

## *The Future of Sustainability as a Product of the Present: Lessons from Modern Food in Ecuador*

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### **1. Introduction: agricultural modernization as a socio-technical project**

Over the last half-century, Ecuador's food –its production, circulation, procurement, and consumption– has undergone unprecedented change as a result of a highly creative, ambitious socio-technical project: agricultural modernization (Sherwood et al., 2013), linked with the arrival and expansion of large grocery store chains and the introduction of industrially processed foods and food stuffs (Reardon and Berdegúe, 2002). According to Van der Ploeg (2008), the foundation of the modernization movement is an emerging class of technicians, scientists, and industrialists organized around the belief that a better future can be achieved through: commodification of food, intermediation of social relationships through currency and financial systems, the social and geographic distancing of markets, and dependence on specialized knowledge and technology. Carolan (2011) explains how this 'expert system' has come to dominate present-day institutions the world over, profoundly influencing ways of knowing and being with food. Here, we summarize the activity of this widely established and influential socio-technical regime as 'modern food'.

Interested in finding existing examples of sustainability in food and agriculture that could serve as inspiration for policy recommendations, in this article we take a look at the long-term, diverse experiences of rural families

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in the northern, highland province of Carchi. At the upstart of agrarian reform, Carchi was identified as a regional “model of agricultural modernization”, where rural families obtained access to relatively fertile land and where there was essentially compliance with expert-devised planting regimes and market integration (Cosse, 1980; Barsky, 1988). Following two decades of considerable economic success, over the last thirty years modernization has intensified and diversified, even though it has been linked with harmful consequences in human health, production and the environment (Crissman et al. 1998; Yanggen et al. 2003; Sherwood 2009).

The socio-technical developments in agriculture and food in Carchi have not been the simple outcome of a series of cost-benefit analyses (Sherwood and Paredes, 2010). Likewise, families have not acted alone, independently or in isolation (Paredes, 2010). Instead, the institutionalization of modern food arguably has been the product of the activity of people operating as individuals and in groups in response to unfolding preferences, creativities and contingencies. Admittedly, this largely self-organizing activity can lead to divergent and even contradictory human health, economic and environmental outcomes, such as the degradation of resources, self-poisoning by pesticides or overweight/obesity, and financial ruin. Nevertheless, in some cases families have managed to utilize modernization in positive ways, thereby “surviving to farm another day” (Paredes, 2010). Here, we strategically mine the diverse experiences of families for ‘endogenous potential’ – those experiences where people manage to advance their livelihood objectives to their immediate and long-term advantage. We argue that unique agrifood styles represent an existent, yet neglected resource for addressing pressing concerns in sustainable food production and health.

## **2. Methodology**

As established in Schatzki (2002), practice can be viewed as a “site of the social”, where people seamlessly resolve the tensions between possibilities and desirabilities presented by everyday life, in this case around the endless pursuit of our primary source of energy and sustenance: food. To explain the arrival and appropriation of modern food in Ecuador, we begin with the perspective that policy –understood as public ‘course of action’– is not a mere function of formalized bureaucratic legislative

processes, but also the outcome of local agency that may or may not be in-line with explicit government purposes. Based on Van der Ploeg's (1993, 1994) concept of farming styles, we draw on mixed quantitative and qualitative means to describe and explain family-level heterogeneity in food production and consumption as a means of shedding light on the diverse outcomes of modernization, with an eye towards those family-level experiences with high potential for strengthening the sustainability of agriculture and food.

This study builds on multi-disciplinary research and interventions involving Ecuador's National Agricultural Research Institute, the International Potato Center (Peru), the University of Toronto (Canada), FLACSO (Ecuador), Oregon State University (USA), and Wageningen University (Netherlands), among other entities. Since 1998, Sherwood and Paredes have been conducting action-oriented research with rural families in Carchi. In 2013, a team of researchers from FLACSO, University of Delaware, Oregon State University, Wageningen University and HealthBridge (Canada), joined this initiative to conduct complementary ethnographic research on family nutrition. This research involved twenty-four hour dietary recalls (also noting home-produced ingredients) with eighty-nine mothers in two highland villages. In the spring and summer of 2013, ethnographers conducted participant observation and semi-structured interviews during home stays between three and seven days per family. Twenty-seven mothers were included in this subset, all of whom provided informed consent, approved by the Universidad San Francisco de Quito Bioethics Committee and Oregon State University's Institutional Review Board.

### **3. Carchi: model of modernization**

In this article, modern food begins with the arrival of industrial era science in the mid-twentieth century, particularly as promoted through land reform and agriculture modernization advanced through development aid, technical assistance, and global marketing (Flora and Flora, 1989). In the later half of the 20<sup>th</sup> Century in Carchi, land reform ended the era of the hacienda and provided a growing number of small-scale farmers with land ownership and high expectations for the future (Barsky, 1984). The Ecuadorian state formally instituted modernization through the Agricultural

and Colonization Law of 1964, giving way to the progressive privatization of land, water, seeds, and other natural resources.<sup>1</sup> Modernization spirited in the arrival of a new class of ingenieros or ‘technicians’ and their state-supported agricultural and urbanization intensification projects built upon externally based, expert knowledge and technology (Costales and Costales, 1971; Cosse, 1980). Generally speaking, the fertile soil of the valleys remained in the hands of large landowners, although the haciendas diminished in size. A new class of smallholder family farmers was relegated to less fertile mountainsides, where the land is arable, but the slopes make it difficult to work and prone to erosion.

Given its rich natural resource base, a mostly literate rural population and communication infrastructure for market access in both Ecuador and Colombia, Carchi was identified as potentially one of the most productive agricultural regions in the Andes (Crissman et al., 1988). The extreme conditions of the Andean highlands (most of the agricultural land is above 2500 masl), however, limits commercial options to the production of potato and milk and beef cattle (Pumisacho and Sherwood, 2002). In the 1960s, rural development experts and representatives from the Ecuadorian government focused on Carchi as a “model” of agricultural modernization (Cosse, 1980). Potato production in Carchi flourished during the 1970s, further developing until it dominated the landscape and became the main source of income for the province (Barsky, 1984). In the early 1990s, Carchi had over 16,700 hectares dedicated to potato production, which produced over 198,000 mt, (approximately half of Ecuador’s national potato harvest), using less than one fourth of the national area sown to potato (Herrera et al. 1999).

Over time, however, modernized potato production in Carchi began to show its frailty. Production based on a single crop, the use of machinery to prepare the soil along with the use of fertilizers and synthetic insecticides intensified dramatically, bringing an end to centuries of diversified production and periods of fallow land (Sherwood, 2009). Eventually, market forces reduced potato biodiversity in farms from an average of eight varieties per hectare at the start of land reform to less than two varieties per hectare 20 years later. By the early 1990s, the majority of farmers produced a single variety: Superchola. Due to soil erosion rates of nearly 80mt/hectare as a result of the introduction of the disk plough (Valverde et

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<sup>1</sup> Congressional Registry No 297, dated 23 July 1964

al. 2001), farmers doubled their use of fertilizers simply to maintain the previous production average (Sherwood, 2009). At the same time, rural families suffered adverse health effects resulting from their continuous exposure to insecticides (Cole et al. 2002), which had a negative impact on the economy of farms (Antle et al. 1994).

In the early 1990s a growing number of rural families became indebted and abandoned potato production (Crissman et al., 1998). During the late 1990s, real prices of consumables increased - mainly as a result of the adoption of the US dollar as the national currency, and the market prices for potatoes became increasingly volatile, with a general tendency to decline (An, 2004). As a result of the adoption of the dollar as the national currency in 2001, the price of external consumables increased sharply (300% in regards to agrochemicals), followed by an increase in monthly variability of the price per crop (Sherwood, 2009). Studies in the early 1990s show that farmers in Carchi lost money on most of their crops -- from 43% in 1991-1992 (Crissman et al., 1998) to nearly 60% in 2004 (Paredes, 2010).

In short, while modernization in Carchi brought families an increase in production and opportunities for accumulation in the short term, over time it destabilized agricultural ecosystems and worked against rural economies. After the initial growth brought by modernization, the frailty of natural resources and the volatility of market prices in distant commercial markets led to a drop in the profitability and sustainability of production. According to data from the III National Census from 2002, the total area planted annually with potatoes in Carchi dropped from a high of 15,000 hectares to 7,000 hectares. Thirty-five years after integration into the markets and modernization, a considerable number of rural families found themselves in a growing crisis. This led to many people abandoning agriculture and migrating to cities throughout the country and abroad.

#### **4. Nutritional transition**

Ecuadorian diets have also experienced massive shifts since the Incan conquest. World cuisines in stable agrarian cultures are based on a starchy core complemented by fringe foods (Mintz and Schlettwein-Gsell, 2001). The starchy core of Andean cuisine was developed from wild species into thousands of varieties of potato and other tubers (Johns, 1990). Quinoa,

amaranth and maize were supplemented by other grains during the Spanish conquest, and native camelids were practically replaced by horses, pigs, sheep, goats, and chickens. These introduced species were gradually indigenized into highland diets.

Dietary shifts accelerated in the latter half of the twentieth century as technological innovations allowed for the relatively inexpensive production and distribution of novel foods. Alongside traditional foods, processed foods such as refined sugar and grains (white rice, bread, and pasta) were incorporated into local diets and stood as symbols of desired whiteness (Weismantel, 1988). The production of Ecuadorian wheat declined as the consumption of wheat-based products grew and cheap imports from Canada and US flooded the market. In 1965 Ecuadorians produced 56% of the wheat they consumed and in 2000 that figure had dropped to 3.9% (Peltre-Wurtz, 2004, p. 65). The National Rice Program increased rice production on the coast five times between 1970 and 2000. Despite the minimal amount of protein in rice, it provides an impressive 19.2% of the dietary protein on a national level, followed by protein-rich chicken which provides 18.2% (Freire et al., 2013).

More recently, what Monteiro et al. (2012) call “ultra-processed” foods have become normalized. These are formed almost entirely of industrialized products and, although they may imitate a food’s appearance, generally contain no or minimal whole foods. One of their major selling points is that they are fast and easy to prepare and eat. However, levels of salt, sugar and fat in ultra-processed foods far outstrip levels in whole foods, and Monteiro et al. (2012) argue that their energy density, hyper-palatability, and nutritional imbalance damage human health. Moreover, the lifestyle that is aggressively advertised through these foods displaces family meals and ultimately decreases popular control over food. In Quito and Guayaquil, the two largest cities in Ecuador, Freire et al. (2013, p. 104) found that 70% food and drink advertisements were for “unhealthy” comestibles.

Two major contributors to the nutritional transition are supermarkets and fast food restaurants (Hawkes 2007). The number of supermarkets in Ecuador almost doubled in six years, from 85 in 1998 to about 160 in 2004, and the top two chains more than doubled their sales in that period (Zamora, 2004). Fast food restaurants have been closely associated with obesity in high-income countries as they make hyper-palatable, ultra-processed food available at a very cheap price. They are often the only food available in poor neighborhoods. This is not the case in Ecuador, where prices at transnational

fast food chains are higher than standard restaurants that serve home-cooked food, making them popular among wealthy urbanites. Rates of overweight and obesity in Ecuador are highest in urban areas, and among children under five, they have increased from 4.2% in 1986 to 8.6% in 2012 (Freire et al., 2013, p. 32; Abril et al., 2013). These trends reflect the global two-fold increase in obesity since 1980 (WHO 2014) and suggest that many elements of the current food system are unable to sustain human health.

From an economic point of view, ultra-processed foods in places such as Ecuador shift the benefit away from producers of whole foods to factory owners who are part of large transnational conglomerates (Reardon and Berdegúe, 2002). Industries in charge of packaging, transporting and advertising these ‘foods’ capture a much greater portion of the price than farmers. Furthermore, whole foods destined for processing must be uniform and available in large quantities, giving advantage to large agribusinesses using monocultures instead of smallholders (Carolan, 2013, p. 113). These impacts on human health, land, biodiversity, and rural economies point to ways in which modern food is not sustainable.

## **5. Heterogeneities in food production and consumption**

Food regimes are continuously in flux and sometimes the pathway forward seems to be behind us. Revisiting past practices, however, is never entirely the same. Furthermore, people don’t simply follow the footsteps of others. In agricultural production and food consumption, practices endlessly converge and diverge based on a multiplicity of conditions, creativities, and serendipities.

### *Farming styles*

Paredes (2010) collected and analyzed quantitative and qualitative data to explain heterogeneity in production patterns. Families that obtained lands between 1930 and 1950, prior to land reform, benefited from primary forests that provided them with resources (particularly charcoal production) to consolidate their own agricultural style without the pressure to become part of the market. Families that obtained land following the agricultural reform in the mid to late 1970s acquired a financial debt with the state. Consequently, their properties had to be rapidly shifted into commercial production to service debts. This resulted in significant pressure to adopt

new practices as a quick means of increasing production by area. Paredes identified four unique categories (Table 1): Tradicionales (traditional) from Seguros (safe) farmers that emerged from the first generation and Arriezgados (Risk Takers) from Experimentadores (experimentalists) that emerged in the second generation.

*Tab. 1 – Potato farming style characteristics in Carchi*

Criteria	Tradicionales	Seguros	Arriezgados	Experimentadores
Rationality	High investment, high return	Low investment, low return	High investment, variable return	Low investment, high return
The driving 'model' of production	Traditional and modern practices	Tries to avoid owner-employee relationships	Modern hacienda production. Limit labor.	Less costly options through experimentation
Main decision making base	Continuous crop monitoring	Cost reduction	Technicians and commercial shops	Experimentation and close crop monitoring
Relevant technologies for potato production	Wachu rozado Numerous pesticides and fertilizer applications	Full tillage. Fewer pesticide applications. High potato seed per hectare	Mechanized full tillage. High quantities of fertilizer and pesticide	Rotations and organic matter incorporation. High use of foliar fertilizer and cheap pesticides

Regarding sustainability, Paredes (2010) found two main features that differentiated the farming styles: the use of highly toxic pesticides and the wachu rozado potato planting system.

Highly toxic pesticides: It has been determined that the use of highly toxic pesticides negatively affects human health and the health of the ecosystem, so it is instructive to see how this technology has been adapted by Carchi farmers. There is a growing sense that the health of farm families has suffered due to pesticide exposure. One farmer noted, “One of my neighbors works alongside her husband while spraying pesticides. I think their children are affected because they always get sick with infections and pneumonia” (Paredes, 2010, p. 153).

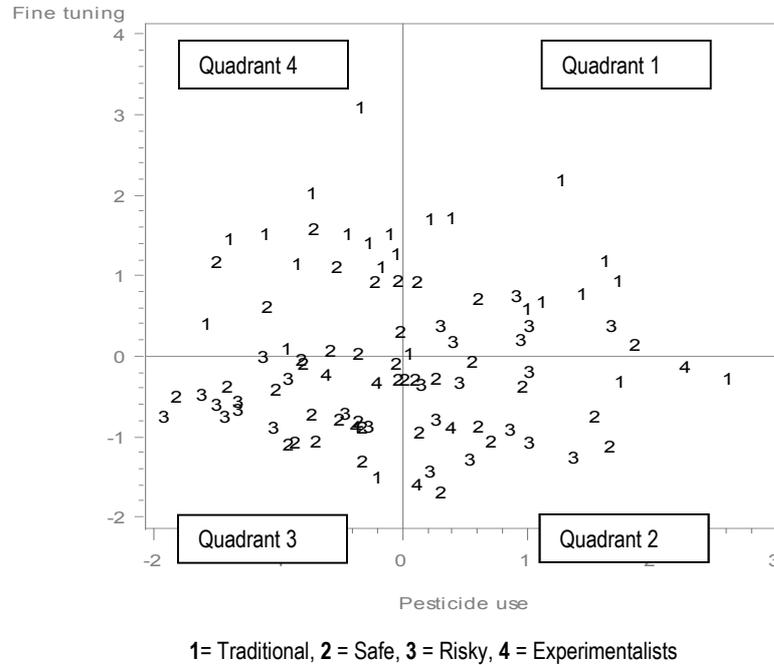
Tradicionales had the most efficient pattern of highly toxic carbamate use, usually applying the lowest recommended dosage and only after monitoring their crops. Experimentadores made excessive use of carbamates, applying higher quantities than recommended and applying it more often. This increases both their costs per hectare and their exposure, negatively affecting their economic sustainability and their health. Acceptable risk is an idea that must be interrogated in agrifood practices.

Farmers who apply pesticides themselves (such as Tradicionales and Se-Seguros), closely monitor whether their crops need the application or not. They have a different way of evaluating “acceptable risk” from Arriegados who hire labourers to apply pesticides on a calendar basis.

Figure 1 is a scatter plot of farmers’ scores in factors “pesticide use” and “fine-tuning”. The fine-tuning used by farmers in quadrant four leads to the most efficient use of pesticides. It is apparent that 100% of farmers in quadrant four belong to the styles of Tradicionales (number 1, 50% of all the farmers in this group) and Seguros (number 2, 24% of all the farmers in this group). Despite the slight differences between farmers in each quadrant in the variables yield and cost per hectare, farmers in quadrant four have the highest benefit per hectare. Farmers explained this mainly by their use of the wachu rozado potato planting system, described in the following section. These results show that in contrast with Arriegados, the production patterns of the Tradicionales and Seguros represent a promising scenario for agricultural policies. Based primarily on internal knowledge and technologies, these styles surpass the other production methods, and represent a sustainable opportunity for the future.

Farmers in all groups reported that people who were well fed and healthy had few problems with pesticides. Nutritionally, that was explained as eating fruits, vegetables and cheese and not just pasta, potatoes, and soda. Resistant people also were thought to be those who didn’t smoke or drink alcohol. On the other hand, it was easy to blame the victim of agrochemical poisoning as someone who abused his or her health prior to being exposed to pesticides. Even healthy children, however, were known to be at risk and were generally kept away when pesticides were being applied, but without proper storage of the chemicals and application equipment, Paredes heard of several small children who were poisoned. Some people saw the health problems as primarily psychosomatic and said that if you didn’t think about the harmful effects of pesticides, they didn’t exist. A pattern of thinking prevalent among Arriegados was that one’s body could become accustomed and even resistant to agrochemicals over time.

Fig. 1 – Scatter plot of the scores from farmers in factors “Pesticide use” and “Fine-tuning”



Some Tradicionales and Seguros have been intensifying resource-conserving agroecological techniques in order to reduce or eliminate highly toxic pesticides. The gardens of these farmers are very diverse. They prepare organic fertilizers and insecticides called bioles and grow a variety of tubers, grains, vegetables, fruits and medicinal plants. They monitor their crops and accomplish the necessary labor with the help of family members. Actually, a concern with their family’s health often motivates farmers to deviate from the technological norm. We met several people who use agrochemicals on the potatoes that they sell to the market but not in fields where they grow food for their families. In these fields they are also more likely to plant heritage breeds of potatoes and other crops that don’t have a clear market niche. Our collaborators talked about mashuas, potatoes, and mellocos of many different colors and tastes, which are no longer available. The heritage crops can be grown without the use of chemical fertilizers and pesticides and some, like the zanahoria blanca (*Arracacia xanthorrhiza*), react negatively to agrochemicals. Here is one agroecological farmer’s account of his change in practice:

Well, before we planted a lot of potatoes, five or six hectares, and for a while it was great for us. We thought that it was going to be good forever and we began to use more and more chemicals. One day we were applying pesticides because we had a problem with gusano blanco (Andean weevil) in the potatoes. We put on three very strong, powerful pesticides: Carbofuran, Oncol and another, Lindane, that was banned in the market in Ecuador, but we were able to get it in Colombia. We mixed them all together and just then some little birds flew to where we were applying the chemicals. In a few minutes they were dead... I already started to look for new alternatives to farm without poisons. Because, I said 'we're eating this and it's poison.' Bees that came to the flowers dropped dead immediately. So, I began to worry a lot and since then we began to change. I'm talking about twenty years ago when this idea came to me.

As reported in Barrera et al. (2001), some of these farmers have come together. They make organic fertilizers and pesticides as a group and they trade seeds and attend seed exchanges in the greater region.

Wachu rozado: The wachu rozado represents a pre-Colombian minimum tillage planting system for potatoes (Sherwood, 2009; Paredes, 2010). Research has shown that it prevents many pests from laying eggs in the ground (for instance the Andean weevil), providing at the same time green manure to the soil and controlling excess water that otherwise would promote fungal plant disease development (such as the common *Phytophthora infestans* in potatoes). Farmers mentioned that by using this system, not only did they avoid many applications of highly toxic pesticides and improve their soil but, potatoes grew free of mud and with a brilliant colour, which made the potatoes more desirable by middlemen and consumers in the market. Therefore, farmers using this system usually obtained a better price per quintal than the rest of farmers while conserving soil and controlling pests in a more sustainable way. Fifty-seven percent of farmers in quadrant four planted potatoes in the wachu rozado system, although this group only represented 23% of all the farmers in the research group.

### *Food consumption*

Scholars and activists have addressed the topic of sustainable food futures and the verdict seems to be that we can feed the world, but not by expanding the current dietary practices of wealthy nations (National Research Council, 2010; Nestle, 2000). Instead, sustainability depends on maintaining low dependency on meat and minimizing the amount of energy that goes into the production and distribution of food. In Carchi, families generally meet their protein needs through pulses and animal sourced

foods, such as dairy products and eggs, but not meat. Most people have not yet acquired a preference for ultra-processed foods.

The people of highland Carchi are known as potato eaters. In the twenty-four-hour dietary recalls we conducted, 100 percent of the women in one village and 97 percent in the other had eaten potatoes (Table 2). It was also the ingredient that most commonly came from home production (Table 3). Potatoes are served at almost every meal, often alongside rice, the second most common starch. Wheat flour (primarily made into tortillas), bread, and pasta were the third, fourth and fifth most common starches. Vegetables such as onions, cilantro and carrots are chopped very finely and used in small amounts for seasoning. Occasionally larger amounts of a single vegetable are used in soups. Purchased eggs and home-produced milk were the most common animal-source foods, though some home-produced eggs and store-bought milk were also consumed. Legumes were another prevalent nutrient-rich food, but conversations we had with residents later indicated that their consumption had dropped considerably. The most common meat was chicken, though it was mentioned only a quarter as often as eggs.

Traditional diets are tied to the land and to sacred and secular calendars. Women are generally the owners and caretakers of pigs and most kitchens have a bucket in the corner where food waste is deposited and later fed to the pigs. Pigs are raised in cycles to be slaughtered for baptisms, first communions, confirmations, graduations, weddings, and other life-cycle events. At graduation or confirmation time, slaughtered pigs can be seen hanging in doorways and sheds throughout the region. Whole families prepare food for the celebratory feast which contains very little industrially processed food.

In the twenty-four hour dietary recall, the number of ingredients consumed ranged from twelve to fifty-two; the number of meals from three to six and the number of home-grown foods from zero to fifteen. We sorted the ingredients into the following eight groups: meat, fruits and vegetables, grains and tubers, fats, eggs, dairy, legumes, and vitamin A-rich fruits and vegetables. The woman who reported twelve ingredients (María) covered five groups and the one who reported fifty-two (Lucía) covered six groups. Examining exactly what was eaten at what time reveals very different styles of eating. María drank a glass of Tang with bread at 9am. She had to skip lunch because she was working, but paused at 2pm to have a cola with bread. She had fava beans and soup for supper. The soup contained potatoes, milk, egg, onion, annatto and a seasoning packet. Lucía had coffee with sugar at 7:30am, along with a potato soup containing egg, onion, annatto and milk.

Accompanying that, she had a cooked egg and a homemade wheat tortilla. At 1pm she ate favas mashed with onions, salt, lard and annatto; potatoes, rice, and homemade naranjilla (*Solanum quitoense*) juice. At 5 she had coffee and tortillas as a snack and at 8pm she had potatoes and noodle soup made with onion, lard, milk and cilantro. Both women are married to agricultural laborers and reported that some of their ingredients (María – 3; Lucía – 10) came from home production, but Lucía’s schedule allows her more time to cook and eat. María seems to have already tipped into modern food, consuming bought bread instead of homemade tortillas, instant instead of homemade juice and processed seasoning packets in her soup. All these products save her time, but reduce the healthfulness of her diet.

We did ethnographic research with ten mothers with young children whose dietary recalls contained a high diversity of ingredients (fulfilling at least seven of the food categories). Several cited health problems in the family (diabetes, gastritis, cancer) as the reason that they try to provide a more diverse diet. Often this meant including more green vegetables and most of these families maintain a small garden (tended by the mothers or grandparents) with vegetables for home consumption. They do not use agrochemicals on these gardens. In fact, every family in this sub sample talked about how diets were healthier in the past because food was grown without chemicals. We observed several other consumption practices that reflect a resistance to modern food and the nutrition transition.

Cristina told us that her mother in law is 78 years old and still healthy after having 11 children. She remarked that nowadays people start getting old age sicknesses when they are only 30 years old. She started gardening because her children had some health issues and she thinks that improving their diet will make them healthier. She grows cabbage, broccoli, chard, onions, beets and cauliflower and shares with neighbors when the harvest is abundant. Her household is closely linked with that of her parents in law, who also raise guinea pigs and medicinal plants. Daily interaction with relatives with whom they gifted and traded food was common among this group.

Elsa explained that in the old days, they grew more favas, mellocos, ocas, barley, and wheat, and that nothing was sprayed. Her family loves to gather wild mustard greens that they call “carne verde” or “green meat” in recognition of its high nutritional content. They used to gather wild watercress as well, but they stopped when the village channeled open black water through the ditches where it grows. Gabi also grows a diverse garden, including onions, tomatoes, barley, peas, ocas, mellocos, and, of course, potatoes. Her idea of the good life is to have extra food that she can share with others who don’t have enough.

All residents generally incorporate moderate amounts of refined foods such as white bread, rice, pasta and sugar into their diets. The ultra-processed foods consumed in this sub-set of families are generally limited to seasoning packets for soups, sweetened yogurt drinks for complementary feeding of young children, and candy and chips for between meal snacks. Soft drinks occasionally enter the diet, but most participants understood that they should be avoided.

People in the area used to render the fat from their slaughtered pigs and use it judiciously throughout the year. Several people mentioned to us that they were advised by medical professionals to restrict their intake of pork fat. Oil palm lard provided an attractive alternative, standing in for modernity and costing very little. At the same time, cooking styles seemed to change. Rather than melting a small amount of pig fat in the pan to fry potatoes, people began veering towards deep fat frying, perhaps in imitation of TV commercials. Hydrogenated palm lard provides the most saturated fat to Ecuadorian diets nationwide (Freire et al., 2013, p. 53). Its extensive monocultures also have a tremendous ecological impact, as the growing plantations gobble up tropical forests at an alarming rate.<sup>2</sup> The tree was introduced to Ecuador in 1953 but the industrial production of oil palm lard didn't become popular until the 1970s. Danec, S.A. was the first Ecuadorian company to produce the lard and in a clever move to displace homegrown pig fat, called their product "Los 3 Chanchitos" or "The 3 Pigs." From 1993 to 2009, production grew 293%.<sup>3</sup> In addition to use in home cooking, palm oil is a major ingredient in processed foods.

We observed that the families in Carchi combined traditional and modern food to suit their families' needs. They tend to recognize what has negative influences on their health and their lands, and their knowledge of nutrition and food grows through peer networks, elders, and outside specialists such as doctors. While highland Carchi farmers have been on the cutting edge of agricultural modernization in Ecuador, the rural isolation of smallholder farmers in the province has slowed down the nutritional transition and consumption of ultra-processed food. Most food is still produced locally and supermarkets are only accessible in faraway cities. In this regard, their food practices represent diverse alternatives to the homogenizing and unsustainable influence of modern food.

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<sup>2</sup> In 2011, an estimated 240,000 hectares of African palms were under cultivation in Ecuador (<http://www.proecuadorchicago.org/#!vegetable-oil-c1bp2>).

<sup>3</sup> [http://agrytec.com/agricola/index.php?option=com\\_content&id=3468:palma-africana-en-el-ecuador&Itemid=43](http://agrytec.com/agricola/index.php?option=com_content&id=3468:palma-africana-en-el-ecuador&Itemid=43).

*Tab. 2 – Ingredients consumed by over 25% of the adult women in 24-hour dietary recalls. Numbers represent percent of women that reported having consumed each item.*

<b>Ingredient</b>	<b>Village 1 (n=35)</b>	<b>Ingredient</b>	<b>Village 2 (n=54)</b>
sugar	97%	sugar	100%
potato	97%	potato	100%
salt	97%	salt	98%
onion	89%	oil	91%
rice	86%	onion	89%
egg	71%	rice	78%
oil	69%	egg	70%
coffee	69%	coffee	67%
wheat flour	63%	milk	65%
milk	60%	cilantro	59%
cilantro	57%	wheat flour	44%
bread	57%	bread	41%
baking soda	51%	pasta	39%
lard	49%	Maggi (seasoning)	39%
cumin	40%	tomato	37%
pasta	37%	carrot	37%
lemon	29%	lemon	33%
blackberry	29%	butter	33%
fava bean	26%	baking soda	26%
butter	26%		
chicken	26%		

*Tab. 3 – Ingredients consumed that were reported to come from home production. Numbers represent number of adult women reporting each ingredient*

Ingredient	Village 1 (n=35)	Ingredient	Village 2 (n=54)
potato	32	potato	47
onion	19	onion	31
milk	16	milk	30
cilantro	12	cilantro	20
blackberry	10	egg	13
fava bean	8	blackberry	8
egg	3	lemon verbena tea	5
melloco	2	fava bean	4
cauliflower	1	chard	3
lemon verbena tea	1	chamomile tea	3
mint tea	1	cabbage	3
zunfo tea	1	carrot	1
		melloco	1
		oca	1
		dill	1
		marjoram tea	1
		mint tea	1
		valerian tea	1

## **6. Conclusion: heterogeneity and sustainability**

The establishment and diversification of agricultural modernization in Ecuador has generated at least three public health epidemics that place into question the productivity and sustainability of modern food: large-scale degradation of soils and biological resources, the intoxication of rural families due to pesticides, and overweight/obesity (Sherwood et al., 2013). The dangers of modern food have become generalized so that they are now a seamless part of the socio-technical landscape. None of these ‘externalities’ were possible prior to the agricultural reform and the reorganization of society around commercial markets, technology and expert knowledge.

Meanwhile, the harmful consequences of modern food are commonly described as unrelated events. It is no longer possible to blame a single farmer, pesticide salesperson or consumer. The blame must be placed on modern food production, circulation and consumption, of which we are all part. Initially, the abstraction regarding intoxication due to pesticides and environmental degradation had invisible effects, which were difficult to perceive and treat. Nevertheless, once research made these effects clear, for example, through quantitative measurements of neurological damage and loss of soil, a powerful class of stakeholders, which has grown around industrial agro-technologies, also kept them invisible. These stakeholders - scientists, agricultural researchers, extension agents, salespeople and officials from regulatory agencies- maneuvered, set up strategies, collaborated and conspired to influence public opinion and keep harmful technologies in the market (Sherwood and Paredes, 2014). Now that the connection between ultra-processed food and the obesity epidemic has been established, obesity is similarly becoming obfuscated as the product of an accident, rather than produced by modern food itself.

Despite the existence of such dominant tendencies, however, we found a wealth of diversity embedded in peoples' daily agrifood practices. Rural families in Carchi are not a passive, homogeneous group, simply victimized by market forces. Rather, they manage labor, inputs, and market interactions in richly diverse ways, generating heterogeneous production-consumption strategies leading to distinct patterns of socio-technical change. The manner in which farmers organize their practices in response to highly dynamic environmental changes, market situations or just individual flair ultimately is an expression of different family perceptions, values and preferences in the pursuit of 'good agriculture'. Similar creativity underlies family food consumption. Women respond to likes and dislikes, age and health restrictions when choosing what food to purchase and prepare. They gather information from older relatives as well as experts in the local health clinic, but are also influenced by commercial advertisements on billboards, the radio and television. They fill their pantries with food that they grow, barter for, and buy in stores and open-air markets. People seem generally cognizant of the potential health effects of agrochemicals and they commonly make efforts to reduce their family's exposure to toxins in foods, for example, by separating out pesticide-free potatoes for home consumption. Nevertheless, most Carchi farmers are not compelled to extend the same care that they afford to their loved ones to the faceless buyers of their crops in far away cities. Meanwhile, urban-based

consumers interested in organically raised food are compelled to pay higher prices to intermediaries for farmers' products.

We're at an interesting point in history where the economic difficulties in rural communities lead the youth to migrate to cities in search of waged labor and where they learn to eat processed foods, while urban-based food activists are advocating a return to more peasant-like lifestyles, learning to grow and cook their own food, recapturing traditional crops and recipes. Will these two sectors continue to cross pathways without taking note of one another? Ecuadorian food activists, family farmers, and indigenous rights advocates all helped to write Ecuador's 2008 constitution which establishes a mandate for an ambitious transition to food sovereignty (Sherwood et al., 2013). But, can this vision be obtained when powerful forces have a vested interest in maintaining the status quo at all costs?

In the case of Carchi, where the result of policies and the global market has been a high level of degradation of natural resources, poisoning and death by pesticides, and increased diet-related diseases, counter-currents of scarcely studied agricultural styles and eating practices reveal that certain families manage to forge relatively viable paths for the future, allowing them to survive agricultural modernization. In light of this process, policies that support the continuous heterogeneity and diversification of practices could provide a more solid basis for greater sustainability and democratic development.

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*Abstract*

Drawing on historical research in the northern highlands of Ecuador, the authors summarize how 75 years of state-supported agricultural modernization and subsequent food policies have led to diverse, wide-scale socio-environmental decline. Despite this global trend, they find considerable heterogeneity in family-level farming and food practices, with highly diverse and important implications for human health, economy and the environment. Following a study of ‘positive deviance’, they argue that certain production-consumption patterns are more sustainable than others, representing a time-proven, yet largely neglected resource for policy reform. Nevertheless, Ecuador’s investment in modern food poses formidable institutional challenges to change, while sparking increasingly influential social counter-movements.

*Key words:* farming and food practices, heterogeneity, sustainability, Ecuador

*Riassunto*

*Il futuro della sostenibilità come prodotto del presente: lezioni dal cibo moderno in Ecuador*

Basandosi sulla ricerca storica negli altopiani del nord dell’Ecuador, gli autori riassumono come 75 anni di modernizzazione agricola sostenuta dallo stato e le successive politiche alimentari hanno portato, su larga scala, a un diverso declino socio-ambientale. Nonostante questa tendenza globale, trovano una notevole eterogeneità in agricoltura a livello di famiglia e di pratiche alimentari, con molte diverse e importanti implicazioni per la salute umana, l’economia e l’ambiente. A seguito di uno studio di “devianza positiva”, essi sostengono che certi modelli di produzione-consumo sono più sostenibili rispetto ad altri, che rappresenta una risorsa ancora in gran parte trascurata a prova di tempo per la riforma della politica. Tuttavia, l’investimento di Ecuador nel cibo moderno pone formidabili sfide istituzionali a cambiare, mentre scatena contromovimenti sociali sempre più influenti.

*Parole chiave:* pratiche agricole e alimentari, eterogeneità, sostenibilità, Ecuador

