CUBA

Turning economic isolation into an opportunity for agroecological transition
From the 1960s to the beginning of the 1990s, Cuban agriculture was focused on highly-mechanized, large-scale monocultures of export commodities, and dependent on large quantities of imported chemicals and fertilizers – in other words, emblematic of the Green Revolution (Burchardt, 2001; Machín Sosa et al., 2013; Rosset et al., 2011).

Although the sector was provided with capital, agro-chemicals, and additional inputs through the Socialist trading bloc, the yields of rice and other key crops began to decline in the 1980s (Machín Sosa et al., 2013; Rosset et al., 2011). The intensive and uniform agricultural model had left soils degraded and struggled to control pests over the long term (Ponce Palma et al., 2015). When the Socialist bloc broke down at the end of the 1980s, Cuba lost 85% of its trade flows and its food production and supply networks collapsed – a situation aggravated by the ongoing US trade embargo.

In response to this crisis, the small-scale agricultural sector in Cuba underwent what has been referred to as an “agroecological revolution” (Altieri, 2016; Machín Sosa et al., 2013). The Cuban peasantry was able to increase production despite a severe reduction in external inputs, while large-scale plantations of sugarcane and other commodity crops continued to struggle (Rosset et al., 2011). The transition accelerated through the 1990s building on a burgeoning campesino-a-campesino (farmer-to-farmer) movement.

Today, an estimated 300,000 small-scale farmers are said to be practicing agroecology in Cuba (Altieri, 2016). Studies suggest that agroecological practices are applied on 46-72% of small-scale farms, accounting for about 60% of the vegetables, maize, beans, fruits, and pork consumed in Cuba (Altieri, 2016). Evolving agroecological design and practices have contributed to a significant increase in the peasant sector’s relative and absolute production levels, alongside increasing climate resilience and other benefits (Funes and Vázquez, 2016).

Urban agriculture (virtually chemical free) has also flourished, and now supplies up to 70% of the consumption of fresh vegetables in larger cities throughout the country (Altieri, 2016), making Cuba a global leader in urban agriculture (Leitgeb et al., 2016). However, these trends are yet to translate into healthy and sustainable food consumption patterns for broad swaths of the Cuban population.

The following steps were key in driving the transition process forward:

1. Organizing horizontal exchanges between farmers in the field through farmer-to-farmer experience sharing and systematic knowledge exchange;
2. Making the farmers the ‘experts’ (through several methods of interaction);
3. Recognizing the need to adapt to local conditions (in the development of crop varieties and biological products);
4. Building institutional cooperation between stakeholders in the process.

Many of these steps were driven from the bottom-up by the Asociación Nacional de Agricultores Pequeños (ANAP or National Association of Small Farmers). State support grew in the wake of grassroots farmer-led change, as the strong potential of agroecology to support food production under difficult conditions became clear (Machín Sosa et al., 2013). Through the creation and redirection of research centres, the provision of biological inputs, and the development of advisory services for agroecology, Cuba has assembled what for many are among the world’s most supportive policies for agroecology. The implementation
of curricula based on agroecology, including both theoretical and practical learning in Cuban agricultural colleges and universities, has also helped to institutionalize the transition over the long-term.

However, policymakers displayed a willingness to back Green Revolution-style approaches once the national economy improved (Altieri and Funes-Monzote, 2012). Though many components of the food system are simultaneously undergoing change in Cuba, many others (e.g. food access, nutrition) have yet to experience significant shifts. While the Cuban experience might not be directly replicable, the case underlines the importance of supportive state policies, a highly organized peasantry, and the intentional and systematic use by a peasant organization of a social change process methodology.

**CHANGES IN PRODUCTION PRACTICES**

Before the supply shocks at the end of the Cold War, the average size of state-run sugar and citrus plantations was roughly 10,000 ha, while state livestock farms averaged about 20,000 ha and rice farms around 30,000 ha. Cuban agriculture had more tractors per person and per hectare than any other Latin American country, and during the 1970s its tractor density became comparable to that of developed countries (Febles-González et al., 2011; Rosset et al., 2011). Fertilizer use on a par with developed countries gave Cuba some of the highest grain yields in Latin America (Ponce Palma et al., 2015; Rosset et al., 2011) while leaving the country’s production base highly reliant on imports – accounting for 94% of chemical fertilizers, 97% of herbicides, and 98% of feed concentrate (Febles-González et al., 2011; Funes, 2002).
Cuba benefited from reasonably high levels of food security through this period (Rosset et al., 2011), with the state managing markets for staple foods and guaranteeing prices as part of Cuba’s participation in the socialist trading bloc, the Council of Mutual Economic Assistance (CMEA) (Deere, 1997).

By 1989, when the Soviet bloc broke down, sugarcane was being grown on 30% of the agricultural land in Cuba, generating 75% of export revenues. Meanwhile, Cuban food import dependency stood at 57% (Rosset et al., 2011), and with the US-led trade embargo still in place, almost all of these trade flows were drawn from the Socialist trading bloc. The dissolution of the Soviet Union disrupted these trade relations. During ‘the Special Period in Time of Peace’, imports of food, oil, raw materials, and spare parts declined sharply and Cuba lost 85% of its trade flows (Nieto and Delgado, 2002; Rosset et al., 2011).

A food and farming crisis emerged. Cuban food production shrank by 5.1% per year from 1986 to 1995, in a context of stagnant production across Latin America. Vegetable production declined by 65% from 1988 to 1994 as the use of agricultural inputs fell to one fifth of previous levels, largely because imported inputs were no longer available. With distribution networks reeling, only one third of the agricultural harvest reached formal markets. Another third rotted in the fields, while the remaining third was distributed on informal markets. Agriculture became the economy’s most subsidized sector (Burchardt, 2001; Rosset et al., 2011).

With the loss of conventional chemicals and fertilizers, and lacking tractor parts, Cuban agriculture began an ambitious transition process. A shift towards agroecology was kick-started by farmers themselves, based on innovative forms of farmer-to-farmer knowledge sharing (see below). In tandem, the government conducted a structural reorganization of the agricultural sector by decentralizing the state farm sector through new organizational forms and production structures. Land was redistributed to encourage diversification of production (Funes, 2002).

At the beginning of the 1990s, the Cuban Ministry of Agriculture (MINAGRI) officially initiated...
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an alternative model of agriculture. This model included implementation of an agroecological training programme on a large scale, including production diversification, replacement of machinery with oxen, and implementation of integrated pest management (IPM) techniques with a view to reducing dependence on pesticides.

The first initiatives to transform Cuban agriculture were based on input substitution via biofertilizers and biopesticides, in a context of low agro-chemical availability (Machín Sosa et al., 2013). The National Programme for Biological Pest Control began in 1982, and by 1991 had founded Centres for Reproduction of Entomophages and Entomopathogens (CREEs). The CREEs produce biological pest and disease-management solutions including predators, insect pathogens and disease antagonists, plants with insecticidal, fungicidal, bactericidal and herbicidal qualities, and parasitic nematodes (Funes, 2002; Perez and Vazquez, 2002).

The centres are spread around the country, allowing locally-tailored solutions based on locally available by- or waste products, to be delivered directly to the farmers with few transportation and storage requirements (Perez and Vazquez, 2002). The use of organic fertilizers, especially those produced with vermicomposting, the production of locally made biopesticides, and the raising of beneficial organisms for pest and disease control, were among the approaches taken up widely by Cuban farmers (Rosset et al., 2011).

In the early 1990s, the Agroecological Lighthouses Programme was initiated with support from the Sustainable Agriculture Networking and Extension (SANE) project of the United Nations Development Programme (UNDP). Agroecological concepts were applied at ‘lighthouse farms’ pertaining to different cooperatives in different provinces of the country (Funes, 2002).

It was only from the late 1990s onwards that the majority of Cuban farmers began a more widespread transition from Green Revolution techniques to production systems based on input substitution. This acceleration came on the back of expanding farmer-to-farmer knowledge sharing under the leadership of ANAP. Over time, production systems have become increasingly diversified, with more and more farmers undertaking soil conservation, crop rotation, green manure, polycultures and agroforestry, biological control of pests, integration of livestock with crops, and overall farm diversification (Mier y Terán Giménez Cacho et al., 2018).

An urban agriculture movement also arose in response to the breakdown of food systems and trade flows at the end of the 1980s (Altieri et al., 1999). The movement has spread in cities and suburbs since the early 1990s and now sees the production of diverse fresh vegetables, spices, fruits, flowers, and livestock in mixed crop-animal systems; with 77% of the Cuban population living in cities, it has become an essential component of the food supply (Companioni, 2002; Altieri, 2016). In 1999, the urban sector produced more than 800,000 tons of produce, mainly vegetables (Nieto and Delgado, 2002). By 2012, urban farms or plots numbered 382,000.

While local markets have evolved alongside the agricultural shifts, this is yet to translate into clear impacts on consumption habits or nutrition. Increasing knowledge on nutrition has been attributed to school and adult education. However, the most marginalized

60 In 2009, Cuba’s first national food consumption survey showed that just 11% of the Cuban population consumed dairy products at recommended levels, while 16% and 17% consumed the recommended amounts of fruits and vegetables, respectively. Excessive consumption of fat was found for 78% of the survey respondents while the same occurred for 59% regarding meat, 51% regarding sugar, 31% regarding cereals and 26% regarding dairy products. The survey results indicated poor nutritional quality and monotony in the diet (Porrata-Maury, 2009).
groups and lowest income groups continue to struggle to access healthy foods (Fernández and Hansing, 2008; Alcala, 2018).

**CHANGES IN KNOWLEDGE GENERATION AND DISSEMINATION**

In the late 1990s, the increasingly influential ANAP looked to kick-start the agroecological transition process by implementing a new methodology of decentralized farmer-to-farmer knowledge exchanges. This methodology was based on one farmer becoming a ‘promoter’ and sharing positive farming experiences and knowledge of successful innovations (including revival of traditional practices) directly with other farmers. Cuban farmers have proven willing to take up new approaches when seeing them successfully implemented on another farmer’s land. This is in line with a Cuban saying, ‘cuando el campesino ve, hace fe’, which loosely translates to ‘seeing is believing’.

Promoters receive no economic compensation, allaying farmers’ fears that inaccurate knowledge might be passed along for economic gain. Information on different forms of experimentation is extensively documented, allowing farmers to be paired with the relevant promoters.61 The farmer-to-farmer methodology thus stands in contrast to conventional top-down extension models (Larsen, 2016; Machín Sosa et al., 2010 and 2013; Rosset et al., 2011).

ANAP piloted a farmer-to-farmer programme in 1997 in the province of Villa Clara (Machín Sosa et al., 2013), arranging workshops to train local farmers in the farmer-to-farmer methodology. In 1999, it had spread to the provinces of Cienfuegos and Santi Spiritus, and one year later to Holguín, Ciego de Avila and La Habana. Though the farmer-to-farmer programme was well implemented in several provinces, the pace of progress frustrated ANAP. At the First Cuban National Gathering of the Campesino-a-Campesino (CAC) Programme in 2001, the ANAP president argued that farmer-to-farmer knowledge sharing should be a bottom-up movement, not simply a programme based on foreign project-based funding – although such funds would still be accepted. The Campesino-a-Campesino Agroecology Movement (MACAC) was thereby initiated, and by 2003 had spread to all Cuban provinces (Machín Sosa et al., 2010; Rosset et al., 2011).

This knowledge paradigm is now supported by institutional actors and programmes. Employees from various state institutions, research institutes, and NGOs regularly visit and learn from the farmers – who are repositioned as experts in a more equal exchange. Institutional actors also provide knowledge of their own and provide farmers with variety of seeds and biological inputs for free.

One example is a bus trip arranged by the Cuban Association of Agricultural & Forestry Technicians (ACTAF). The bus trip gathers employees from different associations and organizations who accompany ACTAF staff to various farms. Cooperation with a range of institutional actors – the Department of Soil, the National Institute of Research in Tropical Roots and Tubers (INIVIT), the National Institute for Fundamental Research

61. Facilitators’ help to pair farmers in need of specific knowledge with relevant farmer promoters. The facilitators are employed by cooperatives. The coordinator oversees the process of knowledge sharing between farmers at the municipality or provincial level by developing and updating a list of problems (banco de problemas) and a list of farmers with solutions to those problems. Due to the growing complexity of organizing farm visits, and difficulties finding promoters with the relevant knowledge in the local area, the Banes method has been developed whereby cooperative members register successful experiences and problem areas in a matrix form. These matrices are then used for rapid identification of problem areas so that new promoters can respond to them when cross-referenced by cooperative facilitators and municipal coordinators.
in Tropical Agriculture (INIFAT) – expands the scientific and professional competences put at the disposal of farmers (Larsen, 2016).

Similarly, in cooperation with the Ministry of Agriculture (MINAGRI), INIVIT conducts a national journey every three months to visit farmers in all provinces of the country. On these visits, INIVIT brings plant material, including the clones they produce, conducts inspections, identifies different problems at the farm level, assesses what crops are suited to local conditions, and provides general technical assistance. INIVIT employees not only share their expertise with farmers in the field, but also obtain data on how their products function through inspections and the identification of problem issues by the farmers (Larsen, 2016).

Peasant farmers also obtain substantial information through the cooperatives to which the majority are affiliated. The cooperatives host monthly, well-attended assemblies, allowing a wide range of issues to be raised by farmers, with many promoters and at least one ‘facilitator’ of agroecology present in each cooperative. Some of the associations and organizations occasionally host debates and conferences at the field level, while ACTAF hosts debates on technical issues, important seasonal crops, and other issues proposed by the farmers (Larsen, 2016).

Books, brochures, magazines, and other materials are also widely-used communication channels (for example, see Funes and Vázquez, 2016). ANAP distributes a magazine four times a year that covers history, law, proceedings of

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62. INIVIT invites a group of crop experts from around Cuba to attend. They control and check previous clones and by doing so, study the suitability of different crops in various provinces across the country.
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Congress agreements, scientific events, and technical reports on farming. ACPA distributes a quarterly magazine and ACTAF publishes three times a year. These materials are physically and financially accessible to Cuban farmers throughout the country: all cooperatives have micro-libraries containing a selection of editions free of charge, while ACTAF and ACPA distribute their handbooks to the micro-libraries in all provinces in the country (Larsen, 2016). ACTAF also hosts radio programmes, including weekly broadcasts with weather forecasts, farmer advice, and practical information about the bus trips.

Agroecology has also been institutionalized in educational curricula. The Agricultural Polytechnic Institutes (IPAs), Cuba’s rural vocational high schools, provide Cuba’s future farmers and agronomists with their first formal introduction to the science and technology of agriculture. The IPAs are full-time live-in schools, which include research plots for student projects. The curriculum includes daily work in the fields as part of a broad-based learning approach that encompasses ecological and social sciences. Farmers’ fields serve as ‘auxiliary classrooms’ where the best agroecological farmers near the school teach directly on their farms. The schools also produce food for the students, based on diversified and integrated crop-livestock systems. Many of the schools also produce biological pest control organisms for their own use, sometimes working with CREEs to generate additional income.

Changes in social and economic relations

Social organization and activism have been essential ingredients in the spread of agroecology in Cuba (Mier y Terán Giménez Cacho et al., 2018; Rosset 2015; Rosset and Altieri 2017). In particular, farmer-to-farmer social process methodology has driven new knowledge dissemination practices while also building solidarity among farmers, and has shown the capacity to lead to rapid scaling of agroecology (Rosset et al., 2011). It would appear that agroecology has spread more rapidly in Cuba than in other parts of Latin America because of ANAP’s greater degree of organizational development and promotion of the farmer-to-farmer methodology (Rosset et al., 2011). The number of farmers practicing agroecology grew quickly from just 200 farmers in 1999 to approximately 110,000 farmers in 2009, representing about one third of the small-scale farmers in Cuba (Rosset et al., 2011).

Social relations have also evolved through and in response to land ownership modalities under Cuba’s Socialist regime. Most Cuban farmers privately own their land but cultivate it as part of cooperatives. In 1977, farmers founded the Agricultural Production Cooperatives (CPA) or collectives, whereby privately-owned plots of land were pooled in order to benefit from supposed economies of scale, as well as common

63. The agroecological curriculum developed in the universities is based on an interdisciplinary approach (agricultural and ecological sciences, social sciences). The development of the curriculum has been based on exchanges between university researchers, professors, students and farmers. The Agrarian University of Havana (UNAH) offers comprehensive courses, practical training and a distance diploma programmes, as well as Master’s and PhD programmes in ‘Agroecology and Sustainable Agriculture’ at the Centre for the Study of Sustainable Agriculture (CEAS), where students are prepared for future work as farmers, consultants and researchers. CEAS has designed and introduced an agroecological curriculum in universities throughout the country (García, 2002; Larsen, 2016).

64. Farmers in Cuba are divided into three categories: (i) farmers who have been given land in usufruct by the state, (ii) farmers with private ownership or parceleros, who are not a member of a cooperative (a minority of farmers, who are dispersed throughout the Cuban countryside mainly producing for own-consumption), and (iii) farmers with private ownership who are members of a cooperative – the vast majority (Alvarez, 2002).
services, credit, and bulk input purchasing (Martin, 2002). Land, machinery, and warehouses in these cooperatives are owned collectively and CPA members receive payments based on the number of days they work. Profits from production are divided annually between the members (Alvarez, 2002; Rosset et al., 2011).

The majority of land-owning farmers can also be members of a Credit and Service Cooperative (CCS). CCS members own their farms and farm individually but obtain services and credit collectively, while sharing machinery and marketing activities (Rosset et al., 2011). Because agroecology and farmer-to-farmer approaches spread much more rapidly in the CCS coops than in the CPAs, part of ANAP’s strategy was to adapt their methodology over time to better address the needs of CPAs (Machín Sosa et al., 2010; Rosset et al., 2011).
CHANGES IN INSTITUTIONAL FRAMEWORK

Cuba’s agroecological transition has also been aided by the institutionalization of agroecology in public policies, government bodies, research institutes, and NGOs (Nelson et al., 2009). These steps built on the momentum created by the farmer-led agroecology movement that had already built strong roots in Cuba. The political weight and influence of the peasant organization ANAP helped to drive transition forward in Cuba, both in terms of spreading agroecology at the production level, and influencing governmental institutions in the process.

As a result of the economic crisis in the early 1990s, the government conducted a structural reorganization of the agricultural sector by decentralizing the state farm sector, and officially began to embrace an alternative model of agriculture. In 1993, agrarian reforms saw the dismantlement of the large state sector. The following year, restrictions were lifted on sales channels for agricultural produce (Deere, 1997). On the back of chronically low prices on global sugar markets, former sugar plantations were divided up and usufruct rights granted to more than 75,000 new farmers, many of whom moved towards agroecological production (Funes, 2002). Benefiting a wide array of farmers, these policies likely served as a precondition for agroecology to take root at the farm level.

The government also removed constraints on urban, family, and community farming movements, and formally lifted restrictions on farmers’ markets (Funes, 2002). The ministry also began to promote cooperation amongst farmers and to support research and development into new sustainable techniques. In a context of increasing urbanization, incentives were provided for rural populations to remain in or return to the countryside with a view to ensuring the availability of farm labour (Nelson et al., 2009).

MINAGRI’s agroecological support programmes were introduced with the involvement and support of various ministries; a range of government agencies became important allies of the farmer-to-farmer movement (Mier y Terán Giménez Cacho et al., 2018). NGOs and universities have provided research, technical, and other types of support. Groups including the Cuban Association of Agriculture and Forest Technicians (ACTAF), the Cuban Animal Production Association (ACPA), and the Programme for Local Agricultural Innovation (PIAL) played similar roles.

However, while support for agroecology by government policies expanded considerably in the 1990s in the wake of economic shocks, the state currently appears to be undergoing a “cyclical return” to conventional agriculture (Altieri and Funes-Monzote, 2012). Recent years have seen major influxes of industrial agricultural technologies, fertilizers, oil, and GM maize varieties through cooperation and exchange with Venezuela, Brazil and other partners (Montalván, 2010; Altieri and Funes-Monzote, 2012; Patel, 2012b). The Cuban government is also investing heavily in biotech research (Altieri and Funes-Monzote, 2012). In 2012, dedicated areas for intensive production of staple crops including potatoes, rice, maize and soy still made up less than 10% of cultivated land, though invest-

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65. The Ministry of Science, Technology and Environment (CITMA) (founded in 1994 during the Special Period) which prepares and implements state policy concerning scientific, technical and environmental issues with major implications for the agricultural sector; the Ministry of Education (MINED) which includes a network of Agricultural Polytechnic Institutes (IPA); the Ministry of Higher Education (MES) which includes all agricultural universities, several research institutes and experimental stations as well as all university and post-graduate teaching (Funes, 2002).
ments in these systems may be on the rise (Altieri and Funes-Monzote, 2012).

Political and economic changes in Cuba may also be exacerbating poverty and affecting the quality and availability of social services – with serious implications for food security and access (Fernández and Hansing, 2008). Following Cuba’s new border policies with the US, an influx of tourists caused a surge in the demand for food by the hospitality industry, resulting in a spike in food prices (Ahmed, 2016). Around the same time, the government proposed to discontinue support for the 50 year-old ‘family ration booklet’ policy, which provides a subsidized basket of basic foodstuffs on which millions of Cuban citizens still rely.

Cuba’s agroecological transition therefore remains in the balance. While agroecology has been institutionalized on various levels, joined-up policies to promote sustainability and food security across the food system are yet to take shape, and agroecology continues to coexist with competing priorities and paradigms.

This case study is based on the findings and original insights of several researchers, in particular the Master’s Thesis of Mille Renée Larsen (‘We are a system’ - Towards a sustainable agriculture. The transition process into agroecology - learning from Cuba), and Peter Rosset, Center for the Study of Rural Change in Mexico (CECCAM), who has reviewed initial materials and provided further insights.