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Farmers, Development, and the Temptation of Nitrogen: Controversies about Sustainable Farming in Nicaragua

Agrarian development is a controversial issue in the Nicaraguan countryside. The state, international organizations, churches, and NGOs all attempt to intervene in the practices and worldviews of small farmers to make them attain a supposedly higher level of organization and efficiency. Implicit is the idea that *progress* has to be made in farming practices, which is measured first and foremost in yield per hectare. As the population increases (in Nicaragua it doubled between 1980 and 2006) more food has to be produced to feed the growing population in the cities and in the countryside. The increase in population has been compensated over the last thirty years by a doubling of the area of cultivated land, but the expansion of the agrarian frontier cannot continue indefinitely. Although all intervening organizations agree that farming practices have to change to produce more crops per hectare, there are controversies about the direction such a change should take.

The two developmental approaches to agriculture that stand in apparent opposition to each other could be characterized as “Green Revolution” technology and “agroecology.”¹ While green revolution technology—and recently, by extension, biotechnology—still dominates development projects and receives the bulk of development funding, agroecology has achieved a prominent role in the global environmental discourse, entering the mainstream with the publication of the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) report in 2008. The argument that has reinforced the general acceptance of the agroecology discourse is that an agriculture based on non-renewable fossil resources is unsustainable in the medium and long term and will be unable to feed a still growing human population.

The ideas that underlie this current of thought stem from nineteenth-century theories of thermodynamics. Podolinsky (Hall et al. 1986) demonstrated during this period that

1 “Green Revolution” techniques, introduced between the 1940s and the late 1970s, rely heavily on chemical fertilizers, herbicides, and pesticides. Some of these must be developed from fossil fuels, making agriculture increasingly reliant on petroleum products and on purchased inputs not available on-farm. “Agroecology” is concerned with the maintenance of a productive agriculture that sustains yields and optimizes the use of local resources and nutrient cycles. It thereby seeks to minimize the use of fossil resources and the negative environmental and socioeconomic impacts of modern technologies.

agriculture was based on a positive energy balance of at least 1:5 (one unit of energy invested by the farmer in the land could bind five units of solar energy into the plant). As Marcel Mazoyer and Laurence Roudart (1997) showed in their *History of World Agriculture*, the nineteenth-century energy balance was the result of a constant, not-quite-linear learning process that required much attention, work, and creativity, and in which the state intervened, regulating and extracting. Often farmers exploited the land until it became infertile, and only returned to reclaim the land after centuries had passed in order to use new methods, with a new attention to the soil and different seeds. What the farmers had to learn over the millennia, as populations grew, was how to maintain the fertility of the soil while it was farmed with increasing intensity.

This changed with the use of chemical fertilizers, pesticides, agricultural machinery, and the development of crops that were able to transform the supply of chemical fertilizer into higher yields. The criteria for selecting seeds changed. Farmers now no longer selected a wide range of varieties that could adapt to different soils, withstand drought or a lot of rain, and were resistant to fungal diseases; instead, with the addition of chemicals, the growing conditions were adapted to a few varieties of highly productive but vulnerable crops. Today, as Pimentel and others (Haberl et al. 2011) have shown, the energy balance in agriculture is often negative: more energy is supplied than the plants can absorb. In addition, the nutrient balance of soils is negative. At present the food system converts non-renewable fossil resources into food, and thereby continuously diffuses energy. For every calorie of food we consume in the West, we use ten calories on transport, packaging, and so on.

The Northern and Southern Hemispheres use different amounts of energy. Southern farmers use much less energy to produce their crops, and many of the industrial crops produced with large amounts of fossil energy in the South are exported to the North. As Hornborg (2001) has shown, energy use constitutes one of the most extreme measures of global inequality. It may sound hypocritical, then, if NGOs from the Northern Hemisphere incite Nicaraguan farmers to pursue organic farming, foregoing the use of chemical fertilizers and pesticides produced with fossil resources.

In this article I analyze how the different agricultural development discourses and the programs and projects attached to them play out in the actual practice of farming. What

kinds of interventions take place in their name? To what strategies do they give rise? Farmers confronted with these different development logics take different decisions; I show to what extent their decisions are linked to global policy making and historical configurations. I also show that, in spite of the overwhelming financial power of certain development projects, farmers create and sustain their own strategies for their land.

Recent Nicaraguan Agricultural Policy

A brief account of Nicaraguan agricultural policy-making over the last thirty-five years shows to what extent the agricultural practices that were promoted are inextricably linked to the political priorities of the governments in place. The Somoza period that ended with the Sandinista Revolution of 1979 was characterized by a traditional system of land tenure: land was concentrated in a few hands, and strong personal relationships prevailed between cattle-owning landowners and tenants. The tenants cultivated the land that the owners wanted to transform into pasture, with very little external input. The Sandinistas brought the Agrarian Reform and the Green Revolution to Nicaragua, and they heavily subsidized the use of Green Revolution plant varieties, fertilizers, and pesticides on the land they had distributed.

By the time the Sandinistas lost the elections in 1990, small farmers had become accustomed to taking out credit to finance the chemicals they now routinely used on their crops. However, the neoliberal governments that stayed in power until January 2007 insisted that the debts be repaid. Many small farmers lost their land and cattle. The debt crisis encouraged the spread of farmers' associations such as *De Campesino a Campesino*, where farmers exchanged experiences and agroecological cultivation techniques. They have used local resources and soil conservation techniques from all over the world to increase the fertility of their land. Building terraces, dikes, and water retention systems, and using green manure and compost on the land was time-consuming and was not immediately rewarded by an increase in yield. These techniques were adopted by small development NGOs, who tried to make them mandatory for any farmers who wanted to take advantage of their projects.

In 2007, when Daniel Ortega became president, government policies towards small farmers changed again. The Sandinistas attempted to capitalize on the countryside: they

distributed cows to thousands of rural women and encouraged the production of basic foodstuffs for export to Venezuela in a barter deal between Chavez and Ortega, where oil was exchanged for food. With the financial crisis in the USA, rising tensions with migrant Nicaraguan workers in Costa Rica, and the closing of maquiladoras (manufacturing operations in free trade zones) in Nicaragua, 2008 and 2009 saw the return to the countryside of many young Nicaraguans who were unable to feed themselves in the cities and abroad. Programs and projects that promoted the preservation of traditional seed varieties and insisted on soil preservation acquired new prominence all over the country. In 2010, however, the European Union (EU), in conjunction with the FAO, distributed large amounts of chemical fertilizers and Green Revolution seed varieties to the poorest parts of the country. In 2011, just before the next election, the Sandinista government promoted the CRISOL program, which distributed fertilizers and Green Revolution varieties on a credit basis in exchange for basic grains.

The Impact of Agricultural Politics on Nicaraguan Farmers

While the indifference of the government towards small-scale farming seems to favor agroecological production methods, governments on the municipal and national level gain in popularity if they distribute chemical fertilizer. How does this impact the actual practices of Nicaraguan farmers?

During my fieldwork from April to November 2009 in La Quebrada, a village in the hilly and relatively dry part of Carazo, I frequently heard farmers insist that production techniques have to be changed to preserve the land for future generations. Few chemical fertilizers were distributed for free and many mouths had to be fed due to the worldwide economic crisis. Some villagers told me diffidently that the economic crisis was out there and affected the rich countries. As they did not have anything, they also did not have anything to lose. The older farmers seemed more glad than worried to see some of their children return to the land. Some farmers explained to me that chemical fertilizers used in the past had burned the land, together with the still frequent practice of burning the residue of fallow land before cultivation. They explained that slash-and-burn cycles had become increasingly shorter as, with more and more people living there, the land became eroded and tired. “Don’t burn the land!” (*No quemal!*) became a common slogan, even receiving legal backing from national and municipal governments. In 2009, some farmers used the then-available family labor to weed the

crops instead of buying herbicides, and became interested once more in techniques of green manuring that had been introduced twenty years earlier by associations close to the movement of *Campesino a Campesino*. Additionally, traditional varieties of maize and beans gained new prominence, and a small but active minority of farmers decided to exchange their traditional varieties of maize and beans and create a seed bank.



Figure 1:
Selecting improved
varieties of seed.

In 2010 and 2011, the situation and also the discourse had changed considerably. The cooperative of La Quebrada, which had been set up by ten villagers in 2007 but had lain largely dormant since then, became the center selected by the FAO to administrate the EU-financed “Food Facility” program.² It distributed hundreds of quintals³ (ql) of fertilizer to the farmers in the village and in surrounding ones at an extremely reduced price. The same farmers who had been active in creating a seed bank for traditional

2 “Food Facility” was an aid program worth 1 billion euros. It was instituted by the European Parliament in 2008 during the world food crisis to help poor farmers all over the world to boost production by using Green Revolution varieties and fertilizers. The FAO became the broker for the program.

3 A Nicaraguan quintal is 45.36 kilograms.

varieties and had been interested in green manuring were now busy distributing fertilizer and Green Revolution varieties, and had withdrawn from the activities of the more agroecologically minded group of farmers.

Were these farmers thus nothing but the playthings of these different conjunctures and interventions, with no strong ecological convictions of their own, adjusting their behavior to the opportunities that opened up for them? Many farmers who could not fall back on unpaid family labor and who had to pay farm hands explained that spraying herbicides was certainly not good for the soil but was much cheaper than the cost of labor. When their children returned to the city (thus no longer helping in the fields and sending money instead), they returned to using herbicides. Further, nitrogen and other fertilizers, which were freely available, were hard to refuse, as they translated, if the conditions were right—that is, if the rains occurred at the right time—into a higher yield. To return fertility to land that was more intensively used, to feed the soil (and not only the plant) without chemicals, was a long-term project requiring work that many farmers were unable or unwilling to do. The temptation of nitrogen was hard to resist.

However, even when the farmers were swamped by the FAO project with freely available chemical fertilizers, not all of them took the offered package of Green Revolution varieties and chemical fertilizer at first. Some told me that in 2010 they had seeded fertile ground that had not required nitrogen. Others took it and then sold it for a decent price. Others again used the chemical fertilizers but gave away the Green Revolution varieties, and used the fertilizer on their traditional seed varieties.

The FAO-EU project ended after only two years, but was immediately followed by the government's CRISOL program. This program drew the farmers into a debt spiral, offering them a credit of \$120–200 to buy fertilizer and to pay labor for their fields, a credit that had to be paid back in kind with the crop. In the first harvest period of 2011, the credit of \$120 for corn had to be paid back with eight q1 of corn. This was almost the amount that farmers would usually sell at harvest time. Now they had spent this money in advance in the hope of a much better harvest: wild speculations and calculations circulated. With the use of chemical fertilizers they hoped to harvest 40 q1 per manzana,⁴ instead of 25 q1. However, the 40 q1 never materialized; the debt remained, and the farmers were obliged to sell more than they usually would.

4 One manzana is approximately 0.6 hectares.

In conclusion, small farmers in Nicaragua are not simply the playthings of different development programs. They follow their own strategies, but the constraints they are under should not be overlooked. Only a tiny minority of Nicaraguan farmers would refuse to use chemicals on principle. Many try to get by with as little as possible, and others would use the full cocktail of what is available if they had the financial means. To practice a different type of agriculture requires a huge amount of extra work to build stone walls, work with green manure, and so on. Farmers only invest in this way if they take a long-term view—if they can envision their children taking over the farm and offering their help, with financial support from government programs that are consistent and of a longer duration than most of the ecological development programs. The direction of agricultural change is strongly influenced by local politics but also by international politics, financial markets, prices, and a will to change, which cannot be just the goodwill of the supposed steward of the land, the farmer.

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