



The *Campesino-to-Campesino* agroecology movement of ANAP in Cuba: social process methodology in the construction of sustainable peasant agriculture and food sovereignty

Peter Michael Rosset , Braulio Machín Sosa , Adilén María Roque Jaime & Dana Rocío Ávila Lozano

To cite this article: Peter Michael Rosset , Braulio Machín Sosa , Adilén María Roque Jaime & Dana Rocío Ávila Lozano (2011) The *Campesino-to-Campesino* agroecology movement of ANAP in Cuba: social process methodology in the construction of sustainable peasant agriculture and food sovereignty, *The Journal of Peasant Studies*, 38:1, 161-191, DOI: [10.1080/03066150.2010.538584](https://doi.org/10.1080/03066150.2010.538584)

To link to this article: <https://doi.org/10.1080/03066150.2010.538584>



Published online: 13 Jan 2011.



Submit your article to this journal [↗](#)



Article views: 7910



View related articles [↗](#)



Citing articles: 82 View citing articles [↗](#)

The *Campesino-to-Campesino* agroecology movement of ANAP in Cuba: social process methodology in the construction of sustainable peasant agriculture and food sovereignty

Peter Michael Rosset, Braulio Machín Sosa, Adilén María Roque Jaime and Dana Rocío Ávila Lozano

Agroecology has played a key role in helping Cuba survive the crisis caused by the collapse of the socialist bloc in Europe and the tightening of the US trade embargo. Cuban peasants have been able to boost food production without scarce and expensive imported agricultural chemicals by first substituting more ecological inputs for the no longer available imports, and then by making a transition to more agroecologically integrated and diverse farming systems. This was possible not so much because appropriate alternatives were made available, but rather because of the *Campesino-a-Campesino* (CAC) social process methodology that the National Association of Small Farmers (ANAP) used to build a grassroots agroecology movement. This paper was produced in a 'self-study' process spearheaded by ANAP and La Via Campesina, the international agrarian movement of which ANAP is a member. In it we document and analyze the history of the *Campesino-to-Campesino* Agroecology Movement (MACAC), and the significantly increased contribution of peasants to national food production in Cuba that was brought about, at least in part, due to this movement. Our key findings are (i) the spread of agroecology was rapid and successful largely due to the social process methodology and social movement dynamics, (ii) farming practices evolved over time and contributed to significantly increased relative and absolute production by the peasant sector, and (iii) those practices resulted in additional benefits including resilience to climate change.

Keywords: agroecology; Cuban agriculture; social movements; ANAP; La Via Campesina; *Campesino-to-Campesino*; agricultural extension

Introduction

Recent years have seen increased interest in *agroecology* among peasant organizations and rural social movements around the world. In the case of the rural peoples' organizations that belong to La Via Campesina (LVC), this is due to a convergence of factors. On the one hand, participation by national organizations in a global social movement has largely politicized the question of how land is farmed. This is

The authors would like to thank the Joint Program in Cuba of Oxfam International for financing this study, ANAP and La Via Campesina for giving us the privilege of carrying it out, and the peasants of Cuba for opening their farms and hearts to us. This paper draws extensively from our book (Machín Sosa *et al.* 2010) published by ANAP and La Via Campesina in Havana, Cuba. We thank the four anonymous reviewers for the *Journal of Peasant Studies* for their helpful suggestions.

especially because LVC views the contemporary period as characterized by an historic clash between two models of farming: peasant agriculture versus agribusiness (Rosset 2006, Martínez-Torres and Rosset 2010), where reproducing the agribusiness model on one's own land – by using purchased chemicals, commercial seeds, heavy machinery, etc. – will also reproduce the forces of exclusion and the destruction of nature that define the larger conflict. There is an increasing search for alternatives by the grassroots membership of LVC member organizations, partly in response to the dramatic fluctuations of prices of petroleum-based inputs over recent years, putting these inputs largely beyond the reach of many peasant farmers (Schill 2008).

The past three to five years have seen virtually every organization in LVC around the world attempt to strengthen, initiate, or begin to plan its own program for promoting, to varying extents, the transition to agroecological farming among their members.¹ Although Holt-Giménez (2009, 2010) has argued that agroecology has in practice been largely the provenance of community-based organizations and non-governmental organizations (NGOs) rather than national peasant organizations and social movements, this, while once partially true, may now begin to change. Over the past three years LVC has given a key role to its 'International Working Group on Sustainable Peasant Agriculture'. Among other tasks, this Working Group (with a female and a male representative from each of the nine regions in which LVC divides the globe), under the leadership of the National Small Farmers Association of Cuba (ANAP) and the National Union of Peasant Associations of Mozambique (UNAC), is charged with strengthening and thickening internal social networks (Fox 1996) for the exchange of experiences and support for the agroecology work of the member organizations. This includes identifying the most advanced positive experiences of agroecology, and studying, analyzing and documenting them (*sistematización* in Spanish) so that lessons drawn can be shared with organizations in other countries.

One of the first tasks carried out by the LVC Working Group was to document the experience of the *Campesino-a-Campesino* Agroecology Movement in Cuba (MACAC), based on the general feeling that it was the most illustrative case of 'sustainable peasant agriculture' and of farmer-to-farmer extension methodology. The analysis reported in this paper (and in Machín Sosa *et al.* 2010) is the result of this internal work. LVC and ANAP jointly designated a national-international team to study the Cuban case, consisting of a male and a female representative from ANAP in Cuba, and a male and a female representative from LVC outside of Cuba. The idea behind such a composition of the team was to have gender balance, and to produce a report that would be useful inside ANAP and Cuba and in other countries. The main objective was to carry out an evaluation of the Cuban experience and identify possible new steps for the future of ANAP's work and that of peasant organizations in LVC in other countries who are planning and/or carrying out their own work with agroecology. The authors of the current paper were the members of the team that carried out this study. We traveled the length and breadth of Cuba two times during 2008 and 2009, visiting cooperatives and individual peasant families in 13 of the 14 provinces. We visited dozens of farms and held exchanges and workshops with farmers to collectively reconstruct the history of the agroecology movement, its achievements, weaknesses and challenges. We also met

¹Uncited affirmations about LVC are based on the authors' own experience working on these issues in various capacities inside the movement.

with ANAP leadership from the cooperative and municipal to the provincial and national levels, as well as government officials, policy makers, researchers and others who have direct relations with, or are experts on, the agroecology movement. Finally we reviewed virtually all the internal files and documents of MACAC, complementing our access to national level agricultural data, and to cooperative level data from Sancti Spiritus province. This paper is the outcome of this self-study process.

The remainder of the paper is organized as follows: the next section is a brief review of the fundamental principles and logic of agroecology, followed by a more macro, historical overview of the development of Cuban agriculture on the eve of the revolution and onwards. This is followed by a brief review of the contrasting approaches of conventional and farmer-to-farmer extension work, before tracing the history of MACAC in Cuba – its beginning as a project or program within ANAP and its transformation into a national movement – along with the evolution of agroecological farming techniques in Cuban agriculture. Finally, we turn to the presentation and analysis of lessons, challenges, impacts and achievements of MACAC (including data on increases in peasant food production output), followed by a short concluding reflection.

Agroecology: why and what?

Agroecology is seen differently by different actors (Wezel *et al.* 2009). Some academic researchers see it as a *science* that seeks to understand the internal functioning of agricultural ecosystems, often including at least part of the human component (Carroll *et al.* 1990, Altieri 1995, Gliessman 2007). For agroecology practitioners, including NGOs and some farmer organizations and farmers, agroecology refers to farming methods that are based on the application of *principles* (rather than recipes) which are drawn from biology. These principles are (Altieri 1995, 2002)

- Increasing the recycling of biomass and achieving a balance in nutrient flows.
- Assuring favorable soil conditions, keeping the soil covered with mulch or cover crops, guaranteeing a high level of soil organic matter and an active soil biology.
- Minimizing nutrient losses from the system, through relatively closed rather than open system design.
- Promoting the functional biodiversity of the system, including within- and between-species diversity, above- and below-ground and landscape level biodiversity.
- Promoting increased biological interactions and synergisms among system components that can sponsor system services like regenerating soil fertility and providing pest management without resorting to external inputs.

The emphasis is on the adaptation and application of the principles in accordance with local realities. For example, in one location soil fertility may be enhanced through worm composting while in another location it might be through planting green manures; the choice of practices would depend on various factors including local resources, labor, family conditions, farm size and soil type. This is quite different from the type of *organic farming*, common especially in Northern countries, that is based on recipe-like substitution of toxic inputs with less noxious ones from

Table 1. Strengths and weaknesses of different approaches to agriculture.

Aspect	Conventional agriculture	Agroecology
<i>Inputs</i>	Potent	Weak
<i>Synergisms</i>	Absent	Powerful
<i>Capacity to restore degraded soils</i>	Absent (but offers ever higher doses of inputs as a way to mask problems)	High

Source: Machín Sosa *et al.* (2010, 30).

approved lists, which are also largely purchased off farm.² This kind of *input substitution* leaves intact dependency on the external input market and the ecological, social and economic vulnerabilities of monocultures (Rosset and Altieri 1997, Guthman 2000, 2004).

The opposite of input substitution is what we define as *agroecological integration* in which off-farm inputs are reduced to an absolute minimum. Here pests may be controlled through intercropping for example, rather than with a conventional chemical nor an organic-approved, alternative biological pesticide. Soil fertility would not be maintained with a chemical fertilizer nor with an organic substitute purchased off-farm such as commercial compost, manures or biofertilizers, but rather through some combination of worm composting of crop residues, constant incorporation of organic matter into the soil, pasturing animals on crop residues and using their manure as fertilizer, intercropping with nitrogen-fixing legumes, and/or the promotion and maintenance of an active soil biology (Machín Sosa *et al.* 2010). These agroecological systems have shown themselves capable of restoring even severely degraded soils (Holt-Giménez 2006).

A given farm seen thusly can have a greater or lesser degree of agroecological integration, ranging from an industrial monoculture (negligible agroecological integration), to a monoculture-based organic farm with input substitution (low level of integration), to a complex peasant agroforestry system with multiple annual crops and trees, animals, rotational schemes, and perhaps even a fish pond where pond mud is collected to be used as an additional crop fertilizer (high level of agroecological integration). A high degree of agroecological integration brings powerful synergisms between system components into play that can generate much higher levels of total production per unit area with fewer or zero off-farm inputs, often with a lower input of labor per unit of production as well (Altieri 2002, Monzote *et al.* 2002, Funes-Monzote 2008, 2010, Vandermeer *et al.* 2010).

In Machín Sosa *et al.* (2010) we argue that an undue emphasis on alternative off-farm inputs often puts alternative agriculture in a poor competitive position *vis-à-vis* conventional industrial agriculture, because alternative inputs are weaker than conventional inputs (imagine a chemical poison with immediate knockdown of pests, compared to a slow acting biological pesticide). This is shown schematically in Table 1. This we feel is one of the reasons why organic farming in wealthier countries consistently fails to out-yield conventional agriculture, while in the South peasant agroecological systems average a higher level of total productivity than conventional monocultures (Rosset 1999, Guthman 2000, Badgley *et al.* 2007).

²In Cuba it is common to use 'organic farming' to refer to any kind of sustainable agriculture, agroecology, ecological farming, etc. But here we are referring to organic farming as it is understood in Europe and the US.

Of course, agroecology and sustainable peasant agriculture are about more than just productivity. From the point of view of La Vía Campesina, among the goals of a transition to agroecology are increased autonomy from input markets, putting peasant families in control of their own production systems, restoring degraded soils, living in harmony with the Mother Earth, producing healthy food, improving the economic viability of peasant agriculture, and building *food sovereignty*³ up from the level of the peasant family to the national level (La Vía Campesina 2010). All of these goals are better achieved with ‘true’ agroecology than with input substitution or Northern-style organic farming. Moreover, the transition to agroecology described here can also be viewed more broadly as part of what van der Ploeg (2008, 2010) calls *re-peasantization*. Finally, La Vía Campesina goes farther than other actors in agroecology and organic farming in giving agroecology not only a technical-ecological content, but also social and political dimensions: it politicizes what used to be seen as purely technical questions of farming. For many in La Vía Campesina, the science of agroecology is perceived as a tool to aid in interpreting ones’ reality in order to transform it collectively, in the sense of Paulo Freire (1970).

Cuban agriculture: revolution, Green Revolution, crisis, embargo, and alternatives

Before the 1959 Cuban revolution, the island was characterized by a typical *latifundio-minifundio* system of land distribution and tenure, with a strong presence of US capital, the production of sugar for export, and a marginalized peasantry. In the early years of the revolution the government invested heavily in improving conditions in the countryside, and carried out an extensive agrarian reform over several progressive phases. While initial policy was directed at diversifying away from sugar and export dependency, extreme hostility by the US and the opportunity to join the international socialist division of labor (COMECON) on favorable terms of trade ended up strengthening the export monocrop emphasis as well as dependency on imported food, agricultural inputs and implements (Nova 2002, Machín Sosa *et al.* 2010). By 1989, 30 percent of agricultural land was devoted to a single export crop, sugarcane, which generated 75 percent of export revenues, while 57 percent of all food was imported (Rosset and Benjamin 1994).

Cuban agriculture was a world-class case of modernization and of the Green Revolution (Machín Sosa *et al.* 2010), with the most tractors per person and per unit of area, and the second highest average grain yields of Latin America (Rosset and Benjamin 1994). Agriculture made heavy use of chemical inputs such as fertilizer, which was 48 percent imported (with a 94 percent import coefficient for the fertilizer that was manufactured domestically), and pesticides, which were 82 percent imported (Rosset and Benjamin 1994). While this model was able to guarantee a relatively high level of food security and standard of living to the Cuban population while the favorable terms of trade with the socialist bloc continued, in the long run it turned out to be dangerously dependent on foreign trade, providing temporary food *security* but not food *sovereignty*. It also proved to not be very sustainable from an ecological and productive viewpoint, as the chemical-intensive industrial monocultures experienced ever increasing pest problems, and the yields of some key crops like rice began to decline in the 1980s due to soil degradation and pests, after decades

³For definitions and discussions of food sovereignty see Rosset (2006) and Martínez-Torres and Rosset (2010).

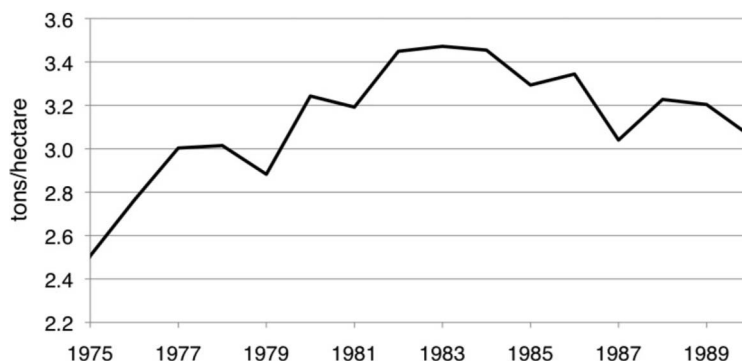


Figure 1. Average rice yields in Cuba during the Green Revolution years (1975–1990).
Source: FAOSTAT.

of increases (see Figure 1, and Machín Sosa *et al.* 2010). This pattern of long-term yield leveling and/or decline is found in Green Revolution lead areas around the world (Pingali *et al.* 1997, Radford *et al.* 2001, Kundu *et al.* 2007, Mulvaney *et al.* 2009), and Cuba was no exception.

When the collapse of the socialist bloc in Europe came in 1989, and the US tightened the trade embargo (called ‘the blockade’ by Cubans), Cuba lost 85 percent of its trade relations and was no longer able to import sufficient food, or the machinery, inputs and petroleum to grow it under the conventional production model (Rosset and Benjamin 1994, Funes-Monzote 2008, Wright 2008). The 1990s saw the Cuban population face an economic and food crisis while attempts were made to recover and boost national food production. In 1990 the Cuban government declared the ‘Special Period in Peacetime’, a war-style economic policy based on austerity measures to survive the crisis. Part of that involved the breaking up of large state farms into Basic Units of Cooperative Production (UBPCs), basically cooperatives made up of former employees with usufruct privileges on the former state enterprise land.⁴ One of the motivations was that while peasant cooperatives were quick to adopt new low external input practices, the state farms seemed incapable of such rapid change (Rosset 1997). Subsequent years have revealed that it is not easy for UBPC members to transition from being farm workers to being peasants, and the record of the UBPCs has been mixed. In Cuba, and in this study, they are not yet considered part of the ‘peasant sector’, nor are they members of ANAP. They are organized by the National Farm and Forestry Workers Union (SNTAF).

But perhaps the most important changes occurred in the peasant sector itself. Virtually all peasants in Cuba belong to ANAP, and almost all of them belong to one of two types of cooperatives. Credit and Service Cooperatives (CCSs) are made up of peasant families who own their own farms and work them individually, but group together in the CCS to achieve economies of scale in marketing harvests, obtaining credit, sharing farm machinery, etc. Agriculture Production Cooperatives (CPAs) are collective farms in which the land and all productive assets like machinery, warehouses, etc., are owned collectively. In 1989, on the eve of the Special Period, 78 percent of arable land was in the state

⁴Laura Enríquez (2003) has called this repeasantization, though as stated below in the text, the transition to becoming peasants has been uneven.

sector, 10 percent belonged to CPAs, and 12 percent to CCSs (Machín Sosa *et al.* 2010, 24).

Under the imperative to boost national food production in the early part of the Special Period, it became clear that each of the two forms of cooperative peasant production offered its own strengths and weaknesses. The CCSs proved to be very agile and rapidly adaptable to the changing conditions of the Special Period. The fact that decisions concerning production methodologies are made at the individual family level meant that they could rapidly adopt alternatives to scarce inputs. Their members typically exhibit a strong sense of belonging to, and caring for, the land (called a sense of *pertenencia* in Spanish), making CCS families initially very open to ecological practices. And they had a direct and perceived relationship between work well done and remuneration for that work. On the other hand, the CCSs were administratively weak, and not particularly adept at marketing products, managing finances, navigating government programs, etc., and had little infrastructure. The CPAs, on the other hand, tended to have a much stronger administration and good infrastructure, but the assigning of work teams to areas on a rotating basis meant there was little attachment to the land and no readily discernable link between hard work and remuneration, which led to lower labor productivity. The fact that decisions were made in the assembly of the full membership rather than at the family level meant that technological changeovers could take much longer, as each step required achieving consensus among many people (Rosset 1997, Machín *et al.* 2010).

The ANAP leadership rapidly recognized these limitations and strengths in the early stage of the Special Period and took steps to address them, along with other measures to respond to the new and more difficult conditions (listed in Machín Sosa *et al.* 2010, 29). Among the steps taken were the creation of new administrative units in the CCSs and help in the acquisition of more infrastructure, and the linking of people with the land and with the results (remuneration) of their labor in the CPAs (called *vinculación con el área*, and *vinculación con los resultados* in Spanish, see Enríquez 1994). Thus the CCSs gained the ‘best’ of the CPAs, and the CPAs gained some of the best of the CCSs, with a greater connection between people and particular areas of farm land (more *pertenencia*), as well as the reinforcement of higher income for better quality work done. Nevertheless the CCSs moved more rapidly and effectively toward alternatives than the CPAs.

A number of authors have described Cuban successes during the 1990s with alternative farming technologies such that by the end of the decade the acute food crisis was in the past, and food was being produced with a fraction of the inputs and equipment previously imported (Rosset and Benjamin 1994, Funes *et al.* 2002, Wright 2008, Funes-Monzote 2008, 2010). While we agree that the Cuba experience in the 1990s with alternative agriculture was remarkable compared to other countries around the world, our vantage point in 2010, and from inside the peasant movement, gives us a more nuanced perspective.

First, when Cuba faced the shock of lost trade relations in the early 1990s, food production initially collapsed due to the loss of imported fertilizer, pesticides, tractors, parts, petroleum, etc. The situation was so bad that Cuba posted the worst mark in all of Latin America and the Caribbean in terms of the annual per capita rate of growth of food production (–5.1 percent for the period from 1986 through 1995, against a regional average of –0.2 percent). But as the country re-oriented its agriculture to depend less on imported chemical inputs, Cuba rebounded to show the best performance in all of Latin America and the Caribbean over the following time

period, a remarkable rate of 4.2 percent annual growth in per capita food production from 1996 through 2005 (the most recent year for which statistics are available), a period in which the regional average was 0.0 percent (FAO 2006). That still was not enough to transform Cuba from a net food importer to a net exporter, as the gap was too large to overcome. However 23 other countries in the region were also net food importers (FAO 2006), as food dependency is unfortunately the norm for developing countries.

There is considerable debate concerning current food dependency in Cuba. Our best guess is that dependency dropped in the late 1990s, but then rose again in the 2000s as imports from the US grew and hurricanes devastated Cuban agriculture, but is now dropping again as the world food price crisis drives prices too high, leading the Cuban government to re-emphasize food self sufficiency, and with record harvests of a number of crops in the past year (see Funes *et al.* 2009 for discussion of this point). Over the past 18 months the *Granma* national daily newspaper has been full of reports on record harvests in various crops and on the growing contribution of the peasant sector.⁵

Second, the better performance in the late 1990s was largely based on input substitution practices, like biopesticides, biofertilizers and animal traction, rather than on advanced agroecological integration, and while initial adoption by Cuban farmers of these and other alternatives was fairly rapid, by the end of the decade it was clear to the leadership of ANAP that things were stagnating, and that further breakthroughs were urgently needed, both technological and methodological, that would speed adoption. While hindsight now shows us that the technological breakthrough that was needed was greater agroecological integration, it was a methodological innovation that in our view has proved key. We believe that in the typical case, in most countries most of the time, there are abundant and productive ecological farming practices 'on offer', but low adoption of them is the norm, because what is lacking is a methodology to create a social dynamic of widespread adoption.

Horizontal communication vs. conventional extension

There is an extensive debate concerning the effectiveness and appropriateness of conventional agricultural research and extension systems for reaching peasant families in general (Freire 1973), and more specifically for promoting agroecology rather than the Green Revolution (see, for example, Chambers 1990, 1993, Holt-Giménez 2006). The fact that agroecology is based on applying principles in ways that depend on local realities means that the local knowledge and ingenuity of farmers must necessarily take a front seat, as farmers cannot blindly follow pesticide and fertilizer recommendations prescribed on a recipe basis by extension agents or salesmen. Methods in which the extensionist or agronomist is the key actor and farmers are passive are, in the best of cases, limited to the number of peasant families that can be effectively attended to by each technician, because there is little or no self-catalyzed dynamic among farmers themselves to carry innovations well beyond the last technician. Thus these cases are finally limited by the budget, that is, by how many technicians can be hired. Many project-based rural development NGOs face a similar problem. When the project funding cycle comes to an end, virtually everything reverts to the pre-project state, with little lasting effect.

⁵See <http://www.granma.cubaweb.cu/>

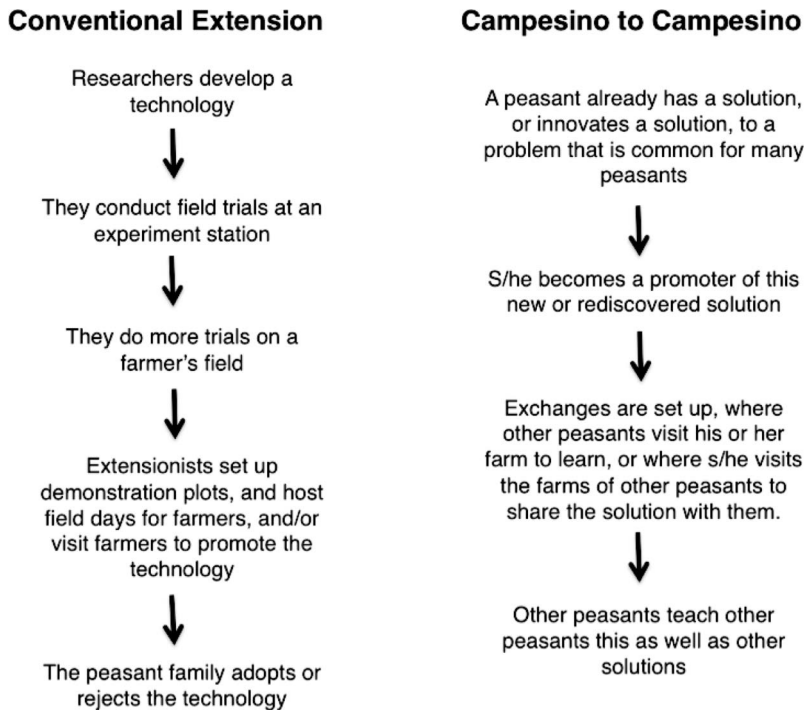


Figure 2. Conventional agricultural extension versus Campesino-to-Campesino.
 Source: Machin Sosa *et al.* (2010, 38).

The most successful methodology for promoting farmer innovation and horizontal sharing and learning is the *Campesino-a-Campesino* (farmer-to-farmer, or peasant-to-peasant) methodology (CAC). While farmers innovating and sharing goes back to time immemorial, the more contemporary and more formalized version was developed locally in Guatemala and spread through Mesoamerica beginning in the 1970s (Holt-Giménez 2006). CAC is a *Freirian* horizontal communication methodology (*sensu* Freire 1970), or social process methodology, that is based on farmer-promoters who have innovated new solutions to problems that are common among many farmers or have recovered/rediscovered older traditional solutions, and who use popular education methodology to share them with their peers. A fundamental tenet of CAC is that farmers are more likely to believe and emulate a fellow farmer who is successfully using a given alternative on their own farm than they are to take the word of an agronomist of possibly urban extraction. This is even more the case when they can visit the farm of their peer and see the alternative functioning with their own eyes. In Cuba, farmers say, ‘*cuando el campesino ve, hace fe*’,⁶ which translates roughly to ‘seeing is believing’.

Whereas conventional extension can be demobilizing for farmers, CAC is mobilizing, as they become the protagonists in the process of generating and sharing technologies, as shown schematically in Figure 2. In comparing CAC with conventional extension, the key question to ask is, who is the passive actor, and who is active? Note that there is still a role for technical staff in CAC, but it is a

⁶In fact this saying is the subtitle of our book, Machín Sosa *et al.* (2010).

different role. Rather than bringing knowledge to the (presumably) ignorant, the extensionist now concentrates on facilitating and supporting a process of farmer exchanges.

Eric Holt-Giménez (1997, 2006) has extensively documented the Mesoamerican experiences with CAC as a methodology for promoting agroecological farming practices, which he calls ‘peasant pedagogy’. This pedagogy rests on five simple principles (Bunch 1985, Kolmans 2006, Holt-Giménez 2006, Machín Sosa *et al.* 2010):

- (1) *Begin slowly and on a small scale.* Farmers try out new methods on a small part of their land, without rushing.
- (2) *Limit the introduction of new methods.* People get overwhelmed when they try many new practices at the same time.
- (3) *Achieve rapid and recognizable successes.* The process works best when farmer-promoters first teach things that they are sure will have a rapid positive impact, because people are motivated to continue participating.
- (4) *Carry out small-scale experiments.* Everyone is encouraged to experiment on small areas of their own land, without risking their entire harvests. The more farmers who become active experimenters, the faster the overall transition advances.
- (5) *Develop a multiplier effect.* As more peasants become promoters and experimenters, the process begins to demonstrate a self-catalyzing momentum.

CAC is a participatory method based on local peasant needs, culture, and environmental conditions that unleashes knowledge, enthusiasm and protagonism as a way of discovering, recognizing, taking advantage of, and socializing the rich pool of family and community agricultural knowledge which is linked to their specific historical conditions and identities. In conventional extension, the objective of technical experts all too often has been to replace peasant knowledge with purchased chemical inputs, seeds and machinery, in a top-down process where education is more like *domestication* (Freire 1973, Machín Sosa *et al.* 2010).

In Guatemala, Mexico, and Honduras, CAC was developed at the margin of national peasant organizations. It grew rapidly within local community based organizations, but crossed over slowly or not at all beyond these organizations. However, in Nicaragua, CAC grew more rapidly. This was to a large extent due to the greater level of organization and grassroots mobilization of peasants as a product of the Sandinista Revolution. Another factor was that it fell within the purview of a national peasant organization, the National Union of Farmers and Cattle Ranchers (UNAG), which although it did not particularly support CAC, tolerated it, allowing it to spread around the country (Vásquez Zeledón and Rivas Espinoza 2006, Holt-Giménez 2006).⁷

Campesino-to-Campesino arrives in Cuba

Through a series of somewhat fortuitous events, ANAP in Cuba learned of, and learned from, the experience with CAC in Nicaragua during the mid-1990s, just

⁷UNAG was a founding member of La Via Campesina, though they have since left the movement.

about the same time as it became clear that the spread of alternative practices to produce food during the Special Period needed a boost.

After hosting a meeting of CAC delegates from Mexico and Central America in 1996, ANAP decided to try the methodology on a 'trial' project basis with external donor funding in the province of Villa Clara. In November of 1997 the first workshop was held in Villa Clara to train local members of the organization in the CAC methodology. The early methodology and structure were the same as in Mesoamerica. The key actors in this phase thus consisted of promoters, facilitators, and the peasant families who belong to the ANAP. Success was fast, and by 1999 CAC had spread to the nearby provinces of Cienfuegos and Sancti Spiritus.

Promoters are recruited from farmers who are recognized by their peers for the successful innovations and agroecological practices employed on their own farms and their desire and ability to teach others. Their farms are their classrooms, and other farmers visit with them to learn. A principle of CAC in Cuba is that they receive no compensation other than the satisfaction of helping others and the status of being considered a good role model. If they were to be paid, people say, then other farmers would not believe in their technologies, finding it easier to think they just use them so they will get a salary. Facilitators are in charge of the logistics of matching and arranging visits of farmers in need of solutions to promoters who have them, organizing workshops, and generally keeping things running. Some of them are trained agronomists or technicians, while some are peasants and co-op members, though they share a commitment to the ecological transformation of farming, that is, they are *activists*. They are hired and paid by each cooperative that chooses to have one or more facilitator. Emphasis is placed on this latter point; if cooperative members do not feel they gain anything worthwhile from having a particular facilitator, or any facilitator at all, then they will fire them. This, people say, ensures that they do a good job for their farmer-employers.⁸

CAC becomes a national movement

By 2000, CAC was clearly successful at accelerating the transition to productive agroecological farming much faster than conventional extension had been able to. It was now firmly established in Villa Clara, Cienfuegos and Sancti Spiritus, and had begun in the provinces of Holguín, Ciego de Ávila, Matanzas and La Habana. But the ANAP leadership was frustrated at the time it took to get CAC established in each new province, especially as up to this point they were depending on external funding from donor agencies, which made the grant cycle the key limiting factor (CAC was being run as a *project* or *program* inside of ANAP). Although the food crisis had by this time eased quite a bit, there was still a strongly felt need to boost national food production more rapidly, and imported inputs were still not abundantly available. In February of 2001 the First National Encounter of the *Campesino-to-Campesino* Program of ANAP was held. At this meeting Orlando Lugo Fonte, the president of ANAP, put forth the radical idea that CAC should become a *movement*, and stop being a *project* or *program*. This meant it could no longer depend on external financing (though such would always be welcome), but

⁸Based on various interviews.

rather must cut the reins that were holding it back and unleash *campesino* energy and creativity to rush forward at its own pace. He said,

The vanguard movement of our organization has to be the movement of *campesino* promoters. We want a thousand promoters, but beyond this first thousand, we want a thousand more aspiring to become promoters, and so on, with new *compañeros* joining the movement all the time. And speaking thusly, of a movement, in a short period of time we should see thousands of men and women working for this noble idea [agroecology]. (Machín Sosa *et al.* 2010, 41)

Reflecting on that time period, Lugo Fonte now says, 'If we couldn't find external financing, the Cuban agroecological movement was going have to emerge with our own resources, even though we had very little' (Machín Sosa *et al.* 2010, 41). While promoters are not paid at all, and facilitators are paid by the cooperatives themselves, significant resources are still needed as the basis of CAC is exchange visits and that means transport, fuel, food, lodging, etc., but ANAP was determined to cover that mainly from their own resources plus whatever they could obtain from government agencies.⁹

The delegates to the encounter agreed, and the national leadership quickly ratified the decision.¹⁰ It is at this point that the experience in Cuba began to diverge from the Mesoamerican experience.¹¹ Like Nicaragua, CAC in Cuba is situated in a national peasant organization. But unlike the case of UNAG, from this point on ANAP assumed the promotion of the henceforth-named '*Campesino-to-Campesino* Agroecology Movement' (MACAC) as an 'organic task' at each level and in every structure of the national organization. Every cadre and every militant of the organization was to be held accountable for facilitating and promoting the movement within their area of responsibility. As a revolutionary mass organization, ANAP had inherent strengths in movement building. It had a political organizing methodology for 'mass mobilization', a methodology which had been used successfully in earlier times to promote other internal mobilizations. During our field work across the Cuban countryside, the international members of the

⁹Contrary to common belief, ANAP is not funded by the Cuban government, but rather by a voluntary self-tax on farm sales by member cooperatives. While the Cuban state has historically provided a much greater degree of support (credit, marketing, crop insurance, extension, etc.) to the peasant sector than other Latin American governments, it is also true that long-term and larger investments were more directed to the state farm sector than to the peasant sector.

¹⁰An anonymous reviewer of this manuscript observed that, 'A skeptic might ask if the decision to decrease reliance upon external funds while expanding the initiative is simply a way of making farmers perform more work without compensation. They might further ask whether the decision was really one made by the farmers or if it was actually implemented by a government'. On the ground in Cuba it is clear that this initiative did not come from the government, though many government agencies came to support it. One need only visit the Cuban countryside to sense the enthusiasm and pride that MACAC members feel for their movement, a movement they feel they built themselves, and which has had to overcome the skepticism of many government officials each step of the way, officials trained in the Green Revolution model of large-scale industrial farming. It is a testimony to their volunteerism and results that this skepticism is being gradually eroded.

¹¹It should be pointed out that many promoters in Mesoamerica identify themselves as part of a movement (Holt-Giménez 2006). But it is a movement that is fragmented among smaller organizations, with the exception of UNAG, which has more 'hosted' than 'promoted' CAC. These factors may at least partially explain the slower growth in Mesoamerica.

team could feel the high level of political consciousness of the ANAP grassroots membership, a testimony to the on-going 'ideological work' carried out inside of ANAP. An example of this is the general belief among members of the organization that the 'historic mission' of the peasant sector is to feed the Cuban people.¹²

ANAP exhibits an unusual degree of *organicity* (among Latin American social movements, 'organicity', or *organicidad* in Spanish, refers to the degree of internal organization that a movement or an organization has). Virtually all peasants are members of CCSs and CPAs, which are the basic units of ANAP membership. Each cooperative has a general assembly and officers, and ANAP has a leadership structure in every municipality of the country, as well as at the provincial and national level. This essentially means that the organization can call on cadre with leadership experience in literally every corner of rural Cuba.

There were thus powerful forces ready to be turned to the task of promoting agroecology. In this environment MACAC rapidly took on a 'mass character', in which agroecology was blended with socialist, communitarian and environmental values. In the anonymous written words of a participant in a workshop that we held in Granma Province,

To *massify* is to move all the methods and forms possible to promote and multiply any task. Taking the practices of peasants and promoters and spreading them in training workshops, seminars, and conversations on the farm. Learn the practices by doing them. Do them in schools, with the children, in the barrio, with the community, so that all these people carry the word from mouth to mouth, to the men or women they are closest to . . . The need to build a great movement at the district, municipal, and national level. To consolidate the practices in an organized fashion; demonstrate that something good is happening, is being experimented with, on the farm. That nothing shall be left which hasn't been taught to others; that all of us can learn and can also teach, each according to our role.

From 2000 to 2003 MACAC spread to *all* Cuban provinces, taking on a movement form, and ANAP began to tinker with the methodology inherited from Mesoamerica. As the farmer exchanges began taking place between provinces and over longer distances, the organizational complexity grew. It was difficult for a facilitator in a cooperative in Pinar del Rio province, for example, with members who needed to solve a particular weed problem, for example, to know that a promoter in, say, Cienfuegos had a good solution, and then organize an exchange visit. ANAP thus created a new role, a new actor, the coordinator. These are typically professionals, sometimes from agricultural sciences, but also include professionals in everything from public relations to administration, who, like the facilitators, are first and foremost activists. They identify and coordinate exchanges and trainings at higher levels or on broader scales. Gradually coordinators have been hired at the municipal and provincial levels, and a national coordinator was added as well. ANAP pays their salaries.¹³

¹²On this see also Lugo Fonte (2000).

¹³Machín Sosa *et al.* (2010, 47–8) includes a description of the distinct functions, qualities, strengths, weaknesses and challenges of promoters, facilitators and coordinators, as elaborated by the participants (who included people with each of the above functions) in a workshop we held in Havana province.

During this period a five-step process was formalized inside of MACAC. These steps are

- (1) *Starting out.* Work begins on the farm with a rapid appraisal of key problems to be addressed, for the purpose of establishing priorities (typically carried out by the peasant family that is new to the movement, accompanied by an experienced promoter and/or facilitator).
 - (2) *Exchange of experiences.* Farmers with the same identified problem visit a farmer with a possible solution, and then begin to experiment with the new method on a small area of their farm.
 - (3) *Methodological tools.* Promoters and facilitators receive specialized training in popular education methods.
 - (4) *Workshop on agroecological techniques.* Promoters, who typically already have mastery of one or several techniques, learn additional methods they can try on their own farms, to expand their repertory. Here many promoters get motivated to innovate and experiment further on their own.
- Intermediate step.* Exchanges among promoters in spaces where they engage in self-evaluation, planning, follow-up monitoring, and knowledge exchange. A lot of debate takes place here.
- (5) *Overall follow-up meeting.* This is an overall review of the process to date, to identify achievements and detect problems, and establish the next priorities.

An innovation added in 2008 is the classification of farms according to the degree of agroecological advance and integration that they exhibit. It was observed that some farms advanced more slowly than others, and it was felt that this was a problem. To address this, a form of public acknowledgement was developed to stimulate emulation of the most agroecologically advanced farm units. They are ranked on a scale from 1 (low integration) to 3 (high) based on 31 criteria (listed in Machín Sosa *et al.* 2010, 54–5). The classification is carried out jointly by promoters, facilitators and coordinators, and the families that receive the highest score gain the respect of the community and cooperative and feel a sense of satisfaction and pride.

Also in recent times, a coordinator in the municipality of Banes in Holguin province developed a method to deal with the complexity of matching the needs of hundreds or thousands of cooperativists with solutions on offer nationally by thousands of promoters. If exchange visits are not well tailored to match needs, a lot of time and resources can be wasted. In the Banes method, the members of a cooperative fill out a matrix form during the assembly of their co-op. The matrix is a self-inventory of both the effective agroecological practices that they carry out on their own farms and the still unsolved problems they are facing. These matrices are tabulated and cross-referenced by the municipal coordinator and the facilitator from each cooperative, and help rapidly identify potential new promoters, problem areas, and key exchanges that must be organized. In 2009 and 2010 the ‘Banes Method’ has been rapidly spreading inside of MACAC, and by the time this comes to print will undoubtedly be used nationally. So far it seems to rapidly accelerate the advances of MACAC.

Today it is clear that MACAC has moved more rapidly in the CCSs, where families farm individually, than in the CPAs, where they farm collectively. This is widely attributed to the more agile family-level decision-making and sense of belonging to the land/farm, compared to the assembly-based consensus

decision-making in the CPAs. However ANAP and the MACAC coordinators have placed a lot of emphasis on bringing the CPAs ‘up to speed’ on agroecology, and that has meant adapting the methodology, with a lot more emphasis on discussion in the assembly and with the teams increasingly assigned to farm a specific area. In CPAs where *vinculación* with both area and results is more advanced, MACAC moves much more rapidly. This is presumably because, as alluded to above, *vinculación* to a certain extent brings the strengths of the individually farmed CCSs to the CPAs.

Peasants as repositories of farming practices and knowledge

It is worthy of note that Cuban peasants, like peasants everywhere, have always employed some traditional agroecological practices. We were interested in how peasants themselves see their technological history in this light, so we held a workshop in Santa Clara city on 25 November 2008, with 40 participants, the majority of whom were MACAC promoters. As a group exercise the participants created the ‘periodization of agroecological practices in Cuba’ shown in Table 2.

This periodization confirms that peasants have always practiced some agroecological methods from traditional agriculture, which they preserved even during the heyday of the Green Revolution. This pool of traditional knowledge has proven to be a key resource for CAC and MACAC in Cuba. The table also reveals the predominance of input substitution types of practices (biocontrol products, biofertilizers, etc.) early in the Special Period, and a more recent emphasis on the practices of agroecological integration (intercropping, diversification, integration of crops and livestock, self-provisioning of animal feed, etc.).

Impacts and achievements of MACAC

By 2008–2009, when we carried out our fieldwork, 12 years after CAC came to Cuba, the results were quite impressive in terms of the membership growth of MACAC, the productivity of agroecological farms and of the peasant sector in general, and other variables.

Growth and influence of the movement

In Figure 3 we can see the growth of MACAC in terms of numbers of families who have formally joined the movement, and numbers of promoters, facilitators and coordinators. From just over 200 families in 1999, the movement had grown to 110,000 families 10 years later. By way of comparison, in 2009 there were less than 350,000 families in the peasant sector (CCSs and CPAs) of Cuba, so this number represents about one third of families joining in a relatively short period of time, giving CAC a much faster growth rate than anywhere in Mesoamerica, both in relative and in absolute terms.¹⁴ There were some 12,000 farmer-promoters, 3,000 facilitators and 170 coordinators.

¹⁴More recently Cuba has initiated a new phase of agrarian reform, in which former sugar cane lands are being given in usufruct to ‘new peasants’, as well as to current peasants who need additional land. By mid-2010 this had added some 75,000 new members to ANAP, and MACAC is currently offering them training in agroecology.

Table 2. Periodization of Agroecological Practices in Cuba.

Period	Practices 'on the rise' during the period
<i>Pre-1959</i> Traditional peasant agriculture (‘before’)	Manual weed control Animal traction Tobacco extracts for pest control Mulching Seed saving Plowing under of crop residues Planting by lunar phases Diversity of crops and livestock Manuring Limits on burning of fields Living fence posts Biodiversity Intercropping Minimum tillage
<i>1959–1970</i> Green Revolution	Peasants preserved traditional practices like seed saving, animal traction, medicinal plants, intercropping, and the lunar calendar
<i>1970–1990</i> Integrated pest management	Integrated Pest Management (IPM) Biological pest control Development of artisanal biocontrol centers (CREEs) Peasants continued using traditional practices like seed saving, animal traction, medicinal plants, intercropping, and the lunar calendar
<i>1990–1997</i> Special Period	Organic soil amendments (poultry manure, worm humus) Biofertilizers CREEs and biological control Alternative feeds and increased pasturing for livestock Resistant crop varieties Improved animal traction with new implements Artisanal food processing Diversification at the farm level
<i>1997–2000</i> ... from Integrated management to agroecological management (beginning of Campesino- to-Campesino)	Initial process of transition from input substitution to agroecology Decentralization of production Rapid Rural Appraisal Integration of crops and livestock Organic soil amendments Reforestation Increased intercropping On-farm production of animal feed and pasture for self-provisioning Medicinal plants Tree crop nurseries Urban agriculture
<i>2000–2003</i> Territorial expansion of Campesino-to-Campesino	Green manures Contour planning and terracing Botanical extracts for pest control, including Neem Less use of biocontrol products Increased biodiversity Further development of nurseries Diversification with fruit trees

(continued)

Table 2. (Continued).

Period	Practices 'on the rise' during the period
2004–present Deepening of Campesino- to-Campesino	Diversification in sugarcane areas
	Alternative energy sources
	Vermiculture
	Soil conservation
	Innovation of intercropping designs
	Seed saving and recovery of local races and varieties
	Peasant seed selection and crosses, and Participatory Plant Breeding
	Increased crop/livestock integration
	New crops
	Improving of local animal feeds and pastures
	Spread of alternative energy sources

Source: Constructed by the participants in the 25 November 2008 workshop in Santa Clara.

Table 3 shows the numbers of activities carried out by MACAC in 2008, and provides a glimpse at the scale of the undertaking, with a total of more than two million participants in more than 60,000 separate activities.

It is important to note that not just the families who have joined the movement are influenced by it. In fact a lot of neighbors-emulating-neighbors takes place in rural areas and within cooperatives, and non-MACAC members also adopt some of the practices that they see their more agroecological neighbors using successfully. Although obviously not just due to MACAC, this partial 'spill-over' effect nevertheless can be seen in Cuba, where typical practices promoted inside the movement are now used by more than the one third of all peasant families who are movement members. These include the use of organic soil amendments on 64 percent of all peasant farms and ecological pest management methods on 82 percent (Machín Sosa *et al.* 2010, 51).

Productivity of agroecological farms and of the peasant sector

Unfortunately neither ANAP nor the Ministry of Agriculture maintains production figures that are disaggregated by the type of technology employed, so a national or even provincial comparison of agroecological versus conventional farming is impossible (though this may soon be changed). Since we had access to production and sales data collected at individual cooperatives in Sancti Spiritus province, we were able to obtain farm level data classified by the level of agroecological integration described above for a sample of 33 farms. The data shown in Figure 4 is for invoiced sales from 2008. As it does not include food produced for self-provisioning or informal exchange, it underestimates production. Nevertheless we can see that the greater the level of agroecological integration, the greater the total value of production, measured in Cuban non-convertible pesos per year, both *per worker* and *per hectare*. This would seem to show that at least in Cuba, agroecology is an effective way to intensify production, and contrary to popular belief or myth, does not suffer from low labor productivity. These findings are in broad agreement with those of Badgley *et al.* (2007) on a global scale, and Martínez-Torres (2006) in her study of organic and conventional coffee in Mexico.

In Figure 5 we present data on the growth of total production coming from the peasant sector in Cuba over the past two decades, the more recent of which coincides

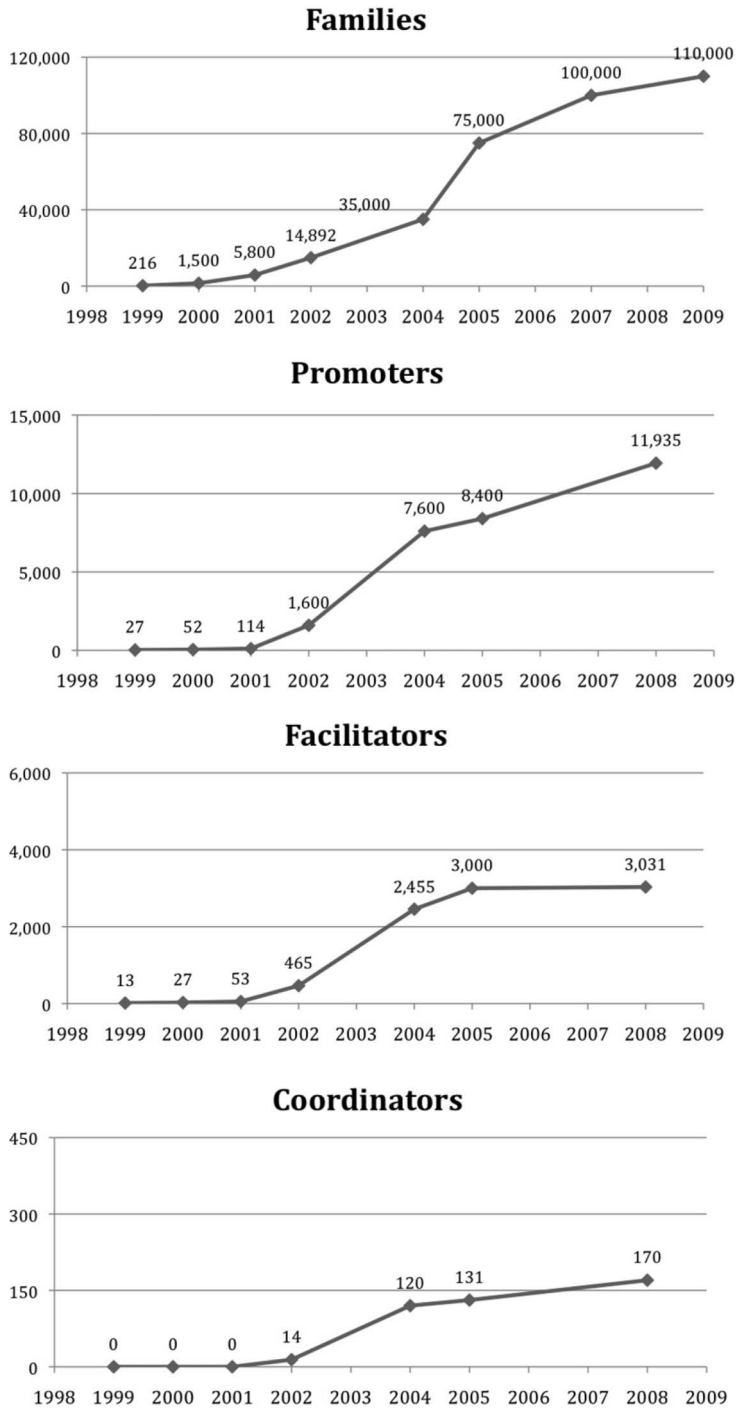


Figure 3. Growth of the Campesino-to-Campesino Agroecological Movement of the ANAP in Cuba. By comparison there were an estimated 345,000 peasant families in Cuba in 2009 (not including UBPC members).

Source: Machín Sosa et al. (2010, 50).

Table 3. Activities carried out by MACAC during 2008.

Activities	Quantity	No. participants
Banes Method applied in cooperatives	3,035	190,940
Rapid appraisals of farms	19,650	110,124
Workshops on agroecological practices	8,650	121,100
Methodological workshops	3,922	47,064
Monthly cooperative assemblies with debates on agroecology	21,233	1,816,317
Activities on National Agroecology Day (21 September)	3,700	92,500
Municipal encounters of promoters and facilitators	262	9,171
Provincial encounters of promoters and facilitators	14	980
<i>Total activities</i>	<i>60,455</i>	<i>2,388,196</i>

Source: Machín Sosa *et al.* (2010, 75).

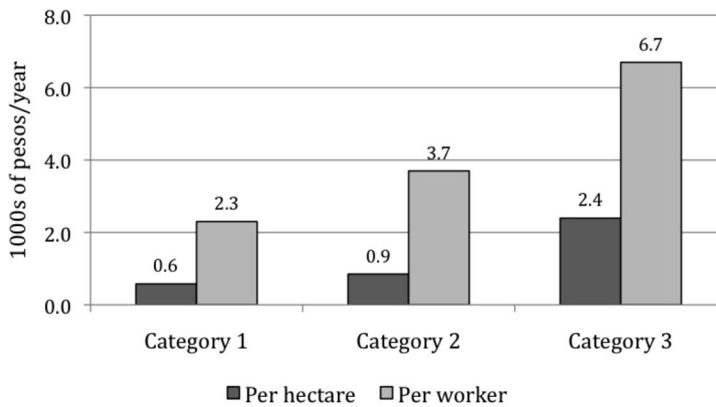


Figure 4. Invoiced value of production during 2008 from 33 farms in Sancti Spiritus province of Cuba ranked on a scale (1 = low, 3 = high, see text) of the degree of agroecological integration they exhibit.

Source: Machín Sosa *et al.* (2010, 55).

with the profound changes toward ecological farming described in this paper. We can highlight a number of critical moments during the period covered by this figure:

- 1988: The highest historical production achieved during the period of conventional agriculture.
- 1994: Drop in production as a result of the disappearance of imported inputs.
- 1997: Period of input substitution. CAC begins in Cuba.
- 2002: CAC becomes a movement, input substitution starts to give way to agroecological integration.
- 2006 and 2007: Advance of agroecology under normal conditions.
- 2008: Cuban agriculture was devastated by three hurricanes, but peasant agriculture showed resilience in that production in this sector only fell 13 percent.
- 2009: Production by the peasant sector exceeds expectations in the National Production Plan.

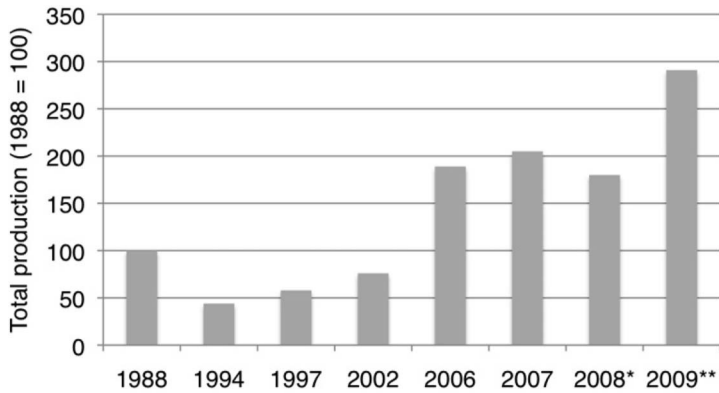


Figure 5. Total production from the peasant sector (CCSs and CPAs) in Cuba (1988 = 100). Notes: *2008 production was drastically affected by three hurricanes. **2009 figures were projected at the time of writing, but in fact they are probably higher. Source: Machín Sosa et al. (2010, 51).

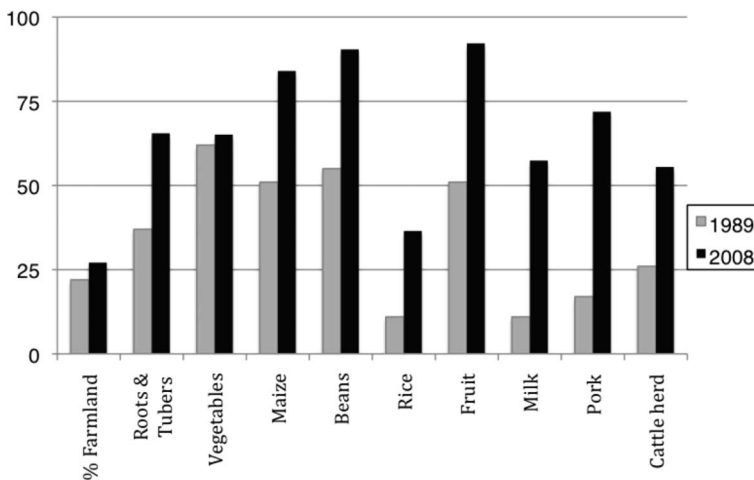


Figure 6. Percent contribution in 1989 and 2008 of the peasant sector to total national production of key food crops and percent of farmland held by peasants. Note: Cattle refers to the percent of the national cattle herd owned by peasants. Source: Machín Sosa et al. (2010, 51).

Though the data that would be needed to prove cause and effect are not available, it is certainly suggestive that the growth in total production mirrors the growth of MACAC and the use of agroecology.¹⁵

Figure 6 shows that this increase in peasant production is not just a simple reflection of generalized production increases in Cuba. It provides a ‘before the Special Period’ (1989) versus an ‘after the spread of agroecology’ (2008) comparison

¹⁵An economic incentive effect has clearly been acting to help boost both peasant production and the implementation of agroecology, due to reorganization and diversification of marketing opportunities for Cuban peasants (Deere 1997, Machín Sosa et al. 2010).

of the relative contribution of the peasant sector to total national production of key food items. In all cases – vegetables, roots and tubers,¹⁶ maize, beans, rice, fruit, milk, and pork – the relative contribution of peasants jumped over the time period, as did the proportion of the national cattle herd in peasant hands. The figure also shows that the relative contribution of peasants for all of the food items is much more than the growth of the proportion of arable land cultivated by peasants. In 2008 peasants produced more than 50 percent of all of these food items except rice, while holding just 27 percent of farmland. Once again this does not prove cause and effect, but the spread of agroecology in the peasant sector has indeed coincided with a major relative increase in its contribution to national food sovereignty.

Another way to tease out the relationship between peasants, food production and agroecology is to look at production data and use of agrochemicals. For example, the production of vegetables, which are typical peasant crops, fell by 65 percent from 1988 to 1994, but by 2007 had rebounded to 145 percent over 1988 levels. This increase came despite using 72 percent fewer agricultural chemicals in 2007 than in 1988. Similar patterns can be seen for other peasant crops like beans (down 77 percent in 1994, but at 351 percent over 1988 levels by 2007, with 55 percent less use of agrochemicals) and roots and tubers (down 42 percent in 1994, at 145 percent of 1988 levels by 2007, with 85 percent fewer agrochemicals). This contrasts dramatically with sugarcane, *not* a peasant crop, which saw yields fall in 1994 to 25 percent below 1988 levels, and fall another three percent by 2007, precisely the same time period during which production of the peasant crops leaped, and this even though the reduction in agrochemical use in sugar (down just five percent by 2007) was insignificant (Machín Sosa *et al.* 2010, 52).

In summary then, our data shows that more agroecological farms produce more than less agroecological farms, and that the peasant sector as a whole has made dramatic strides in food production both in absolute terms and relative to other sectors over the same time period, while consuming much less agrochemicals.

Resilience to climate change

Because of its geographic location, Cuba is one of the countries hardest hit by the extreme climate events associated with climate change. In recent years this has meant severe droughts, increasingly unpredictable rainfall patterns and more powerful hurricanes. La Vía Campesina (2009, 2010) argues that peasant agriculture is more adaptable to a changing climate and more resilient to extreme climate events than industrial agriculture, a position also held by a growing number of scientists (Borron 2006, Altieri and Koohafkan 2008, Altieri and Nicholls 2008a, NWAEG 2009, Mercer and Perales 2010). Holt-Giménez (2002, 2006) compared the farms of peasants from the CAC movement in Central America with peasants farming more conventionally in the wake of Hurricane Mitch, which struck the region in 1998. He found that the agroecological farms of the CAC participants suffered less erosion and gully formation and fewer landslides during the devastating hurricane.

We conducted our field work in 2008 in Holguín and Las Tunas provinces just 40 days after Hurricane Ike had devastated agriculture in that region. We observed large areas of industrial monoculture where not five percent of the plants were left standing. We visited numerous agroecological peasant farms with multi-storied

¹⁶Root and tuber crops, called *viandas* in Cuba, are a key element in the national diet.

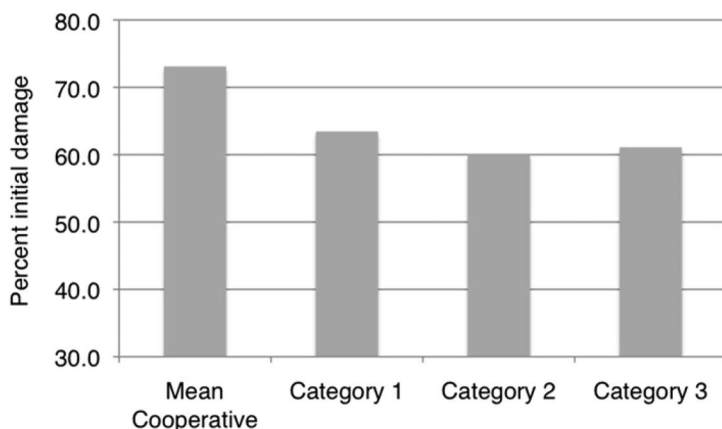


Figure 7. Estimated percent initial damage to farms after Hurricane Ike (2008) in the 'Rafael Zaroza' CCS in Sancti Spiritus province of Cuba, ranked on a scale (1 = low, 3 = high, see text) of the degree of agroecological integration they exhibit versus the mean of the entire cooperative.

Source: modified from Machín Sosa *et al.* (2010, 57).

agroforestry farming systems where Ike had only knocked down the taller 50 percent of the crop plants (tall plantain varieties and fruit trees), while lower story annual and perennial crops were already noticeably compensating for those losses with exuberant growth, taking advantage of the added sunlight when upper stories were tumbled or lost leaves and branches. We also saw tremendous new leaf growth on branches that had been stripped. And perhaps most impressive of all, a substantial portion of the trees that had been blown down had been saved by peasant families who stood them back up and covered their roots the first morning after the storm. We also saw many newly transplanted seedlings already growing in the spots left by the trees that were killed. In contrast, there was no evidence of trees having thus been 'saved' by the workers on industrial agriculture plantations, and replanting was well behind the pace observed on peasant cooperatives. It is worth noting that the farmers we visited assured us that the moisture-conserving mulches and ground covers in the agroecological systems also made them more resistant to drought.

We call these perceived responses of agroecological peasant farms to climate events *biological-physical resistance* (less damage from the initial impact), *biological compensation* (abundant growth by lower story crops), *biological recovery* (leaf regrowth on stripped branches), and *human/peasant resilience*. Together they make up overall *resilience* to extreme climate events

Figure 7 illustrates the average initial losses from Ike suffered by farms from the different agroecological categories who are members of the 'Rafael Zaroza' CCS in Sancti Spiritus province. While on the average, initial losses of the entire cooperative were almost 75 percent, the more agroecological farms suffered losses of about 60 percent, supporting our field observations of greater biological-physical resistance.

Figure 8 shows the average estimated recovery of the farms by category at 60, 120 and 180 days after Ike. Just 60 days after the storm, the most agroecologically integrated farms had a greater than 80 percent recovery, and by 120 days they had recovered almost 100 percent of their estimated productive potential. In contrast, the

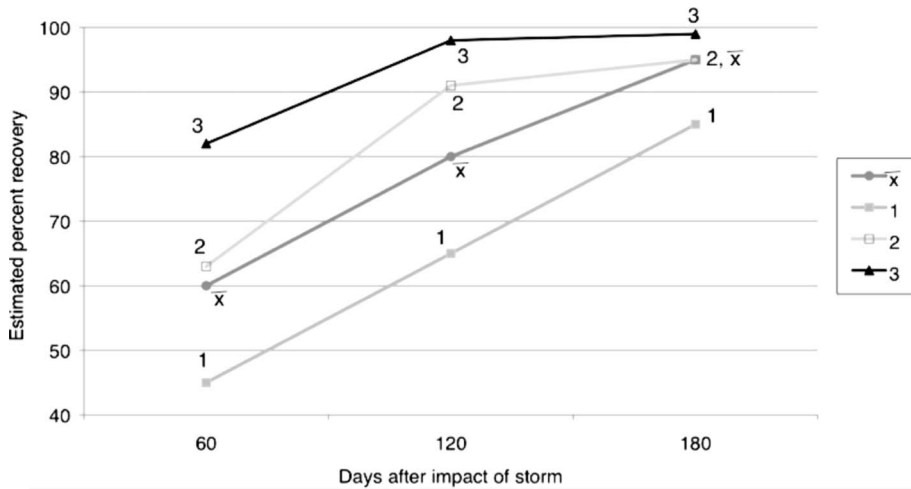


Figure 8. Estimated percent recovery from damage to farms at 60, 120 and 180 days after Hurricane Ike (2008) in the 'Rafael Zarzoa' CCS in Sancti Spiritus province of Cuba, ranked on a scale (1 = low, 3 = high, see text) of the degree of agroecological integration they exhibit versus the mean (\bar{X}) of the entire cooperative.

Source: modified from Machin Sosa *et al.* (2010, 50).

averages for the entire cooperative and for the least integrated farms did not reach the 80–90 percent recovery range until six months (180 days) later, lending support to the observation that the more agroecological farms show possible greater resilience to hurricanes.

Our data should be taken as highly suggestive rather than conclusive. However, it is important and sufficient to claim at this point that our initial empirical investigation suggests that agroecology contributes to building farms that are more resilient to environmental disturbances associated with climate change than conventional farming systems.

Agroecology and the peasant family

Another observation from our field work, and a tentative conclusion, is that the transition from conventional monoculture to diversified agroecological farming may also have impacts on the structure, roles and power relations inside the peasant family. What peasants told us, especially peasant women, is that with a conventional monoculture the 'crop belongs to the man. He drives the tractor, plants, applies chemicals, harvests and sells the crop. And all the money goes to him'. In the conventional system, peasant women told us, 'the man was king'. But as the farm is diversified through participation in MACAC, the roles and income earning opportunities for the different members of the nuclear and the extended family are also diversified (as we observed, and as we were told). There are row crops that the man may still manage, but also animals, vermiculture, and medicinal plants that may be the province of the woman, where she makes the decisions and receives the income. There may be some animals managed by adolescents, others by smaller children, and fruit trees and preserves managed by grandparents (see Table 6.1 on 'Roles and Tasks of Family Members' in Machin Sosa *et al.* 2010,

65). There are now a diversity of decision-making and income generating roles, all of which, we were told, work to reduce the weight of patriarchy inside the family unit.

We saw many families where the diversification of opportunities had brought members of the nuclear family (sons and daughters who had moved to town) and extended family (grandparents, aunts, uncles, cousins) back to the farm to engage in productive labor. A number of teenagers told us they had become fascinated with agroecology and were reconsidering previous plans to move to the city. In Cuba this of course cannot be separated from the effects of the recent economic crisis, which have made farming relatively more attractive than city living in economic terms. Nevertheless, we tentatively conclude that agroecological diversification can be an element in reconstituting the peasant family that has been atomized by modernization.¹⁷

Lessons and challenges

The workshops and interviews that we carried out allowed us to distill some tentative lessons by comparing more and less successful local cases throughout Cuba, especially with regard to the more challenging aspects of applying CAC on a large scale. A principal challenge has been to achieve gender equality in the movement. While we conclude that agroecology may dilute patriarchy within the family, that is not the same as gender balance in the movement itself. Although women made up 40 percent of coordinators in 2009, only 12 percent of facilitators and 8 percent of promoters were women (Machín Sosa *et al.* 2010, 70). It is clear that the movement needs to make a more concerted effort to recruit and train women activists, especially as many members of MACAC lauded the skills that women bring to promotion and facilitation.

We observed that the CAC process develops best when special attention is devoted through training and by leaders to privileging the protagonism of peasants (rather than technicians, political leaders, etc.) in all aspects of the process. This means a careful balance has to be achieved between the vertical and horizontal elements of the structure of the movement. Where peasant protagonism is overly diluted by other actors, the process slows to a crawl. There have also been some cases where peasant promoters developed ‘know-it-all’ superior attitudes reminiscent of technicians and extension agents, with similar effects in reducing the dynamism of the overall process.

The implementation of CAC in a cooperative or municipality should be based as much as possible on resources that are already available locally. That means both human and material resources. Minimizing external dependency is the best way to build sustainable processes; where the local process has been overly dependent on the outside it has typically failed to develop. However this does not mean that the organization (i.e. ANAP) does not need to play a large scale role in planning and in obtaining needed resources.

When peasant promoters have been overly saddled with bureaucracy like paperwork for reporting, the process has typically ground to a halt. Nevertheless, it

¹⁷Fernandes (2000) has similarly noted how successful land occupations by the Landless Workers’ Movement (MST) in Brazil often lead to the reconstitution of the atomized peasant family.

is crucial that promoters, facilitators and coordinators work together closely in planning, monitoring and evaluation.

Another key to success is absolute respect for local culture and customs in each locality, and the process should emphasize recovering, valuing, recognizing and promoting local knowledge, and complementing but not overwhelming it with knowledge from outside. It is critical to avoid imbalances between technological aspects, which have a rapid dynamic, and the social methodology process, which takes time to develop. The most successful cases involved and built on the skills of and respect for local leaders, took advantage of local structures like the cooperative assembly, and involved potential local allies, ranging from school teachers and physicians to local officials.

MACAC has proven to be a 'hot house', to use a phrase that was often repeated, for identifying and developing new grassroots leadership within ANAP. Peasants who become promoters, receive training in popular education methodology, and experience success in helping other farmers transform their production systems, gain self-confidence and gain respect from their peers. Many are soon elected to leadership positions in their cooperatives, and some rise further to municipal, provincial or national leadership positions in ANAP. We could literally feel the bottom-up rise of a whole new generation of peasant leaders as a result of MACAC, some of whom eventually leave ANAP and come to occupy political offices, start to work for government agencies, etc. ANAP and MACAC activists see this as both a plus and a minus. A plus because this is providing ANAP with a dynamic new cohort of leadership, but a minus because it means constantly identifying and training new promoters to replace those who are 'lost upward and outward'. But even this loss carries within it a plus, as the former MACAC promoters in leadership positions inside ANAP reinforce the importance given to the movement by the organization itself, and those who now occupy leadership positions outside of ANAP have proven to be key institutional allies for MACAC and for agroecology in general, (re)shaping government policies to support MACAC and agroecology.

Reflections on *Campesino-to-Campesino*, agroecology and food sovereignty

The story of MACAC in Cuba provides a lot of material for reflection on a variety of issues, from a variety of perspectives. From a natural science perspective, it speaks to the productivity of more complex and more integrated agroecosystems. In this case there was a correlation between the transition from conventional farming to simple input substitution to agroecological integration and an increase in total productivity both of land and of labor. But it is also a warning to natural scientists, technicians and extensionists: more and better technology will not alone lead to widespread ecological farming. Typically many agroecological practices are available but not widely adopted because of the lack of a social process that encourages and drives their adoption. Thus the limiting factor is most often not technical but social and methodological, and the latter are most often under-addressed. Furthermore, even a good social process may not be successful unless structural barriers to agroecology and food sovereignty can be at least partially overcome.

From a policy perspective, it speaks to questions of achieving national food sovereignty in the face of the global economic, climate and food crises. The Cuban experience would tend to support the arguments of La Via Campesina (2010, see also Rosset 2006) that building food sovereignty requires putting land in the hands of

peasants, through genuine agrarian reform, fair prices through protection from dumping of cheap food from abroad, and a transition to agroecological farming. Agroecological farming breaks dependence on imported inputs in times of economic crisis (in Cuba it helped boost national food production just when the global food crisis had driven the foreign exchange cost of imported food to unacceptable levels), and increases the resiliency of the economy to ever more frequent climate shocks. In Machín Sosa *et al.* (2010, chapter seven) we detail the many ways in which the Cuban state now provides complementary policies and institutions which have strengthened MACAC, even though we also point out that many high level policy makers (and their policies) continue to have a conventional Green Revolution/industrial agriculture mindset.

Some observers raise the issue of ‘Cuban exceptionalism’,¹⁸ arguing that experiences from the island nation do not apply to other countries who have not had social revolutions, or who do not face food crises as severe as that faced by Cuba during the Special Period. It is of course important to be cautious about universalizing and generalizing particular experiences. But we would first observe that the growth of MACAC in Cuba actually occurred after the most difficult moments of the Special Period had passed, when the economy was experiencing some level of recovery. But of course there is no denying that MACAC in Cuba, and Cuban peasants in general, have greatly benefited from a supportive rather than a hostile state, relatively high food prices that translate into fair crop prices, land already in the hands of peasants (organized peasants), and a high ‘scarcity cost’ for imported farm inputs. But rather than accept such conditions as impossible outside of Cuba, LVC and many other social movements actively struggle around the world for genuine agrarian reform, banning dangerous pesticides, protection of the national economy from dumping and speculation by transnational corporations, and other food sovereignty policies (Rosset 2006, Martínez-Torres and Rosset 2010, Borrás and Franco 2010). When we can demonstrate that certain policies function in Cuba, for example, this is a powerful argument to use in other countries. The role of social movements in generating changes of governments in Venezuela, Bolivia and Ecuador, for example, and their lobbying in favor of food sovereignty, agroecology and other pro-peasant policies in these countries are a case in point. These efforts have been partially successful, though uneven to date, and certainly offer hope (Wilpert 2006, Gascón and Montagut 2010).

A key lesson of this study is that to scale up agroecology requires a peasant organization and a socially dynamic methodology like CAC, as has been argued by La Via Campesina (2010). Peasant self-organization must be supported and encouraged, and conventional agricultural extension from the state, NGOs or the private sector is no substitute. The question of how to scale up agroecology is under debate in the literature (von der Weid 2000, Altieri and Nicholls 2008b), and our results fall squarely in support of the position of Holt-Giménez (2001, 2006) that the CAC methodology is the most effective way found to date, and of Altieri (2009) that rural social movements hold the key.

From the perspective of a peasant organization searching for a way to support its member families in a transition from conventional to ecological farming, the experience of ANAP presented here is unequivocal. When conventional extension was the method being used, the results were slow and haphazard. But a dramatic

¹⁸See Hoffmann and Whitehead (2006) for a discussion of Cuban exceptionalism.

speed-up occurred through the adoption of the socially dynamic CAC methodology, with another important leap taking place when this was combined with a grassroots social movement-building methodology.¹⁹

Some additional perspective can be gained from asking why CAC grew faster in Cuba than in Mesoamerica. Beyond the advantages offered by Cuba, we conclude that the key factors probably are the *intentionality* by which ANAP consciously built it as a *movement*, the degree of *organicity* possessed by ANAP and which ANAP promoted inside of MACAC, and the *systematic* way the CAC methodology was implemented and augmented. These are all factors that people, organizations and policy makers anywhere can learn from.

From the perspective of La Via Campesina, a transnational social movement trying to support its member organizations to develop agroecology, a key lesson is that the *Campesino-to-Campesino* methodology can and should be applied at the international level. This would be a ‘*Campesino* organization’-to-‘*Campesino* organization’ method based on exchange visits, and this is something we are already beginning to carry out.²⁰

Of course, the fact that a national peasant organization using the CAC methodology under favorable structural conditions was able to achieve so much success does not guarantee that an international peasant movement will be able to use the same methodology to advance agroecology worldwide under decidedly less favorable structural conditions. That the CAC methodology is now in the hands of a international peasant federation with increasing ‘organicity’ would seem to be a necessary but not sufficient condition. First, not many organizations inside or outside of LVC boast the degree of organicity that ANAP has. Second, while in some countries, as noted above, conditions are becoming more supportive, those countries may still lack such a well organized peasant organization and/or the supportive conditions may still be partially lacking.

It is clear to LVC that the internal work of strengthening member organizations is a critical priority (Martínez-Torres and Rosset 2010), and in fact is probably a precondition for achieving further structural and policy changes such as those of Cuba, Venezuela, Ecuador and Bolivia, as well as for developing CAC and agroecology on a broad scale in other countries. However, the tasks of internal strengthening and the promotion of CAC can be mutually supportive in terms of developing grassroots leadership cadre and credibility inside organizations, as the example of ANAP has shown us. In many countries, organizations find that both agroecology and food sovereignty are much more disputed terrains than they are in Cuba. Typically the countryside is awash with NGOs, reformist and reactionary farmers organizations, foreign foundations, and government and inter-governmental

¹⁹Like many other farmer organizations, ANAP has a national farmer training school. A key lesson of the ANAP experience is that the school can play an integral role in supporting MACAC. Promoters, facilitators, and coordinators all take short courses at the school to learn methods (i.e. pedagogical and organizing methods) specifically tailored to their roles. Cooperative presidents and other ANAP cadre and leaders from all levels receive courses to sensitize them to agroecology and to the CAC methodology (Machín Sosa *et al.* 2010).

²⁰ANAP has hosted dozens of exchanges with peasant organizations from around the world, with a particular affluence of Venezuelan organizations (Machín Sosa *et al.* 2010). In 2009 the International Working Group on Sustainable Peasant Agriculture of La Via Campesina met at ANAP’s farmer training school, with delegates from Latin America, Asia, Africa and North America.

programs all touting a sometimes intentionally confusing mixture of a re-packaged Green Revolution, sustainable agriculture, organic farming, etc.²¹ Can CAC methodology be a tool to help LVC member organizations navigate this complicated landscape and build internal strength? We hope to find out.

In the final chapter of Machín Sosa *et al.* (2010) we urge Cuban policy makers to take a close look at what MACAC has demonstrated in terms of the benefits of agroecologically integrated peasant farming for the island nation:

- Compared to conventional monoculture, it is more productive per unit area, per unit of labor, and per unit of investment, especially investment in still-scarce foreign exchange.
- This kind of production is more resilient to climate change and extreme climate events, which is critical on an island like Cuba that is experiencing more hurricanes and more droughts.
- It is also more resilient to external economic and political shocks, as it does not depend on imported inputs. Production is insulated from the effects of the embargo and fluctuations in the price of petroleum and petroleum-based products.²²
- This style of production does not damage the environment nor human health, as it does not rely on toxic chemicals nor GMOs, and it is capable of restoring the lost productivity of degraded soils and agroecosystems.

In the book we urge those Cuban policymakers who still have a conventional, Green Revolution, industrial farming mindset, to consider their reality as a small island nation facing an embargo and hurricanes, and to more seriously weigh the role that MACAC and agroecology are playing – and can play to an even greater extent in the future – in helping Cuba achieve food sovereignty and maintain its political autonomy.

References

- Altieri, M.A. 1995. *Agroecology: the science of sustainable agriculture*. Boulder: Westview Press.
- Altieri, M.A. 2002. Agroecology: the science of natural resource management for poor farmers in marginal environments. *Agriculture, Ecosystems and Environment*, 93, 1–24.
- Altieri, M.A. 2009. Agroecology, small farms, and food sovereignty. *Monthly Review*, 61(3), 102–13.
- Altieri, M.A. and P. Koohafkan. 2008. *Enduring farms: climate change, smallholders and traditional farming communities*. Penang: Third World Network.
- Altieri, M.A. and C. Nicholls. 2008a. Los impactos del cambio climático sobre las comunidades campesinas y de agricultores tradicionales y sus respuestas adaptativas. *Agroecología* (Spain), 3, 7–28.
- Altieri, M.A. and C. Nicholls. 2008b. Scaling up agroecological approaches for food sovereignty in Latin America. *Development*, 51(4), 472–80.
- Badgley, C., *et al.* 2007. Organic agriculture and the global food supply. *Renewable Agriculture and Food Systems*, 22(2), 86–108.

²¹See Borras (2010) for an example of how ‘cluttered’ the landscape can be.

²²In recent years agreements with Venezuela and China have led to renewed imports of farm chemicals. However, fluctuations in the price of petroleum have made these imports somewhat unreliable, supporting the argument by MACAC activists that it is better not to depend on such imports in any case.

- Borras, S.M. 2010. The politics of transnational agrarian movements. *Development and Change*, 41(5), 771–803.
- Borras, S.M. and J.C. Franco. 2010. Contemporary discourses and contestations around pro-poor land policies and land governance. *Journal of Agrarian Change*, 10(1), 1–32.
- Borron, S. 2006. *Building resilience for an unpredictable future: how organic agriculture can help farmers adapt to climate change*. Rome: Food and Agriculture Organization of the United Nations.
- Bunch, R. 1985. *Two ears of corn: a guide to people-centered agricultural improvement*. Oklahoma City: World Neighbors.
- Carroll, C.R., J.H. Vandermeer and P.M. Rosset. 1990. *Agroecology*. New York: McGraw-Hill.
- Chambers, R. 1990. Farmer-first: a practical paradigm for the third agriculture. In: M.A. Altieri and S.B. Hecht, eds. *Agroecology and small farm development*. Ann Arbor: CRC Press, pp. 237–44.
- Chambers, R. 1993. *Challenging the professions: frontiers for rural development*. London: Intermediate Technology Publications.
- Deere, C.D. 1997. Reforming Cuban agriculture. *Development and Change*, 28(4), 649–69.
- Enriquez, L. 1994. *The question of food security in Cuban socialism*. Berkeley, CA: Institute of International and Area Studies, University of California.
- Enriquez, L. 2003. Economic reform and repeasantization in post-1990 Cuba. *Latin American Research Review*, 38(1), 202–18.
- Fernandes, B.M. 2000. *A formação do MST no Brasil*. Petrópolis: Editora Vozes.
- Food and Agriculture Organization of the United Nations (FAO). 2006. *The state of food and agriculture 2006*. Rome: FAO.
- Fox, J. 1996. How does civil society thicken? The political construction of social capital in rural Mexico. *World Development*, 24(6), 1089–103.
- Freire, P. 1970. *Pedagogy of the oppressed*. New York: Seabury Press.
- Freire, P. 1973. *Extension or communication?* New York: McGraw.
- Funes, F., M. Altieri and P. Rosset. 2009. The Avery Diet: the Hudson Institute's misinformation campaign against Cuban agriculture. Available from: <http://www.landaction.org/spip/spip.php?article422> [Accessed September 2010].
- Funes, F., et al. 2002. *Sustainable agriculture and resistance: transforming food production in Cuba*. Oakland: Food First.
- Funes-Monzote, F.R. 2008. *Farming like we're here to stay: the mixed farming alternative for Cuba*. PhD thesis, Wageningen University. Available from: <http://edepot.wur.nl/122038> [Accessed October 2010].
- Funes-Monzote, F.R. 2010. Cuba: a national-level experiment in conversion. In: S.R. Gliessman and M. Rosenmeyer, eds. *The conversion to sustainable agriculture: principles, processes and practices*. Boca Raton: CRC Press, pp. 205–27.
- Gascón, J. and X. Montagut. 2010. *¿Cambio de rumbo en las políticas agrarias latinoamericanas? Estado, movimientos sociales campesinos y soberanía alimentaria*. Barcelona: Icaria Editorial.
- Gliessman, S.R. 2007. *Agroecology: the ecology of sustainable food systems*. New York: Taylor and Francis.
- Guthman, J. 2000. Raising organic: an agro-ecological assessment of grower practices in California. *Agriculture and Human Values*, 17(3), 257–6.
- Guthman, J. 2004. *Agrarian dreams: the paradox of organic farming in California*. Berkeley: University of California Press.
- Hoffmann, B. and L. Whitehead. 2006. Cuban exceptionalism revisited. *Giga Working Papers*, 28, 1–24.
- Holt-Giménez, E. 1997. *La canasta metodológica: metodologías campesinas para la enseñanza agroecológica y el desarrollo de la agricultura sostenible*. Managua: SIMAS.
- Holt-Giménez, E. 2001. Scaling-up sustainable agriculture. *LEISA*, 3(3), 27–9.
- Holt-Giménez, E. 2002. Measuring farmers' agroecological resistance after Hurricane Mitch in Nicaragua: a case study in participatory, sustainable land management impact monitoring. *Agriculture, Ecosystems and Environment*, 93(1/3), 87–105.
- Holt-Giménez, E. 2006. *Campesino a campesino: voices from Latin America's farmer to farmer movement for sustainable agriculture*. Oakland: Food First Books.

- Holt-Giménez, E. 2009. From food crisis to food sovereignty: the challenge of social movements. *Monthly Review*, 61(3), 142–56.
- Holt-Giménez, E. 2010. Grassroots voices: linking farmers' movements for advocacy and practice. *Journal of Peasant Studies*, 37(1), 203–36.
- Kolmans, E. 2006. *Construyendo procesos 'de campesino a campesino'*. Lima: ESPIGAS and Pan para el Mundo.
- Kundu, S., et al. 2007. Long-term yield trend and sustainability of rainfed soybean–wheat system through farmyard manure application in a sandy loam soil of the Indian Himalayas. *Biology and Fertility of Soils*, 43(3), 271–80.
- La Via Campesina. 2009. *Small scale sustainable farmers are cooling down the Earth*. Jakarta: La Via Campesina. Available from: http://viacampesina.org/en/index.php?option=com_content&view=section&layout=blog&id=8&Itemid=30 [Accessed September 2010].
- La Via Campesina. 2010. *Sustainable peasant and family farm agriculture can feed the world*. Jakarta: La Via Campesina. Available from: http://viacampesina.org/en/index.php?option=com_content&view=section&layout=blog&id=8&Itemid=30 [Accessed October 2010].
- Lugo Fonte, O. 2000. Nuestro deber patriótico es producir para el pueblo. *Granma*. 17 May.
- Machín Sosa, B., et al. 2010. *Revolución agroecológica: el movimiento de campesino a campesino de la ANAP en Cuba. Cuando el campesino ve, hace fe*. Havana: ANAP and La Via Campesina. Available from: <http://www.viacampesina.org/downloads/pdf/sp/2010-04-14-rev-agro.pdf> [Accessed September 2010].
- Martínez-Torres, M.E. 2006. *Organic coffee: sustainable development by Mayan farmers*. Athens, OH: Ohio University Press.
- Martínez-Torres, M.E. and P.M. Rosset. 2010. La Via Campesina: the birth and evolution of a transnational social movement. *Journal of Peasant Studies*, 37(1), 149–75.
- Mercer, K.L. and H.R. Perales. 2010. Evolutionary response of landraces to climate change in centers of crop diversity. *Evolutionary Applications*, 3, 480–93.
- Monzote, M., E. Muñoz and F. Funes-Monzote. 2002. The integration of crops and livestock. In: F. Funes, et al., eds. *Sustainable agriculture and resistance: transforming food production in Cuba*. Oakland: Food First Books, pp. 190–211.
- Mulvaney, R.L., S.A. Khan and T.R. Ellsworth. 2009. Synthetic nitrogen fertilizers deplete soil nitrogen: a global dilemma for sustainable cereal production. *Journal of Environmental Quality*, 38, 2295–314.
- New World Agriculture and Ecology Group (NWAEG). 2009. *Effects of industrial agriculture on global warming and the potential of small-scale agroecological techniques to reverse those effects*. Ann Arbor: NWAEG. Available from: http://viacampesina.org/en/index.php?option=com_content&view=section&layout=blog&id=8&Itemid=30 [Accessed September 2010].
- Nova, A. 2002. Cuban agriculture before 1990. In: F. Funes, et al., eds. *Sustainable agriculture and resistance: transforming food production in Cuba*. Oakland: Food First Books, pp. 27–39.
- Pingali P.L. M. Hossain and R.V. Gerpacio. 1997. *Asian rice bowls: the returning crisis*. Wallingford, UK: CAB International.
- Radford, B.J., et al. 2001. Crop responses to applied soil compaction and to compaction repair treatments. *Soil and Tillage Research*, 61(3/4), 157–66.
- Rosset, P.M. 1997. Alternative agriculture and crisis in Cuba. *Technology and Society*, 16(2), 19–25.
- Rosset, P.M. 1999. The multiple functions and benefits of small farm agriculture in the context of global trade negotiations. *Food First Policy Brief*. No. 4. Institute for Food and Development Policy. Available from: <http://www.foodfirst.org/pubs/policybs/pb4.pdf> [Accessed October 2010].
- Rosset, P. 2006. Moving forward: agrarian reform as part of food sovereignty. In: P. Rosset, R. Patel and M. Courville, eds. *Promised land: competing visions of agrarian reform*. Oakland: Food First Books, pp. 301–21.
- Rosset, P.M. and M.A. Altieri. 1997. Agroecology versus input substitution: a fundamental contradiction of sustainable agriculture. *Society and Natural Resources*, 10(3), 283–95.
- Rosset, P. and M. Benjamin. 1994. *The greening of the revolution: Cuba's experiment with organic agriculture*. Melbourne: Ocean Press.

- Schill, S.R. 2008. Perfect storm for fertilizer prices. *Ethanol Producer Magazine*, June. Available from: http://ethanolproducer.com/article.jsp?article_id=4136 [Accessed September 2010].
- Vandermeer, J., I. Perfecto, and S. Philpott. 2010. Ecological complexity and pest control in organic coffee production: uncovering an autonomous ecosystem service. *BioScience*, 60(7), 527–37.
- van der Ploeg, J.D. 2008. *The new peasantries. struggles for autonomy and sustainability in an era of empire and globalization*. London: Earthscan.
- van der Ploeg, J.D. 2010. The peasantries of the twenty-first century: the commoditization debate revisited. *Journal of Peasant Studies* 37(1): 1–30.
- von der Weid, Jean Marc. 2000. Scaling up, and scaling further up: an ongoing experience of participatory development in Brazil. São Paulo: AS-PTA. Available from: <http://www.fao.org/docs/eims/upload/215152/AS-PTA.pdf> [Accessed October 2010].
- Vásquez Zeledón, J.I. and A. Rivas Espinoza. 2006. *De campesino a campesino en Nicaragua*. Managua: UNAG.
- Wezel, A., et al. 2009. Agroecology as a science, a movement and a practice. A review. *Agronomy for Sustainable Development*, 29(4), 503–15.
- Wilpert, G. 2006. Land for people not for profit in Venezuela. In: P. Rosset, R. Patel and M. Courville, eds. *Promised land: competing visions of agrarian reform*. Oakland: Food First Books, pp. 249–64.
- Wright, J. 2008. *Sustainable agriculture and food security in an era of oil scarcity: lessons from Cuba*. London: Earthscan.

Peter Michael Rosset is a member of the technical support team of La Via Campesina. He is also a researcher at the Center for the Study of Rural Change in Mexico (CECCAM), an associate of the Center for the Study of the Americas (CENSA) in Berkeley, California, a visiting research scientist of the University of Michigan in Ann Arbor, and co-coordinator of the Land Research Action Network (www.landaction.org).

Braulio Machín Sosa was a technical cadre of the National Association of Small Farmers (ANAP) in Sancti Spiritus province in Cuba. He has since been named national coordinator of the *Movimiento Agroecológico de Campesino a Campesino* (MACAC) of ANAP.

Adilén María Roque Jaime is professor of agroecology at the ‘Niceto Pérez’ National Farmer Training School of ANAP in Cuba.

Dana Rocío Ávila Lozano is a militant of the Landless Workers’ Movement (MST) of Brazil, and is professor at the ‘Paulo Freire’ Latin American University Institute of Agroecology (IALA-Vía Campesina) in Barinas, Venezuela. IALA is an international university for the sons and daughters of peasants and indigenous people, created jointly by La Via Campesina and the government of Venezuela.