

URBAN AGRICULTURE IN THE CITY OF HAVANA: A POPULAR RESPONSE TO A CRISIS

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1. Introduction

The city of Havana covers an area of 721 km², 0.67% of the total area of Cuba. Unlike many other cities in developing countries, Havana has not been plagued by a massive influx of migrants. The population growth is 1.8% per year. The city has about 2.2 million inhabitants, or 20% of the total population of Cuba, of whom 1.5 million are in their economically active age. The population density is 3,014 persons/km². The highest density is found in the districts of Centro Habana (45,093 inhabitants/km²), Habana Vieja (21,774 inhabitants/km²) and Diez de Octubre (19,480 inhabitants/km²). Administratively, the city of Havana is one of the 14 provinces of Cuba. It is divided into 15 municipalities, which are subdivided into 104 people's councils (*consejos populares*), the government structure at neighbourhood level.

Havana has a tropical coastal climate with a mean annual temperature of 25°C, a relative humidity of 79% and average annual rainfall of 1,400 mm.

2. The emergence of urban agriculture in Havana

Since the revolution of 1959, being able to eat sufficient food has been asserted as a basic human right by the Cuban Government. One of the ways by which the government secures access to food is a distribution system guaranteeing basic food packages at subsidised prices.

Since 1959, much work has been done to develop the national agricultural sector into a highly mechanised sector, with intensive use of agrochemicals. Most attention was paid to the production of sugarcane and other export crops. In the mid-1980s, over 50% of the total foodstuffs consumed in Cuba was imported. The imports were made possible by the favourable terms of trade of the socialist bloc (especially for sugarcane), as well as by cheaply provided Russian oil, of which part was re-exported.

When the Socialist Bloc disintegrated, Cuba lost access to cheap fossil fuels, direct food imports and the agricultural inputs on which it so heavily depended for its export production. Imports dropped: in 1993/94 supplies for agriculture dropped by 67%. Cuba was thrown into a severe crisis, commonly referred to as the “special period”. The crisis was further compounded by the further tightening of the US embargo. Food shortages occurred, most severely in Havana. It has been estimated that food availability declined as much as 60% between 1991 and 1995. Extensive food rationing was instituted to ensure equitable distribution.

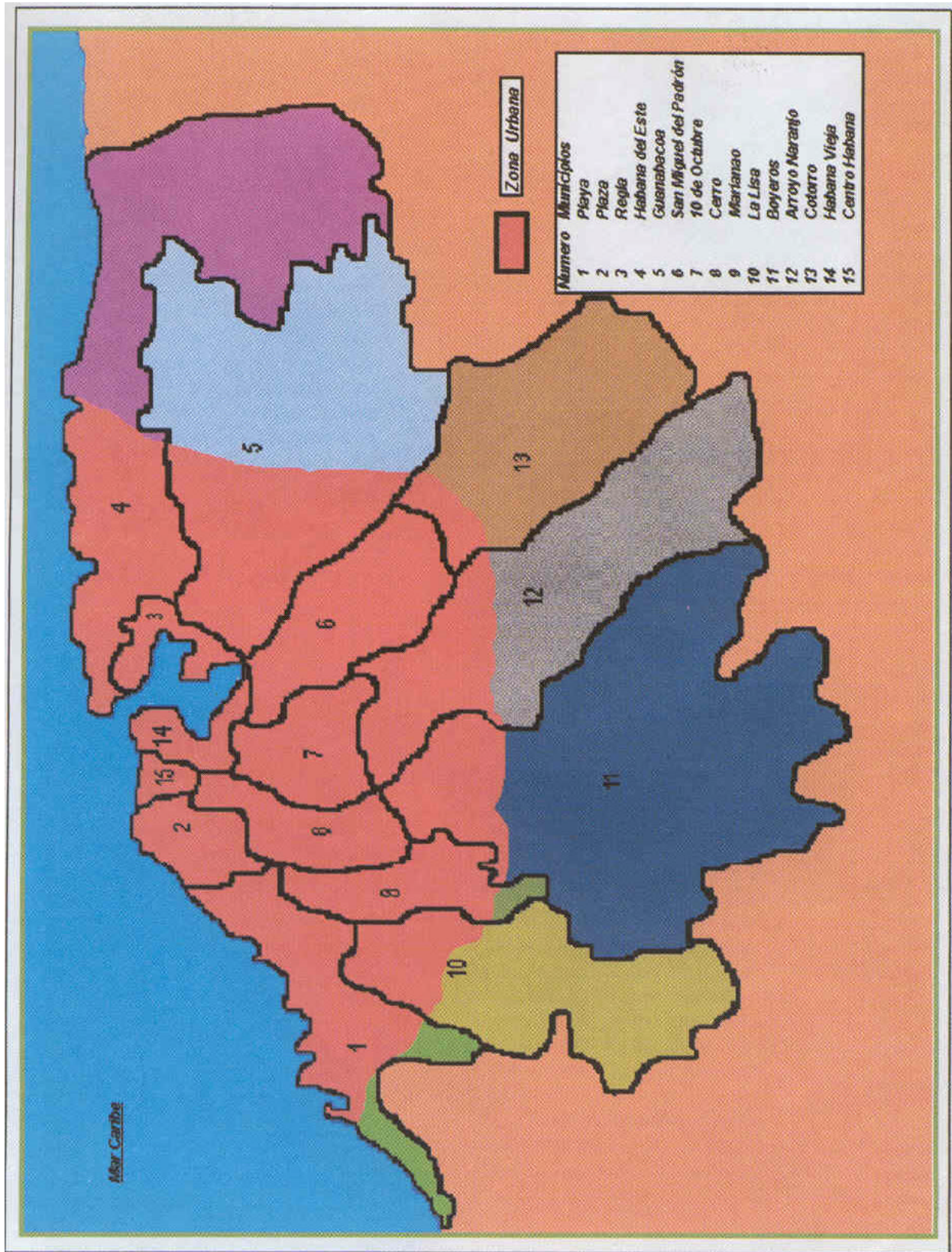
Before 1989, urban agriculture was almost non-existent in Havana. There was no need, not even for the poorest residents, to grow food, as food was distributed by the State. However, because of the food crisis, urban agriculture emerged. President Fidel Castro proclaimed that no piece of land should be left uncultivated. So even on the front lawn of the Ministry of Agriculture (MoA), crops were planted.

The strongly urbanised district of Havana was not exempt from the search for non-conventional food-supply programmes. A start was made to decentralise production and to link production directly to transportation and consumption patterns. The self-supply (*autoconsumo*) plan, initiated in the late 1980s, was expanded. This plan to increase local food self-sufficiency reduced the need for transport, refrigeration, storage and other resource-demanding activities. All over Havana, urban gardens were started. For the residents, it was not so much a question of whether, but rather how, they could produce food or raise animals.

3. Characteristics of urban agriculture in Cuba

The main idea of urban agriculture in Havana can be described as “Production in the community, by the community, for the community”, which refers to the cycle of producers, products, marketing and consumers. Urban agriculture is very much seen as a way to bring producers and consumers closer together in order to achieve a steady supply of fresh, healthy and varied products directly from the production site to the consumer.

In general, urban agriculture is an intensive, high-input (organic pesticides and organic manure), high-output system favouring the production of a diversity of crops and animals throughout the year. Urban farming is a common practice and extremely heterogeneous. It involves efficient use of water; careful management of soil fertility, crops and animals; and close attention to environmental protection.





Organopónicos INRE 1. One of the 20 existing organopónicos in Havana (Picture Department of Urban Agriculture Havana).



Marketing point part of the concept "Production of the neighborhood for the neighborhood" (Picture Department of Urban Agriculture Havana).

It is strongly supported by the government, and governmental institutions play an important role in the organisation of urban farming. The Havana City Government passed a law prohibiting the use of chemical pesticides in agriculture within the city limits. Thus, the crops are grown almost entirely using active organic methods.

In Havana, urban agriculture is a quickly developing sector in which a lot of new ideas and adaptations from producers as well as scientific institutions are tested.

4. The organisation of urban agriculture

Until recently, most of the agriculture in Cuba was carried out on state farms, with each farm having certain production targets. However, in September 1993, the Cuban Government issued Law No. 142, breaking up the majority of large state farms into Basic Units of Production (*Unidades Básicas de Producción Cooperativa* (UBPCs), small collectives owned and managed by the workers. Law No. 142 aims to connect the workers to the land, encouraging a concrete feeling of responsibility, to make the collective of workers and their families self-sufficient, to connect income directly to the degree of productivity and to increase autonomy of governance.

Also, the previously banned farmers' markets have been allowed to operate again. In October 1994, 121 farmers' markets opened around the island. Most producers have state contracts meaning that their produce is used in the state distribution system. After complying with these contracts, however, all food producers are allowed to sell their excess produce directly to consumers rather than through the state redistribution chain.

Decentralisation has not meant that the government has stopped playing an active role in urban agriculture. On the contrary; for the relatively quick turn-around of the production system, from chemical-based to organic-based, and for the success of the urban agriculture programme, the strong government (national and provincial) support has been decisive, in addition to the strong educational base of the population. In this way, the booming urban-gardening movement was supported through the world's first co-ordinated urban agriculture programme, integrating: 1) access to land; 2) extension services; 3) research and technology development; 4) new supply stores for small farmers; and 5) new marketing schemes and organisation of selling points for urban producers.

4.1 Access to land

The high demand for agricultural land needed regulation to settle land-use rights for gardeners.

The first priority for the development of urban agriculture was to make land available for growing food. Therefore, land-use rights for urban gardeners had to be secured. Emphasis was put on giving land to all those who wanted to grow food in the city. The reorganisation was led by the newly created Urban Agriculture Department. The department worked with the *Poder Popular* (Legislative Council) to change city laws so that gardeners would have legal priority for all unused space. Citizens who wanted to set up a garden could solicit the local government, usually requesting a specific plot. Land-use rights are thus being distributed through the popular councils or the municipality.

This decentralised strategy has allowed for land transfer to happen in a timely manner, with little red tape. Even unused private land was turned over in usufruct to those who wished to cultivate it. However, if the gardener would not produce for six months, all rights would be returned to the legal owner.

5. Production systems

By 1998, over 8000 officially recognised agricultural production units were operational, in which over 30,000 people were working. Women play an important role in urban agricultural production; however, the majority of the official work force in urban agricultural production are men (ca. 80%). With approximately 30% of Havana's available land coming under cultivation, the city farms and gardens can be subdivided into five main categories.

5.1 Popular gardens

Popular gardens (*grupos de parceleros*) managed by the cultivators are the most popular form of urban agriculture in Havana. These gardens more or less spontaneously emerged in yards and on balconies, patios and rooftops in response to the problems of the "special period". In the first years of the crisis, almost all of the food harvested in Havana's popular gardens went directly to the families¹, close

1 Angela Moskow (1995) found in her survey among 42 gardeners that, on average, 10 people regularly eat out of each garden.

friends and neighbours of the producers. With the relaxation of laws governing the sale of urban produce, production increased and allowed gardeners to also make economic gains.

On the other hand, gardeners also make considerable food donations to the neighbourhood, especially to schools and daycare centres. This is considered to be only reasonable, since the communities provide the land to the gardeners free of charge. Today, over 26,000 popular gardens cover 2,438.7 ha in Havana and produce 25,000 tons of food each year.

The majority of gardeners already have an official job and farm in their spare time. A large number of the gardeners are retired men and women. The role of women in gardening is remarkable since, in Cuba, agricultural work is traditionally considered to be a man's job.

Many gardeners are organised into *Grupos de Horticultores* - voluntary organisations of gardeners working in the same neighbourhood. Today, there are 908 gardeners' groups with a total of 17,900 affiliates.

5.2 Basic Co-operative Production Units

Basic production co-operative units (*Unidades Básicas de Producción Cooperativa, UBPCs*) are the result of the splitting up of state farms. They can be found throughout the country, usually with about 5-10 members, depending on the available resources. The UBPCs produce different kinds of products: some produce vegetables, e.g. in the *organopónicos*; some produce fruit in orchards; and 16 UBPCs in Havana are part of the Ranching Association and produce milk.

5.3 Farms of the State Co-operative Supply Units

The production of these farms (CSUs) is intended to supply the *cafeterias* of factories². Most of these farms are on site, as the Worker Centres used to have idle land which, after the crisis, was made productive. Most of the CSUs produce a surplus, which is sold to the workers at the low "State prices". They might also directly sell to the public, often from an on-site stand. The organisation of a CSU depends on the management of the workplace. It might be that a fixed group of employees tills the land while, in other CSUs, a system is in place whereby the

2 In Cuba, the majority of the factories and government institutions have cafeterias where a meal is offered to the workers for a small charge.

agricultural work is divided among all employees. Often, the profits of the farming are redistributed among the farmers in one way or another.

5.4 Individual farms

Within the city limits of Havana, a number of individual farms (*Campesinos particulares*)

exists. The typical farm size is about 13 ha. Most of the land is held in usufruct. Most of the milk and cut flowers sold in Havana originate from these farms. The milk is sold not in farmers' markets but distributed through the state distribution system.

5.5 State farms

There are three state-run agricultural enterprises (*Empresas Estatales*) in Havana: *Empresa de Cultivos Varios* (Mixed-Crop Company), *Empresa Hortícola Metropolitana* (Metropolitan Vegetable Company) and *Empresa Pecuaria* (Animal Production Company). The Mixed-Crop Company is found on the fringe between the more urbanised and the more rural zones. The enterprise is organised into 21 municipal farms. Each farm supplies the enterprise at “reasonable prices”. This produce is then distributed through the state distribution system. Most of the land of the farms is dedicated to fruit production, amongst other things, for the tourist market.

A group of 20 *organopónicos* form the Metropolitan Vegetable Company, which covers a total of 19 ha of irrigated land, permitting the *organopónicos* to gain high yields (up to 30 kg/m²). As the groups form a state farm, the financial responsibility is with the government, which supplies the money and uses the produce in the food distribution system.

5.6 Organopónicos and intensive gardens

A special feature of Havana's agriculture is the so-called *organopónicos*. These are raised container beds with a high ratio of compost (50%) to hydroponic fibres or soil (50%). The *organopónicos* are used mainly for intensive vegetable production. This system works very well in urban settings; for example, on paved vacant lots or plots with poor soils.

As already mentioned, 20 *organopónicos* together form a state enterprise. Other *organopónico* units are, however, organised as a UBPC. The biggest *organopónico* is managed by the Federation of Cuban Women and employs 140 women.

Where the soil is appropriate, the system of *organopónicos* is increasingly replaced by *huertos intensivos* or intensive gardens. The gardens use intensive gardening methods on raised beds without a retaining wall, promoting plant spacing for maximum yield per area and the incorporation of organic matter. Today, 773 production units of *organopónicos* and *huertos intensivos* cover 386 ha with an average production of 21 kg/m². Many of the *organopónicos* and *huertos intensivos* have their own stalls next to their fields and cater for a particular market with prices somewhere between State prices and those of the free market (*Mercado agropecuario*). However, even the successful system of *organopónicos* and *huertos intensivos* faces certain challenges, as obvious in the 11-point programme to improve the *organopónicos/huertos intensivos* system as announced by Mr Alfredo Jordan, the Minister of Agriculture:

- to strengthen the production in *huertos intensivos*;
- to dedicate 10 m² per inhabitant of Havana to *organopónico/huerto intensivo* by the year 2002;
- to appoint one person in each municipality to be in charge of all organoponics, including construction and maintenance;
- to promote planting more fruit and flowers in the schemes;
- to continue to hand over land in usufruct to UBPCs and individual farms and to increase the organisation of the plots and growers;
- to increase crop diversity and, more specifically, reach the full potential of leafy vegetable and condiment production, and increase the production of tomatoes, green beans, onions, garlic and chives;
- to build direct relationships between *organopónicos* and all municipal organisations;
- to address irrigation problems;
- to improve soil fertility through the use of compost and bio-fertilisers;
- to expand biological plant protection; and
- to expand the agricultural stores³ into houses for intensive outreach (*Casa de Atención Intensivo*).

3 See point 7.2: *Tiendas Agrícolas*

6. Production of urban agriculture

The total area of Havana is 721 km², of which 299 km² is used for agricultural production, in which a very high diversity of crops is produced (see Appendix 1).

Table 1: Agricultural production in the City of Havana

Year	1995	1996	1997	1998
Production (tons)	44,243	80,462	96,653	113,525

Table 2: Urban agricultural production in Cuba per production system (1997)

Sector	Production (tons)
<i>Huertos populares</i>	28,385
<i>Autoconsumos</i>	23,389
<i>Organopónicos</i>	47,651
<i>Campeños particulares</i>	44,480
<i>Empresa de Cultivos Varios</i>	16,095
Total	160,000

Source: Grupo Provincial Agropecuario 1998

The *popular gardens* not only overcame the monotony of available foods, but even brought back traditional crops (passion fruit, sesame, custard apple) and introduced new crops such as spinach. Among the various production types, some differentiation can be observed. Home gardens and workplace gardens mainly produce for self-consumption, so the gardeners plant what they want to eat, such as fresh vegetables, roots and tubers (cassava, sweet potato and taro), condiments and some fruit. Many also raise small animals for meat, milk, eggs, etc.

Autoconsumos raise similar crops, as they produce to cater the lunch of the workers in the workplace. When space is available, the *autoconsumos* often raise animals, sometimes even dairy cattle. In 1997, the *autoconsumos* produced 8,355,000 eggs, 1,392,000 litres of milk and 240 tons of meat (Fuster 1997b).

Organopónicos have another role and focus on providing the complementary foods that residents cannot obtain from the ration, and which are best bought fresh daily. These products include lettuce, green onions, New Zealand spinach, tomatoes, green beans and some other vegetables and condiments.

6.1 *Mi Programma Verde*

Deforestation is also a problem known to Havana. In order to protect, maintain and create new forested areas, the *Mi Programma Verde* (My Green Programme) was initiated. The programme includes wooded areas and grouped and individual trees found in gardens, patios, parks, schoolgrounds, etc. Within the programme, 86 nurseries and 92 micro-nurseries have been established. The goal is to plant 17 million fruit and timber trees by the year 2000. In 1997, 5 million trees had already been planted by 5,120 grassroots projects (Agropecuaria 1997).

All these trees have secondary benefits such as edible fruit, fuel for cooking or wood for construction. The programme has been promoted in order to increase urban biodiversity and options for food production, as well as to encourage citizens to take personal responsibility for the reforestation of the city. The policy is to also ensure high permanent fruit yields in the city.

6.2 Animal production

Regulations exist to ensure that pig production does not take place in areas where it is likely that local populations are affected, or where water supplies can be contaminated. Pig farming is found mainly on the fringes of the city. There are 63,000 pigs, of which 68% are privately owned. The producers formed a partnership with an outlet company.

In Havana, 700 rabbit-rearing units can be found with 3,500 female rabbits. Residents directly raise 170,000 birds through the urban agriculture program. Sheep and goats are also kept, not only for their meat, but – more importantly – for their milk, frequently used in prescription diets.

Manure is used mostly as fertiliser. There are also some biogas systems operational, whereby on-farm gas for cooking is obtained from manure before it is used as fertiliser.

7. Support services

Urban citizens do not become experienced gardeners overnight. Also the major change from agriculture based on high chemical inputs to low-input sustainable agriculture cannot be made without technical support. The surge of urban agriculture has been made possible by an impressive set-up of support

organisations for producers. The role of the Urban Agriculture Department has been very important in facilitating the changes by, among other things, creating an extension network. Urban agriculture comprises 26,000 people and an integrated system organised by the municipalities, popular councils, research institutions, extension networks and service networks. Many women work as extensionists (45 out of 68), in the urban agriculture department (14 out of 30), in the agricultural store consultancies (32 out of 62), etc.

7.1 Extension network

Each municipality has an extension team of two to seven workers, depending on the size and number of gardens. In most cases, each extensionist works in a specific *consejo popular*. In total, 68 extensionists are now working on local community level, providing veterinary and phyto-sanitary services, and transferring technologies. They spend most of their time visiting the different producers in their area. They assist the farmers in monitoring crops, identifying pests and obtaining the necessary (biological) control products.

Another important responsibility of the extension agents is to distribute land to the growers. Local residents can request garden plots directly from the extension agent, who in turn is obliged to find a suitable plot and to secure the rights for the gardener. At harvest time, the extensionist issues a selling permit to the producer. In case the extensionist observes that a piece of land is not being made productive, s/he can ultimately, after some warnings, give the land to another producer.

The extension workers are also community organisers. Their role has been crucial in the creation and success of the *Grupos Horticultores*. The agents encourage producers to join the network and help with the integration of new members, the formation of new clubs, etc. Their work facilitates, in short, the grassroots level of the national transformation to a “new agricultural model” (Rosset & Benjamin 1994).

The extension agents also work closely with other institutes involved in urban agriculture - the agricultural stores, seed houses and agricultural research centres. In this way, the work of the different institutes complements each other. Educational workshops offered to both extension workers and city gardeners exemplify the co-ordination among these agencies. So far, over 30,000 people have gone through training sessions and seminars organised by extension services and research institutes in Havana (Paez 1998).

7.2 Agricultural store consultancies

Havana has 26 agricultural store consultancies (*tiendas agrícolas*). Their role is to guarantee the technical and material viability of urban agriculture. The shops are found in urban areas and provide seed, seedlings, tree saplings, bio-fertilisers, bio-pesticides, soil conditioners and tools such as hoes, machetes, etc. The clients are given technical advice on agriculture and MoA publications can be found in the stores.

At first, the stores were run by employees of the MoA. In the general process of decentralisation, however, the employees became self-employed managers with a high degree of autonomy. The staff of the stores are well-qualified agronomists or other staff with substantial agricultural experience.

Originally, the distribution system from state suppliers to the stores was not perfect, forcing the stores to close at times, but the situation has been gradually improved. The prices are set by the stores, and their salaries are determined by the net profits.

7.3 Veterinary clinics

Before the development of urban agriculture, there was only one veterinary clinic in Havana. Today, there are nine clinics and, in addition, each community council has its own veterinary service. In total, there are 250 veterinarians, of whom 126 are women.

7.4 Biological Pest-Control Centres

The recent economic crises have deprived Cuba from attaining the foreign currency needed for importing the chemical products the country had formerly relied on so heavily. This accelerated the adoption and production of bio-pesticides. Eleven *Centros de Producción de Entomófagos y Entomopatógenos (CREEs)* provide services to all producers. The centres produce and supply bio-pesticides to the producers through the above-mentioned agricultural stores. As the city regulations do not permit the use of chemical pesticides, bio-pesticides are fundamental to the development of urban agriculture. Related to the CREEs is the phyto-sanitary service, which employs inspectors who are charged with the authority to fine any violation of the regulations.

7.5 Agricultural research centres

Cuba has a large agricultural research sector. The development of the urban agriculture sector has been supported by research and technical assistance of research institutes. It also should be noted that the curriculum of agricultural colleges has been adapted to the transformation of the agricultural sector, ensuring qualified researchers for the future. The Urban Agriculture Department has been working with all these institutes to determine how they can best serve the needs of city farmers (Iturriaga 1997). The institutes are increasingly working directly with urban gardens, providing resources and assistance. The institutes also disseminate research results, brochures, etc.

The National Institute for Basic Research in Tropical Agriculture (INIFAT) has been working most directly with urban farmers. INIFAT's role in extension has become quite widely known among growers, and many now go directly to the INIFAT central headquarters for advice. INIFAT also co-ordinates a new network of 5 seedling nurseries in Havana. The seedlings and saplings produced are sold at prices lower than seedlings available from other places. Six more seedling centres have been planned. INIFAT stresses the importance of recognising local knowledge and learning from growers, not just teaching them.

Other institutes involved in the urban agriculture sector are the Plant Protection Research Institute (INISAV), which runs the 11 CREEs in Havana. All the representatives of the *consejos populares* and the extensionists have been trained in aspects of biological plant protection. The Institute for Research on Pastures and Forage (IIPF), Soils and Fertiliser Research Institute and the Rice Research Institute are also involved in urban agriculture. Each institute has a national plan as well as a plan for Havana, detailing concrete tasks and responsibilities.

8. Challenges for urban agriculture in Havana

The success of Havana's urban agriculture very much depends on the supportive role of the Cuban Government and its direct involvement in resolving concrete problems. Co-ordination of access to resources, as happens in Havana, avoids strong competition for and speculation on resources, as is the case in many cities around the world. Urban agriculture in Havana has been benefiting from this, because land has been secured for productive use and production sites have been

planned at suitable locations, for instance, near water sources. Nevertheless, resources are limited.

Water availability is a major issue for Havana's gardens. The national water network does not bring in sufficient water to satisfy all household needs. Recently, the local government restricted the use of urban water supply for agriculture, in order to conserve water for drinking, washing and sanitation. Alternative water sources for urban agriculture need to be found, together with methods to prevent water losses and to enhance soil moisture conservation. Some steps have been taken to solve the shortages, such as the micro-jet drip-irrigation systems which use water more efficiently. Also, more wells are being dug.

In urban areas, there is, of course, limited open space for agricultural production. In addition, open land often has extremely hardened soil, is full of gravel and has a low organic matter content. It demands much effort to bring these soils into production, and especially organic matter and compost⁴ are needed in large quantities. In some areas with no topsoil, gardeners plant in 100% compost. The use of vermiculture is spreading, as well.

For historic reasons, there is a serious lack of diversity in seeds and crops. For example, there is only one kind of melon and one kind of squash available in Cuba. This lack of diversity has been addressed by the *popular gardens* and many rare crops are being brought back. This has been largely due to local seed saving, which allows the cultivation of locally-adapted crops and varieties that are suited to the particular conditions of a site. The Urban Agriculture Department has also offered a series of workshops for urban gardeners and extensionists on seed selection and saving.

9. Impacts of urban agriculture

Havana probably offers the most successful example for which the concept of urban agriculture was used as a response to a food crisis, not only by individual residents but also as a government-supported strategy. The easing of the worst impacts of the crisis is not bringing with it signs of abandoning urban agriculture. In fact, farms and gardens are steadily increasing in size and number. With

4 Compost is produced mainly from the residue of sugarcane production (*cachaça*).

experience rising, not only the production has increased, but the quality has improved as well.

9.1 Food security

It has only been a few years since Havana was consuming large amounts of food that was barely produced domestically. Thanks to urban agriculture, the city has become one of the largest producers of vegetables in the country, demonstrating the enormous potential of urban agriculture in Havana.

Urban agriculture has had a dramatic positive impact on the deteriorating food situation in Havana during the “special period”. The urban gardens were central to mitigating the food crisis. Urban production is not enough to provide for all food needs in Havana, but it has contributed to the amount of food available. Its increased local self-sufficiency has made food cheaper and more easily accessible, for instance, by reducing the time needed to buy food. Today, some neighbourhoods produce up to 30% of their food supply (Sanchez 1997). Urban farmers, on average, sell their produce 20% cheaper than mainstream market traders and effectively counter excessive price increases. Because the produce is bought on the spot and no storage and transport are needed, post-harvest losses are lower as well.

As mentioned above, neighbourhood gardens regularly donate food to schools and daycare centres. In an attempt to promote better eating habits and improve nutrition, production units are linked with youth groups and schools. Thus, urban agriculture also improves the quality and variety of food consumed. Havana's residents are now eating more fresh vegetables than before the “special period”. In addition, the popular gardens enhance cohesion and solidarity in the neighbourhoods.

9.2 Employment

The development of urban agriculture has created new employment opportunities – an important aspect, since the crisis reduced jobs significantly. Overall, the Government estimates that 117,000 people work in urban agriculture and 26,426 workers are employed in jobs related to urban agriculture. In 1998, urban agriculture accounted for 6-7% of the new jobs. The household income of many people working in urban agriculture is actually higher than the national average salary.

9.3 Environment

Originally, urban agriculture was not specifically aimed at improving the environment. Havana is not without its environmental problems, but the city does not face such grave environmental problems as do other large cities. Over time, however, the ecological aspects of urban agriculture have been appreciated by the Cuban Government.

The integrated approach has helped to avoid many of the problems associated with urban farming in other cities. For example, the use of toxic agricultural chemicals is banned. This ban was facilitated because the research institutes, internationally renowned for their achievements, were able to produce biological control methods, both for control by insects, fungi and bacteria as well as organic control by plants with insecticidal properties, such as neem (??) and tobacco.

Instead of hindering urban planning, urban agriculture has become an important component in urban development. The Department of Urban Planning together with the Department of Urban Agriculture developed zoning plans for allocating land suitable for farming. Potential health hazards associated with raising animals are thus avoided. For example, the rearing of pigs is located in the urban periphery with strict sanitary management and veterinary control, and certain agricultural activities are banned close to water sources. Another example of co-ordination is the involvement of the Ministry of Public Health in mitigating health risks related to animal keeping.

Daily, the city produces 1,400 tons of solid waste from residential areas. Part of the waste is recycled in the newly created centres for producing compost. In total, about 25 units are in place in Havana for the recycling of urban organic waste.

An extra contribution to the environment by urban agriculture is the reforestation programme (*Mi Programa Verde*). The net environmental impact of urban agriculture thus has been positive, contributing to increasing the greening of urban wasteland, improving water retention, improving the air quality and beautifying the urban landscape.

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Appendix 1: Main crops grown in Havana

Vegetables	Fruit	Tubers / roots	Legumes	Other
Beets	Avocado	Cassava	Pigeon pea	Rice
Cabbage	Banana	Sweet potato	Black beans	Sugarcane
Celery	Plantain	Taro	Red beans	
Chard	<i>Chirimoya</i>		Soybeans	
Chives	Coconut		Chick peas	
Corn	Grapefruit			
Cucumber	Grapes			
Eggplant	Guava			
Garlic	Sour orange			
Green Bean	Soursop			
Lettuce	Lime			
Okra	Mandarin			
Onion	Mango			
Peanut	Mamey			
Pepper	Cantaloupe			
Radish	Orange			
Spinach	Papaya			
Squash	Pineapple			
	Passion fruit			
	Tamarind			
	Tomato			

Source: own findings 1998