

# Urban Agriculture

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### Chapter 9 Constraints to Urban Agriculture

**By:**

Jac Smit  
Joe Nasr  
Annu Ratta

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# 9

## Constraints to Urban Agriculture

Urban agriculture is an economically viable industry that is constrained by a variety of obstacles and negative attitudes. Some of these constraints are identified in this chapter:

- Long-standing philosophies are narrowly focused on fighting famine and hunger rather than building food security.
- Benefits are not recognized.
- Policies are inappropriate, if not outright hostile.
- Agricultural research and development focuses on select commercial products and large-scale standardized practices.
- Potential organic inputs for urban farming are removed by modern sanitation and garbage disposal systems.

If these constraints can be removed, urban farming will become more competitive and efficient, and participation by new practitioners in additional locations becomes possible.

The constraints to urban farming can be classified in five broad types:

- sociocultural biases and institutional constraints;
- constrained access to resources, inputs, and services;
- special risks of farming in the city;
- post-production constraints, particularly in processing and marketing; and
- organizational constraints.

### Sociocultural Biases and Institutional Constraints

The sociocultural biases against urban agriculture are often strong. Some arise from outdated, European views of what a city should be, while others are related to local cultures. They involve attitudes and misconceptions about aesthetics, efficiency, hygiene, and modernity in general.

The biases tend to be persistent, particularly when they become institutionalized through policies, laws, regulations, and their enforcement mechanisms. Negative attitudes from critical actors are particularly constricting. For example, when planners and economists regard urban agriculture as a marginal activity of the informal sector, the bias spreads to market and credit agents, legislators, and the general population. The result is insufficient official support, public policies and legislation that are inimical to farming in cities, and consequently restrained private financing.

### ***'Modern' View of Cities***

In the dominant 'modern' milieu, rural areas have become inseparably linked to agriculture and urban areas to commerce and industry. Agriculture is thus perceived in many cultures as rural and not modern, with low economic returns. When practiced in urban areas, it is seen as temporary at best, and unproductive. Many leaders consider urban agriculture a step backward, and policies have emerged that have crippled its development.

Urban agriculture has an uphill fight to overcome the view of planners and economists that agriculture is an inappropriate, misplaced use of land in the urban economy and landscape; the belief of sanitary engineers and doctors that it is 'unclean' and a health threat to the population; and the attitude of the upper-income elite that it is unsophisticated and contrary to the 'city beautiful, clean, and efficient' ideal.

In countries with a colonial history, a major contributor to this bias is the 19th-century European concept of the city as a planned, 'civilized' space where the modern industrial revolution took root. For instance, when Belmopan, the colonial capital of Belize, was designed and built, the British government included regulations banning agriculture within the city.<sup>1</sup> This concept survives in the minds of many decisionmakers despite decades of decolonization. This view holds that the city has space only for recreational gardens, forests, and neat lawn patches — and none for growing food (except perhaps for 'recreational' kitchen gardens). The use of urban waste to enrich soil is regarded as unsanitary, and the sanitation system is intended to remove waste from the city — and get it out of sight.

When positive attitudes toward urban farming emerge within the economically and politically influential sections of some cities, the impact can reach well beyond the narrow confines of such districts, fostering city-wide acceptance. In Dar es Salaam, for example, attitudes toward livestock changed considerably when the richer residents of Oyster Bay started to raise cows in their backyards (see Case 5.8).

### ***'Traditional' Sociocultural Biases***

Social biases further limit the growth prospects of the industry. In many places, urban farming is treated as an 'outcast' industry, much as tanning leather is viewed in Hindu societies and gambling in Muslim ones. This view lowers the social position of urban farmers and increases the likelihood that they will move to other occupations when feasible. In these situations, either immigrants or a long-established group tend to dominate urban agriculture or certain farming systems within it, and the industry remains marginal to the society and often to the economy as well. Traditional methods persist, even though they may be inefficient, unresponsive to the changing market, or even damaging to the environment.

Often, immigrants who arrive with a new agricultural technology and who may face isolation or even social ostracism as new arrivals, either choose not to share their methods or do not communicate with other urban farmers. The production of those products then becomes socially assigned to that group.

Acceptance of urban farming as a legitimate activity is also hampered by a gender bias that does not recognize household work done by women as an economic activity. Although a large portion of farming for home and neighborhood consumption is done by women, this activity is usually not incorporated in official food or economic statistics. Nor is it always fully recognized by the household, especially the male head, as a valuable economic activity — even though it feeds the family and frees income for other expenditures.

The view that urban agriculture is ‘women’s agriculture’ prevents it from receiving adequate research and extension services. A study in sub-Saharan Africa found that although women make up 60-80 percent of the agricultural labor force, they receive only 4-6 percent of extension visits.<sup>2</sup> This may not be the case in all African countries, but a significant anti-female bias nonetheless does seem to exist in most.

Women engaged in urban farming also have unequal access to markets, inputs, land, and credit. In many cultures, women are prohibited from owning land, sometimes even from leasing it. Or women may be excluded from participation in farming for commercial purposes.<sup>3</sup> For example, in the urban farming activities at Mont Ngafulla, Zaire, primarily women work in the home gardens for extended family consumption, while men work in fisheries and orchards whose products are sold in the market.

Dietary restrictions on religious grounds can be found in a number of religions, most notably the ban on eating pigs among both Muslims and Jews. Pigs have a particularly important role in urban areas, most markedly for their ability to consume massive quantities of organic solid waste. In the poorer parts of Middle Eastern and North African cities, goats sometimes substitute for pigs in the performance of this function. Another consequence of religion is the avoidance of wastewater reuse by some urban Muslim residents.

### ***Institutional Constraints***

Planning, cultural attitudes, and colonial heritage have conspired to produce policy, administrative, and legal hurdles for urban agriculture in most low-income countries. Typically, urban agriculture is not included in the planning process. In a number of countries, the official attitude toward urban agriculture is even less supportive — policies deter it, and laws and regulations limit or prohibit it.<sup>4</sup> In colonial times, farming and animal husbandry in urban areas were prohibited in most sub-Saharan countries. These laws and regulations continue unchanged in most countries even today, with many farmers facing harassment from government authorities as well as landowners. In Nairobi following World War II, the government passed a law ordering all crop to be cut down. Livestock and horticulture remain illegal today, and although crop slashing is less common, it remains a threat. In Kampala, more than one-fourth of farmers face harassment and eviction or threat of eviction from the city council or landowners.<sup>5</sup>

Even where urban farming is allowed, policies to encourage development and greater extraction of benefits are seldom coherent. Few countries take a planned, promotional approach to urban agriculture, although Argentina, Peru, Romania, Denmark, Mozambique, and Indonesia are making efforts to support farming in cities. Government policy in Lusaka, Zambia has gone through an interesting evolution (Case 9.1).

### **Case 9.1 Influence of government policies on the development of urban agriculture in Lusaka**

For decades, authorities in Lusaka, Zambia adopted negative attitudes and policies toward urban farming. Cultivation within the vast open spaces of the 'garden city' of Lusaka began with the influx of migrants after independence in 1963. The city council considered crop production in the city a health hazard and enforced laws that made farming on vacant land illegal. Legal proceedings were rarely taken against farmers, but authorities regularly slashed crops on public land.

With a worsening economy in the late 1970s, the urban poor felt an increased need to produce their own food. Concerned about the need to improve economic conditions, the president in a 1977 speech urged urban residents to grow their own food, in part so that rural crops could be exported to neighboring countries to increase foreign earnings. The president's endorsement prompted the Lusaka city council to stop enforcing laws against farming. Subsidized seeds for fruits and vegetables were made available through government-run stores.

Programs promoting urban farming in low-income communities were started through cooperation among the city council, the national government, the American Friends Service Committee, and later UNICEF. The programs provided technical assistance and low-cost inputs to farmers in low-income townships. The assistance was for home gardens, rainy-season gardens further from homes, and community gardens. One community planted fruit trees. In three squatter areas, land tenure and access to water were provided, which both improved farming and extended the season.

In 1977, 43 percent of Chawama, one of the largest slums in Lusaka, was farming home gardens, and 53 percent of the families were farming rainy-season gardens. On average, residents were eliminating 10-15 percent of their food expenditures by growing their own food. A decade later, a survey of low-income areas found that 40 percent of the families had plot gardens, 25 percent had rainy-season gardens, and 19 percent had both.

The continuing decline in income over recent years is expanding urban agriculture in Lusaka, yet the official attitude to urban farming remains mixed in Zambia. At a 1997 UNDP Global Conference of Mayors, the then mayor of Lusaka stated emphatically that urban agriculture was more trouble than it was worth. Another government action has led to gardening becoming even more important — subsidies on food were removed because parastatals were privatized. This has generated renewed growth in cultivation around residential areas as well as in more remote rainy-season sites.

*Contacts:* Axel Drescher, Harrington Jere, and Carole Rakodi (see Appendix F for full addresses).

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Only a handful of cities include urban farming in the land-use planning and design process. In India, it is not part of the master plan of any city.<sup>6</sup> Some countries (China, Japan, and Indonesia) have historically included agriculture as an urban land use, and others (Brazil and Mexico) have begun to do so more recently.

The lack of positive government recognition affects urban farming in many ways. Because no data are collected and the activity has no identity or validation as a productive sector of the economy, credit agencies, research and development agencies,

and market agents generally view urban agriculture as a high-risk activity. The lack of government recognition also reduces the availability of land, water, and waste.

Because the agriculture, food, health, nutrition, and environmental policies of most countries do not include urban agriculture, the sector's full benefits are not available to urban populations seeking either income or food security. The lack of official recognition also leads to economic insecurity among farmers and consequently limits their commitment to and investment in farming.

Urban farmers would like government to take an active, positive role in promoting their industry. They believe that government can help them expand and modernize their farming activities by facilitating credit, easing access to tools and seeds, paying agricultural extension agents, and improving access to land for agricultural use.<sup>7</sup>

### **Constrained Access to Resources, Inputs, and Services**

Most cities have sufficient usable land and water (surface water and wastewater) to allow farming, although both are scarce urban resources. Yet in most cities, farming is not recognized as a legitimate use of land or as a legal consumer of water, creating an administrative hurdle.

The main land and water issues affecting urban agriculture are the use of waste and drainage water for fertilizer and irrigation and competition with other urban land uses. Public authorities have crucial roles in both issues. They organize and control access to appropriately sanitized wastewater and influence the allocation and use of the most appropriate land for food and fuel production.

#### ***Irrigation***

Although the water supply system in most cities does not recognize farming as a customer, this in itself is not necessarily a serious issue because irrigating with potable city water is a wasteful use of such a resource. Farming need not compete with household usage or with drinking water. The irrigation water that urban farming needs can usually be supplied from wastewater, groundwater, and surface water. Where these are available for farming, urban agriculture flourishes.

The constraint that urban farming faces is *access* to groundwater, sewage water, and surface water. Using wastewater to irrigate has the added advantage of providing nutrients to crops (although its disadvantage is the greater threat to human health and the environment when mishandled). However, wastewater is usually not readily available to urban farmers because sewage systems are designed to remove sewage from the city, not to reuse it locally. Nor do cities typically make provisions for reuse of surface water in farming. The lack of access to alternative irrigation water compels urban farmers in many countries to use a piped water supply, often illegally.

In Havana at the time of the food crisis in the early 1990s, urban farmers tapped the city's potable water supply without objection. A few years later, partly due to the great expansion in urban farming, water shortages became acute for both drinking and irrigating, so negotiating a solution to the conflict has become necessary.<sup>8</sup>

Globally, urban agriculture tends to be more demanding of irrigation than rural agriculture, much of which may employ a rain-fed regime. Urban farmers produce more intensively and for more weeks during the year, so they cannot rely as much as their rural counterparts on rainfall. In most countries, agricultural irrigation policy is conceived with rural farming in mind.

Throughout the 20th century (and especially since the middle of the century), irrigation investment was often targeted to global markets rather than local economies. Development planners on both sides of the Cold War designed and funded large rural irrigation projects. Many of these projects are reaching obsolescence well ahead of the useful life for which they were designed. At the same time, many smaller and cheaper ‘traditional’ irrigation projects and management systems, including ancient networks found in peri-urban zones that have long helped feed cities, were allowed to deteriorate. It can be said, with hindsight, that the technology that is suitable for (and sustainable in) urban farming was starved.

Irrigation in urban areas is thus constrained today by a lack of effort devoted to appropriate technology by government policy, the agriculture industry, universities, and funding organizations. This is true for fresh water irrigation (usually flowing from rural areas), saltwater irrigation (in coastal regions), and wastewater irrigation. One reason investment for urban farming has generally been hindered, particularly for its irrigation systems, is because a great concern has long existed about the health effects of irrigation for urban agriculture — the fear of contamination and creation of habitats for disease vectors. Another significant constraint to the spread of appropriate urban irrigation has been the pervading public opinion that urban agriculture is a temporary phenomenon.

The presence of arid and semi-arid conditions in disparate locations such as the West African hinterland, northwest India, coastal Chile, the Middle East, and North Africa endows urban agriculture in such regions with certain shared characteristics that make water supply a more crucial issue than in most other regions. Consequently, water availability, access, usage restrictions, and cost all tend to play a greater role in the decisions of property owners and farmers — what should they grow or raise, if at all, using what techniques.

Moreover, while water availability is a general characteristic of cities located in some zones that suffer water shortages, a particular seasonality that is associated with cities located in Mediterranean climates (the Mediterranean basin, as well as Southern California and South Africa) further distinguishes the irrigation behavior of urban farmers. The near-complete lack of rain in such zones for several summer months (the primary growing season) contrasted with the presence of rain in the winter months means that all urban farmers in Mediterranean climates must adapt to particular precipitation patterns.

The presence of water distribution and wastewater collection systems in urban areas can be an advantage that urban farmers have over rural farmers. Just as dams and impoundments prolong the availability of water in rural areas, the urban water systems and infrastructure can mitigate the seasonality of the Mediterranean climate for the urban farmer.

Urban water availability is a consideration beyond arid and semi-arid regions. Recent evaluation of long-term climate trends has observed that stable, well-fed populations are living where the climate is getting wetter, whereas rapidly growing and urbanizing populations are living with food scarcity in tropical and subtropical regions where rainfall is decreasing by the decade.<sup>9</sup> This will bear heavily on the rural and urban farmer alike in the coming years.

Given its special significance for urban farming, wastewater reuse bears more detailed attention. The presence of chemicals and pathogens in wastewater presents serious problems for urban farmers (see Chapter 8). There are often no local treatment facilities, standards, and monitoring systems to ensure the purity of wastewater before it is applied to land crops or used as a growth medium for water crops and fish. A concern for health is not, however, the only factor that determines whether wastewater can be reused successfully. Other factors include:

- cultural acceptability;
- relative scarcity, reliability, and cost of water;
- wastewater system in use;
- environmental conditions; and
- population health.

The scale of wastewater management systems is thus one technically and politically significant factor. Economies of scale have formed the guiding principle of wastewater systems since Roman times, and especially since the middle of the 19th century. Yet smaller systems — such as biological treatment using duckweed (see Case 5.4) — may be better suited to modern biological technology.

The most subtle and challenging hurdle in the use of urban wastewater for human food consumption may be cultural. In a number of cultures, irrigation with ‘soiled water’ is either taboo, faces religious opposition, or is considered unsafe. In Muslim countries, for example, there is particular reticence to use wastewater for aquaculture or irrigating crops. Given the severe water shortages in the Middle East, wastewater-based agriculture is a particularly relevant area of agricultural research and consideration, already explored and applied in countries as diverse as Kuwait, Uzbekistan, and Tunisia (Case 9.2). Moreover, certain applications, such as irrigating agroforestry, are acceptable from a religious standpoint.

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### Case 9.2 Using treated wastewater for irrigation in Tunisia

Using wastewater for irrigation has long been a traditional practice in Tunisia and is now an official practice. In 1988, 26 treatment plants (activated sludge, trickling filters, stabilization ponds, and oxidation ditches) were in operation. Today, irrigation with wastewater serves 1,750 hectares, and future projects will extend this to 6,700 hectares using 95 percent of treated wastewater, most of it in the Tunis region.

Treated wastewater is used for irrigation in the dry seasons, sometimes after mixing with groundwater. Irrigated crops include fruit trees, forage, and cotton. The National Water Law makes it illegal to irrigate vegetables (which are often eaten uncooked) with wastewater.

The government undertook experiments to study the short- and long-term safety of using wastewater for irrigation. Overall, use of properly treated wastewater was found to be safe. Wastewater-irrigated crops also produced higher yields than those irrigated with groundwater.

The government has created a strict and integrated system to monitor the use of wastewater for irrigation. Distribution of irrigation water is supervised by a regional Department for Agriculture Development. Use of treated wastewater requires separate clearances from the ministries dealing with agriculture, public health, and the environment, and the frequency of biological analysis is defined. Guidelines include quality standards, crops that may be irrigated, and health and safety practices for workers and consumers. Crops irrigated with wastewater are tested by the Ministry of Public Health.

*Contact:* See source listed in Appendix C.

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Concern about the proper disposal (rather than reuse) of wastewater dates to the ‘microbe hunters’ of the past century. Over time, fear of contamination by unclean water became institutionalized in law, and many governments and bureaucracies are still reluctant to consider reusing wastewater to irrigate animal fodder and certain crops for human consumption. Professional city managers and planners, concerned about public health and the efficiency of their infrastructure, have until recently been little concerned about the efficient reuse of waste to achieve ecologically sustainable towns and cities. They have tended to act as enforcers of cultural values rather than as creative problem solvers.

Sometimes real problems combine with perceived ones to halt practices that have been successful for a long time. This was highlighted recently west of Paris, at the massive fields used to absorb the treated wastewater of the capital and its suburbs before it flows to the Seine River, a practice with roots in the 19th century (see Case 2.2). Heavy-metal contamination of thyme grown there in 1998 stopped not just that cultivation, but by the following year, all agricultural production aimed at human consumption. While a decade earlier farmers still paid to obtain the sludge from the waste treatment site, and the heavy-metal content of this sludge had been cut by 95 percent in 20 years due to increasing controls at industrial outflows, a ban was still imposed in 1999. Consumer groups raised fears to the extent that even large-scale cereal growers would no longer use sludge.<sup>10</sup> This example illustrates the challenges that wastewater reuse for irrigation and soil improvement often faces.

### ***Land and Water Surfaces***

For land and water surfaces, just like irrigation water, the problem is not one of availability but of adequate access. Both Kampala and Nairobi still have large expanses of open land that colonial planners reserved a century ago, but are still not in productive use today. Similarly, in Port Moresby, Papua New Guinea, a significant amount of farmable land is not farmed, primarily because of existing land tenure patterns.<sup>11</sup> And the successful farming program in Barrio Matalahib in Manila ended because land tenure was not secure (Case 4.11).

Today, in cities around the world, a vast amount of land is farmed that is neither officially allocated for that purpose nor reported. Informal or illegal land transactions include usufruct agreements between landowners and farmers. However, private landowners often will not lease their land for farming because of the lack of adequate laws governing tenancy and lease arrangements.<sup>12</sup> Public landowners may also hesitate to make land available for farming, even in USA ‘Rust Belt’ cities where tens of thousands of vacant lots may be idle.

Both landholders and farmers need secure access to and exploitation of a property. Since agricultural use does not have to be permanent, landowners’ fears can be assuaged with the right contractual arrangements. The validity and enforceability of permits, leases, and contracts determines whether such arrangements will be practicable.

Where no arrangements exist, the informality, illegality, and thus the precariousness of the activity (eviction is always a possibility) are not conducive to efficient farming. With low tenure security and questionable legality, the farmer is not motivated either to follow efficient farming practices or to be concerned about the long-term condition of the land, the need to regenerate the soil, or the impact of the farming activity on the environment. Such farmers are also considered high-risk borrowers by credit agencies.

Even farmers who own their land may face problems from zoning laws that prevent them from farming. In Kampala, middle- and low-income urban farmers identify access to land, harassment, and eviction as important problems. Richer farmers do not (Case 9.3).

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### Case 9.3 Land access and land tenure in Kampala, Uganda

Agriculture has long been a major use of urban land in all parts of Kampala. Lack of access to land appears to be one of the biggest obstacles to farming in the city. Despite this obstacle, much of the urban land does get farmed, whether legally or not. One recent estimate puts agricultural land use at close to 12,000 hectares, representing well over one-half the total land area of the city (more than double the next largest category — residential land use). A full one-third of the population was estimated to be engaged in some form of agriculture.

Kampala is a combination of two cities: Kampala proper, the colonial capital of Uganda, and Mmengo, the capital of the ruler of Buganda. Land tenure practices in the latter prevailed under the *Mailo* system, which allowed private ownership of land, and in which public land was held in trust by the ruler or notables. In the former, land was held under other freehold forms or by the state.

In an effort ostensibly to promote agricultural development, the Amin regime abolished (at least on paper) the *Mailo* system in 1975 through the Land Reform Decree, making owners into holders of long-term leases and other lease forms. A range of legal and illegal practices emerged in reaction to this change, which only added to the chaotic land-holding situation. This includes overlapping rights to many lands, particularly in the *Mailo* areas.

Given the confusing array of land tenure arrangements within the city, and in particular the overlapping rights of various parties, urban planners have long been concerned about unplanned subdivision and fragmentation of land holdings. Kampala’s planners, as well as urban managers, have so far viewed urban agriculture as a problem. They are also challenged with how to make

sufficient land available for urban development purposes to cover commercial, industrial, and housing requirements, while at the same time, protecting access of the urban poor to land for food production.

The presumption underlying all tenure reform proposals since 1990 is that the ambiguity over property rights in Uganda is a fetter on both urban development and agricultural productivity. The issue for urban agriculture is whether increased formalization of tenure would enhance or hinder access to land for agricultural purposes in the city. The case of Kampala has shown that a system that permits some informal access to land has within it some protection for the urban underclass to provide basic needs such as food. With land prices rising rapidly, the need for poor and working people to rely on informal mechanisms may be increased.

The consequences for urban agriculture of any tenure formalization in Kampala will undoubtedly entail a loss of land for cultivation. Urban cultivators have clearly taken advantage of the complexities of multiple tenure systems, tax laws, and tenancy arrangements prevailing in the city, and by the administrative turmoil both during and since the Amin era. Still, advocates of urban agriculture considered it a victory that plot sizes in some newly planned areas will be increased in order to permit cultivation by the owner on his/her own land. Ironically, low-income customary tenant cultivators were evicted from the land in order to make room for the middle-class occupants who would have non-farming income sources.

For individuals and households that have lost a paying job in the current retrenchment of government employees, urban agriculture is one of the few options available in the short term. Urban farming could be granted short-term legitimacy in its current form, while issues of land-use planning, rezoning, compensation, and review of municipal bylaws could be undertaken some time in the future.

*Contact:* Daniel Maxwell Kenya (see Appendix F for full address).

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Larger private corporations and public authorities with excess space (for example, the Port Trust in Bombay, the U.S. Navy in Los Angeles, and the Singapore Airport) may be more likely to lease land to farmers to make a profit because they have greater tenure security and resources than private landowners. However, government agencies that do not pay rent are less motivated to seek a return on their excess space.

Problems of access to land and water surfaces for farming tend to be more acute for lower income groups. Some farming systems have particular accessibility problems for such poorer groups. Aquaculture, for instance, has in the majority of applications a high cost per unit of area. Thus it is less accessible to low-income communities and low-income countries where it is most needed. Adding to the challenge is that in many contexts, surface water in and near cities has been assigned to recreational and aesthetic purposes, making it difficult to introduce aquaculture, regardless of the multiple benefits. Very careful design and an extensive public outreach campaign would be required — neither of which may always be feasible.

Sometimes, a crisis acts as a catalyst to overcome constraints to land access. For instance, in Jakarta in 1998, the economic crisis led to scattered invasions of unused lands (particularly government properties) by urban residents, for both self-consumption and market gardening. The lands included the city's race course and a cattle ranch owned by ex-president Suharto. After initial resistance using security forces and police patrols, the capital's governor relented and gave an official go-ahead to use idle government land for

farming — as a temporary measure. Thousands of hectares thus became available. These are now planted with vegetables, banana trees, and fast-growing tubers.<sup>13</sup>

### ***Accessing Inputs***

Lack of access to farming inputs — such as seeds, fertilizer, pesticides, equipment, chicks and heifers, feed, and medicine — is another major constraint facing urban farmers. These inputs are not readily available in cities because the markets and sales channels are either not developed and organized or are oriented toward rural farmers. Moreover, the limited supplies are of uncertain quality. For example, the available *seeds* may not produce high yields. For many poor farmers, the only source of seeds is spoiled produce in the marketplace. In Kenya, some farmers receiving help from the Undugu Society are trying to produce onion crops from bulbs discarded in the market.

*Equipment and tools* are usually designed for rural agriculture and are seldom well suited to urban needs, smaller fields, and more intensive production. There is a vast untapped global market for agricultural supplies and equipment appropriate to urban farming. Italy and Japan produce special equipment for small-scale and urban farmers, but they are the exception rather than the rule. Recognizing the need to serve urban farming clients, a national cooperative that sells inputs in rural areas of Tanzania is opening outlets in Dar es Salaam.<sup>14</sup>

Hydroponics, a farming technique that is particularly suited to urban areas, provides an excellent example of the special inputs that are needed, ranging from sophisticated supplies for large-scale industrial operations (see Case 4.4), to basic supplies used in the ‘popular’ version being promoted by UNDP in a number of Latin American countries.<sup>15</sup> Hydroponics requires containers, water supply mechanisms, nutrient solutions, seeds, and extension support specific to the technique. Therefore, the businesses and distribution channels that serve farmers practicing hydroponics must be adapted to specific needs.

*Fertilizer* also may not be readily available to urban farmers. However, because chemical fertilizers pollute the water table and can easily affect the surrounding population, it is vital that their application be both limited and properly practiced. The best choice for urban farmers is composted organic solid waste, which may be more readily available.

Unlike the case of wastewater, the foremost hurdles to wider use of solid waste in urban agriculture are organizational rather than technical, sanitary, or cultural (Case 9.4). First, the solid waste that originates in households and businesses is most often collected as a large system and transported to major dumping locations within or outside the city. This city-wide process is not conducive to maximizing the use of solid waste in diverse, small-scale agricultural activities or to regenerating the natural resources of the city. Second, most solid waste management systems do not separate organic and inorganic wastes or toxic and non-toxic wastes. Solid wastes disposed of through wastewater systems are usable for farming if the sewage is biologically treated and the sludge is composted before being used to irrigate and fertilize crops.

### **Case 9.4 Challenges to suburban farmers who want to acquire solid waste as an agricultural input in the Hubli-Dharwad urban area of Karnataka, India**

A research project begun in 1998 and funded by the UK Department for International Development (DFID) aims to improve the use of urban waste in the Hubli-Dharwad area. The research project examines problems experienced by small-scale urban farmers who want access to waste (including transport difficulties), and the poor quality of the mixed municipal waste from dumpsites.

Urban waste has been used by farmers in Hubli-Dharwad for many years. The waste is purchased from the Hubli dumpsite by tractor loads and from the Dharwad dumpsite via an annual auction system managed by the Hubli-Dharwad Municipal Corporation (HDMC), selling waste by the pit load.

The sale and use of urban waste is declining. Non-compostable materials, particularly plastics, are increasingly contaminating the waste. Several other factors have affected the ability of the HDMC to sell the waste and farmers' willingness to buy it. These include:

- labor shortages at the dumpsites make pit preparation difficult;
- labor shortages make it difficult for farmers to employ laborers to dig up the waste pits, sort the waste, and spread it on fields, primarily due to competing employment opportunities; and
- farmers who do not own tractors are less willing to hire vehicles to purchase urban waste when the quality is so low.

Still, there are many farmers who continue to purchase urban waste. These farmers are relatively wealthy, have their own tractors, and are able to hire labor to transport and sometimes sort the waste. Small-scale farmers do not presently have access to this potentially useful resource that can be used to improve their soil.

In December 1997, the HDMC advertised for private-sector companies to tender for waste disposal and treatment services. The preferred response intends to develop vermi-composting on a commercial basis. This will potentially continue to limit access to urban waste by small-scale farmers. HDMC, together with local NGOs, has also initiated trials of source separation and composting within a number of suburban localities. DFID's research project will seek to complement and build on the experience of these trials.

*Contact:* Fiona Nunan (see Appendix F for full address).

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In most urban situations, farmers collaborate with their neighbors to retain and reuse solid waste. Support from the municipality and major institutions is less common because of obsolete legal obstacles, especially in more developed countries. However, some universities and botanical gardens have good support programs, particularly in India, the Philippines, and the United States.

### ***Accessing Services***

Urban farmers may need more support services than rural farmers because urban production has more precise requirements, such as getting products to market on time, managing intensive production, coping with poor water and air quality, and producing

during the off-season. They also need different technologies, and not all rural farming techniques can be easily transferred to the city. Yet the agricultural credit, research, training, extension, and education agencies that serve rural farmers usually do not include their urban counterparts. In the mid-1990s, Dar es Salaam and Baltimore presented a somewhat surprising contrast in commitment to extension services. Dar es Salaam had 80 agriculture extension workers, but Baltimore had only one, despite having among the highest poverty and childhood malnutrition rates in the USA at the time.

Moreover, relatively little investment is made in developing or promoting farming techniques that work in urban areas or in adapting rural techniques to urban areas. Singapore represents one of the outstanding exceptions (Case 9.5).

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### Case 9.5 Services offered by Singapore's Primary Production Department

The land-use management practices of Singapore, known as among the most effective anywhere, are reflected in the successful urban agriculture system that uses both ancient technology and advanced modern techniques adapted to its multi-racial society. Singapore farms between high-rise buildings in its suburbs, and farms the surrounding seas. The loss of thousands of hectares of farmland to urbanization has been partly compensated by significantly intensified production on the remaining land.

The Primary Production Department of the Ministry of Agriculture is responsible for applied research, extension, training, and supplies for nutritional self-reliance. Most of the farmers it caters to run small operations and have been in business, on average, more than 10 years. Singapore has both 3- and 10-year lease agreements with farmers, depending on the type of crop and the abutting land uses. Rents are related to production, not land value. Among the other innovations are fish-horticulture mixed farming, and even a crocodile farm.

Singapore's citizens consume much meat (70 kilograms per capita per year), yet Singapore is fully self-reliant in some meats. Singapore also produces 25 percent of the vegetables its people consume. On about 7,000 hectares, Singapore licenses just under 10,000 farmers in fish, livestock, and horticulture. Many householders are unlicensed small-scale producers as well.

The Primary Production Department has planned to recycle wastes into green areas to an exceptional degree, concentrating on livestock and vegetable production and fish farming. Organic wastes feed both land and sea crops, including seaweed and shrimp. Since 1974, mushrooms have been grown on multi-story stacking shelves using compost from agricultural wastes such as banana leaves and straw.

The Department is also enabling the expansion and development of intensive and innovative agricultural activity by setting up six 'Agrotechnology Parks' in Singapore. Occupying a total of 1,500 hectares, these are divided into parcels of land ranging from 2-30 hectares, allocated on 20-year leases to farming companies. Products include everything from common vegetables, eggs, milk, and fish to ornamental plants, freshwater ornamentals, and exotic animals and birds.

*Contact:* See source listed in Appendix C.

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International agencies should consider increasing their support for urban agriculture programs. Most international assistance to urban farming has focused on enhancing

family nutrition and introducing certain exotic crops and farming systems, many of which are unsuited to low-income urban families. Some of the more successful urban agriculture assistance programs have actually been funded as rural programs. Examples include peri-urban market gardens (such as gardens for women in Senegal funded by the International Fund for Agricultural Development and those of FAO in Côte d'Ivoire) and various forms of aquaculture (such as in Panama). Interviews and correspondence by the authors in the late 1990s found that the African Development Bank was the global or regional development bank that supported urban agriculture.

Too often, international assistance programs for urban agriculture are small-scale and short-lived, lasting only a year or two. It may take considerably longer (perhaps 5-8 years) to introduce a new farming system, since fine-tuning and a prolonged diffusion process may be required. A study of home and community gardens in the slums of Lima found that projects promoted by local and international agencies fail for several reasons — they are poorly implemented, use inappropriate technologies and crops, or stop too soon.<sup>16</sup>

### ***Credit***

Credit requirements are similar for rural and urban farmers, and it is difficult for both to obtain. Urban farmers, however, often have the added difficulty that potential creditors do not recognize urban agriculture as a significant industry.

As mentioned elsewhere in this chapter, the lack of recognition, tenure insecurity, dearth of data, and lack of organized markets make urban farming an uncertain activity for both private and government lending agencies. Many countries that have special (subsidized) credit facilities for rural farmers have no government programs to provide credit for urban farmers. In Dar es Salaam, for example, bankers consider urban farming a higher-risk investment than other urban activities, and therefore encourage farmers to diversify their agricultural products.<sup>17</sup>

Further research is needed to determine the actual level of risk in lending to urban farmers. Such lending may, in fact, have lower risk than lending to rural farming since it takes place closer to markets and the technologies used may be less dependent on climate. Moreover, farming may be less risky than other urban activities because the products it produces — food and wood — have a stable and substantial demand.

Urban farmers producing in response to market demand cycles need working capital to manage the production cycle. The absence of credit reduces farmer capacity to absorb business shocks and survive bad times, resulting in high failure rates. The lack of credit can also contribute to low crop yields because farmers do not have the working capital to plan and purchase inputs. Without capital, poorer farmers cannot upgrade farming technology or invest in higher-yield ventures such as poultry, fisheries, livestock, and ornamental horticulture.

Credit can help farmers improve agricultural practices by financing tools and equipment to stretch the season, as well as processing to prepare wastewater and solid waste as inputs to enrich soil and water. Access to credit can also enable farmers to acquire season-stretching plastic domes and tunnels.

In many cities, NGOs help increase access to credit for entrepreneurs in the informal sector. For example, they may act as intermediaries between entrepreneurs and the banking system and organize entrepreneurs to spread the risk and ensure collective management and responsibility. However, even these credit supply systems often fail to include low-income urban farmers, as was seen in Bangladesh (Case 9.6).

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### Case 9.6 Microfinance for urban nurseries in Dhaka, Bangladesh

Urban agriculture in Dhaka has been largely invisible, yet recent evidence is showing its significance. In the peri-urban lower-income zones, cropping on larger parcels is common. In the inner city, farming favors production activities that use little or no land, including: vines and hanging cucurbits grown from roof gardens or hanging pots; various high-value horticultural products (vegetables, flowers, herbs, and potted shrubs); economically useful tree varieties; and small-scale livestock based on organic waste and/or forage.

Twenty years ago, there was virtually no commercial nursery industry in Dhaka. Today, that industry is booming and evident on many street corners, banks of waterways, or what were once broad footpaths. Nurseries are an important new industry in Dhaka, providing employment to a growing army of poor people who manage to find their way into the nursery workforce, both through self-employment and regular wage employment.

In 2000, 168 nurseries were surveyed in Dhaka. Most operate on areas of less than 100 square meters. While nearly half are occupied on a squatting basis, many are sited on low-lying vacant land that is subject to flooding or land for which an informal agreement with the owner has been made, often including crop sharing. Almost all the nurseries are less than 20-years old, with half dating from the past six years.

Nursery owners overwhelmingly fund the establishment of their nurseries from personal savings, including contributions from extended family. The two most significant constraints mentioned in the survey were access to land and water. Still, while the nursery business is lucrative, business expansion was generally limited because credit was limited. In particular, funds are crucial to gain access to land and water.

While Bangladesh has earned a worldwide reputation for its micro-credit programs, these have largely focused on rural areas. Where urban credit programs have been introduced, they have not targeted groups that traditionally spawn entrepreneurial farmers. BRAC, for instance, targets women slum dwellers who recently migrated from rural areas. These recent arrivals have the least knowledge of where land might be available for planting or animal production, and whose farming skills are not well-suited to commercial urban crops.

The funds of some micro-credit providers are in fact used for agricultural production. In the case of ASA, several group members indicated that they had used their first loans to buy a cow or some chickens. Others used the loans to buy small areas for vegetable production. One member indicated she is able to feed her family well and easily repay her 'working capital' loan.

Despite these positive examples, given the invisibility of urban agriculture, little of the available micro-credit makes its way to urban farming. Indeed, all the micro-finance providers surveyed reported that fewer than 2 percent of their loans were used to support urban agriculture.

Urban farming is likely to remain underutilized so long as micro-finance institutions — as well as agricultural research bodies and extension services — eschew proactive involvement.

*Contact:* Joe Remenyi (see Appendix F for full address).

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In Kampala, access to capital was reported as a major problem by farmers in all income groups.<sup>18</sup> In India, urban farmers receive credit from the agricultural lending quota of state-owned banks — usually the part of the quota not used by rural farmers. However, this credit is not likely to reach low-income urban farmers.<sup>19</sup> Urban banks in the USA are reported to be biased in favor of ornamental horticulture over food production in metropolitan areas.

### **Research**

Research into techniques of particular relevance to urban farmers, as well as dissemination of that research, could come from research, government, and international agencies. Yet in most cities none of these groups is working explicitly to further urban agriculture. The Asian Vegetable Research and Development Center (AVRDC) and the International Potato Center (CIP), the world's leading research facilities in their respective fields, are now actively conducting research that focuses explicitly on urban production. This was not the case only a few years ago. However, many of the other centers within the Consultative Group on International Agricultural Research (CGIAR) still have not explicitly recognized urban activities within their research agendas.

Although a few urban specialists can be found in the agricultural research institutions in countries such as Cuba, Japan, China, the Netherlands, Tanzania, the Philippines, and Canada, they are relatively scarce, especially in rapidly urbanizing developing countries with decaying urban cores where they are needed most. When research that is relevant to urban agriculture is undertaken, there may be inadequate information exchange and communication among researchers or with technology transfer and extension agencies (primarily non-governmental and development agencies).

### **Extension and Training**

Few extension services address the problems of urban farmers, and even less training is designed specifically for them. Drescher's statement concerning Zambia applies in most other contexts: "Concepts for agricultural extension in the urban environment are missing due to the fact that 'real agriculture' was thought to take place in the rural sector only." He emphasized the need for different extension services to be offered and adapted to intra-urban, peri-urban, and rural areas.<sup>20</sup>

The few training programs that do exist tend to be in specific, mostly upper-income farming systems such as poultry and market gardening. They also tend to be technical rather than comprehensive, not covering aspects important to the overall success of urban farming enterprises such as marketing, investment management, or processing. Extension services in Kampala, for example, are more available to richer farmers than to poorer ones. Forty percent of high-income farmers received visits from government extension

workers in the early 1990s, compared with 5 percent of low-income farmers.<sup>21</sup> In Kenya, where low-income urban livestock farmers lose more cattle than they sell on the market, veterinary services go to higher-income farmers for two reasons — they pay extension agents a bonus, and their farms are more accessible than those of low-income urban farmers.<sup>22</sup>

An outstanding case of an effort to decentralize extension can be found in Dar es Salaam, where each of the city's 45 intra-urban and peri-urban wards has at least one extension worker. Each one receives special year-long training through the Urban Vegetable Promotion Project.<sup>23</sup>

Technology transfer and information dissemination in urban farming often occur through non-governmental organizations and minority and immigrant farmers. Grassroots NGOs are often in better touch with low-income urban residents than are government and international agencies and private firms. However, only a few NGOs promote urban farming. Successful examples include the Center for Education and Technology in Chile, Undugu Society in Kenya, Commercial Farmers Bureau in Lusaka, Urban Food Foundation in Manila, San Francisco League of Urban Gardeners (SLUG), and Peru Mujer in Lima. Argentina is one of the few countries with an integrated national-level agency that promotes urban agriculture (see Case 6.5).

### **Education**

The lack of good education in urban agriculture is quite possibly a major constraint to urban agriculture fulfilling its natural role in urban food systems, economics, and the living environment.

Primary, secondary, and college agricultural education stresses rural production methods. There are very few facilities that include the basic structures of an urban farm — pond, greenhouse, raised bed, compost bin, etc. Teachers are generally not well qualified in the advantages and problems of urban food and ornamental production.

Agricultural education at the higher levels tends to focus largely on the needs of agribusiness and not the smaller urban/suburban producer. Food production in the city, considering both intensive production and intensive human settlement, requires a different emphasis than rural agriculture.

One positive trend is that agricultural education is returning to city schools. During the past century there have been waves of renewed interest in having urban children learn agriculture. In the more distant past these have been short lived and related to economic crises/depressions or periods of civil unrest/war. Today it seems to be more related to connecting the next generation back to nature. Europe's City Farms program mentioned in Chapter 3 is but one example of this growing interest.

The allotment and leisure gardens of Europe have been the point of origin to educate children in the urban agriculture family for over a century. The later community garden in its post-1960s incarnation has included an educational element as one of its cornerstones. The Community Food Security Coalition has been promoting farm to school activities in North America, including the production of an excellent book.<sup>24</sup>

FAO and other international organizations have since the 1950s supported school gardens in 100 countries. One of the best studies of their value was carried out by AVRDC during the 1980s in six countries. Canada has a policy to develop school garden nationwide, and does California in the USA. In Cuba each pre-school includes a medicinal garden so that the kindergartner learns that healing comes from nature, not just the pharmaceutical factory.

Dar es Salaam offers one possible solution to the integration of agricultural education into schools. The goal is to place an agricultural teacher in each school, which is promoted under the guidance of the Urban Vegetable Promotion Project along with cooperation between local extension workers and the headmasters. The headmaster decides whether to maintain the program after an initial trial round.<sup>25</sup>

### Special Risks of Urban Farming

Unlike most other industries, urban agriculture occurs mostly in unguarded areas, a circumstance that can pose security risks for the farmer. Urban farming is particularly subject to theft because most people passing by can make use of the product, whether food or fuel. Several surveys have reported that theft and lack of police protection are among the most common problems of urban farmers. In the extreme, farmers are sometimes attacked in isolated gardens.<sup>26</sup>

The problem of theft is most serious where farmers cultivate open land far from their homes. Upper-income and corporate farmers are more likely to farm inside closed yards and at secure sites on the fringes of the city. Poorer farmers, by contrast, generally plant on unguarded public land or on private land to which access has been acquired illegally or informally. Their theft risk is therefore particularly high, but they have little or no recourse to police assistance.

Urban farmers address this problem in several ways, all of which have drawbacks. Some grow low-value crops, particularly if they are farming along unguarded and highly accessible roadsides, which reduces returns to labor. Others, particularly in larger peri-urban sites, pool resources to hire guards, a costly measure. Still others harvest before the crop reaches its peak, which reduces market value.

Lack of insurance makes farming ventures all the more risky in the face of disasters, whether natural or manmade. Rural farmers suffering a widespread catastrophe may receive compensation or assistance from the government, but not unrecognized urban agriculturists. Farmers' organizations that provide shared risks and responsibilities may be one solution to lack of insurance.

### Post-Production Constraints

Urban farmers are also handicapped during the post-production phase by inadequate processing, storage, packaging, distribution, and marketing facilities. This lack of processing capacity stymies growth of the industry. Many products benefit from quick or early processing and packaging, such as fish and easily damaged fruit. The need for freezing plants, cold storage facilities, appropriate packaging, canneries, etc., is great (Case 9.7).

**Case 9.7 Cooperatives for livestock production, processing, and packaging — Urban Food Foundation, Manila**

The Urban Food Foundation, an NGO based in Manila with the objective of promoting food security and reducing poverty, facilitates the formation of diverse farmer cooperatives in Metro-Manila (see also Case 3.4). These include cooperatives that serve farmers growing small livestock, either on small farms or by grazing on public land in the city.

The cooperatives help farmers increase their profits and management through forward integration. They arrange direct marketing of livestock products, including contracts with supermarkets, thus eliminating middlemen. To do this, one cooperative has established a slaughterhouse and packaging plant with help from the foundation. Whereas producers previously sold at a buyer's price on the hoof, they now sell wrapped finished products to retailers at a negotiated price. To accomplish this, the farmers pay for a full-time professional manager and an assistant.

The project received support from various international agencies for start up in the mid-1980s, and is now financially secure.

*Contact:* Roberto S. Guevara (see Appendix F for full address).

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In most countries, processing, storage, and packaging capacities are oriented to rural agriculture. Although these facilities may be located in towns and cities, they may not be able to cater to smaller-scale urban farmers. They deal in big quantities and are controlled by large-scale operators who transport from rural areas to wholesale markets that distribute to retailers or supermarkets.

Similarly, many urban food markets were designed, often since colonial times, to import food from rural areas. Input-producing agribusinesses are also geared to serving rural agriculture. The market structure may be composed of wholesalers who purchase directly from rural areas or from intermediate wholesale markets at the edge of the city, and then supply retail outlets throughout the city. Smaller-scale urban farmers generally do not fit well into this structure.

Some wholesale merchants may not be willing to do business with small-scale producers. Larger-scale urban farmers, by contrast, usually have the resources to market through such a market structure. They may also be large enough to be able to sell to wholesalers. Small- and medium-scale farmers need either a community-based market where they can sell produce directly or a middleman or agency to sell to retail outlets for them.

In response to all these obstacles, some NGOs have specifically targeted post-production constraints faced by urban growers. Human Settlements of Zambia, for instance, promotes solar drying of vegetables, fruit preservation, soy processing, tomato jams, and other post-production options among farmers in Lusaka and elsewhere.<sup>27</sup> Ibadan's Food Basket Foundation offers another example (Case 9.8).

### Case 9.8 Overcoming marketing challenges in Ibadan, Nigeria

Farmers in and around Ibadan, Nigeria are handicapped by lack of access to micro-credit. They also lack the processing capacity for their agricultural products. Furthermore, their profit margins tend to be low because they compete with products from other sources, particularly those offered by rural farmers who also bring their produce to the same market.

The Food Basket Foundation International is an NGO based in Ibadan with the objective of helping low-income families achieve food and nutrition security and poverty reduction on a sustainable basis. It facilitates networking among various stakeholders involved in urban agriculture in the Ibadan metropolis, and emphasizes marketing.

As a way of supporting small-scale urban farmers, links with street food vendors were created to facilitate direct marketing of vegetables, fruits, and other products. Neighborhood markets were also aided so that consumers could purchase these products at such stalls without going to the formal markets.

Urban agriculture farmers found it difficult to offer their products for sale without disturbance from members of the organized markets union. Even when the local government authorities intervened, the farmers were required to pay fees to government coffers. The authorities encouraged development of new markets under their control because they saw these as a means to generate income for the state.

The market fees initially discouraged farmers until they were able to come up with an innovation — a section of markets should be set aside by local governments for use by farmers. Farmers are responsible for maintenance of their sections of the markets. Here, farm products, especially vegetables, fruits (particularly citrus), plantains, bananas, and staples such as maize are offered for sale. Prices tend to be lower than in other sections of the same market.

Moreover, other designated points around each of these markets are being used for bulk sales. The expansion of these sites is usually hindered by landowners and government officials in charge of land and housing matters. Continued dialogue with government officials and closer networking among urban agriculture practitioners will enhance and create better outlets for their products, which are always in demand, given their lower prices.

*Contact:* Isaac Akinyele (see Appendix F for full address).

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Managua, Nicaragua offers another example. Produce had been marketed in the overcrowded central market for generations. Over time, the market had become corrupt, controlled by a few agents, and dominated by large-scale food traders. It also was difficult for small-scale urban farmers to sell their produce. In 1990, the mayor's office created an alternative Saturday market, located four miles from the central business district, where stalls could be rented at a low, fixed price. The market is conveniently located for both farmers and consumers and has proved popular with both groups, and has been an impetus to urban farming. Because farmers market their produce directly, there are few middlemen.

## Organizational Constraints

A final constraint to the growth of urban agriculture is the lack of organization among urban farmers themselves. The wide dispersion and lack of cohesion among small-scale urban farmers hinders the development of markets for both their products and the inputs they require.

Urban agriculture lacks organization in most parts of the world. This problem is particularly acute for low-income farmers. Upper-income farmers may be organized within high-value farming systems or products. Although a few low-income farming systems, such as the fisheries in Calcutta (see Case 3.5), are organized through farmers' cooperatives at a regional level and cut across urban and rural lines, these cases are few.

The fact that farming may be illegal or informal further reduces the likelihood that farmers will organize. Furthermore, low-income farmers frequently lack the means or information to organize themselves without outside help. Because they get no recognition by those outside their community and have no identity as a distinct industry, they generally neither perceive themselves as an industry nor function as one. Nonetheless, some farmers are aware that their lack of organization is a constraint, and see it as the most important obstacle to further development. They dream of more collaboration and organization.<sup>28</sup>

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The potential of urban agriculture is constrained by limited access to the key ingredients that could make it successful. In most cases, the problem of access is not physical but instead administrative, sociocultural, or organizational.

Low-income farmers in the informal sector are particularly affected by these constraints. High-return farming practiced by upper-income farmers, such as poultry and floriculture, is typically more organized. These systems tend to have better access to resources, more developed input and output markets, government recognition as agribusiness industries, and more available credit. They are also more likely to be included in agricultural research and extension efforts.

The key to unblocking the various constraints that now work against the industry is to increase awareness of the importance of urban agriculture. The next chapter begins to define a strategy and offers some suggestions about how this objective can be achieved.

## Notes

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1. However, these regulations were largely ignored by the local descendants of the Mayas who substituted kitchen gardens for the planned lawns. Elizabeth Graham, personal communication, 2000.
  2. Winrock International. 1994. *Annual Report*. African Women's Leadership in Agriculture and Environment Project. Arlington, VA: Winrock International.

3. Friedhelm Streiffeler. 1993. *General Principles and Approaches for Sustainable Urban Greenbelts with Special Reference to Africa*. Department of Rural Sociology. Berlin: Technical University of Berlin, p. 27.
4. Timothy Greenhow. 1994. Urban Agriculture: Can Planners Make a Difference? *Cities Feeding People Series No. 12*. Ottawa: International Development Research Centre.
5. Donald B. Freeman. 1991. *A City of Farmers: Informal Urban Agriculture in the Open Spaces of Nairobi, Kenya*. Montreal: McGill-Queen's University Press. Bishwapriya Sanyal. 1985. Urban Agriculture: Who Cultivates and Why? A Case Study of Lusaka, Zambia. *Food and Nutrition Bulletin* 7:15-24, Sept. Carole Rakodi. 1988. Urban Agriculture: Research Questions and Zambian Evidence. *Journal of Modern African Studies* 26(3):495-515. Freeman, 1991, op. cit. Daniel Maxwell and Samuel Zziwa. 1992. *Urban Farming in Africa: The Case of Kampala, Uganda*. Kenya: ACTS Press, pp. 55-56.
6. Yue-man Yeung. 1985. *Urban Agriculture in Asia*. Food-Energy Nexus Programme. Paris: United Nations University.
7. Streiffeler, 1993, op. cit., p. 32.
8. Angela Moskow. 1999. Havana's Self-Provision Gardens. *Environment and Urbanization* 11(2):127, Oct.
9. A recent study by the National Geographic Society highlighted this phenomenon.
10. André Fleury, personal communication, 1999.
11. Daniel E. Vasey. 1985. Household Gardens and Their Niche in Port Moresby. *Food and Nutrition Bulletin* 7:37-43, Sept.
12. Maxwell notes, however, that landowners often put their "land to short-term (farming) use, which keeps squatters from being able to claim any access to the land." When the landowners reclaim their property, they don't have to compensate the squatters. Thus, "in some instances, farming actually serves the interests of both the landowner and the farmer." Daniel Maxwell, personal communication, 1993.
13. Agence France Press. 1998. Jakarta Governor Says Poor Can Farm City Land. 6 Aug.
14. Luc Mougeot, personal communication, 1994.
15. See Peggy Bradley and Cesar Marulanda. 2000. *Home Hydroponic Gardens*. Corvallis, Ore., USA: Global Hydroponic Network. Cesar Marulanda and Juan Izquierdo. 1993. *La Huerta Hidroponica Popular*. Santiago, Chile: Regional Office of FAO for Latin America and the Caribbean. Jorge Zapp. 1991. *Cultivos Sin Tierra: Hidroponia Popular*. Bogotá: UNDP.
16. Vera Niñez. 1985. Home Garden Programmes in Lima Slums. *Food and Nutrition Bulletin* 7:6-14, Sept.
17. Mougeot, personal communication, 1993.
18. Maxwell and Zziwa, 1992, op. cit., p. 57.
19. R.S. Ganapathy, personal communication, 1993.

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20. A.W. Drescher. 1993. Management Strategies in African Homegardens and the Need for New Extension Approaches. Pages 231-246 in *Food Security and Innovations — Successes and Lessons Learned* (F. Heidhues and A. Fadani, eds.). Frankfurt: Peter Lang. Drescher emphasizes three areas with particular need for urban extension: pest management, species composition and diversity, and soil fertility.
  21. Maxwell and Zziwa, 1992, op. cit.
  22. Diana Lee-Smith et al. 1987. *Urban Food Production and the Cooking Fuel Situation in Urban Kenya: National Report — Results of a 1985 National Survey*. Nairobi: Mazingira Institute.
  23. Petra Jacobi, personal communication, 2000.
  24. Details are available on the Internet — [www.foodsecurity.org](http://www.foodsecurity.org)
  25. Petra Jacobi, personal communication, 2000.
  26. Harrington Jere, personal communication, 1999.
  27. Harrington Jere, personal communication, 1999.
  28. Streiffeler, 1993, op. cit., pp. 28-29.