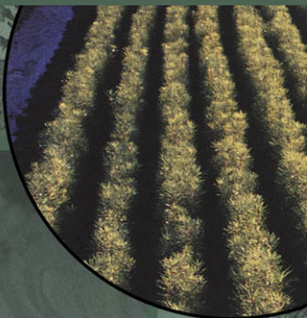
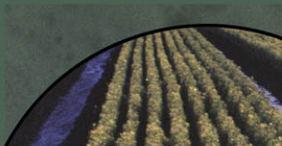


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# Agriculture urbaine en Afrique de l'Ouest / Urban Agriculture in West Africa

Une contribution à la sécurité alimentaire et à l'assainissement des villes /  
Contributing to Food Security and Urban Sanitation

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sous la direction de / edited by Olanrewaju B. Smith

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*sous la direction de / edited by Olanrewaju B. Smith*

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# **Actual and potential contribution of urban agriculture to environmental sanitation: a case study in Cotonou**

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*University of Amsterdam, The Netherlands*

## **Résumé**

Ce document présente diverses formes d'activités horticoles et leurs caractéristiques de localisation dans la région de Cotonou. L'apport de ces activités aux divers objectifs de développement de la ville — en particulier la gestion des déchets — a été étudié en utilisant les méthodes adaptées de participation et d'enquête. Les trois formes d'activités horticoles étudiées sont la production de légumes, de plantes ornementales et de coton-fibres. Chacune avait à la fois des effets favorables et négatifs sur le système de drainage de la ville, sur ses approches à la planification et à la gestion de l'environnement. Ce document donne également des preuves des apports actuels et éventuels de ces activités dans les domaines de la gestion des déchets solides et liquides. Il comporte également des recommandations techniques et de politique adaptées pour améliorer les aspects positifs et réduire les effets néfastes des activités horticoles sur l'hygiène et, de façon générale, sur les objectifs de développement de la ville.

## **Abstract**

This paper presents the various forms of horticultural activities and their spatial location within Cotonou. The contribution of these activities to various development goals of the city — particularly waste management — was examined using appropriate participatory and survey methodologies. Vegetables, ornamental plants and staple crop production were the three forms of horticultural activities observed. Each had positive as well as negative impacts on the city's drainage system, and its environmental planning and management approaches. The paper also presents evidence of both the current and potential contributions of these activities as they apply to solid and liquid waste management. Appropriate technical and policy recommendations were made to enhance the positive and minimize the negative impact of horticultural activities on the city's sanitation and overall development goals.

## **Introduction**

A careful analysis of the literature on urban agriculture (UA) in 1996 revealed three interesting observations:

- In sub-Saharan Africa most research on UA came from anglophone rather than francophone countries. The analysis suggested that over 50% of the urban population was involved in one form of UA or the other, producing

food mainly for home consumption and as a component of a “survival strategy” (Smit 1996). On the basis of a fewer number of research results, the prevailing assumption was that a similar situation exists in francophone countries.

- As yet, there is no consensus on the definition of peri-urban agriculture to clearly distinguish it from the classical rural agriculture in terms of distance from the city.
- The environmental aspects of UA received far less attention than, for instance, food security and poverty alleviation issues. This observation was made by Jac Smit, president of The Urban Agriculture Network (TUAN), who noted that “The benefits [from urban agriculture] to urban environments, that have been identified, but not studied, have been ignored, relative to the recognition of its social benefits. There may be environmental benefits unrecognized and under exploited. This may be the most dynamic aspect of urban agriculture. ... It seems likely that neither sustainable agriculture nor sustainable human settlements are feasible without urban agriculture.”

These three issues guided the formulation of the objective of this study, as well as the choice of its thrust and the favoured entry points into UA discourse and research priorities. Its objective was to evaluate the real and potential contributions of urban horticulture to the sustainable development of Cotonou. In this context, sustainable development relates exclusively to urban environmental issues, particularly those of waste management and landuse planning, irrigation drainage systems, and the rational use of agricultural inputs. An analysis of the positive and negative linkages between UA — particularly horticultural activities and these environmental issues — is the focus of this study.

## **Methodology**

### **Research site**

The Circonscription Urbaine de Cotonou (CUC) was chosen as the research area for three reasons:

- It is located in francophone West-Africa.
- It is enclosed by the Atlantic Ocean in the south, Lake Nokoué in the north, a swamp in the east, and urban municipalities both to the east and west. Thus, there is no “peri-urban” space within its boundaries. The waters surrounding the city might be considered peri-urban areas, and these are indeed intensively used for food production — mostly fish-

breeding — and even for housing (on stilts). This might prove to be an interesting subject matter for extended UA studies in Cotonou, but it was not included here, since this study was to be limited to horticultural activities.

- It was already familiar with environmental policies and projects, as they exist on both municipal and national levels.

## **Methods**

Using a city map, neighbourhoods were identified, marked and recorded. With the aid of a walk through a transect strip through the neighbourhoods, an inventory of the types and numbers of horticultural activities was constructed. The information thus obtained was summarized and mapped with the aid of a GIS application tool. Informal and formal interviews with individuals, groups and key informants were used to obtain additional information. The interviews and interactions covered a range of people, including workers from local and national government institutions, university and research institutions, and Non-Governmental Organizations (NGOs). Available literature and previous studies were consulted to fill in some historical gaps, especially the growth of the sector with respect to time (Aisso 1994). A field visit to Lomé, Togo, provided a useful comparison and a measure of triangulation was achieved through a feedback mechanism to all participants who were interviewed.

## **Results and discussion**

### **Inventory of horticultural activities (HA)**

Three forms of horticultural activities (HA) were observed: vegetable production, ornamental plants production, and staple crops (maize, and cassava) production. Vegetable gardens were found in almost every corner of the city, although highly concentrated in some ten large sites, close to the vegetable markets, where groups of individual cultivators operate as cooperatives.

### **Staple crops**

Staple crops were usually planted on locations with rather low security of tenure, such as a plot waiting for development where a neighbour hoped to get one or two harvests for their own consumption, before building started. Or, maize was planted on “lost corners” of institutional grounds, providing some “extras” for lower echelons of personnel — guards, gardeners, cleaners — who had to sustain the fields themselves. Examples could be found on roadsides, behind the INFOSEC conference



centre, on railroad property in the heart of the city, or at the CARDER (Ministry of Rural Development Extension Unit) itself. The maize produced was not usually sold or marketed.

### **Ornamental plants and flowers**

Ornamental plant production sites were located mainly along the sides of major road or in the most wealthy areas of Cotonou (Figure 1). Thus, locations are obtained mostly by "illegal invasion" (squatters using vacant lots). Lots are usually rather small, although some roads really have "garden centres" stretching for considerable distances, for example, close to the harbour. Plants are grown on the spot and watered daily. They are transplanted into plastic bags when they are big enough to be sold, primarily to richer urban residents, urban businesses and institutions who make aesthetic use of them. Also, they provide flowers for burials "to those who cannot afford plastic flowers," as one gardener explained to me. The larger sites also sell a variety of plant pots and some have young trees. Many sites are related to nearby vegetable gardens, though usually there is a clear product and market specialization.

### **Vegetable gardens**

A total of fifteen major vegetable growing farms or gardens were identified. These were permanent, well-maintained agricultural locations, with people cultivating them on a full-time, professional basis, every day of the week. Unlike much of the



**Figure 1.** Ornamental plants being cultivated and sold along roadsides in central Zongo-Ehuzu district.

information in the literature, these were considered real, commercial businesses and people were very aware of the economic value of their crops' seasonal demands, as well as supply and cost fluctuations. Producers worked efficiently and had considerable knowledge of input use, and cropping techniques such as crop rotation and inter-cropping. Production from these sites probably constitutes about half of the vegetables consumed in Cotonou. The remainder come mostly from other urban areas in Nigeria and Togo, notably from gardens in Lagos and Lomé. These producers receive some assistance from CARDER extension officers who visit them every second week. They sell to individual market vendors who come not only to the gardens, but also to larger outlets like hotels. In short, these farmers are professionals who know how to sustain their agricultural activities in a competitive way. Figure 2 shows a vegetable garden in Cotonou. It illustrates the professionalism of the farmers (background plots); how they use poor, marginal land (foreground); the tools that are used (manual and nonpolluting); and that groundwater levels in Cotonou are very close to the surface (water pit to the right).

In contrast to the situation in eastern and southern Africa, practically no-one cultivated household plots, which were considered far too valuable to be used for agriculture in this densely populated city. It is also important to reiterate that the urban cultivators in Cotonou are very well organized, at least in comparison with other artisan groups. They have formed some 15 "groupements" or "co-operatives," usually around a specific location. As well, they were the initiators of the Union of



**Figure 2.** One of the bigger, well-looked-after vegetable gardens of Cotonou. It uses the poor soil of the beach near the Hotel Sheraton.

Producers in the Sous-Prefecture of Cotonou (USPP), which includes groups of fish-producers on the lake, urban livestock producers, and merchants. Their activities include training, looking for new locations and sourcing for inputs (vegetable seeds).

## **Relations to urban environmental problems**

### **Urban waste management**

Urban waste is considered the biggest and most pressing of the urban environmental problems in Bénin. This is especially true in Cotonou. It alone produces half of all the waste in the country, because it is relatively wealthy (notably because of its harbour).

### **Solid waste as an agricultural input**

The original soils of Cotonou are as sandy as a beach and very poor. This is the reason why no agriculture existed here prior to the foundation of Cotonou: thus, agricultural production exists because the city is here. Most horticultural sites in Cotonou use household and industrial waste — such as dredge from the local beer brewery or cottonseeds left at the harbour — as agricultural inputs of organic material. Producers pay for all of these, finding urban waste a valuable and relatively cheap source of inputs. Chicken manure is their favourite, bought in 50 kg bags from poultry producers in and around Cotonou, but this is relatively expensive. They usually buy a truckload of garbage from the driver of a waste-collecting company, who delivers it to their site. The gardeners often let it lie for a while, so the organic materials decompose, which occurs fairly rapidly in the tropical climate. Sometimes non-organic waste is removed, sometimes not. Experiments with proper composting have been made on several sites, but most were considered too difficult, too labour-demanding, or simply not sufficiently profitable.

### **Sewage as an agricultural input**

There is only one sewage treatment site in Bénin and it mainly serves Cotonou, where the danger of groundwater pollution is very high. Toilet pits are emptied into septic tank trucks and brought here, some 20 km to the east of Cotonou (Figure 3). But the basin is too small and the sun evaporates too much water from it too quickly. Much of the sewage is dumped into the sea without being sufficiently cleared of pathogens, but so far there is no alternative. Unlike in the Sahel, cleaning the water here would have to be done to dispose of it properly, not for irrigation purposes, since in Cotonou the groundwater level is only at a maximum of 2 metres below the surface. The gardeners simply walk into a pit with two empty watering cans and walk out again with two full ones. Still, sludge from the basins is very high in



**Figure 3.** SIBEAU's sewage-treatment site east of Cotonou, with maize

nutrients and can be used without risk of contamination for ornamental plants, fruit trees and grain crops (Figure 3) growing on the left.

### **Sustainable drainage systems**

Unlike some other West African cities, one of the biggest environmental problems in Cotonou is the abundance of water, especially during the two rainy seasons. Cotonou was built on a sandy beach to create a harbour close to the only waterway between the ocean and Lake Nokoué. Unfortunately, this proved not to be an ideal location. Frequent flooding constrained both development and long-term investments, while rapid expansion of the city produces such pressures on the urban space that many locations unsuitable for construction — notably the marshes — are being built upon. This causes increased flooding in neighbouring locations and threatens the local ecological balance.

More than 50% of Cotonou suffers from yearly flooding with large areas being flooded for several months. Nevertheless, many houses have been constructed in such areas, but at other places people managed to create productive gardens despite the water problem, and merely stop production activities for a couple of months. To rid the city of this excess of rainwater, some very expensive drainage channels have been constructed (Figure 4). Many more are needed and indeed planned at the municipal level, but for years now they have not been constructed,



Figure 4. An open concrete drainage channel polluted with street waste.

owing to a lack of funds. It seems unlikely that funds will be available soon for these works. In the meantime, the canals continue to be blocked and polluted by wastes.

### **Urban management and land-use planning**

Historical and political events leave little maneuvering possibilities for government, particularly the CUC intervention in urban land-use layout. Available land is mainly privately owned, with less than 3% of land in Cotonou owned by the government — and such lands have been built up with offices and government ministries, leaving hardly any space for planning or negotiation. Moreover, tradition in Benin is such that people are very attached to their plots, rarely move house and, thus, they resent government interference in the utilization of such plots. Consequently, construction is haphazard, with hardly any open spaces for city development. The situation is such that it would be difficult to change this land-use system. Only the roads are still government property, and these often have wide sidewalks, much of which are used by the informal sector.

### **Sustainable use of agro-inputs**

A lot of chemical fertilizers, pesticides, seeds and other agro-inputs are available in the city, given the presence of both the harbour and airport. Some are imported directly by the gardeners cooperatives and the one in Kouhounou has a special shop which serves as such. They also have a lot of paper information on uses and dosages,

and additional information can be obtained from the CARDER. For maize and other staples, no chemical inputs whatsoever are applied, and production is mainly rain-fed. For ornamental plants, young trees and flowers, some pesticides are used and, in several cases, some chemical fertilizers too — though not much. In vegetable gardens — especially the better-organized ones with lots of European types of vegetables — it is common to use both pesticides and chemical fertilizers. Both are dissolved in water and sprayed onto the fields by means of a tank with a hand pump carried on the back, so dosage can be very exact.

### **Soil enrichment**

High prices of fertilizer products like urea or NPK have encouraged cultivators to both search for and use alternatives. Such alternatives primarily include urban waste and some industrial wastes, notably beer brewing sludge, cottonseeds which are left in the harbour in large quantities during the season, bags of chicken manure bought at local or regional poultry farms, as well as any other type of animal manure, when available. Cultivators of gardens in the wealthy residential areas are forbidden to use waste “because it smells.” It should be noted, however, that prior to the plots being used to grow vegetables, they were often informal garbage dumps, with lots of unkempt bushes providing perfect hide-outs for robbers, whereas now the plots provide a clear view and permanent (free) “guards.” In other words, the value of the gardens does not only depend on its products.

### **Pest control**

In this climate, the use of pesticides is necessary, but the gardeners of Cotonou are very professional about it. They respect the suggested period before treated material can be marketed and respect the prescribed dosages, often economizing by reducing such dosages. Some organic pesticides have been successfully introduced, notably from the neem tree, wood ashes and chicken manure — all of which are reputed to have insecticidal properties. Indigenous knowledge is certainly flourishing.

## **Recommendations to enhance contributions**

### **Urban waste management**

#### **Solid Waste**

A lot of solid waste is currently being recycled into fresh food through urban cultivation, without long distance transportation of such wastes, thus avoiding pollution and contributing to some environmental sanitation. Nevertheless, there is still a long way to go in this respect. It may be necessary to sort out degradable from non-degradable



**Figure 5.** The ministers of environment and health inspect the composting site in Hévîé.

material, which could be composted. Government intervention may be needed for this type of operation, and fortunately the government has initiated this process at the Hévîé site (Figure 5). Nevertheless, the compost is expensive and Hévîé is too far from the city. A price reduction to that of untreated waste may stimulate urban cultivators to be interested in compost. Transport would still remain a problem, but sites in Cotonou (such as on the grounds where the garbage trucks are parked) could be used. In cooperation with gardeners organizations and NGOs which specialize in waste recycling, a good plan of action could be put in place to serve the city.

### **Sewage**

Given the problems at the SIBEAU sewage treatment site, there is a need to look for another technical solution that can both deal with larger quantities and eliminate dangerous pathogens in sewage. This could be costly. The company could afford the investment, but will do so only if it is profitable. Agricultural application of the residues could help to generate revenue, as demonstrated on a small scale at the Songhaii Centre and on the Tohoué site. Water hyacinth can sufficiently clean household wastewater for it to be used on trees and ornamental plants, and the water plants themselves can be fed to livestock. Also, fish breeding might prove possible, as in Asia and Central America. Meanwhile, the dredge is very fertile as is apparent from the maize on the left side of the basin (Figure 3). Dredge could be applied right

there, since there is a large palm tree plantation just next to the site, where some maize and cassava are already flourishing.

This location could become a real (peri-urban) “vegetable factory” using the dredge, if only a solution for the transport of gardeners and produce could be organized. SIBEAU’s company trucks are driving past daily, but also many trucks are transporting beach sand into the city to raise the ground level of sites before construction begins. And, along the road there is an unused railroad waiting to be used again. A participatory approach, by inviting all stakeholders to the planning process, could provide fruitful solutions.

### **Drainage**

It might prove worthwhile to involve the gardeners’ associations in the upgrading of the city’s drainage system, as well. For example, instead of digging an open channel in a wide street (like the one in Figure 4) a simple ditch could be dug. Along both sides of it, a line of vegetable beds could be created. In return for the space and the proximity of open water, the gardeners could be made responsible for the maintenance of the ditch. They could dig it out every so often to prevent it from closing again — and they would be gaining fertile soil in the process. They would also have something to gain by keeping the garbage out (and thus educating the population not to pollute the open waters in the process). It would take up the same amount of space, enhance the urban environment — and it would be so much cheaper than constructing open channels out of concrete that an experiment like this would certainly be justified.

### **Urban management and land-use planning**

The above section on drainage channels is already a good example of how to use urban space for cultivation while enhancing the environment. There are also several informal waste dumps that could be transformed into gardens as well, just as the history of at least five garden locations in Cotonou have already proved. This would help prevent health hazards, upgrade the aesthetic value of the city and provide jobs in the neighbourhood. Allowing and stimulating gardens in those places where flooding is frequent and which have a precarious ecological balance could prove to be a smart policy as well.



## **Sustainable use of agro-inputs**

### **Soil enrichment**

It is not necessary to intervene with the use of chemical fertilizers for it is not posing an immediate environmental threat in Cotonou. Still, the provision of more high-quality organic fertilizers could certainly influence the market competition in a positive way. According to one of the cultivators, “mineral fertilizers are not really appropriate and certainly not necessary in tropical Africa.”

### **Pest control**

To improve the quality of the crops, rather than lowering the prices of imported agro-chemicals, it would be wise to stimulate the use of local organic inputs. Luckily, a lot of expertise is readily available at the Songhai Centre in Porto Novo and some other institutions. The introduction of new environment-friendly pest control systems should be quite easy if taken up by the well-organized CARDER in collaboration with the gardeners' cooperatives, for the agricultural producers have become one of best-organized artisan groups of Cotonou.

## **Closing comment**

There is a large and growing demand for urban agricultural products in Cotonou and the “urban peasants” want to provide them. They are well organized, capable professionals, and are also open to new ideas and reasonable environmental measures — as long as these do not harm their business. They have a lot to offer to the city of Cotonou, their potential is hardly tapped — and they have a rightful place in the urban fabric. The garden is more than just a means of income: it is a way of life and it is their home.

## **References**

- Aisso, F.X. 1994. *La Dynamique des Cultures Maraîchères à Cotonou*, PhD thesis in Geography. National University of Bénin, Abomey-Calavi.
- Smit, J. 1996. Urban agriculture, progress and prospect: 1975-2005. *The Urban Agriculture Network (TUAN)*. March 1996 pp. 38-40.