community members as my collaborators. My approach to researching and telling the story of Sabana Grande blends microhistory, the community history model developed in Great Britain, and environmental history (Levi, 1993, Twells, 2008, Cronon, 1992). As R.W. Sandwell writes, "because the most commonly recognized kind of microhistory is the community-based study...its advantages to environmental history are both extensive and generally unacknowledged" (Sandwell, 2009, 125)

The research framework mostly held up during my time in Nicaragua, though as with any project I have had to adjust my vision of what's possible along the way. Written and photographic documentation of change and continuity over time is very hard to come by. During my four months in Nicaragua I found some source material in municipal and departmental archives that helped account for changes in population, land use practices, public health, and other categories of analysis of interest to environmental historians. The richest sources are the more than thirty oral history interviews (with community members ranging from twenty to ninety-four years old) that my collaborators and I conducted. Drawing on the approach Katie Kuszmar (2015) and Irene Reti (2010) have taken to using oral history to illuminate environmental and social change in a particular place, our questions rippled out from basic inquiries about food production and consumption, water use, and energy use. The interviews produced a rich array of stories, stories that converged around the theme of profound and rapid change over the past 20 years.

Above all, as we will see below, these interviews help chart the impact of innovative, collaborative sustainable development work between a domestic NGO (Grupo Fénix), a women's cooperative (Las Mujeres Solares), and countless international visitors whose expertise in renewable energy and agro-ecology has combined with local knowledge. These collaborations have helped to transform Sabana Grande from an isolated, impoverished community reeling from Nicaragua's decade-long civil war, into a place where women have become change agents in both their

[3] United States Congress, 1962.

households and in the community. With women at the forefront, the community has become an incubator for creative ideas about how to manage energy, water, and waste, and a possible model for how to build resilience in the face of climate change.

Figure 1. Women from the internationally-renowned cooperative Las Mujeres Solares reflect on their lives before and after the arrival of Grupo Fénix in the community during a collaborative history workshop in 2017. Photo credit Michael Smith.

Historical and Cultural Context

An indigenous community in the municipality of Totogalpa, Department of Madríz, Sabana Grande sits in the northern highlands of Nicaragua not far from the frontier with Honduras. Located within the *zona seca* of the country, average rainfall is less than 900mm per year (Caracterización Municipal de Totogalpa, 2017). By at least one measure, Nicaragua itself faces long-term climate change impacts that make it the fourth most at risk country in the world (Kreft, Eckstein, and Melchior, 2017). The Intergovernmental Panel on Climate Change (IPCC) has specifically emphasized the vulnerability of Central America to climate change (2014). Changes in monsoonal rain patterns have deeply impacted the agricultural (Joint Global Change Research Institute, 2009). More frequent droughts are now coupled with extreme precipitation events during the rainy season (Field, et al., 2012). Regional governmental authorities are increasingly alarmed about food insecurity and the climate changes that seem certain to exacerbate it (Caracterización Municipal de Totogalpa, 2017, OXFAM,

2012, FAO 2012). *Ocote* pine forests once covered the region (Denevan, 1961), but deforestation has profoundly reduced tree cover of all types over the past century. Indeed, deforestation has become a crisis that preoccupies national environmental management agencies (MARENA, 2015, Humboldt Center, 2017). As one history of the Nicaraguan Segovias puts it, "[the extraction of *ocote*] forcefully altered favorable microclimates, and produced unprecedented erosion in the region" (CIERA-MIDIRA, 1984, 226). For decades the Nicaraguan Longleaf Pine Company clear-cut mountainsides, farmers have cleared forests for agriculture, and householders have cut trees for fuel. The result has been a radical transformation of the landscape, and increased vulnerability to climate change (Gourdji, 2015).

The landscape itself contains evidence of the indigenous history of the region, both in the place names and in the culture, especially the foodways. Although there is some dispute about the indigenous origins of the inhabitants of Totogalpa (which means "nest of birds" in Nahautl), most historians believe that the area was settled in the late first millennium CE (Incer Barquero, 1985, Cormack, 2002). The Spanish arrived in the region in the mid-sixteenth century, bringing with them the cultural and environmental destruction that followed in the wake of Europeans wherever they colonized the Western Hemisphere (Crosby, 1972). But their attention was focused elsewhere, both in the Americas generally and in Nicaragua itself. Beyond outposts in Cuidad Antigua, some 40 kilometers to the northeast, and a few mining operations, the Spaniards' presence in this part of the highlands was very modest through the end of the 18th century. Written records are sparse, but there exists one document from 1747 that calls the community where Totogalpa is now Santa María Magdalena de Nueva Segovia (Caracterización Municipal de Totogalpa, 2017, CIERA-MIDIRA, 1984).

It was not until the second half of the 19th century that mestizo settlers began moving into the region, joining the remnants of the indigenous population in practicing slash and burn (*roza y quema*) subsistence agriculture in the northern highlands region (CIERA-MIDIRA, 1984, Horton, 1998). These communities lived in profound isolation from the centers of power in Nicaragua, largely ignored until the late 19th and early 20th centuries when a series of land reform laws initiated what amounted to an enclosure movement. *Campesinos* without title to the land they had inhabited and worked for decades were often displaced by large, often absentee landowners or were forced into tenancy. Even those who were allowed to remain on the land were often compelled into migrant labor to work in mines, to cut sugar cane, or, most commonly, to harvest coffee from December to February each year. This migrant wage-labor system persists

to this day (CIERA-MIDIRA, 1984, Rocha, 2001), and even members of the community whose work with Grupo Fénix has obviated the need for migrant work remember the experience as one of the most notable hardships of the not-so-distant past. As Reyna López noted, "all the women, especially the women in my family, we had to go out to cut coffee, I went out to cut coffee with my children from a very young age with my husband...Dipilto, San Juan del Río Coco. We left our homes...our children, sometimes we left them alone" (Smith, 2017). The suffering through cold, harsh working conditions, and uncomfortable living quarters are deeply engrained in Eddy Pastrana's memory: "Most of all my childhood, my parents always stayed on the mountain. I still think about...I was one year old, we were taken to the mountains at that age. It's hard work...when we were growing up, we all cut coffee. We were raised on the mountain and I think that life was quite harsh but it was worth it that now we know what it is to suffer in the mountains" (Smith, 2017).

Despite being at the geographical center of Augusto Sandino's rebellion in the 1920s and 1930s (Gobat, 2005, Schroeder, 1996), the rhythms of life and economy did not change appreciably until the 1950s when the Somoza regime embarked on an aggressive campaign to develop commodity agriculture for export in the region. The two most important features of this campaign were the construction of the Pan-American Highway through the region (in the 1960s) and the extension of credit to large landowners. The latter stimulated these local elites to scale up the cultivation of cotton, basic grains (*granos básicos*), and coffee, as well as establishing industrial-scale processing of commodities such as timber and livestock through the creation of slaughterhouses and large sawmills (CIERA-MIDIRA, 1984, Walter, 1993). In general, the Somoza decades in Nicaragua completed the transformation of much of the landscape and the economy into an agro-export economy that introduced widespread use of chemical pesticides and fertilizers and amplified the inequality in land ownership and access to resources (*Envio*, 1989).

As a result of these changes, most *campesinos* in Sabana Grande fell even deeper into subsistence penury, even as the wealthy elites of the region benefited from the infrastructure development and economic shifts. According to a community history initiative undertaken in Sabana Grande in 2009, in 1950 there were only around 60 people living in the community, land was generally farmed in common (*ejidales*), an often meager amount of water was drawn from a single spring, and the houses were constructed of grass with palm leaf roofs. Hunger was common, as was water scarcity, and there was no public education or much other presence of the state. Only in the

1970s did families begin to construct dwellings from adobe and use tiles for roofing (Historia del Frayle, 2009). As eighty-five year old María Eugenia Sánchez told me, "When we were little girls we left to grind (maize) at 4:00 and after that one got up to make that little tortilla. We had to haul water, and then start to weave to *petates* (woven sleeping mats) until 12 o'clock in the day. And then grind more raw corn in the stone [pestal] and make corn tortillas... That's how my upbringing was... That's why I did not learn to read because [my life] was only cooking and weaving" (Smith, 2017). Reflecting on the higher rates of disease in his youth in the 1970s, Hilario Martínez noted that there were no latrines then, "we went to the toilet in the 'open air'" (Smith, 2017). Descriptions of the dire living conditions the *brigadistas* encountered when they headed into the countryside in the northern highlands around 1980 as part of the Sandinista campaign to eradicate illiteracy offer an additional taste of what life in Sabana Grande was like at that time (Valenzuela, 2011, Hirshon and Butler, 1984). The memories community members have of these times have contributed significantly to the sense of transformation they experienced as a result of their sustainable development efforts over the past twenty years.

Figure 2. Despite tremendous cultural and technological change in Sabana Grande over the past twenty years, the traditional and the modern co-exist. Most maize and bean cultivation relies on biological (bovine or human) rather than mechanical traction. Photo credit: Michael Smith.

The Sandinista rebellion and revolution of the 1970s, and the civil war that followed in the 1980s, profoundly affected Sabana Grande. There was some degree of land redistribution. Families at times divided along ideological lines, and some young men went into hiding to avoid being drafted into military service on one side or another.

Everyone in the community knows someone, often many, who died in the conflict. In addition to the death and destruction wrought by the war itself and the social upheavals and dislocations from 1979-1990, the land mines planted by the thousands in the borderland region with Honduras proved to be the most destructive legacy of those years. When the fighting officially ended in 1990, the Nicaraguan Army recorded over 115,000 anti-personnel mines nationwide, a figure that was eventually increased to 178,751 as the de-mining efforts began during the 1990s (García & Chau, 2008). Located on land that was returning to uses such as farming, grazing animals, and foraging for fuel wood, these mines took a terrible toll on the civilian population both during and after the war, killing and maiming thousands nationwide.

But in Sabana Grande the tragedy of war and of lost limbs and livelihoods became the prelude to a story of recovery, rebirth, and resilience. This adversity served as the prelude to a community transformation that can provide an example for development at a moment in human history when it is clear that the old way of doing things will not serve us well in the face of climate change and unprecedented inequality.

"Cuando llegó la luz": Renewable Energy in a Time of Renewal

The citizens of Sabana Grande have been the principal agents of their community's and their own personal transformations over the past 20 years. A collective of students at the National Engineering University of Nicaragua interested in alternative energy technology, however, planted the seeds of transformation in 1996. With the support and guidance of Professor Susan Kinne (who has continued as an adviser for the sustainable development work ever since), they began exploring alternative energy technologies that would be appropriate for Nicaragua. Believing that their work would help in Nicaragua's rebirth from the ashes of years of conflict and privation they called themselves Grupo Fénix, named after the mythical phoenix bird. Within a year, Grupo Fénix and the UNI hosted the first of what became annual alternative energy fairs in Managua (Kinne & Komp 2001, Botica, 2015).

In 1998 the UNI formalized the students' experiments with renewable energy, creating the Alternative Energy Sources Program (PFAE); Grupo Fénix became a non-profit branch of PFAE. When the Falls Brook Centre of New Brunswick and the Canadian International Development Agency were looking for collaborators for a project to help rehabilitate land mine victims, Grupo Fénix was well-positioned to become the on-the-ground partner. This collaboration with the Falls Brook Centre allowed Grupo Fénix to expand its community partnerships into rural areas of

Nicaragua, leading eventually to being based in Sabana Grande. The initial project trained land mine victims in the fabrication, installation, and maintenance of solar panels in areas of northern Nicaragua without access to electricity from conventional sources (Kinne & Komp, 2001, Krukenberg, 2015). Two Sabana Grande natives, Marco Antonio Pérez and Mauro Antonio Pérez, formed part of the core team in northern Nicaragua, and by the turn of the millennium, a solar panel fabrication workshop had been constructed on Marco's property in the village. Marco recalled those first years:

> I started going out to install systems even with my disability. We went out sometimes on horseback...well, it is a long story that at times was sad for me, having to walk in mountains. But I liked it a lot because I...was more familiar with the rural parts where there was no light and so on. Systems were installed in the community centers—a health post, a seed bank, houses, even in some rural churches. We installed several systems and the people were scared, but we showed it is possible and so on. It was all very novel, very impressive. (Smith, 2017)

As Mauro's father Nicasio related to Eric Fedus,[4] before the arrival of these initiatives, the vast majority of the village was without electricity. "Dark, totally dark," he said. "When you [foreign guests and collaborators from the outside] began to visit, there was no light" (Fedus, 2017). It is revealing that when members of the community talk about the arrival of electricity to the community they use the word *luz*: "cuando llegó la luz". "When light arrived," would be the literal translation; it is clear the degree to which electricity represented literal enlightenment. With the arrival of Grupo Fénix, for the first time dozens of families had electrical power for illumination and small appliances. Reflecting on that initial impact of solar panels in the community, Marco Antonio said that "to see light in a place where there was no light, it changed the life of people completely...a big, big, big impact" (Smith, 2017).

Water and Earth: Fundamental Elements of Sustainability

At around the same time foreign aid from the European Union, Canada, and other NGO's helped fund the installation of infrastructure that was equally life-transforming: drilled wells. In the time before 2000, when the first well was drilled, collecting enough water for household needs was an ordeal, especially for women. The following are comments made at a local history roundtable focusing on the time before organizing in the community began: "We had to wait many hours to obtain one bucket

[4] Eric Fedus has also worked with Grupo Fénix over the years and conducted a few interviews with community members in early 2017. He has shared them with the author.

of water" and "it fell to us to go far, to the creek or El Frayle [an artesian spring in the hills] to wash clothes and get water" (Smith 2017). When asked about how her relationship to water had evolved in recent years, Norma González, a 52 year old who now runs a small *pulpería* in the community said that before

> we did not have water, there was no water and now we have the communal wells in truth we always have to be carrying buckets and traveling with it but it is easy now. Not before. Before we went up the hill and we hoped that we would pick up the little water to be able to bring it to the house. I would bring back one [container—for cooking and drinking] and then return and wait for another, another little bit of water for the house. (Smith, 2017)

There was not much potable water when she was young, Vidalia Pérez said, remembering the false hope of an attempt to drill a well in the 1980s. "They drilled a well with a machine nearby, but it didn't work, the water came out tasting bad, so they did nothing. We continued hauling water from a long way away, no rest" (Smith, 2017).

The history of the community's relationship with water is more extensive (and existential) than just access to water for household uses, of course. As in so many places on earth—perhaps, really, *everywhere* on earth—water dictates life. When there is too little, hunger can follow. When there is too much, catastrophe. Almost twenty years after Hurricane Mitch devastated much of Nicaragua and Honduras (National Climate Data Center, 1999), the specter of what water can do when the rain comes down in torrents for days on end is still fresh in people's minds. "When this disaster happened all our trees were knocked down and not only ours but those in other watersheds...the fruit trees, mangoes, avocados," remembered Mauro López, sweeping his arms to gesture at the hillsides all around his house. "All of our resources that were part of the watershed died" (Smith 2017). Juan López's eyes widened when I asked him about the hurricane. "Look," he said, also gesturing at the hills that surround the village. "Landslides, there were collapses [of hillsides] so the streams were flooded, the crops were lost, all crops were lost. It was quite painful for us, everyone, because everyone, we all fled... They took refuge there in the school... The fear here was that because these houses are made of adobe that they would come apart. It was dangerous inside and would be better to leave, even if one gets wet and we did not want be inside" (Smith 2017). Houses derived from the earth stood no chance against liquefied earth sliding down mountainsides; there were apocalyptic consequences.[5]

[5] While the death toll from Hurricane Mitch in Nicaragua topped 3,800, more than 2,000 perished in the landslides on the Casita Volcano alone (Moore, 1998).

"Oh, I remember it," recounted Reyna Lopez, with tears forming in her eyes. She carries the trauma with her, since it amplified the suffering she was already experiencing due to losing a child:

> We lived...we lived in the hills where there was a mudslide when the hurricane hit. I did not want to leave my house. When the hurricane had already [brought 3 days of rain] I remember that I was sick because I had lost a son at that time. But I never thought that our house was going to disappear. But the earth opened up and our house was destroyed. At that point we did not have food, the water took all crops because it was October [the height of the growing season]. We were left without land. We did not have anything because it damaged everything. (Smith, 2017)

Such trauma was widespread in Nicaragua in the aftermath of Mitch (Caldera, et al., 2001). Though no one explicitly mentioned anxiety about the prospect of another precipitation event of the magnitude of that hurricane, there is no question that the likelihood of such a storm afflicting the region has increased considerably as the climate changes (Scoccimarro, et al., 2017). Community members do recognize the need for building resilience in their land and water management and agricultural practices as the prospects for climate unpredictability and extreme climate events (both inundations and droughts) grow more likely. Studies have shown that farmers who used agro-ecological cropping methods suffered far less damage to their fields in the wake of Mitch (Altieri, et al., 2015, 878-79). Grupo Fénix has also facilitated efforts to cultivate maize and beans in Sabana Grande using agro-ecological methods, which include tree intercropping and reforestation. The costs of slash and burn agriculture have become clear to Hilario Martínez, one of the community members most involved in the agro-ecology work. "I want to see our community much more reforested than it is right now," he told me. And he sees the impact of working with the youth of the community at Solar Mountain, a kind of experiment station for agro-ecology. "We work with accessible materials from the community. We are an example in that we do not burn, we do not use chemicals. We make everything here and we harvest healthy food" (Smith, 2017). Members of the agro-ecology group of Grupo Fénix produce their own naturally derived botanical pesticides, utilize urine collected from dry latrines as fertilizer, and practice seed saving. That they carry out this work on a prominent plot of land in the center of the community insures that the results of these techniques are visible to community members and outside visitors alike.

Figures 3a & 3b. An ecological dry latrine (right) developed by Grupo Fénix designed to replace the pit latrines (left) in the community that are beginning to threaten groundwater, one of many challenges associated with water the community is confronting. Photo credit: Michael Smith

Holistic Sustainability: Toward a Regenerative Economy

Developing more sustainable ways of managing energy, land, and water in Sabana Grande has not only begun to build ecological resilience. These collaborations around renewable energy, agro-ecology, and micro-enterprise have also enhanced the community's social capital, especially with respect to empowering women. Individuals in the community have been learning skills and becoming empowered to share knowledge with others in and beyond the community. By the early 2000s, PFAE was experimenting with ways to continue (and even expand) the project beyond the life of the initial grant from the Falls Brook Centre. Community members now had practical knowledge of appropriate technology, and had begun to experiment with and adapt renewable energy on their own. In partnership with PFAE and Grupo Fénix, citizens of the community began to convert these skills and knowledge into an income-generating service by offering "hands on" learning opportunities to international visitors interested in renewable energy (and eventually other kinds of sustainable development projects). "Edutourism," as this exchange program came to be called, became both a source of funding for the community's ongoing work in sustainable development and nurtured collaborations that led to additional grant support (United Nations, 2018).

The members of the cooperative the Solar Women of Totogalpa (Las Mujeres Solares de Totogalpa) are emblematic of this kind of empowerment. Observing the

transformative power (literally and symbolically) of solar panels, a group of women in Sabana Grande began experimenting with solar cookers in 1999, eventually becoming a fully recognized cooperative in 2010. Since their formation, the entire community has acquired an international reputation due to the efforts of these women (Botica, 2015, Farhar, Osnes, & Lowry, 2015, Krukenberg, 2015). In nearly 20 years of sustainable development initiatives, the Solar Women have seen their social and political capital amplified in ways that have benefitted the entire community and that serve as an inspiration for others. Their efforts have led to recognition by numerous international agencies, including the 2008 United Nations SEED Award and 2017 SEED-sponsored Hogan Lovells Community Solar Innovation Award. In a wonderfully organic way, the community of Sabana Grande has made considerable progress toward several of the Sustainable Development Goals, with the Solar Women leading the way.

And as with the other changes in Sabana Grande, these shifts in the role of women in the community have happened quickly. In the course of a workshop about the recent history of Sabana Grande, members of the Solar Women responded in small groups to questions about how life had changed in Sabana Grande since the arrival of Grupo Fénix.[6] They expressed over and over how at the end of the last century, far less than a generation ago, their sense of agency was confined to domestic affairs. Again and again they used the word *tímida* to characterize both themselves and the community. As we have already seen, daily life was defined by the relentless manual labor expected of women, from rising before dawn to fetch water from the single spring or to mill maize by hand, to cooking for hours a day in smoke-filled kitchens, to selling tomatoes by the side of the road, to leaving the community for weeks at a time to harvest coffee. Tasked with summarizing the conversation among workshop participants, Jennifer, the youngest member of the cooperative, said: "We have moved forward with training. We now have solar electricity. Our lives have changed with the technical knowledge we have acquired through workshops about alternative energy, through volunteers who have come to the community for exchanges about solar energy and agriculture." As a result, she added, there is "greater confidence in ourselves" and "higher self-esteem" (Smith, 2017).

[6] The five-hour workshop in 20 October 2017 was facilitated by the author, Oscar Sánchez López (program assistant for Grupo Fénix), Yerill Tórrez (Director of Community Development, Grupo Fénix), and Kristen Brennan.

Figure 4. Two women from Las Mujeres Solares teach an international visitor how to construct a solar cooker, one of the many ways Grupo Fénix collaborations embody novel approaches to sustainable development. Photo credit Susan Kinne.

In both the workshop and in individual interviews, women (and many of the men as well) consistently evinced a profound understanding that courageous and tenacious resilience through troubling and tumultuous times defined their personal histories, their families' histories, and their community's history. But the collaborations with each other and with people from beyond the community that had begun around the turn of the century had been empowering in a way that had permanently established a "before and after" dynamic in their perception of themselves and the community. Rumalda López embodies this transformation perhaps better than anyone else. Now in her sixties, Rumalda was born and raised in Sabana Grande. She remembers her childhood, youth, and young adulthood as a time of being "very poor," with "few houses" and no opportunities for formal education unless you had disposable income. As a result, Rumalda never went to school and to this day cannot read or write. She has nonetheless emerged as a leader, proudly introducing herself as "coordinator of the solar ovens...and also coordinator of the improved stoves" (the latter an initiative to build efficient home cooking stoves that use thirty percent of the wood in the community) (Madres de la Tierra, 2012). Rumalda often notes that before the arrival of Grupo Fénix in Sabana Grande, they did not recognize the power of collective action. "We were not very organized," she says, echoing a sentiment many others have expressed (Fedus, 2017). "But once organized we became a cooperative and a sub-group within Grupo Fénix."

Reyna López, who is in her late 40s and also a founding member of the Solar Women cooperative, described the grinding poverty of domestic labor and coffee harvesting in the years before the projects in the community began, and of making

petates (palm leaf bedrolls) to sell for pennies on the streets of Ocotal, the nearest city. Tears came to her eyes as she remembered. "So many big changes since," she said. "And the community has also experienced this change, not just the Solar Women...today the whole community...with solar systems, solar ovens, eco-stoves." Reyna noted how her energies can now be directed toward organizational and community development instead of mere survival, "working united to generate even more opportunities in the community" (Smith, 2017). Oscar Sánchez, a young man who grew up in the community and now works for Grupo Fénix, has lived the transformations of the past 15 years and can see a difference in the general outlook of the residents. "I think that many people are very positive and they have that openness to learn new things," he said. The "ability to communicate with others, with people from outside is something that is very recognizable...and I think is something that is different from other communities" (Smith, 2017).

The foregoing snapshot of a rural Nicaraguan community that has experienced a rapid social and material transformation suggests that the most durable sustainable future in Latin America will be grounded in local knowledge and initiative, with trans-local partners contributing in a reciprocal way. Sustainability will be dynamic, and will be most meaningful when it involves the systems that address the most elemental human needs: food, water, and energy. Beyond this, the recent history of Sabana Grande also shows that empowering women must be central to any vision of a sustainable future. Latin America is, of course, a vast cultural and geographical terrain. The sustainable development achievements in Sabana Grande were forged in historical, geographical, and cultural conditions that are particular to that place. Nonetheless, the ingredients of collective community action and the reaffirmation of traditional practices are present in many places. The "post-extractivist" ethos of the *buen vivir* movement that has emerged in South America (Gudynas, 2011, Acosta, 2017) has much in common with the sustainable practices being explored in Sabana Grande, and demonstrates that Sabana Grande's biocentric approach to community development and resilience might well be one of the principal paths to a sustainable future in the region.

Works Cited

24 Hours of Reality. 2017. [webcast program]: https://www.climaterealityproject.org/video/24-hours-reality-2017-it-takes-solar-village-nicaragua

Acosta, Alberto. 2017. "Post-extractivism: From discourse to practice—reflections for action." In Gilles Carbonnier, Humberto Campodónico, & Sergio Vázquez (eds.), *Alternative Pathways to Sustainable Development: Lessons from Latin America*. 77-102. Leiden, Boston: Brill. Retrieved from http://www.jstor.org/stable/10.1163/j.ctt1w76w3t.12

Altieri, Miguel, Nicholls, Clara., Henao, Alejandro. et al. 2015. "Agroecology and the design of climate change-resilient farming systems," *Agronomy for Sustainable Development* 35: 869-90.

Botica Sevilla, Gemma. 2015. *Mujeres rurales ante el reto del desarrollo sostenible. Análisis crítico de la experiencia de la Cooperativa Multisectorial "Mujeres Solares de Totogalpa"—COOMUSOT (Nicaragua)*. M.A. Universitat Politécnica de Valencia.

Caldera, T., Palma, L., Penayo, U. et al. 2001. "Psychological impact of the hurricane Mitch in Nicaragua in a one-year perspective," *Social Psychiatry and Psychiatric Epidemiology* 36.3: 108-14.

Carmack, Robert. 2002. "Historia prehispánico de los Chorotega de Nicaragua", *Revista de historia* 14: 13-20.

CIERA-MIDINRA. 1984. *Nicaragua:* y *por eso defendemos la frontera—historia agraria de las Segovias Occidentales.* Managua: Centro de Investigaciones y Estudios de la Reforma Agraria.

Cronon, William. "A place for stories: Nature, history, and narrative," *Journal of American History* 78(4): 1347-1376.

Crosby, Alfred. 1972. *The Columbian Exchange: Biological and Cultural Consequences of 1492*. Westport, Conn.: Greenwood.

Denevan, William. 1961. *The Upland Pine Forests of Nicaragua: A Study in Cultural Plant Geography*. Berkeley: University of California Press.

Envío. 1989. "Nicaraguan Environment: A Legacy of Destruction," *Envío* November: 100. https://www.envio.org.ni/articulo/2756

Farhar, Barbara., Osnes, Beth, and Lowry, Elizabeth. 2015. "Energy and gender." In Antoine Halff, Benjamin Sovacool, and Jon Rozhon. *Energy Poverty*. Oxford: Oxford University Press. 152-79.

Fedus, Eric. and López, Rumalda. 2017. Oral History Interview.

Fedus, Eric. and Pérez, Nicasio. 2017. Oral History Interview.

Field, Christopher, Barros, Vicinte., Stocker, Thomas., et al. 2012. *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*. 1st ed. New York: United Nations.

FAO. 2012. *Estudio de caracterización del Corredor Seco Centroamericano*. New York: United Nations.

García, Johanna and Chau, Erika Estrada. 2008. "A year of advancements and accomplishments," *Journal of Conventional Weapons Destruction* 13: 19-21.

Gourdji, Sharon, Läderach, Peter, Valle, Armando, et al. 2015. "Historical climate trends, deforestation, and maize and bean yields in Nicaragua," *Agricultural and Forest Meteorology*, 200: 270-281.

Gudyna, Eduardo. 2011. "*Buen vivir*: Today's Tomorrow," *Development* 54(4): 441-47.

Hawken, Paul, et al. 2017. *Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming*. New York.

Hirshon, Sheryl. and Butler, Judy. 1983. *And Also Teach Them to Read*. Westport, Conn.: L. Hill.

Historia del Frayle. 2009. [Manuscript] Grupo Fénix Archives. Sabana Grande, Nicaragua.

Horton, Lynn. 1999. *Peasants in Arms: War and Peace in the Mountains of Nicaragua*. Athens, OH: Ohio University Press.

Incer Barquero, Jaime. 1985. *Toponímias indígenas de Nicaragua*. San José: Libro Libre.

Karlsson, Rasmus. 2016. "Three metaphors for sustainability in the Anthropocene," *Anthropocene Review* 3(1): 23–32.

Kinne, Susan and Komp, Richard. 2001. "A Catalyst for Growth: The Work of Grupo Fénix in Nicaragua." *Refocus* 2(1): 33-35.

Kreft, S., Eckstein, D. and Melchior, I. 2017. "Global Climate Risk Index 2017: Who Suffers Most from Extreme Weather Events?' www.germanwatch.org. Accessed 1 June 2018.

Kruckenberg, Lena J. 2015. "North–South partnerships for sustainable energy: Knowledge–power relations in development assistance for renewable energy," *Energy for Sustainable Development*, 29: 91-99.

Kuszmar, Katie. 2014. "Long live the king: Storytelling the value of chinook salmon fishing in the Monterey Bay." https://mbstp.org/wp-

content/uploads/2014/12/Long-Live-the-King-Final-Draft-for-MBSTP.pdf. Accessed 7 August 2018.

Levi, Giovanni. 1993. "On Microhistory," *Critical Inquiry* 20(1): 10-35.

MARENA. 2015. Apoyo a la preparación de la estrategia para la reducción de emisiones por deforestación y degradación forestal. Managua. Online. Available at: http://enderedd.sinia.net.ni/Docs/Doc_PaqueteR/6.%20Estrategia_Comunicacion_ENDEREDD.pdf. Accessed 20 June 2018.

Martin, Rachel, et al. 2006. "Design of solar ovens for use in the developing world," *International Journal for Service Learning in Engineering* 2(1): 78-91.

Moore, Molly. 1998. "Lost to the Earth," *The Washington Post*, 6 November 1998. A01.

Moore, Steven. ed. 2016. *Pragmatic Sustainability: Dispositions for Critical Adaptation.* 2nd ed. Abingdon: Routledge.

Municipio de Totogalpa. 2017. "Caracterización Municipal de Totogalpa".

National Climate Data Center. 1999. "Mitch: The deadliest hurricane since 1780." http://lwf.ncdc.noaa.gov/oa/reports/mitch/mitch.html. Accessed 10 August 2018.

OXFAM. 2012. "Desafíos desde la seguridad alimentaria y nutricional en Nicaragua". https://www.oxfamblogs.org/lac/wp-content/uploads/2013/05/Desafíos-desde-la-seguridad-alimentaria-y-nutricional-en-Nicaragua.pdf.

Reti, Irene. 2010. "Cultivating a movement." https://library.ucsc.edu/reg-hist/cultiv/home. Accessed 7 August 2018.

Sandwell. R.W. 2009. "History as experiment: Microhistory and Environmental History." *Method and Meaning in Canadian Environmental History*. Alan MacEachern and William J. Turkel, eds. Toronto. 124-38.

Scoccimarro, Enrico. et al. 2017. "Tropical cyclone rainfall changes in a warmer climate." In Jennifer Collins and Kevin Walsh (eds). *Hurricanes and Climate Change*. New York: Springer. 243-255.

Smith, Michael and González, Norma. 2017. Oral History Interview.

_____ and López Blandón, Manuel. 2017. Oral History Interview.

_____ and López, María Eugenia. 2017 Oral History Interview.

_____ and López, Juan. 2017 Oral History Interview.

_____ and López, Mauro. 2017. Oral History Interview.

_____ and López, Oscar. 2017. Oral History Interview

_____ and López, Reyna. 2017. Oral History Interview

_____ and Martínez, Hilario. 2017. Oral History Interview

_____ and Martínez, J. 2017. Oral History Interview

_____ and Pastrana, Eddy. 2017. Oral History Interview

_____ and Pérez, Marco. 2017. Oral History Interview

_____ and Pérez, Vidalia. 2017. Oral History Interview

Twells, Alison. 2008. Community history. https://www.history.ac.uk/makinghistory/resources/articles/community_history.html Accessed 1 June 2018.

United States Congress. 1962. Senate, Committee on Public Works. *Report on Progress on the Inter-American Highway*. Washington, D.C.: United States Printing Office.

Valenzuela, Orlando. 2011. *Días de lluvia y sol*. Managua: La Prensa.

Walter, Knut. 1993. *The Regime of Anastasio Somoza, 1936-1956*. Chapel Hill: University of North Carolina Press.