WASTED AGRICULTURE
THE USE OF COMPOST IN URBAN AGRICULTURE
URBAN WASTE EXPERTISE PROGRAMME
Composting of Organic Household Waste
UWEP Working Document 1

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FOREWORD

Urban agriculture may seem a waste of time and energy, but for many people in the South it forms an important part of their income and/or food. Given this situation and the problem of growing amounts of (organic) waste in cities, we decided to execute an inventory study on the use of compost in urban agriculture.

What was initially a theoretical idea to us, turned out to be a living phenomenon for the people involved. That made this study a challenge to us: we were motivated by the reactions from the South to come up with relevant data and with future plans on the use of compost in urban agriculture. We hope this report will stimulate people working for CBOs, NGOs, governments and research institutes to pay attention to the use of urban compost in urban agriculture.

We would like to thank all the people who contributed in one way or another to this report: the colleagues of WASTE for the pleasant working environment and the support, Jac Smit (UAN), Luc Mougeot (IDRC) and many others for providing useful information, Ann Waters-Bayer (ETC) for the very inspiring discussion we had, Anne-Lies Risseeuw (WASTE) for the language corrections, and Anneke Lubbers and Thea 't Hart for translating the questionnaire. A word of special thanks goes to Inge Lardinois of WASTE, who supported us throughout the whole process with innovative ideas, helpful comments and Easter eggs. Last but not least we would like to thank all the people who responded to the questionnaire for their very thorough and inspiring answers; we are very grateful to them. Our special thanks go to John Y. Musa of AHA (Cameroon), who sent us some very nice pictures of urban agriculture in Bamenda.

Is urban agriculture a wasted agriculture? Looking at the experiences in the field we believe that it is certainly not wasted; on the contrary, it has potentials to turn waste into food and money for urban people in the South.

Gouda, April 1996 Doortje 't Hart
Jacomijn Pluimers

CHAPTER 1 PROBLEM SKETCH, QUESTION AND METHODOLOGY

1.1 Historical background

In 1989, WASTE started a research on the potentials of recycling to become a source of income for people in the low-income areas of Nairobi (Kenya) at the request of the Undugu Society of Kenya, an NGO. Rather than `reinvent the wheel' and try to develop recycling activities itself, WASTE decided to involve local consultants from five cities where resource recovery activities are better developed than in Nairobi. Local consultants in Cairo, Bamako, Accra, Manila and Calcutta investigated the technologies used, the products made and the markets covered by micro and small enterprises recovering urban solid waste materials. Ten waste materials were identified: rubber, plastic, motor oil, cooking oil, tin cans, photochemicals, broken glass, bone and horn, household batteries and organic waste. One result was the publication "Organic Waste; options for small-scale resource recovery" (Lardinois & Klundert, 1993), the first book in a series on Urban Solid Waste.

In 1995, WASTE started the so-called Urban Waste Expertise Programme (UWEP), which builds on the results and experiences gained from the WAREN research. One of the activities of the UWEP programme is a research on *`composting organic household waste'* (UWEP 5). This research aims at documenting successful composting activities and deals specifically with the type and scale of technology used, financial and economic aspects and the marketing and application of compost. Since not much is known about the use of compost in urban agriculture and as a means to broaden the marketing opportunities for compost, an inventory study on this topic was started. This report comprises the results of this inventory study.

1.2 Problem description

In Bamako `the cultivation of cereals is banned since 1989, on the grounds that the tall stalks provide hiding places for bandits' (Lachance, 1993). Other official bans refer to the health risks of keeping livestock in town and the fact that fields of maize would obstruct the view of drivers and cause accidents (Mougeot, 1993). Behind these official stories, lies the fact that urban agriculture does not fit into people's perception of what a city should be.

Whatever official reasons there are to ban urban agriculture, it is impossible to deny its growing importance in the expanding cities of the South. Urban agriculture is practised in many cities, often at a considerable scale. It provides many people with the necessary starch, vitamins and minerals.

All over the world cities are growing because of urban migration and natural growth. The increase of the population is often so fast that the delivery of basic services, such as water supply, sanitation and waste removal cannot keep up. Unemployment, growing poverty and deterioration of the environment are related problems to urban expansion.

With an increasing population and often a more Western way of living, the amounts of waste generated are consequently growing. The municipal waste collection service is usually not capable to deal with this waste problem. In Southern countries waste is removed only in some parts of the city, such as the centre and the high-income areas, in the rest of the city the waste is left along side the streets, in streams and in scattered heaps between the houses. As a result of this and the growing poverty, informal waste recovery activities have arisen. Plastic bags are washed and sold again, oil tins are used for making lamps, tyres for making shoes and organic waste is converted into compost.

1.3 Justification

1.3.1 Opportunities of urban agriculture

Smit and Nasr (1992) describe that the benefits of urban agriculture vary in time and place. In times of particular stress urban agriculture can be practised as a defence against hunger and malnutrition, at other times it may be practised to improve the quality of the urban environment or the objective lies in between where both income and food supply are of interest to the farmer.

Benefits of urban agriculture for the city can be:

1. Poverty alleviation

2. Food provision/lower food prices

3. Employment

4. Improvement of the quality of the urban environment, through greening and reduction in pollution

5. Strengthened economic base (by reducing the need to import food)

6. Contribution to balancing global ecology (among other things by reducing the need for transportation)

(Smit and Nasr, 1992)

In addition, urban agriculture has a threefold relation with resources:

a. Urban waste can be recycled and used in urban agriculture

b. Some (unused) areas can be made productive by urban agriculture

c. Other resources can be conserved through urban agriculture, because urban agriculture:

- Saves energy (transportation/fuel wood)

- Saves food expenditures, so the available money can be used for non-food expenses

- Can reduce land pressure and thus withhold conversion of deserts, mountain slopes and rainforests into cropland

- Can conserve human resources (rural farming skills)

- Offers opportunities to achieve equity between groups

(Smit and Nasr, 1992)

Alongside the aforementioned potentials, the practice of urban agriculture may however also include risks. Examples of the risks are: health problems by eating contaminated products (air pollution by exhaust gasses and soil contamination) and taking away the market for products from rural areas and thus possibly creating new problems in the rural areas.

1.3.2 Opportunities of composting

A large part of urban waste in Southern cities is organic and one of the ways of recovering this is through composting. Resource recovery creates employment, reduces the volume of waste to be disposed of by municipal authorities, it saves foreign currency by reducing the quantity of raw materials needed in the production process and it plays a role in natural resource conservation.

Organic waste can be re-used for compost making, raising animals or fish (fodder) and as a source of energy (biogas or briquettes). Composting is a promising activity, because waste is turned into a good soil conditioner which can be used for agricultural practices. An important constraint in compost-making is the lack of a nearby market. Transport of compost to rural areas is expensive and therefore this study looks into the possibilities to use the urban compost in urban agriculture.

Also composting can have risks. We can think of health problems, when the process of composting is not applied accurately; and also when the waste contains hazardous components, such as chemicals or heavy metals which may effect the quality of the compost.

1.3.3 Potentials of linking composting and urban agriculture

Both urban agriculture and composting seem to be promising activities, which can contribute to solve the complex urban problems.

There are various options for the use of compost, such as agriculture in rural areas or urban areas and urban forestry or `greening the city'. Linking compost with urban

agriculture seems to have most potentials, because of low transporting costs and direct benefits to low-income dwellers. This may cause the closure of nutrient cycles, a reduction in transporting costs and the use of fertilizer, available space and labour made more productive and a healthier urban environment.

The concept of closing cycles is not new. An interesting example in this context is that in Berlin, in the early days of this century, farmers who brought their products into the city, had to carry waste back, out of the city.

1.4 Central research questions and methodology

The use of compost in urban agriculture is a rather new concept, a field in which, to date, limited research has been carried out. Because of its potentials, we decided to carry out an inventory study around the following question:

* *Can urban agriculture be a potential market for compost, made of urban organic waste materials?*

1.4.1 Literature study

We started the study with an inventory of the literature, mainly available in the Netherlands, on urban agriculture and composting. The sub-questions for this inventory were:

a. What is meant by urban agriculture?

b. What are reasons for people to practise urban agriculture?

c. Who are the urban farmers?

d. Which forms of urban agriculture exist?

e. What are the constraints faced by urban farmers?

f. At which scale is urban agriculture practised?

g. Is compost used in urban agriculture?

h. What are problems of using compost in urban agriculture?

1.4.2 Network study

Besides gathering information on the subject, also an inventory of resource persons, mainly in the Netherlands, was drawn up. Interviewing these resource persons gave information on the expertise available within several organizations in addition to information on urban agriculture.

The sub-questions that are related to this expertise network were:

i. Who has expertise on urban agriculture and/or compost in the Netherlands?

j. What type of organization are they working for?

k. What type of activities are they undertaking concerning urban agriculture and/or the use of compost in urban agriculture?

The results of this inventory on the `expertise network' can be found in Appendix I.

1.4.3 Questionnaire

Within the scope of this study field research was not possible. In order to obtain recent field information a questionnaire was elaborated. The central objective of this questionnaire was:

To obtain recent information about the actual occurrence of urban agriculture and the existing potentials and threats of urban agriculture and the use of compost.

Names and addresses of the organizations to whom the questionnaire was sent, were selected during the `network study'. The majority of the organizations that we approached are contacts of WASTE, ETC Foundation, CEBEMO and Both ENDS. Other addresses were found in ILEIA's newsletter of December 1994, Vol 10 no. 4 `Farming at close quarters' and other literature. Appendix II includes the addresses and a short description of the organizations.

The questionnaire was sent to 20 organizations in 16 different countries in Asia, Africa and Latin America, working with urban agriculture. Because it was not known whether these organizations used compost, the questionnaire was kept short and the questions about compost were not very specific. 14 questionnaires were returned!

The questionnaire was subdivided into 3 major parts. Firstly, information was requested on the type of organization, their objectives and their involvement in urban agriculture. Secondly, questions were asked about the type of urban agriculture project; what the goals are, who the farmers are, what type of space is used, which crops are cultivated and what the constraints are the urban farmer faces? Thirdly, it was asked whether or not compost was used in urban agriculture. Appendix III includes a complete print-out of the questionnaire.

1.5 Structure of this report

Chapter 2 describes all the aspects determining the various forms of urban agriculture. The chapter starts with an explanation of the definition of urban agriculture that is used in this report. Furthermore, the different reasons to practise urban agriculture are reviewed and the question `who the urban farmers are' is answered. Section 2.4

contains the important issue of the type of space used for urban agriculture; Section 2.5 presents the types of crops and Section 2.6 reviews the crop management practices. After some comments on the political context in 2.7, Section 2.8 reviews the major constraints.

Chapter 3 presents data on the use of organic waste in urban agriculture. Firstly, the chapter describes urban organic waste and its characteristics. In 3.2 the focus turns to compost. Section 3.3 analyzes the use of organic waste as fertilizer, whereby a distinction is made between fresh garbage and compost. Section 3.4 reviews the environmental and health risks.

Chapter 4 shows the results from the questionnaire. Section 4.1 gives an overview of the organizations who returned the questionnaire. Section 4.2 presents the urban agriculture projects: objectives, target groups and description of the practised type of agriculture. Section 4.3 gives a description of the use of compost in urban agriculture projects.

Chapter 5 presents the major conclusions from this inventory study: 5.1 contains the conclusions based on the literature study, 5.2 the conclusions from the questionnaire, 5.3 the conclusions from the network study. You will find the overall conclusions in Section 5.4, and Section 5.5 describes the possible follow-up activities.

Appendix I presents the results of the network study. In Appendix II lists the names and addresses of the organizations to whom a questionnaire (Appendix III) was sent, and Appendix IV gives an overview of the crops cultivated in urban agriculture.

CHAPTER 2 URBAN AGRICULTURE

Urban agriculture, as described in Chapter 1, has a great potential in feeding the urban population, as an income provider and as a market for organic waste. More important than these potentials, however, is the actual occurrence of urban agriculture in many Southern cities. Despite the fact that many governments in Third World cities deny the presence of urban agriculture; to many people, urban agriculture is the only way to survive.

2.1 Definition

In reviewing the literature the first question that arises is: *`what is meant by urban agriculture?'*.

First of all, urban agriculture should not be confused with `homegardens'. Hoogerbrugge and Fresco (1993) define a homegarden as follows: "A homegarden is a small-scale, supplementary food production system by and for household members that mimics the natural, multi-layered ecosystem. It never provides the main source of income or food to the household; this distinguishes it from commercial horticulture or arable cropping".

Homegardens appear both in urban and in rural areas. Homegardens are only meant for supplementing on food and income, while several forms of urban agriculture are indeed providing the major source of food or income for the urban household. For that reason homegardens are only one kind of all the different forms of agriculture that are found in cities.

Several authors come up with a definition of urban agriculture in a broader sense. Smit and Nasr (1992) use the following definition of urban agriculture: "Food and fuel grown within the daily rhythm of the city or town, produced directly for the market and frequently processed and marketed by the farmers or their close associates; it includes aquaculture, livestock, orchards, vegetables and other crops."

This definition is broad in the type of activities that it covers, and vague in defining the area where urban agriculture occurs. Where are the boundaries of the city?

Mougeot (1994) is a little bit more precise in his definition as far as location is concerned. He describes urban farming (or city farming) as: "The growing of food and non-food crops and the raising of animals such as cattle, fowls and fish both within and on the edge of built-up areas".

The big question is where the edge of a city is. Using the official boundaries of a city does not seem to give much practical clue: somebody can live outside the borders, but have a field within the borders or the other way around.

The definition of urban agriculture that we use in this report is related to the central question of this study: "can urban agriculture be a potential market for compost, made of

urban organic waste materials?". This also restricts the type of activities: only crop-production will be included and not animal production, because compost can only be used in crop-production. In order to further narrow down the definition, tree-production, urban forestry, is excluded from this study, with the exception of orchards, either communal or individual, and agro-forestry-systems. Although urban forestry can be a potential market for compost, the scope of this study did not allow to include it.

The discussion on the spatial scale can be shortened when we talk of urban agriculture within a distance of the city where there are direct (commercial) links with the city. Either because the farmers live in the city or because the marketing is done within the city, and where agriculture is still a potential market for compost, made of urban organic waste materials. The size of this area around the city will depend largely on the structure of the city.

The following definition of urban agriculture is therefore used in this report:

Urban agriculture is the growing of food and non-food crops within a city and in the area around the city where direct links with the city exist:

- The producers live in the city, or

- The city is the only market for the agricultural products, or

- Agriculture is still a potential market for urban compost.

Although several terms are used for agriculture within the cities, such as `urban agriculture', `city farming', `urban farming', the term urban agriculture is used in this report, because this term is most common.

2.2 Reasons for practising urban agriculture

In general, two main reasons exist for people in Southern cities to practise urban agriculture: nutritional reasons and socio-economic reasons, which turn out to be very much related to each other. There is no generally applicable hierarchy: depending on the situation of the farmer one reason is more important than the other.

Possible nutritional reasons are:

a. To produce (higher quality) staple food

b. To supplement the food with vitamins and/or minerals

c. To decrease the loss of nutrients through freshness (Niñez, 1985)

Possible socio-economic reasons are:

a. To obtain (supplementary) cash income

b. To diversify income

c. To obtain employment

Although the reasons are presented here as separate, they are mostly interrelated. For example, the nutritional needs can have a socio-economic reason: the lack of income to buy food, or the need to save money for other expenses. This may explain why urban agriculture is practised even when there is a low return for labour. (Maxwell and Zziwa, 1993)

There are several reasons why people get involved in urban agriculture:

1. Urban people may have a rural background and thus have the knowledge to practise agriculture.

2. Agriculture can be practised with available (`free') resources (Waters-Bayer, 1995). In many urban areas small plots of unused land can be found, water is often near and organic waste can be used as fertilizer. On small plots the work can be done with simple equipment such as a hoe.

3. Urban agriculture can often be combined with other tasks within the household. When the crops are near the house, they can be looked after without leaving the house and the children.

Box 2.1 illustrates the above mentioned reasons, from which it becomes clear that people in one city can have very different motives to get involved in urban agriculture from people in another city.

Box 2.1 **Farming the city for food, cash and self-improvement: three case-studies in Nairobi (Kenya)**

* Rose (a subsistence farmer) cultivates two plots of land owned by the Kenyan Railways. For cultivation she uses a *panga* (a large bush knife) and a borrowed *jembe* (hoe). She has eight children and no other occupation than cultivating `her' two plots, where she plants a mixture of maize, beans and peas. She sells about 10% of her products, the rest comprises her food supply. Her main reason for cultivating is "to have some food for myself, since I have nobody to help me except God."

* Sakina (farming for the love of it) is cultivating two plots, situated on public land. She grows a wide variety of different crops, solely for consumption within her household. Her tools for gardening are a *panga* and a *jembe*. She uses some chemical fertilizers and relies on rainfall rather than irrigation. Sakina pays two helpers about 40 shillings per week (0,75 US$) to help her cultivate her plots. Sakina belongs to a middle-income household; the reported family income is about US$ 5700 per year. Sakina's motives for

cultivating urban vacant lands are that she "hates sitting down idly, loves *shamba* (field) work and trying out different types of plants."

* Joan (urban entrepreneur) has for over 15 years been cultivating a plot on public land. The plot is situated near the food kiosk, which is her main occupation. She is growing staples such as maize, beans and potatoes, but also bananas, chili, *sukuma wiki* (leafy vegetable) and cow peas. Joan's main motives for cultivating are to cut household expenses for food and to generate income by selling these products in her kiosk. For her gardening is a suitable activity, because she can easily combine the garden tasks with running the kiosk and her household. Her mother and two non-family members help with cultivation in exchange for some of the harvest.

Source: Freeman, 1993.

2.3 Who are the urban farmers?

Urban farmers do not form a homogeneous group, they can be found among almost every socio-economic group of the city. Mougeot (1993) identifies three farmer categories, classified according to the reasons for practising urban agriculture:

1. Low-income survival farmers; they practise urban agriculture mainly to survive and achieve a combination of nutritional and socio-economic benefits.

2. Middle-income homegardeners; they practise urban agriculture mainly to provide supplemental food and/or income.

3. Agribusiness `farmers'; they practise urban agriculture to obtain income.
In the second category we also find the upper-class people who have their gardens maintained by their servants and watchmen.

The literature does not state numbers of farmers per category, but it appears that the agribusiness farmers are a minority.

The diversity of the group of urban farmers is illustrated by numerous case-studies on urban agriculture, which were found in the literature (see References). In Soweto, South Africa, for example, urban farmers are "long-term urban residents, mostly widowed pensioners, with little income and scant alternative household income opportunities." (Rogerson, 1994) Another example is taken from Ibadan (Nigeria), where "most urban farmers are men, who are part-time farmers; if women are engaged in urban agriculture they are full-time farmers. Besides that, they are all low-income earners." (Gbadegesin, 1991) The last example is from Lima (Peru), where most urban farmers are low-income women. (Niñez, 1985) The case-studies show that urban farmers are often women and/or part-time farmers. This has to do with the fact that urban agriculture is often not the main activity of urban households and that women often have more possibilities of combining their household tasks with urban agriculture.

Mougeot (1993) further mentions that urban agriculture is not the business of recent migrants, owing to its considerable resource needs; recent migrants have less access to the `free resources' as mentioned in Section 2.2. This is in contrast to the belief of many governments that urban agriculture is an activity of recent migrants and that it is only temporarily.

Urban agriculture is mostly practised at household level, but in several places urban farmers work together. In Dasmarinas Bagong Bayan, the Philippines, for example, the farmers have organised themselves in the `Bio-Intensive Gardening Association' (BIGA). See also Box 4.4 in Chapter 4. As a group they have obtained a grant to install deep-well hand pumps. They sell their products on an open market in Manila for organically grown products. (Ignacio, 1994)

In Addis Abeba (Ethiopia) there are five cooperatives involved in urban agriculture, alongside the rivers and the streams of the city. Some of the produce is consumed by members of the cooperatives, but most of it is destined for sale. (Egziabher, 1993).
What strikes when reviewing the literature is the fact that most of the time urban agriculture is a spontaneous activity and not officially planned. Most urban farmers operate informally and therefore actual facts and figures of who the urban farmers in a city are and how many they are, are missing.

Some authors, however, try to give an indication of the number of urban farmers. Wade (1986) presents the following data: "In Lusaka, Zambia, for example, over 50% of the residents in squatter areas surveyed were found to have home or distant gardens for food cultivation." Mougeot (1993) gives some other figures, which even show that the number of households involved in urban agriculture is increasing: "In 1980, in Dar es Salaam, Tanzania, 44% of low-income earners had farms, but by 1987 70% of heads of households engaged in some farming or husbandry. During the 1980s, 57% of all urban households in six cities in Kenya engaged in food production, and other city-specific figures are ranging from 32.6% to 70% for Kisangani (Zaire), Kampala (Uganda) and Lusaka (Zambia). In the early 1980s, Cairo (Egypt) had at least 80,000 households raising animals at home." Another example comes from Port Moresby, Papua New Guinea, where "about four-fifths of all households take part in some form of food production". (Vasey, 1985)

Although there are no exact data on numbers of urban farmers, the above presented percentages will make clear that the number of urban farmers in the South is considerable.

2.4 Space used for urban agriculture

Agriculture in cities is practised on different types of space: it can be practised on plots of land (2.4.1) and on other types of space (2.4.2).

2.4.1 Availability, quality and ownership of land

Urban agriculture practised on land is found in different locations in the city:

1. Backyard or courtyard (the area close to the house)

2. Communal land

3. All kinds of public, vacant land suitable to grow crops.

In this context we may think of the space next to roads, near to rivers or dumpsites, places vacant to be built on, places around abandoned factories, etc. In general, these are the places which are unsuitable for building houses or roads, or which are not yet used for these purposes.

4. (Large) fields at the edge of or outside the city; particularly frequent in Africa.

Which types of land a city has, depends among other things on the structure of the city. A city with a high population-density and a comprehensive planning for buildings and roads, will have less `unused' land available for agriculture than a city with houses further away from each other and a lot of `unplanned' land. But also in planned quarters, space for agriculture can be (made) available. In Harare, Zimbabwe, for example, the public tenant flats are surrounded by land which is big enough to provide a garden for all the inhabitants of the building. (Mougeot, 1993)

The quality of the soil is an important indicator for the quality of the used land. It is very hard to say something on the types of soil in cities where crops are grown, because the soils will probably show as much variety as the plots of land used for agriculture. In rural areas people can often choose the right soils for agricultural production, in cities, however, the choice of land and thus of soils is in general limited. One has to do with what is available. Often cities are built along rivers and thus the soil is clayey and fertile. (e.g. in Nairobi, Kenya, along the Nairobi river).

However, fertility is not always the case. In Lima (Peru) the soils are sandy and saline and are only slowly improved by the use of plant refuse. (Niñez, 1985) These examples also show that availability of water is a second important indicator for the quality of the used land.

A third important indicator for the quality of the land is the pollution of the soil. Soils near an abandoned factory or dumpsites may contain hazardous materials, such as oil and chemicals, which may contaminate the crops. The places near roads can be polluted with heavy metals by the exhaust fumes of the cars. Unfortunately, urban farmers are often not in the position to choose a pollution-free plot. In the first place, because there are often no other plots available and in the second place, because they are often not aware of the dirt in the soil. See also Section 2.6.3.

Besides quality of the used space, the land tenure situation highly influences the type of urban agriculture that is practised and the sustainability of the cropping system. Maxwell and Zziwa (1993) distinguish in Kampala, Uganda, four types of land tenure:

1. Freehold land

a. With a title

b. In the form of a *kibanja*

This *kibanja* land entitles use and inheritance rights, as well as the right to improve the land, but not actual ownership of the land itself. Holding land in the form of *kibanja* offers the tenant reasonable security of tenure, and compensation if the landowner reclaims the land. Although the *kibanja* system is specific for the area, it can be compared to a system of `lend and borrow', with very strict regulations for both the owner and the tenant.

2. Public land

a. Land used with no arrangements at all

b. Land where some arrangements for its use were made. These arrangements are e.g. by paying the previous user for taking over a plot of land. This indicates the emergence of a kind of informal `land market'. (Maxwell and Zziwa, 1993)
Probably not all four categories will be found in every city, but the rough distinction between owned, borrowed and public land can be found almost everywhere. Some illustrations of different types of space and ownership can be found in Boxes 2.2 and 2.3.

Box 2.2 **Two plots of land in Lusaka, Zambia**

In Lusaka most cultivation is done by women. Often they have two plots of land: one small plot next to the house (backyard) and a larger field at the edge of the city. On the plot near the house (which is often only a few square metres) they grow tomatoes, onions, rape, cabbages and fruit trees, e.g. bananas. It is important to grow these crops on a plot that can be looked after daily, because these crops need regular watering and can be harvested on a continuous basis. The plots at the edge of the city are often situated on un-used public land. Only in the rainy season do the women grow maize, beans, groundnuts and/or pumpkins here. These crops need space and can grow with little care.

Source: Dankelman and Davidson, 1988

Box 2.3 **Land for gardening in Port Moresby, Papua New Guinea**

In Port Moresby, the capital of Papua New Guinea, the spatial niche into which urban

food production has spread, is provided by:

a) `Bush' gardens, which are village or clan owned

b) Vacant lots adjacent to settlements

c) Hill sides

Port Moresby first spread east along the seaward slope, then on the inland plain and west along the inland slope. Within the coastal hill zone of the city, the tendency is to occupy valleys and foot slopes while avoiding steeper slopes; only hill sides near the city are built on to a greater extent. Most gardeners in the inner city are far from the boundaries of cultivated land, but vacant undeveloped land within the city is seldom used for gardens even where it is available. Therefore, apart from household plots, the main areas left for gardening are on fairly steep slopes. The garden area attached to the lower-income settlements of Port Moresby ranges from zero to well over 1000 m^2, with an average of 372 m^2. Where the intra-community settlement pattern is dense, garden plots tend to be smaller. The largest cultivated areas, the `bush gardens', are worked by residents of the `urban vllages', i.e. former villages, which are now within the boundaries of the city. The gardens are often several kilometres away from these villages.

Source: Vasey, 1985

2.4.2 Other spaces used for urban agriculture

When land is not available, because of high building density, or when only polluted land is available, people still find places to practise agriculture. Examples are:

a. Rooftop production

By growing crops on the roof of the house, people do not use any new space.

b. Balcony-gardens

Balcony-gardens offer opportunities for people living in an apartment without garden or own roof.

c. Container-gardening

Many items, that are often discarded, can be used for growing edible plants (e.g. plastic bags, tyres, milk containers, tin cans, old baskets, coconut shells).

d. `Growing walls'

A container gardening system based on walls with built-in growth boxes made of hollow concrete blocks.

e. Hydroponics

Hydroponics (or tubeoponics) is growing crops on artificial `soil' (e.g. crushed lava rock, vermiculite) or water, whereby the crops are daily fertilized with specially made nutrient solutions. Because of the cost of the equipment and fertilizer solutions, and the non-availability of the fertilizer solutions in many Southern cities, this method is often too expensive for community production. (Wade, 1986) An example was found in Bogotá, Colombia, where hydroponics is practised on rooftops. (Robson, 1989) For this report hydroponics is not relevant, because compost cannot be used in this system.

Although for most of these spaces people still use soil as growing-medium, they have the opportunity to choose the soil they want to use. Of course the distance of transporting the soil may limit the choice of soil considerably. Where soil is scarce, people have become creative in using locally available materials such as rice hulls, shredded corn husks or cobs, compost or only dried leaves from trees; only an inch or two of good soil are needed to cover these materials and create a growing medium. (Wade, 1986)

People using the above mentioned spaces for agriculture do not face land tenure problems, because the crops are grown in, on, or around their house. They might, however, face other constraints. Rooftop crop production is only possible when the roof is stable enough to carry soil, plants **and** the farmer who has to take care of the crops. Wall-growing requires walls with holes and for container-gardening one needs to have material to make the container. In this last case people turn out to be very creative using old tins, carton boxes or tyres. Box 2.4 describes an example.

Box 2.4 **Using worn tyres and wastes in Kuala Lumpur, Malaysia**

In Kuala Lumpur worn rubber tyres are used in urban gardening, landscaping and soil conservation. The worn tyres, which can often be obtained for free, are cut on one or both sides with sharp kitchen knifes along the lines demarcating the thick and stiff tread region from the flexible `belly' region. When cut on one side a `ringpan' is formed; when cut on both sides a `ring' is formed; the remains are `hoop'. Ringpans, rings and hoops have a variety of uses in gardening, landscaping and soil conservation. They can be used as containers for soil composting, soil terracing, storing materials and growing a wide variety of plants and trees. Stacked pans used as containers for large plants produce multiple layers of roots within the containers for the efficient use of water.

Source: Santiago and Santiago (not published)

2.4.3 Scale of urban agriculture

The scale on which urban agriculture takes place is determined by three factors:

1. Number of urban farmers in a city (see 2.3)

2. Size of the plots (determined by city structure and land availability, see 2.4.1)

3. Actual level of production

It is impossible to determine the average size of space used for urban agriculture. The size varies from a few square inches (containers) to a few square metres (balconies, walls, backyards, etc.) to acres on open plots of land or fields at the edge of some cities (mainly in Africa).

The number of urban farmers and the size of the plots together determine the total area used for urban agriculture in a city. Although hardly any statistics have been found on this issue, some authors give estimations of the area used for urban agriculture.

Isabel Wade (1986) writes that in a relatively small town such as Suva in Fiji (68,481 inhabitants in 1988; Bissio, 1990), approximately 50% of the land on the 30 km^2 peninsula where the capital is located is under cultivation. According to Mougeot (1993) the area devoted to agriculture in cities is much larger than indicated by most urban land use classifications. He gives the example of Bombay, India, where some 60% of Greater Bombay was officially under urban agriculture in the 1980s. Mind the distinction Mougeot makes between Inner Bombay and Greater Bombay.

Also the relevance of the production is hard to determine, because it is not registered. Mougeot (1993) gives us some idea about the (economic) relevance of urban agriculture. Asian cities, such as Kathmandu (Nepal), Karachi (Pakistan), Singapore, Hong Kong, Shanghai and other cities in China, produce between 25% and 85% of the total supply in vegetables and fruits. Depending on the income-group, self-produced food is found to account for between 18% and 60% of household food consumption in East Jakarta (Indonesia), Dar es Salaam (Tanzania) and Kampala (Uganda). (Mougeot, 1993)

What should be clear is that the scale of urban agriculture varies per city. The scale is among other things determined by the level of poverty, the attitude of the municipal government, the structure of the city, the availability and quality of land and the climate.

2.5 Types of crops

Firstly, it is important to note that practically all types of crops are grown in cities (provided they are adapted to the prevailing climate). The prejudice that most crops grown in cities are vegetables, is not true.

We find fruit and nut trees, trees of which the leaves are eaten, green leafy vegetables, roots and tubers, other staple crops, legumes, fruit vegetables, pumpkins, onions, spices, medicinal crops, etc. (Wade, 1986) Not only seasonal production is found, but

also year round production, although this depends of course on land tenure, labour availability, taste and climate, water availability.

The type of crops grown depends on many factors, such as:

- Reasons of farming (see 2.3)

- Climate, soil and availability of water

- Availability of labour

- Culture

- Distance from the house (if a crop needs much care, it can only be grown close to the house)

- Ease of theft

- Pollution

- Land tenure
- etc.

Box 2.5 shows the list of key considerations as elaborated by Wade (1986).

Box 2.5 **Key considerations in crop selection**

Economic factors
inexpensive to grow

good market crop

minimal cooking time (to keep fuel costs low)

Environmental factors

suitable for local conditions (e.g. drought tolerant)

cultural growing habits (e.g. plants that climb)

Taste/nutritional factors

high yield to boost food intake

compensates for specific urban deficiency (e.g. Vit. A)

palatability and ease of preparation in cooking

Production factors

availability of seed and growing materials

ease of growing

(including resistance to insects and diseases)

length of growing season

Source: Wade, 1986

Urban farmers often grow a combination of several types of crops, as they mostly take several of the mentioned factors into consideration. Box 2.6 and Box 2.7 describe some examples.

Box 2.6 **Homegardens in the Lima slums, Peru**

In the gardens in Lima, with an average size of 200 square metres, the cropping list can be quite divers. The typical garden features:

1. Tree crops (mainly banana and papaya, though avocado, mango, guava, guanabana, fig and *pacay* can also be found)

2. Fruit-bearing climbers (e.g. passion fruit)

3. Vegetable staples (maize, roots, and tubers)

4. Some leaf and fruit vegetables

5. Beans

6. Herbs, medicinal plants and flowers

Vegetables not native to the region and poorly adapted to the harsh tropical desert environment are only found in the larger plots of experienced gardeners or people with horticultural backgrounds who are provided with good soil and water.

Water is in Lima the major factor limiting urban gardening; kitchen waste water is used for producing small numbers of plants and (on a limited scale) extra water is purchased.

Source: Niñez, 1985

Box 2.7 **A rank-order of the crops grown in Port Moresby, Papua New Guinea**

To assess the relative importance of garden crops, a measure was obtained for all gardens in the study by rank-ordering, and a score was compiled for the entire sample. As a result, cassava, banana and plantain (in order of importance) emerged as the most important garden crops, followed by sweet potato, *aibika*, pumpkin, maize, beans, sugar cane, yam, taro, peanuts, various cabbages, tannia and other minor crops. Pumpkins are grown mainly for the green tips and beans for their immature pods.

Tree crops were not included in this score. Fruit trees are commonly grown where long-term occupancy is assured and tend to be more abundant in older neighbourhoods. Papaya was the most common fruit tree.

Source: Vasey, 1985

2.6 Crop management practices

Crop management practices in urban agriculture vary according to available space, labour, knowledge, water, inputs, soil and equipment. But also the types of grown crops and the reasons behind the production are important determinants.

2.6.1 Optimal use of resources

In general we see that on the small `plots' close to the house the crops are managed intensively. Weeds are removed as much as possible and water is applied when available and needed. Mostly people try to fertilize the crops close to the house using whatever is available: crop and food residues, compost, manure. People hardly ever use artificial fertilizer on their crops around the house. See also Chapter 3. The case-studies on urban agriculture (see also the literature list) give very little information on fertilization.

Because of the intensive farming, high yields and a large variety can be obtained. In Guangzhou, China, for example, a single field can produce up to nine crops a year. (Pepall, 1993)

Intercropping is often practised to make optimal use of available space, sunlight, soil-characteristics and water. Reijntjes et al. (1992) describe a system that makes optimal use of vertical and horizontal space in a homegarden: four-tier vertical distribution of tall trees, medium-height trees, shrubs and high/lowfield crops.

Although the management of the crops around the house is generally very labour-intensive, it is often not capital-intensive. People make use of simple equipment such as a hoe and a simple sprinkling can (e.g. handmade of a tin). The family garbage pile often functions as a seedbed, where spontaneous propagation from kitchen waste takes place (e.g. tomato, papaya and pumpkins). Also rural relatives and neighbours may supply seed. (Niñez, 1985)

Money is only spent on seeds and hardly on other inputs, such as fertilizer, pesticides or modern equipment. Of course, the people who practise urban agriculture solely for marketing purposes, are able to invest more than people who practise crop production solely for complementing the household diet.

Hydroponics, as is e.g. practised in Bogotá, Colombia, on rooftops, requires relatively high investments, because the fertilizer solution and the seed bed medium has to be bought. (Robson, 1989)

Larger fields, which are not close to the house are often not intensively managed, because of the distance to the house (which makes intensive care more difficult), lower crop-density and the risk of theft.

2.6.2 Knowledge and information

People often use the agricultural knowledge they obtained in the rural areas to determine the management practices. If conditions (climate, soil, crops) are comparable, this knowledge can be useful. But often people grow different crops once they are in the city and need to intensify more than they did in the rural areas, which makes their knowledge no longer sufficient. Especially on the use of fertilizer, which is more often necessary on the exhausted soils in the city than on the soils in the rural areas, the knowledge of farmers is often limited. (Streiffeler, 1991b) A big problem in most cities is that neither agricultural extension, nor input-services are available for city farmers.

2.6.3 Protection against pollution

Because crops grown along roadways are vulnerable to heavy metal pollution, some city farmers have developed ways to reduce the risks. In literature not much is found on this issue, but some examples can be given:

1. Selection of crops which are less vulnerable to heavy metal pollution; e.g. fruiting plants are safest, while root crops and green leafy plants absorb more lead and cadmium. (Wade, 1986)

2. Adding organic matter (such as well-aged compost), by at least 25% volume plus keeping the soil pH high (between 6.5 and 7) prevents lead uptake by plant roots. When the soil pH is above 6.5 this will also help to inhibit cadmium uptake by plant roots. See Chapter 3.

3. Peeling root crops, such as sweet potato, before they are cooked or eaten can be done when soils are known to very polluted. (Wade, 1986)

4. Planting so-called `barrier-crops', such as trees, cassava or another hedge plant, can also help to avoid the problem of air-borne pollution. (See Box 4.4)

Besides air-borne pollution, the soil can be polluted with hazardous waste or dangerous chemical or industrial waste. Very polluted soils should not be used for agricultural purposes at all. Unfortunately city farmers are not always aware of the pollution, nor of the measures they can take to reduce the risks, and very little research has been done on polluted soils in cities so far. Besides, city farmers often have no choice of land and thus are stuck with a plot of polluted land.

2.6.4 Protection against theft

Although theft of agricultural products also occurs in rural areas, it is more severe in cities, because of the increasing food-shortage in many Southern cities. Urban farmers use different measures to reduce theft and vandalism, of which Isabel Wade (1986) describes some:

1. A security force; the gardeners and residents adjacent to a garden act as a security force to protect crops. (Seniors, handicapped persons, and children can often watch a garden during the day and nearby neighbours are the best guards for evening hours.)

2. Using potential offenders; include as many of the potential offenders as possible in activities relating to the garden. A special event, such as a tree planting, may work well.

3. Planting more vegetables than will be needed.

4. Constructing fences.

5. Planting unfamiliar varieties of crops that require extra effort to pick.

6. Harvesting crops at the earliest possible moment.

7. Visiting the gardens frequently; the gardens should be located as close to the people's homes or stores as possible.

2.7 Political context

When we compare urban agriculture to rural agriculture, one important difference is that many governments do not recognize nor accept the presence of agriculture in their cities. On the one hand, this is caused by the fact that urban agriculture is often a spontaneous activity and therefore the municipal government will often not be aware of the existence of urban agriculture, the number of urban farmers, and the scale on which urban agriculture takes place. On the other hand, many governments tend to ban agriculture from the city, for which several reasons are given:

- It destroys the image of the city

- It provides a breeding place for diseases

- It provides hiding places for bandits

- It obstructs the view of drivers

Sometimes municipal governments tend to believe that urban agriculture is a temporary activity of people and therefore pay no attention to it (see 2.3). Mougeot (1993) describes that urban agriculture is not a temporary business, but an activity that once started, is usually practised for many years.

In some cities the governments do recognize the importance of urban agriculture and try to stimulate it with enabling policies, such as favourable land rules, creating farming zones and stopping the dumping of cheap imported food. In general, however, there is a lack of enabling policies: few rules for land tenure, no agricultural extension services, no agricultural inputs available within the boundaries of the city, lack of unpolluted water, no coordination between the work done by the government, the NGOs and private institutions, etc.

Often law and existing regulations are even against the practice of urban agriculture. In the literature several of these policies are mentioned, such as:

- Low prices paid to producers of food for the urban market

- Growing reliance of food imports

- Insufficient transportation, storage and distribution systems (Mougeot, 1993)

- Restrictions on the use of water and empty areas for agricultural purposes in Bogotá (Böhrt, 1994).

2.8 Major constraints

Although urban agriculture is a rather new concept in research, policy and planning, the practice of cultivation within the boundaries of cities in the South is well-established. (Niñez, 1985; Vasey, 1985) Because of its history, it is not difficult to determine the constraints faced by urban farmers.

The constraints, faced by urban farmers in the South, as were found in the literature, are:

1. Land-availability (quantity and quality)

2. Land tenure rules

3. Lack of enabling policies

Of course the extent in which each problem is occurring differs from city to city and from situation to situation. Although these constraints can limit the possibilities, low- income urban people have found ways to bypass them and continue their practice of urban agriculture.

Less mentioned and more city-specific problems are:

* Lack of extension, input and credit facilities

* Lack of capital (Maxwell and Zziwa, 1993)

* Pests (Maxwell and Zziwa, 1993)

* Theft of crops (Maxwell and Zziwa, 1993)

* Lack of water (Niñez, 1985; Wade, 1984))

* Contamination of crops with heavy metals or residues of pesticides (Wade, 1984)

Striking is that in none of the case-studies in the literature lack of fertilizer is mentioned as a problem.

The mentioned problems are all linked to each other. The fact that in many cities no enabling policies exist, is directly related to the problem of land availability and the lack of land tenure rules. When pests are a problem, technical advice and capital to deal with the pests are lacking. It is obvious that the possibilities individual farmers have to solve their problems are limited and urban agriculture will only be improved when research, policies and planning are focusing on the constraints as well.

CHAPTER 3 THE USE OF ORGANIC WASTE IN URBAN AGRICULTURE

The use of organic waste materials in agriculture is not new. From centuries of experience farmers know that organic matter improves the workability of the soil, and soils rich in organic matter are likely to give a good harvest. In this chapter the re-use of organic waste in urban agriculture is discussed. A more technical description of compost and composting is given. Then more specific attention is given to the role of compost in urban agriculture, its advantages and disadvantages.

3.1 Urban organic waste

For the creation of a sustainable urban livelihood, handling waste cannot be ignored any more. In this report only urban organic waste will be discussed. The definition used for this report is:

Urban organic waste *is the biodegradable part of households refuse, market waste, yard waste and animal and human waste. Waste water is not included.*
In this report the emphasis is laid mainly on household waste.

When waste is not managed properly it may cause serious health and environmental risks. The overall goal of municipal refuse management is to improve and safeguard the public health and welfare, reduce waste generation and increase resource recovery and re-use, and protect environmental qualities (Cointreau, 1982).

Town refuse in Southern cities has a different composition if compared to waste material from industrialized areas, as Table 3.1 also illustrates. This table shows that the nature of municipal refuse is related to the relative consumption and production activities within countries, according to their stage of economic development.

Table 3.1 **Composition of municipal refuse for low, middle and upper income countries**

	Low-income countries	Middle-income countries	Industrialized countries
Waste generation (kg/cap/day)	0.4 - 0.6	0.5 - 0.9	0.7 - 1.8
Composition			
(% wet weight)	1 - 10	15 - 40	15 - 40
paper	1 - 5	1 - 5	3 - 13
metals	1 - 5	2 - 6	2 - 10
plastics	40 - 85	20 - 65	20 - 50
vegetable	1 - 5	2 - 10	-
wood/bones/straw			

Source: Cointreau, 1982

The scale of resource recovery is much wider in economically less developed countries than in the industrialized countries. In economically less developed countries, poverty is the major reason why thousands of people are involved in the (informal) collection, sorting and processing of solid waste.

3.2 Compost

3.2.1 Processes

Compost is the end product of a number of biological degradation processes (composting, co-composting or anaerobic digestion). It is the stable end product from the biological degradation of organic material, which can vary from dead leaves and rots to kitchen waste and vegetable remains.

Composting is an aerobic decomposition process in which some of the organic material is decomposed to carbon dioxide (CO_2) and water, while stabilized products, principally humic substances, are synthesized. The composting process is carried out by micro organisms which spontaneously grow in any mixed natural organic waste if it is kept moist and aerated. The growth of these organisms liberates heat, CO_2 and water vapour. The principal variables which must be controlled to make a good compost are:

- Oxygen

- Moisture

- The fraction of nitrogen in the organic matter, usually expressed as the C/N ratio

- The temperature, and

- The acidity (pH) (Brunt et al., 1985).

Composting systems can be categorized as open (non-reactor) and closed (reactor system). Closed systems are popular in industrialized countries. In an open system the organic waste material can be arranged in piles or in windrows.

Anaerobic decomposition can take place in uncontrolled systems (for example waste dumps) and in controlled systems (for example reactors). Anaerobic decomposition in a waste heap occurs when the oxygen supply is restricted or absent. Besides compost biogas is produced. Due to the formation of biogas less compost is produced. [(1)])

If the organic waste material is well decomposed (aerobically or anaerobically), the odourless and pathogen-free black brown mixture can be used as a soil conditioner. Good compost resembles humus that is made naturally in the soil from plant and animal residues.

3.2.2 Characteristics of compost

Compost has been used as: a) fertilizer, b) soil conditioner, c) feed for fish in aquaculture, d) landfill material and e) soil medium for horticultural purposes (Polprasert, 1989).

According to the degree of biochemical degradation and final processing, compost may be classified in four types :

1) Raw compost - not decomposed or disinfected

2) Fresh compost - composting material in the early stages of biological degradation and fully disinfected

3) Mature compost - fully composted and disinfected product of a composting process

4) Special compost - compost which has been given further processing by screening, ballistic separation or air classifying, the addition of mineral substances, or both (Brunt et al., 1985).

All of these forms can be used in urban agriculture. Type 3 and 4 are preferred, because the waste material is fully disinfected and has a settled composition. General properties of a mature compost are listed in Table 3.2.

Table 3.2 **General properties of finished compost**

Property	Normal range
Moisture (g/100 g)	30 - 50
Inert matter (g/100 g)	30 - 70
Organic content (g/100 g)	10 - 30
pH (1 : 10 slurry in distilled water)	6 - 9
Maximum particle size (mm)	2 - 10

Source: Brunt et al., 1985

Both the major and the minor nutrients are important for the growth of plants. The major essential plant nutrients are N (nitrogen), P (phosphorus) and K (potassium) (Brunt et al., 1985). They are called major, because a relative high amount of these nutrients is needed. The higher the content of these nutrients, the greater the fertilizer value of the compost. Most of the N in the compost is in an organic form and must be mineralized to inorganic ammonium or nitrate before it is available to the plant. The N, P and K values for compost depend on the type and the initial C/N ratio of the material. The ranges of concentrations of the major nutrient in finished compost are shown in Table 3.3.

Minor elements are also important for plant growth, but only in a small amount. Too high amounts will negatively influence crop growth.

Table 3.3 **Concentrations of the major elements in finished compost**

Element	Normal range (in g/100 g dry basis)
N	0.1 - 1.8
P (P2O5)	0.1 - 1.7 (0.2 - 3.8)
K (K2O)	0.1 - 2.3 (0.1 - 2.8)
S	0.5 - 3.0
Alkalinity (as CaO)	(1 - 20)
Total salts (as KCl)	(0.5 - 2.0)

Source: Brunt et al., 1985

Maung stated in 1982 that the generally high organic matter content and low heavy metal content of municipal solid waste found in developing countries mean a high-quality compost which is safe for application to the soil (Maung, 1982). Due to the increased `modernization', the composition of the waste is changing. Organic chemicals such as pesticides and polychlorinated bi-phenils (PCBs), and heavy metals may be present in wastes in such high concentrations that will make compost undesirable for land application (see Section 3.4).

Compost can be considered as a fertilizer rich in organic matter. The organic matter is an excellent soil conditioner because it has been stabilized, decomposes slowly, and thus remains effective over a longer period of time (slow release N-fertilizer). With synthetic fertilizers the nutrients are mainly directly available for plant uptake.

Besides acting as organic fertilizer, compost plays a role in soil physical properties. Compost maintains the humus balance in the soil, which improves the structure of the soil, helps to bind nutrients, ensures the proper circulation of air and water, and is thus indispensable for the growth of healthy crops. When compost is applied around the plant it has a mulching effect which includes moisture holding capacity, prevention of weeds and reduction of soil erosion.

The greatest improvement in soil physical properties occurs in sandy and clay soils (Polprasert, 1989).

3.3 The use of organic waste as fertilizer

There are various ways of using urban organic waste materials for urban agriculture practices:

- Using garbage: directly on the garbage heap or in the back yard

- Using compost, self-produced or bought

- Using manure from cattle (raised near the house)

- Using human waste (treated or untreated)

The use of manure and human waste are only discussed when they are used in combination with garbage or compost. Combining different types of organic materials may have a positive result, because these materials complement each other very well. Compost has a high carbon (C) content and is a good bulking material, while human and animal wastes are high in nitrogen (N) content and moisture contains.

Table 3.4 shows an overview of the nutrient values of various natural fertilizers.

Table 3.4 **Nutrient value of various natural fertilizers**

Nutrient content (% dry matter)

	Ntot	P2O5	K2O
Pig manure	4 - 6	3 - 4	2.5 - 3
Plant residues	1 - 11	0.5 - 2.8	1.1 - 11
Composted material	0.4 - 3.5	0.3 - 3.5	0.5 - 1.8

Source: Cross & Strauss, 1985

There is not always a clear distinction between fresh garbage and compost. Garbage which have been disposed can already be in a far-reaching phase of decomposition, e.g. when it has been lying for some time on the street or at a transfer station.

This section analyses only the use of urban organic waste, as was defined in Section 3.1, in urban agriculture. Some different practices of urban solid waste use will be described to show the diversity. Firstly, the use of garbage is reviewed and secondly the use of compost.[(2)]

3.3.1 The use of garbage

We distinguish two ways of using garbage in urban agriculture: gardening on garbage heaps, and using garbage on the farmer's `own' plot of land.
Gardening on (former) waste disposal sites is common in many Southern countries (Drescher, 1993). Such sites offer fertile land not used for other purposes. In general, these sites have a high organic matter content. Serious disadvantages are the possible heavy metal content and types of wastes, such as broken glass and tins, which may cause injuries. Heavy metals can be absorbed by the cultivated crops and may cause health problems to the consumer.

Examples of gardening on garbage are given in Box 3.1 and 3.2.

Box 3.1 **Gardening on garbage in Lusaka, Zambia**

From 1967 to 1992 the river bed and its edges 15 km north of Lusaka were used as a waste disposal site. Nowadays, the area is intensively used by vegetable gardeners

from December to July, when water is available. About 25% of the people living in Lusaka town do dry season farming, 75% of the people living in the peri-urban areas practise more market orientated farming. The main crops are fruit trees, sugar-cane and vegetables. The heavy metal content in the garbage may be a serious disadvantage, as the following table illustrates.

Table Box 3.1 **Heavy metals in soil samples from disposal sites**

Sample no.	Pb (ppm)	Cd(ppm)	Zn(ppm)	Cu(ppm)
1	5	no data	6.6	4.25
2	4	6	112.5	2.50
3	4	no data	54.0	8.50
4	10	no data	6.6	4.25
5	200	6	525.0	25.00
6	4	8	135.0	2.25
7	5	15	27.0	900.00
EU thresholds	50-300	1-3	150-300	50-140

The concentrations differ greatly within the heap. Some concentrations exceeded the international threshold for vegetable growing. A high pH and a relatively high content of organic matter and clay help to demobilize heavy metals and thus reduce the uptake by crops.

Source: Drescher, 1994

In India not only solid organic waste is used but also sewage sludge is included in an inventive system of re-using urban wastes from the city for the production of food.

Box 3.2 **Multiple use of organic waste in Calcutta, India**

Most of the waste collected in Calcutta is taken by the municipality to a landfill next to a large fishery located in the Eastern Wetlands of Calcutta. Farmers use the sewage in their pond to grow fish. The garbage is searched through by waste pickers for non-biodegradable material. Pigs and cows are raised on the organic waste. Older sections of the landfill are flattened and the excess waste is removed and used as fertilizer. About 800 hectares of the flattened land leased by the municipal corporation are used as plots for vegetable farms. Biodegradable waste such as vegetable matter, coal ash, animal dung, sewage sludge, bones and other organic material is used as fertilizer.

In this city also sewage waste is used. It provides food/nutrients for the production of fish. An estimated 20,000 people find work in this intensive farming system, growing 25 varieties of vegetables throughout the year, with an average yield of 150-300 tonnes per day, without the use of chemical fertilizers. Vulnerability to diseases and health needs of farmers has never been studied systematically.

Source: Ghosh, 1993

`Fresh' garbage can also be used in the backyard. It can be collected in the kitchen and directly applied to the land or plot or it can be obtained from the street where it can be relatively fresh or already partially decomposed.

An example is a family garbage pile which can serve as seed bed, where spontaneous propagation from kitchen waste takes place (e.g. tomato, papaya and cucumbers) (Niñez, 1985). Using fresh garbage is also practised in many Asian and West African countries. Here town refuse is used for the fertilization of vegetable plots. Also garbage is carried to the field. It is used pure or mixed with animal manure, nightsoil, city sludges and other organic waste material.

In Mali garbage is used on different plots (maize and sorghum). The plastic bags, tins and paper are not removed before application and can be found in between the crops.

The amount of refuse needed to maintain the fertility level of the soil and to replace mineral removed by the previous crop is variable. When no other (chemical) fertilizers are used at least 25 to 50 tonne/ha/crop of fresh raw organic refuse can be applied. A rule of thumb is that without chemical fertilizer, you need 1 kg of refuse for the production of 1 kg non-leafy vegetable and 2 kg of refuse for 1 kg of leaf vegetable (Grubben, 1976).

3.3.2 Compost use

Compost is applied to the land at levels generally varying from 5 to 50 kg/m^2. The higher levels are used for fruit and vegetable cultivation, as is shown in Table 3.4. The value in this table are not specific for tropical conditions, but they illustrate the relations of application. Urban agriculture is most of all a mixed cropping system so no specific recommendation for application level can be given.

Table 3.5 **Level of application to land**

Type of application	Quantity(kg/m^2)
Root crops cultivation	6 - 25
Cereal agriculture	10
Forage crop cultivation	20
Grazing – land	3 - 5
Piglet breeding	3 / piglet
Vineyard	8 - 30
Fruit orchard	20 - 100
Vegetable cultivation	20 - 50
Nursery	up to 30

Source: Brunt et al., 1985

Information about the use of compost in urban agriculture is hardly available. The literature contained few examples of the use of compost in urban agriculture. These

examples will be presented in order of scale of compost production. The different scales are:

- Household level production (family)

- Small-scale production

* neighbourhood level

* micro-entrepreneurs

- Large-scale production

Household

Composting at household level is simple, in that it requires only organic waste, limited space, time and effort to make the necessary construction. The organic fractions of the household waste can be left to compost in the backyard. Box 4.4 illustrates an example of household composting and its use in urban agriculture.

Neighbourhood

The distinction between neighbourhood and large-scale composting is that neighbourhood composting is more labour intensive and less capital intensive than large-scale composting. The scale of neighbourhood composting may vary from 5 to 50 tonnes of compost per day.

As with any community based project, small-scale composting faces all the problems of obtaining sufficient resources initially, of sustaining the motivation of the community and achieving stable markets (Lardinois & van de Klundert, 1993).

This last item is also a problem in Yaoundé (Box 3.3).

Box 3.3 **Refuse composting in Yaoundé, Cameroon**

Nine composting sites have been set up in the vegetable growing areas of Yaoundé, the capital of Cameroon, which now counts over 850,000 inhabitants. While the market gardeners do their own composting, the refuse is collected in the surrounding wards and neighbourhoods by youth groups. Composting lasts about a month with the heap being turned 4 times, after which a ten-week maturation period is recommended. A study done in a ward of the city found out that there were 16 valid market gardening sites which could absorb 8,000 tonnes of garbage per year, i.e. 5 % of all solid waste produced in the city. Increasing composting activities would require a wider market for the use of organic matter, the setting up of transfer sites for pre-collection of solid waste in each neighbourhood and a labour intensive collection system.
Source: Municipal Africa Vol. I, No. 2, April 1994

Micro-entrepreneurs

Lardinois and van de Klundert (1993) conclude that compost making usually is not a financially feasible business. An exception are a couple of micro-entrepreneurs in Bamako, Mali, who produce compost with relatively simple tools and a simple process. Traders manage to produce fine compost by sieving out the impurities and non-organic materials. The resulting compost has a good appearance and is almost free of visible foreign matter. The regular supply, the low price and proven quality have created a high demand, particulary from farmers with peri-urban vegetable gardens (Lardinois & van de Klundert, 1993).

Box 3.4 contains an example of composting as an income generating activity for the youth.

Box 3.4 **Re-using refuse in Tohoue, Benin**

Every evening the tractor tows the tailors back to the recycling centre in Tohoue, where 21 previously unemployed youths work at sorting out the garbage. They remove plastics, metal, glass and other substances that do not decompose biologically. The organic refuse is thrown into pits and covered with palm leafs. Humidity, air flow and heat are regularly checked to ensure that decomposition takes place correctly. After two months, compost is ready for use. Hyacinths are used to increase the nitrogen content of the compost. In addition to producing compost, for which they are paid US $ 3 a week, the youths employed by the centre have branched out into market gardening.

Using 5 wheel barrows of compost, 3 crops a year were yielded from a plot of 120 square meters. The villagers were so impressed that they are now paying 2$ for a wheel-barrow of compost to use in their own gardens (corn and manioc).

Source: SOURCE March 1991, pp. 24 - 27

Large-scale composting

Large-scale composting plants are in general technical and capital intensive and produce more than about 50 tonnes of compost per day. In earlier days many compost plants were built in developing countries with the (financial) aid of Western countries. Most of these projects failed, because the technology used was inappropriate for the use in economically less developed countries. Most of the time no feasibility study had been done either, not on the distribution nor on the marketing of the produced compost. Because of the technical and marketing problems composting plants have been facing, this scale of composting will not be further elaborated on in this report. Nor have any examples been found in urban agriculture of the use of compost that had been produced at large-scale facilities.

3.3.3 Advantages and disadvantages of the use of organic waste

The advantages of using fresh refuse in comparison to compost as fertilizer are:

- It is easily and directly available, while composting takes a lot of time and work.

- The mineral content of fresh refuse is higher, while composting results in a loss of minerals (see Table 3.4) (Grubben, 1976).

Using compost has the following advantages:

- Reduction of pathogens

- Reduction of weed seeds

- No odour

- No risk for temporary N-immobilization

- Stabilized organic matter

In both cases, there may be a risk of heavy metal contamination. However, compost can also be effective on contaminated soils. The addition of organic matter such as well-aged compost, by at least 25 percent volume, plus keeping the soil pH level above 6.5 and 7.0, prevents the uptake of heavy metals by plant roots (Wade, 1986).

Due to the hygienic aspect, in most cases compost making will be preferred.

Only one research, by Maxwell and Zziwa (1992), deals with farmers' perception. They studied the use of urban waste in the case of Kampala, Uganda. Urban organic waste was found to be very under-utilized. Farmers mentioned the following reasons:

- 16 % refused to have anything to do with urban waste and did not want to discuss the matter further.

- 52 % mentioned either the high costs of transporting waste products to their plots or the high costs of the compost.

- 8 % had no idea urban waste could be beneficial to crops.

- 6.7 % was concerned about health problems they associated with urban waste products.

3.4 Environmental and health risks

Composting methods and the use of compost may pose health hazards to workers and inhabitants (Lardinois & van de Klundert, 1994). The health hazards may be caused by:

- Pathogens

- Heavy metals

- Toxic organic substances

3.4.1 Pathogens

Solid waste may be highly contaminated with human pathogenic micro-organisms, whether or not it has been deliberately mixed with sewage sludge or night soil. Solid disposable baby napkins, disposable paper handkerchiefs and faecal matter from pets are some sources that can give raw solid waste an almost as high bacterial count as sewage sludge (Brunt et al., 1985).

There are two groups of micro organisms that may cause disease: primary and secondary pathogens. Primary pathogens, which are normally present in raw waste and can cause infections in healthy individuals, include bacteria, viruses, protozoa and helminths eggs. Most of the infections they cause, such as diarrhoea and dysentery, are spread via faecal-oral transmission routes. Secondary pathogens are micro-organisms, fungi and acid-producing bacteria, that grow during biological decomposition. These pathogens are less important, but they can cause primary infections and respiratory diseases usually in people with a weak immune system.

Composting is an efficient process for killing micro-organisms if it is carried out properly. If the temperature of a composting mass does not exceed 55 C throughout the process, there is serious danger that human and animal pathogens and parasite spores and eggs may survive. The second most important control is time. Bacteria are killed by a combination of temperature and time (Polprasert, 1989).

3.4.2 Heavy metals

Heavy metals are found throughout the environment. Soils, plants and water contain various (low) amounts of heavy metals, depending on geological sources and atmospheric deposition. Compost may have an hazardous heavy metal content.

Application of compost on a plot of land may cause an increase in the concentration of heavy metals in the soil. Metals of importance are mercury (Hg), cadmium (Cd), copper (Cu) and zinc (Zn), as well as borates (B). Mercury appears in batteries, but also in hospital waste. Cadmium is widely used in paints and plastics. Copper and zinc are used in pigments and dyes and can be released by corrosion of metals. Borates are used in adhesives of paper board. Copper and zinc are essential elements for plant grow and compost can be an important source of these elements for certain crops.

In excess, however, the soluble salts are toxic and inhibit plant growth. Borates are toxic to certain plants, especially in arid regions. They are very soluble and leach out by

rainfall. Cadmium and mercury serve no traditional role in plant growth (Brunt et al., 1985).

Some of the factors affecting plant uptake of heavy metals are (Polprasert, 1989):

1) Level of toxic elements in the compost/waste water and their characteristics

2) Species of plants, their age, conditions, and rooting depth. Leafy vegetables and root crops are sensible for heavy metal uptake.

3) Background concentration of toxic elements in the soil and their distribution

4) Ability of soil chemical constituents to convert toxic elements to non-available chemical compounds - this ability is in turn affected by the nature of the toxic elements and the type of soil, for example; pH, Organic Matter and Clay content, phosphate level, CEC (Cation Exchange Capacity) of the soil, absorption and precipitation.

Especially Cd, Cu and Zn may accumulate in the food chain. Other heavy metals do not seem to accumulate in the edible parts of crops. Zn is more readily absorbed than most other heavy metals. The presence of Cu inhibits Zn transport through the plant.

Little is known about long-range effects of toxic elements applied to agricultural land through the continuous use of waste water and compost (Polprasert, 1989). Table 3.6 shows the maximum values of some heavy metals content in different compost qualities as distinguished in the Dutch compost decree.

Table 3.6 **The maximum values of some heavy metals content in different compost qualities as distinguished in the Dutch compost decree in mg/kg dry compost**

Metal	Compost A	Compost B	Clean compost	Very clean compost
Cd	2	1	1	0.7
Cu	300	60	90	25
Hg	2	0.3	0.7	0.2
Pb	200	100	120	65
Zn	900	200	280	75
As	25	15	15	5

Source: De Haan & Van der Zee, 1993

3.4.3 Toxic organic substances

Toxic organic substances, such as pesticides and polycyclic aromatic hydrocarbons, are of minor concern in compost derived from domestic waste. Translocation of these substances from the root systems to the edible portions of plants may occur to a small extent, and direct contamination by dust from the applied compost will also occur (Brunt

et al., 1985). The contributions via polluted air from all forms of combustion greatly exceed the amount of toxic organic substances which could come from compost.

Persistent organic material, such as pesticides and polychlorinated bi-phenyls in compost, could under certain circumstances cause problems, because they have the potential to bio-accumulate in the food chains.

1. Further information about recovery of organic materials can be found in 'Organic Waste, options for small scale resource recovery' (Lardinois and Van de Klundert, 1993)

2. For more information about the use of human waste in the form of waste-water we refer to Strauss and Blumenthal (1990): Human waste in agriculture and aquaculture, utilization practises and health perspectives.

CHAPTER 4 FIELD EXPERIENCES

This chapter contains some practical experiences of urban agriculture and the use of compost in various cities in the South. It presents the answers to the questionnaire that were sent to 20 organizations (Appendix II) working on urban agriculture, of which 14 were returned. Chapter 1 contains a description of the methodology. The questionnaire can be found in Appendix III.

4.1 The organizations

This section shows an overview of the organizations, their objectives and activities.

4.1.1 The organizations and their objectives

The organizations that received the questionnaire can be subdivided in three groups: Community Based Organizations (CBO), Non-Governmental Organizations (NGO) and International Donor Agencies (IDA).

This subdivision is according to the scale on which the organization is operating. A CBO works at community level in a neighbourhood. Their goals are self-help and improving the living conditions of the people in the neighbourhood. CBOs may receive external assistance in the form of technical and/or financial aid from different agencies.

A broad spectrum of various types of intermediary organizations fall under the heading of NGO. Generally NGOs are intermediate organizations which are not directly involved in community projects. They operate at city level or even at national or international level. An IDA operates internationally and may finance and implement projects at local level.

Table 4.1 contains the names of the organizations, the type of organization, the project name, the city and country where the organization is operating and the year in which the project started. Many organizations started recently.

The general and common objective of all organizations is urban development, the amelioration of the lives of the urban poor in particular. Some organizations emphasize the environmental and conservation objective. The organizations focus on the urban poor. Other descriptions of target groups are lower income groups, areas with a high unemployment rate, women, marginalised communities etc.

The more specific objectives differ per organization. The following examples serve to illustrate the differences in emphasis:

The Undugu Society of Kenya (USK) is "committed to the principles of upholding human dignity, decency and freedom (preferential concern for children) and gives hope and confidence through the intergraded empowerment processes aimed at achieving self-reliance". The Help Self Help Centre (HSHC) "aims at creating an environment for the

rural and urban poor to empower themselves and to influence indirectly their development." ("We help the poor so that they can help themselves.")

Bamenda Horticulture Society's (BAHORSO) objectives are: to encourage people to grow, consume and enjoy plants, to contribute towards environmental conservation, to organise markets and to improve thereby their economic situation.

The Amateur Horticulture Association (AHA) promotes organic horticulture and environmental awareness. Amelioration of the nutrition of people is a specific objective of GTZ and UNICEF. Education and research on (organic) city farming is aspired by the City Farming Institute (CFI) and the Institute on Organic Agriculture (INORA).

Some organizations cover a range of activities, while others focus on agriculture only. The organizations usually work in urban slums of one city, but there are also organizations that cover other cities as well (for example, GTZ in Tanzania). IIRR, INORA, PRAKRUTI and ALPHALOG are also working in rural areas or peri-urban areas.

Table 4.1 **The 14 organizations that returned the questionnaire**

Organization	Type of organization	Project name	city/country	project started	remarks
Undugu Society of Kenya (USK)	NGO		Nairobi, Kenya	1988	
Help Self Help Centre (HSHC)	NGO		Nairobi, Kenya	1991	
Bamenda Horticultural Society (BAHORSO)	NGO	Feasibility of using organic household waste to produce organic manure for food crops cultivation for farmers in Mezam Division, N.W. Province of Cameroon.	Bamenda, Cameroon	1995	
Amateur Horticultural Association (AHA)	NGO		Bamenda, Cameroon	1990	
International Institute of Rural Reconstruction (IIRR)	NGO	Semi-commercial gardening project	Cavite, Philippines	1986	
German agency for Technical Cooperation (GTZ)	IDA	Urban Vegetable Promotion project	Arusha, Dodoma & Dar es Salaam, Tanzania	1993	
Population, Environment and Development Agency (PEDA)	NGO	Market gardening, urban growth and sustainable income generation on the Jos Plateau, Nigeria	Jos, Nigeria	1993	
City Farming Institute (CFI)	NGO	City Farming Project	Bombay, India	1992	
Institute on Organic Agriculture (INORA)	NGO		Bombay, India	1990	
PRAKRUTI	NGO		Bombay, India	1992	no urban agricultural project
UNICEF	IDA	Urban Agriculture Antananarivo	Antananarivo, Madagascar	1993	
Association Libre pour la	CBO		Bamako, Mali	1994	Agriculture

Promotion de l'Habitat et du Logement (ALPHALOG) - the questionnaire was responded by GIE (Groupement d'Intérêt Economique) named Faso Kanu				in Jigine (no urban agricultural project)
Environment et Développement du Tiers-Monde (ENDA) - Colombia	NGO	`Participación de las mujeres en la gestión ambiental urbana'	Bogota, Colombia	1995
Alternativa	NGO	`Centro Piloto de capacitación y producción agro-ecológica "Planta Fertil"'	Lima, Peru	1994

4.1.2 The roles of the organizations P>Differences in organization and objective also mean differences in roles and activities. The activities vary from coordinating, social assistance to executive and technical assistance. Some organizations are specialized in research and education in urban agriculture. In general, their role is a coordinating one, taking responsibility for the objectives and financing the project.

Box 4.1 and Box 4.2 describe two different organizations and their activities. Box 4.1 illustrates a small national initiative (AHA), and Box 4.2 a bilateral, research orientated project (GTZ).

Box 4.1 **The promotion of organic horticulture and environmental awareness in Bamenda, Cameroon**

The AHA was founded in 1990 for the promotion of organic horticulture and environmental awareness in Bamenda. Their objective is to ameliorate the general health of the public and avoid chemical pollution of the environment by agro-chemicals. AHA has Bamenda as its headquarters and most of the members are located there. The members are supposed to be catalysts in their various communities in the field of organic gardening. The expectation is that the spill-over effect is to be felt by neighbours and other members of the communities. About fifteen people are actively involved. Lower income groups are expected to benefit from this project more, but everybody may join.

The activities are:

- Organic growing of vegetables, fruits and flowers by members

- The growing of herbs for culinary and medical use

- The growing of trees for various purposes

Future plans are:

- Organising seminars and courses

- Establishing a demonstration farm

- Building an office

- Employing paid staff

- Acquiring a vehicle

- Large-scale recycling of bottles and mounting a travelling exhibition of recycled items

AHA provides technical assistance where it is needed. Planting materials (seeds) and the resource materials are available for members' use as well as for the general public.

Source: Amateur Horticulture Association (AHA), Bamenda, Cameroon

Rich compostable organic matter is dumped into an urban stream in Bamenda, Cameroon. *Photo: AHA, John Yuniwo Musa, July 1994.*

A backyard compost heap of a member of AHA. Note the pineapple plants in the foreground, the maize and papaya to the left and the mandarin tree in the background. *Photo: AHA, John Yuniwo Musa, August 1994.*

Some flowers and herbs in front of a house. They are grown with compost and other organic manure notably rabbit droppings. *Photo: AHA, John Yuniwo Musa, July 1995.*

Box 4.2 **Homegarden production in Arusha, Dodoma and Dar es Salaam, Tanzania**

The Urban Vegetable Promotion Project in Tanzania is a bilateral, research orientated project that was started in March 1993. The objectives are:

- To improve the nutritional situation of the urban poor through homegarden production, concentrating on leafy nutritious indigenous vegetables

- To encourage producers to make the best use of available resources

- To inform farmers about market prices and broadcasting

The project is executed in Arusha, Dodoma and Dar es Salaam.

Since the project is at the end of the pilot phase, data and information collection, participative approach techniques, besides demonstration plots and training had been the activities.

In the future the project will concentrate on selected wards, groups, demonstration gardens and nurseries.

Source: Urban Vegetable Promotion Project- GTZ Tanzania

Most of the organizations cooperate with one or more non- governmental organizations. Just a few (research and education orientated) organizations are not cooperating with an NGO at this moment but are willing to associate.

4.2 Urban agriculture projects

Of the 14 organizations that returned the questionnaire, 12 work on urban agriculture.

4.2.1 Objectives

The objectives the organizations hope to achieve with the urban agriculture project can be distinguished in three main groups:

1. Nutritional objectives

2. Socio-economic objectives

3. Ecologic objectives

These objectives are sometimes closely related. For example, `extra' income can be used to buy additional food.

Table 4.2 lists the objectives that were mentioned by the organizations. In the second column, the type of the objective is listed. The third column indicates the number of organizations referring to this objective.

Table 4.2 **The goals of urban agriculture**

Objectives	Type	Number
income	socio-economic	11
better nutrition	nutritional	9
employment	socio-economic	8
food security	nutritional	3
better living conditions	socio-economic, nutritional, ecological	2
clean environment	ecological	2
development of micro-enterprises	socio-economic	2
keep appreciated	socio-economic	1
women status and welfare	socio-economic	1
exchange material	socio-economic	1

The major arguments for practising urban agriculture are income generation, better nutrition and employment. Income generation is an important benefit, but no data were given about the percentage of income generated by urban agriculture.

"Urban gardening is really gathering momentum here with more and more people replacing ornamental plants with food crops... The food is most of the time meant to

supplement the nutritional needs of the family particulary at a time when money has become increasingly scarce.... Some of the urban dwellers are engaged in small-scale market gardening for some extra income to meet the costs of daily needs. Most of the time those who would engage in urban gardening as an employment do not have the land and the means for such activities. There is of course the group that gardens for the adornment of the environment." (AHA, John Musa)

The number of people joining the project differ largely and this number depends mainly on the type of the organization and their objectives. Box 4.1 and 4.3 illustrate the difference in target groups of two projects. ENDA has chosen to support women activities and thus supports the position of women. AHA supports members who are supposed to function as catalysts in organic gardening in their community.

Box 4.3 **Women's participation in the urban environmental Management Bogota, Colombia**

ENDA (Environment and Development Activities) is an international NGO with local offices all over the world and is dedicated to promote and support the construction of a sustainable urban environment. ENDA Colombia works on 3 areas of interest: communication and culture, sanitation and recycling, and women and city.

The actual project which was started in January 1995 is named "Participación de las mujeres en la gestión ambiental urbana" (Women's participation in urban environmental management). It is the fourth phase of the process of knowledge and work within urban agriculture. During the first phase, a reorientation was made towards organic agriculture, based on the production of compost and the management of solid residues in the city.

The objectives urban people hope to achieve with urban agriculture, **regarding to ENDA's women group**, are to produce crops which can ameliorate nutrition and take care of the health of the group. Women in general cultivate medicinal plant and herbs. Moreover, women attach importance to the didactic and demonstrative aspects of their experiences and they say: "una casa sin plantas es una casa sin mujeres" (a house without plants is a house without women).

The objective urban people hope to achieve with urban agriculture, **regarding to an investigation on urban agriculture in Bogota**, is income generation and employment. There is a difference between what women cultivate and what men cultivate. Women cultivate herbs (medical and aromatic) in much smaller plots, men cultivate commercial crops. In some cases this gives conflicts, cf. land availability.

The objectives of the project are to support women's initiatives in urban environment and to spread out the AGRISAC culture, growing crops in bags, to ameliorate the nutrition of the population, increase their income and to develop a communal enterprise of composting organic waste.

The target groups are women. ENDA advises 60 women in 6 women groups (10 groups at the end of 1995), all located in urban slums of Bogota. Two groups are women leading the communal children yard of 150-200 children. Another group consists of 25 `mothers' who take care of 15 children each. One group assists 150 children who work in the school garden. And two groups are `barriales', one is a traditional neighbourhood organization where 11 women represent 10,000 inhabitants. Another group is a cooperative that recycles non-organic material, and produces and commercializes ornamental plants and seedlings of trees.

Source: ENDA Latin America, Bogota, Colombia

4.3 Who are the urban farmers?

The answers to the question `Who are the urban farmers ?' depend on the target group chosen by the organization. In most cases, the target groups are low-income groups and women, as is illustrated in Table 4.3.

The urban farmers `advised by ENDA' are women from low-income groups. These women are generally daughters of migrant farmers. They are organized to do various jobs that support their community. **None** of the groups are organized with urban agriculture as their **main objective**.

Most urban farmers are people living in a peripheral neighbourhood, not consolidated and without a developed infrastructure. In neighbourhoods that are getting more structurized, crops disappear. In general it may be said that urban agriculture is practised in `subnormal' neighbourhoods. The crops cultivated by men have major extension. They are cultivated on private plots of land. Men only produce for the local market and use fertilizers and agrochemicals.

The crops cultivated by women are generally smaller and tend to be more varied: horticultural crops, fruits, medical and ornamental plants.

Table 4.3 **Who are the urban farmers? (project information and general information)**

Organization	project information	general information
ENDA	women (daughters of migrant farmers) of low income groups	people in peripheral neighbourhoods
ALTERNATIVA		women of low income groups with a rural background
USK		women from the rural area looking for employment
HSHC	mostly former sisal plantation workers, mainly women from different ethnic groups	
BAHORSO		low to high income in descending order
AHA		both men and women irrespective of social status, income of origin
GTZ		in high density areas mainly women in plots near the house; in low density areas the work is carried

		out by the servants
PEDA		indigenous farmers 20 %, settlers 50 % and seasonal farmers 30 %
UNICEF		lower and middle income class
IIRR	people of a semi urban resettlement project with a high unemployment rate (see text)	
CFI	no classification is made	
INORA		mostly women

The garden cooperators of the IIRR project are men and women. Their average age is 37 years. Cooperators are usually household heads (45.5 %) and housewives (36.4 %), although their sons and daughters also help (18.1 %). The literacy rate is quite high: only 2.3 % had no formal schooling, 59 % had elementary school and 35 % reached high school or college. 52 % are unemployed. The average stay in the area is 28 months. The average number of hours spent in the garden is 2.8 hours per person per day. Gardening is a part-time activity even for the jobless cooperators (IIRR research assistant: A.R. Cantada).

4.2.3 Space and plot size

The choice of space will depend on several factors (see Chapter 2). The availability of space is closely connected to the population density and the city structure. Table 4.4 shows an overview of the spaces used for urban agriculture. In the first column the organization is mentioned. The second gives the average amount of space on which urban agriculture is being practised, and the third column lists the type of space. Distinction is made between general information and specific project information (**general** resp. **project**). When it is not specified in the table, the information is general.

Table 4.4 **The space used in urban agriculture**

Organization	Space	Place
ENDA	**project**: 5 m^2 (2-60 m^2) **general**: 15 m^2	**project**: patios or terraces and lake banks **general:** space is variable and depends on soil type, sexe farmers and type of production
ALTERNATIVA	4 m^2	terraces and patios
USK	**project**: 4 x 55 m^2 strips to the river	**project**: riverbanks (owned by the government)
HSHC	**project**: 250 m^2 1000 - 2000 m^2 500 m^2	**project**: backyard public land project group plots
BAHORSOAHA	50 m^2 various	backyards, communal garden, public land backyards, container gardening on verandas
GTZ	**project**: 5-200 m^2	**project**: homegardens, backyards, riverbanks, under high tension lines and space up to the road

PEDA	10,000 m^2 (in total?)	river banks, tin mined ponds, back yards, underdeveloped plots of land
UNICEF	unknown	(communal) gardens, gardens of primary schools
IIRR	**project**: 240 m^2	**project**: public land
CFI	2.5 - 150 m^2	terraces, balconies and backyards
INORA	various	terraces, balconies and backyards

Backyards are frequently used for growing vegetables and other bushy crops, while the front yards are used for growing ornamental plants and more increasingly also fruit crops. For those with little or no space, the solution lies in container gardening on the veranda's and balconies. Old motor car tyres are used for growing some of these crops. Public land is equally `invaded' by the ever growing population and marginal lands susceptible to landslides as well as wildlife habitats are not left out. John Musa, AHA, Cameroon

4.2.4 Crops and crop management

The crops can be divided into herbs for medical or culinary use, vegetables, fruits and staple food crops. The crops cultivated vary according to land ownership. Permanent ownership enables the cultivation of perennial crops, where unsure land-owning e.g. river banks with the risk of inundations results in seasonal crops.

Appendix IV lists the crops cultivated in the different projects.

As reviewed in Chapter 2, different types of crop management systems exist in urban agriculture.

The NGOs reported various forms of crop management:

- Organic Farming, use of organic pesticide and other Intergraded Pest Management (USK, HSHC, IIRR)

- Urban agriculture is in many cases a mixed cropping system (PEDA)

- Hydroponic culture (ENDA, Alternativa)

Some organizations did not mention any special crop management (GTZ, CFI, INORA, UNICEF).

Only a few organizations mentioned practices to protect the crop against pollution by exhaust gasses. PRAKRUTI advises to cultivate crops away from public roads. In Dasmarinas trees are used to protect the crops against pollution. This living fence also has other purposes, which are described in Box 4.4.

Box 4.4 **Living fences in Dasmarinas, the Philippines**

IIRR is a non-profit, non-governmental organization dedicated to improve the quality of

lives of the rural poor in developing nations of Africa, Asia and Latin America.

One of the projects is `Household food security through home gardening'; they supply courses and workshops about helping people to supply their nutritional needs and supplement income through gardening. The techniques presented in the courses are low-cost and specially suitable to be used by lower-income groups.

The crops are protected against pollution by a living fence surrounding the garden. These are usually multi-purpose tree species (leguminous trees with multiple uses, i.e. green manure, fodder, fuel, etc.) which serve as a barrier.

Source: IIRR, Bio-Intensive Gardening Association, Dasmarinas, the Philippines

HSHC, CFI, INORA and ENDA mentioned that the pollution of crops by exhaust gasses will be studied. GTZ was not aware of any pollution caused by gasses.

4.2.5 Constraints in urban agriculture

Table 4.5 lists the constraints that were mentioned by the organizations. The numbers indicate the number of organizations who qualified something as a constraint.

Table 4.5 **Constraints mentioned by the organizations**

Constraint	number of organizations that mentioned the constraint
lack of access to land (insecurity of land)	6
inadequate inputs: appropriate seeds manure appropriate pest control	6
lack of support, facilities and capacity	5
lack of access to water	5
administrative instruments making urban agriculture illegal or hindering	3
availability of funds/financing	3
theft	2
lack of information about market and poor market structure	2
inadequate labour, conflict with other household activities	2
flooding of the rivers	1
risk for contamination	1
marketing problems	1
lack of organization within the farmers	1
bad soil quality	1
no mentality	1

The major constraints are lack of land, inadequate inputs, lack of support and facilities and lack of access to water. Only one organization did not mention any constraints (UNICEF).

"There is a need to form an urban agriculture network which will have responsibility for:

- Providing training and information on urban farming issues.

- Raising awareness among urban planners and policy-makers of the importance of agriculture in the urban context.

- Providing facilities to test levels of pollution of food harvests and at sites allocated to farming.

- Providing training and information on effective management of organic wastes."

(Elizabeth Munene, Help Self Help Centre)

4.3 The use of compost in urban agriculture projects

4.3.1 Reasons for not using compost

Nine organizations work with compost of which one, PRAKRUTI, is not involved in urban agriculture. Only the use of compost in urban agriculture is described.

The following reasons were mentioned for not using compost in urban agriculture:

- People use other nutrient suppliers, as household refuse, crop remains, animal dung and livestock waste (BAHORSO & UNICEF).

- Compost is not available at the market or at the right time (BAHORSO).

- Transport problems of organic waste material (UNICEF).

- No information available about the production of compost (UNICEF).

- Unawareness of the benefits of the use of compost (out of urban organic waste) (CFI & INORA).

In most cases the use of compost had been considered, but in the end the constraints carried more weight than the benefits.

4.3.2 The use of compost

In the USK project, compost is made as part of the project. It is made of garbage which is collected at household level and which is decomposed anaerobically.

ALTERNATIVA is changing the use of chemical fertilizers into organic fertilizers. A credit programme promotes the production and use of compost. The compost consists of vegetables residues which are sprinkled with water and turned around periodically.

When compost is used, it is usually part of the project. The farmers make the compost themselves. In general, it is made of household organic waste, to which sometimes leaves, animal droppings, wood ash or crop residues are added. It is made in compost heaps. Three organizations mentioned their excellent and good quality of compost (USK, AHA).

The compost is used in all crops, sometimes only on vegetables. Once it is mentioned that when there is a surplus, it is sold or given away (ENDA).

The amount of compost used per ha varies and depends on the amount available. No specific data were given about the amount used.

4.3.3 Constraints of using compost

There are several constraints of the use of compost. Mentioned were:

- Not properly made compost results in problems with weeds and acidity (AHA).

- Health problems through eating inadequately treated vegetables (AHA).

- Large quantities of organic matter needed which are not always available (GTZ & AHA).

- Bad compost and contaminations with rubbish from the dump (HSHC).

- Composting involves working with dirty waste (GTZ).

- Making compost costs money (GTZ).

- Compost can be stolen (GTZ).

- The production of compost is an unfamiliar/difficult process (AHA).

There is a need for information services about the production of compost.

IIRR, PEDA, ALTERNATIVA and USK did not mention any problems with the use of compost. The pollution of compost with heavy metals and other material is seldom investigated. Only ALTERNATIVA had analyzed it and the results were within the permissible margins (the margins were not mentioned).

" Use of compost is not considered to be respectable or in tune with present trends. Larger quantities have to be used. It is a slow action product compared to instantly acting chemical fertilizers. The state promotes the use of chemical fertilizers through regular campaigns and through subsidies and incentives. Composting is not pursued as an organized activity. Being bulky, transportation over distance is a limitation. Availability at the right time and in easily acceptable form is not assured. The

government and the industry spread misinformation that compost generates more pests" (Kisan Mehta, PRAKRUTI).

4.3.4 Other fertilizers

For optimal plant growth, nutrients must be available for plants. Besides compost other types of fertilizers are being used, for example animal manure and fresh garbage. Table 4.6 shows the fertilisers used in each project (organization). In the column of `compost' the materials for the production of compost are listed. The column of `fresh garbage' lists what kind of plant material is applied to the fields/plots without composting. In the third column the origin of the animal manure is mentioned and the rest is indicated as `others'. Many projects (6) use animal manure.

Table 4.6 **Fertilizers used in urban agriculture**

Organization	Compost, made of:	Fresh garbage, types:	Animal manure, types:	Other
ENDA	household waste			
ALTERNATIVA				oil cakes, fish and bone meal
USK	household garbage	tea manure		
HSHC	household garbage	mulching	cattle dung, goat and chicken manure	organic suspension of waste water
BAHORSO		household refuse and crop remains	livestock waste	N,P,K
AHA	household and municipal waste	coffee and rice hulls	chicken, rabbit, cow, pig and goat manure	
GTZ	manure			
PEDA	household waste, municipal and crop refuse and (farmyard) manure			
UNICEF			bird, pork and cow dung	
IIRR	garden sweepings, kitchen refuse, leafs and manure	liquid fertilizer out of leafs of leguminous trees		
CFI				oil cakes, fish and bone meal
INORA	worm compost		cow dung	
PRAKRUTI	vermicast compost out of city waste and animal dung			
ALPHALOG		fresh waste	stable manure	liquid waste of latrines

The compost is made of kitchen wastes, such as peelings from yams, plantain, etc., grass from the lawn and leafs from some of the trees and plants and sometimes droppings from animals such as rabbits, goats and chickens. Wood ash is also added. The quality of such compost is excellent and probably the best alternative John MUSA, AHA.

4.3.5 The price of compost per project

An exact price for compost is not mentioned by any organization. In most cases an indication is given. Unfortunately it is not possible to compare the prices of chemical fertilizer and compost. The quality and nutrient value of compost in comparison with the chemical fertilizer are not mentioned. In general, compost seems cheaper than chemical fertilizers.

It should not be forgotten that in most situations the question is to use either nothing or compost which can nearly always be obtained for free. The use of chemical fertilizers is not an alternative to the use of compost on this level of (urban) agriculture. Table 4.7 shows the price of compost; wherever possible in comparison to the price of (chemical) fertilizer.

Table 4.7 **The price of compost and other fertilizers**

Organization	price compost	price fertilizer	notes
ENDA	cheap	-	when not used, it is given away
ALTERNATIVA	70 $ / ton	350 $ / ton	-
USK (Kenyan Shilling)	1.71 $ / 20 kg 85.39 $ / ton	-	-
AHA	150 kg manure from the municipal dump for 10 $ 67 $ / ton	50 kg for 24 $	compost is not yet for sale
GTZ	free or exchanged for labour	-	transport : 25 $ one tractor load
PEDA (Nigerian Naira)	unprocessed municipal waste one truck load 9.40 $	-	-
IIRR	free	-	labour not computed
CFI	cheap	-	-

1 Nigerian Naira = 0.01175 $ (August 1995)

1 Kenyan Shilling = 0.01898 $ (August 1995)

CHAPTER 5 CONCLUSIONS AND POSSIBLE FOLLOW-UP ACTIVITIES

A literature study and interviews with resource persons in the Netherlands have formed the basis to this inventory study. The assumption was that not enough information could be found in the literature. Questionnaires were therefore sent to projects in the South involved in urban agriculture to obtain recent information about the practices of urban agriculture.

This report uses the following definition of urban agriculture:

Urban agriculture is the growing of food and non-food crops within a city and in the area around the city where there are direct links with the city:

** the producers are living in the city, or*

** the city is the only market for the agricultural products, or*

** agriculture is still a potential market for urban compost.*

This chapter first describes the conclusions from the literature study, the questionnaire and the network study. Secondly the overall conclusions are presented, and we end with possible follow-up activities.

5.1 Conclusions from the literature study

Urban agriculture

The two main reasons why people practise urban agriculture are nutritional (e.g. to provide starch, to supplement the food with nutrients/vitamins and to decrease the loss of nutrients through freshness) and socio-economic (e.g. to obtain income, to diversify income and to obtain employment). A positive side-effect is that the growing of crops makes the living environment more attractive and green.

Since most literature on urban agriculture consists of case-studies, no general data are available on the number and type of farmers involved, the area cultivated and the production levels. Nevertheless, it seems that urban agriculture is practised in most cities in the South at a considerable scale.

Although urban agriculture in the South varies widely, some general characteristics can be mentioned:

* It is a spontaneous activity

* It is mostly practised on household-level

* It is practised in a labour-intensive way

* It often has a low capital-input per unit of production

* It has a high productivity level

The urban farmers can be found among almost every social group in the city, ranging from low-income survival farmers to middle-income home gardeners to agribusiness farmers. The case-studies in the literature show that urban farmers are often women and/or part-time farmers. This has to do with the fact that urban agriculture is often not the main activity of urban household, and that women often have more possibilities of combining their (household) tasks with urban agriculture than men. Urban agriculture is mostly practised at household level, but in several places urban agriculture is practised in groups.

Urban agriculture is practised on many types and sizes of spaces; it can be practised on plots land, as well as in containers and walls, on roofs and balconies and on artificial `soil' (hydroponics). A variety of crops is grown and also a variety of management practices can be found. A very important factor determining the kind of urban agriculture, is the land tenure situation.

The shape, scale and (sustainability of the) farming system of urban agriculture varies per city and is determined by several factors, such as:

* Climate

* Location and structure of the city

* Standard of living

* Cultural (food) habits

* Availability and quality of land and land tenure

* Socio-economic and agricultural background of farmers

* The level of availability of inputs, extension and credit

* Policies and attitude of the government

The major constraints faced by urban farmers are:

1. Land availability (quantity and quality)

2. Land tenure rules

3. Lack of enabling policies

As far as land availability is concerned, a serious problem is the pollution of available land. Unfortunately, urban farmers are not always aware of the pollution, nor of the measures they can take to reduce the risks, and very little research has been done on polluted soils in cities so far. Furthermore, urban farmers often have no choice of land and are therefore stuck with polluted land.

Remarkable is that in the literature on urban agriculture hardly any attention is paid to the issue of land fertility and in none of the case-studies in the literature on urban agriculture, shortage of nutrients/fertilizers is mentioned as a problem.

No information has been found about the marketing of the cultivated crops and their prices.

The use of organic waste as fertilizer

In low-income countries municipal solid waste consists predominantly of organic material. This organic material can be re-used for urban agricultural practices. The re-use of organic solid waste reduces the volume and weight of material which has to be disposed of and improves the urban environment.

Organic waste can be used as fertilizer in urban agriculture in various ways;

1. Fresh garbage

2. Compost

3. Manure from cattle

4. Human waste (treated or untreated)

Sometimes combinations are used. In this report the emphasis was laid on the use of fresh garbage and compost.

The advantages of using fresh garbage are:

- Easily and directly available

- Low labour input

- A high mineral content

There are however also serious disadvantages, such as heavy metal content and contamination with rubbish (such as tins and broken glass), and the risk of N-immobilisation (by soil micro-organisms).

Compost has been used in agriculture since old times. The advantages of composting are:

- Reduction of pathogens

- Reduction of the weed propagation

- Stabilized organic matter (no risks of N-immobilization)

- No odour

Disadvantages are the risk of unhealthy conditions of composting and the possible contamination by heavy metals and (toxic) organic materials.

Composting is practised at different scales, however, composting at household level and neighbourhood level seem to offer the best options for compost production and use in urban agriculture.

5.2 Conclusions from the questionnaire

The questionnaire was sent to organizations that implement projects on urban agriculture. Enthusiastic responses were received with extensive information about specific projects. The first impression was that urban agriculture is a `living' phenomenon that is practised by citizens.

The objectives the organizations wish to achieve with urban agriculture can be distinguished in three groups:

1. Socio-economic objectives

2. Nutritional objectives and

3. Ecological objectives

The first two objectives were mentioned most.

The target groups of the projects are mostly women and low- income groups.

The space used for urban agriculture varies a lot and depends on what is available. The majority of the crops cultivated are horticultural crops.

The most important constraints of urban agriculture are:

- Lack of land

- Inadequate inputs

- Lack of support and facilities

The use of compost in urban agriculture is in most cases part of the project (8 out of 12). In most of the cases the compost is made of garbage, in which other organic materials may be substituted. Composting is not carried out as an income generating activity; composting has a more ecological objective. Table 5.1 shows the number of projects working with compost.

Table 5.1 **Organizations, projects and fertilizers**

# Organizations who received a questionnaire	20
# Organizations who returned the questionnaire	14
# Organizations involved in urban agriculture	12
For the organizations who are involved in urban agriculture:	
# Projects where compost is used	6
# Projects where both compost and animal waste is used	2
# Projects where only animal manure is used	4

In general the reasons for not using compost are:

- The lack of technical information about the production of compost

- The unknown benefits of the use of compost

6 out of 12 organizations use animal dung as fertilizer, of which 2 organizations use both compost and animal manure.

When compost is used. it is made by the farmers themselves; in none of the projects compost is bought. 4 out of 8 organizations using compost, mention constraints, such as:

- Health aspects

- Lack of knowledge and information

- Time and money needed for the production of compost

There is a clear need for information on the marketing of compost and technical aspects of composting. Research on heavy metals was only carried out once; the results were within the permissable concentration. Because heavy metals may have a serious health risk, further investigation on this subject is advised.

5.3 Conclusions from the network study

Expertise on urban agriculture in the Netherlands is scarce; only at ETC Foundation we found specialized expertise and working experience on the subject.

ETC Foundation is a non-profit international organization with several offices. One of the major issues of ETC is sustainable agriculture. Three ETC offices are dealing specifically with urban agriculture: ETC Netherlands, ETC Kenya and ETC Andes. The activities on urban agriculture are:

* Short-term consultancies

* Publications

* Participation and co-organization of workshops

* ETC field offices

In the Netherlands quite a number of organizations are dealing with issues that are related to urban agriculture, such as urban waste management (UvA), composting (Ingenieursburo Amsterdam), urban development (IHS), urban planning (IIUE), urban nutrition (IAC), urban food security (SOH, Mensen in Nood), organic farming (IFOAM), marketing horticultural products (KIT-AED) and homegardening (LUW). In this study we did not come across any organization with specific expertise on the use of compost in urban agriculture.

The approached organizations were universities, consultancy companies, international institutes for training and research, and NGOs on development and environment. The activities in urban agriculture and related issues are research, training and funding/supporting projects in the South.

For the results of this network study, please be referred to Appendix I.

Overall conclusions

There is a clear difference between what can be said about urban agriculture as a spontaneous activity and as a project set up by an organization. Organizations concentrate in general on low-income groups. Spontaneous urban agriculture (not encouraged by any organization) is usually practised by people of all income groups.
There is a deficit in the available information/data on the number of urban farmers and their socio-economic background. It is also difficult to give any data on the scale of urban agriculture.

The reasons for urban farmers to practise urban agriculture, as found in the literature, are economic and nutritional. Organizations that are active in the field of urban agriculture often add a third environmental objective, namely the improvement of the living conditions and the urban environment.

It is striking that in the literature nutrient availability was never found as a constraint nor the availability and the use of compost. Hardly any attention is paid to the use of fertilizers in general and the use of compost in particular; it is not possible to draw any

conclusion on this subject. Development organizations stimulate the production and use of compost from an environmental perspective.

We may conclude that urban agriculture provides opportunities as a market for compost made out of city organic waste, but it is not self-evident.

There are some issues of special attention which have to be taken into account, when a combination of the production and use of compost and urban agriculture is envisaged:

- Urban agriculture should be present or stimulated.

- The costs of composting should be low, it should not take too much time and the distances between the place of production and the place of use should be minimal.

- There should be a market for the compost produced

- There should be a cultural acceptance of using (urban) waste for agricultural practices.

- Urban farmers need technical assistance for the production of compost out of organic city waste.

Also enabling policies on city level should be developed. Municipal authorities and the government should therefore be introduced to the benefits of urban agriculture and of the use of urban solid waste in urban agriculture. The needed enabling policies are:

- Land tenure regulations

- Community or municipal composting requires the coordination of city and regional authorities, prior research into existing practices, pilot studies, safety tests of the compost being produced etc. (Furedy, 1989a).

- Attention should be paid to the state law regarding the sale of fertilizers or soil conditioners. In many developing countries chemical fertilizers have been subsidized by the government.

5.5 Possible follow-up activities

The use of compost in urban agriculture is a rather new phenomenon. On the basis of the literature research, the questionnaire and the net-work study, we suggest the following short-term activities.

Literature research

On the basis of the literature research we suggest some general activities:

- Organic waste management and urban agriculture can be brought together, but need research on waste-streams and urban agriculture activities on **city level**.

- Research on general data of urban agriculture on city level: There is a need for `general' information about urban agriculture. Most literature found about urban agriculture are case-studies of capitals of countries in the South.

Specific subjects for further (literature) research are:

- Health aspects of composting and the use of compost. On this subject research could be done on the risk of heavy metals contamination in crops and the effects for human health.

- The cost-benefit relations of urban agriculture and the use of compost in urban agriculture. Is urban agriculture an economic feasible activity and should it be an economic feasible activity to practise composting in urban agriculture? Or should the use of compost be encouraged from an environmental point of view?

- The land tenure situation was mentioned as a serious constraint of urban agriculture. Are there any solutions for land tenure problems?

- Formulation of enabling policies.

Questionnaire follow-up activities

We distinguish two possible questionnaire follow-up activities.

- The first is to send an open questionnaire to the NGOs who replied to the previous questionnaire and who are working with compost in urban agriculture. This questionnaire should be focused on the possibilities and problems of using compost in urban agriculture. Aims of this second questionnaire:

a. Obtain more detailed information on the current situation of the use of compost in urban agriculture in several Third World cities (e.g. on composting techniques, health risks, economic feasibility, simple evaluation methods of the composting process in relation to the (local) circumstances and scale of the project)

b. identify key issues for the fieldwork (e.g. organization, scale, members)

- Another activity resulting from the questionnaire could be a workshop with the organizations who answered the questionnaires. The aim of such a workshop is to get insight in the practice of urban agriculture as `project activity' and to discuss the different experiences, on f.ex. the use of compost. Organizations could present cases to identify possible solutions for the constraints.

The most practical way to organize such a workshop is to participate in a workshop of the Urban Agriculture Network (UAN).

Network research in the Netherlands

Organize a meeting in the Netherlands with representatives of Dutch organizations that are involved in urban agriculture and/or (composting of) urban organic waste in Third World cities. This meeting should be small-scale and have the following aims:

a. Exchange expertise on the subject

b. Identify major issues and problems in the relation between urban agriculture and compost

c. Discuss possible solutions for identified problems

d. Discuss possibilities for cooperation between the different participants of the workshop on this subject

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APPENDIX I: EXPERTISE IN THE NETHERLANDS ON COMPOST AND/OR URBAN AGRICULTURE

In this appendix the results of the network study are presented. The information is mainly based on telephone interviews. The approached organizations are presented in alphabetical order. At the end of this appendix, the names and addresses of some relevant foreign organizations and experts are listed.

APPROACHED ORGANIZATIONS IN THE NETHERLANDS:
Both ENDS

Environment and development service for NGOs in the South

Damrak 28-30
1012 LJ Amsterdam
tel. +31-20-62.30.823
fax. +31-20-62.08.049
E-mail: BOTHENDS@Geo.2.Geomail.Org

contact persons: Edith Tuboly and Anouk van Heeren (sustainable agriculture)

Bert Zijlstra (African contacts)

Both ENDS supports NGOs in the South and as such is not performing activities itself. Within Both ENDS there is no specific expertise on urban agriculture, but there is on sustainable agriculture. Both ENDS has contacts with many NGOs in the South. One of them is the Help Self Help Centre in Nairobi, which returned the questionnaire (see Chapter 4 of this report).

CEBEMO/VASTENAKTIE

Catholic Funding Organization

`Huize Duinzicht'- Rhijngeesterstraatweg 40
P.O. Box 77
2340 AB Oegstgeest
tel. +31-71-51.59.159
fax. +31-71-51.75.391

Contact person: Mr. van Leeuwen (tel. 51.59.343)

CEBEMO/VASTENAKTIE is funding projects in the South, mainly in rural areas. CEBEMO/VASTENAKTIE supports some agricultural projects nearby cities who face specific marketing possibilities and problems. The pressure of cities on the surrounding rural areas can be very high and by supporting the farmers around the city CEBEMO/VASTENAKTIE hopes they can manage to cope with this pressure.

CEBEMO/VASTENAKTIE also supports several waste composting projects in cities. One of the supported organizations is ALTERNATIVA in Lima, Peru, which returned the questionnaire (see Chapter 4 of this report).

Eco-operation

Organization implementing the `sustainability contracts' between the Dutch government and the governments of Costa Rica, Benin and Bhutan

Mariaplaats 3-I
P.O. Box 19023
3501 DA Utrecht
tel. +31-30-23.00.999
fax. +31-30-23.67.998

Eco-operation has so far not met the issue of urban agriculture in their work. They have had contact with a waste management project in a city in Benin.

ETC Foundation

Non-profit consultancy organization

Kastanjelaan 5
P.O. Box 64
3830 AB Leusden
tel: +31-33-49.43.086
fax: +31-33-49.40.791
telex: 79380 ETC NL

contact person: Mrs. Ann Waters-Bayer

ETC is an international organization with several offices; three offices are dealing with urban agriculture:

* ETC Netherlands, which also coordinates activities in Harare, Zimbabwe

* ETC Kenya works together with National Resource Institute on a study on urban horticulture in Dar es Salaam

* ETC Andes

In 1992 ETC Netherlands published a report on urban agriculture (Bliek, 1993) and in 1994 they assisted ILEIA in publishing a newsletter on urban agriculture.

The activities on urban agriculture are at the moment:

* Short-term consultancies

* Publications

* Participation and co-organization of workshops

* ETC field offices

ETC would like to get involved in long-term projects on urban agriculture too. Donor-agencies and policy-makers should be made aware of urban agriculture. ETC tries to raise this awareness in a way they consider to be important: by first looking what is happening (Participative Appraisal) and then studying how to develop suitable techniques (Participatory Technology Development).

Recently the Latin American urban agriculture network was started. Julio Prudencio Böhrt is coordinator of this network. The role of ETC in this network will be: advising and backstopping. ETC Andes will be involved in this network, because they are already active in the field of urban agriculture. The specific expertise of Ann Waters-Bayer is on urban livestock.

IFOAM - International Federation of Organic Agriculture Movements

Dutch department of IFOAM

P.O. Box 176
3970 AD Driebergen
tel. +31-343-51.21.99
fax. +31-343-51.24.99
e-mail: ifoam99@antenna.nl

IFOAM is dealing with organic farming; this often involves intensive farming and thus intensive techniques such as composting. IFOAM therefore also deals with urban agriculture, because the techniques they promote can be profitable in urban agriculture. Recently they started a program on Community Supported Agriculture, direct marketing and waste recycling.

Ingenieursburo Amsterdam

Consultancy company

Wibautstraat 3
1091 GH Amsterdam
tel. +31-20-59.62.666
fax. +31-20-59.64.416

contact persons: Luc Weteling, Koen de Jong and Cees Bruins

Ingenieursburo Amsterdam has supervised two composting projects in Managua (Nicaragua):

1. A small-scale project initiated by the people of the neighbourhood itself. Ingenieursburo Amsterdam assisted with technical and financial support.

2. A dumpsite for market-waste (on municipal level).

Selling the compost seemed to be a problem. A marketing program was therefore started. A questionnaire to determine the need for compost showed that people considered compost to be old-fashioned. On the basis of these results a video was made in which the potential of compost was explained and the places where it could be sold were announced. The video was shown on television and turned out to be successful. As a consequence the municipal project managed to cover the costs. Also the small-scale project was benefiting from the promotion video.

Institute for housing and urban development studies (IHS)

Institute for training and research

Weena 718
P.O. Box 1935
3000 BX Rotterdam
tel. +31-10-40.21.523
fax. +31-10-40.45.671

contact person: Jos Frijns

At IHS no-one is specifically involved in urban agriculture, but urban agriculture is an issue in the training program. IHS has a reserved attitude towards urban agriculture for environmental reasons. The problem of heavy metals has long-term health consequences, while pathogens in irrigation water can have short-term consequences for human health. According to Jos Frijns compost could in theory contribute to the improvement of the environmental conditions, but he stresses the fact that polluted compost will deteriorate the situation.

International Agrarian Centre (IAC)

IAC advises DGIS (and others), gives trainings, intercedes for posting abroad and organises international conferences

Lawickse Allee 11,
P.O. Box 88
6700 AB Wageningen
tel. +31-317-49.01.11 (reception)
fax. +31-317-41.85.52

Library open: Monday-Friday 9-12h and 13.30-16.30h

contact person: Mrs. Tina van den Briel (senior in nutrition; tel. 49.03.44)

IAC is focusing its activities on rural development mainly; therefore, not much is done on urban agriculture. In 1988 Tina van den Driel was involved in an assignment for the Dutch Ministry of Agriculture, concerning urban agriculture and urban nutrition. Her expertise concerning urban agriculture lies in **urban nutrition**. Her colleague (M. Beek), whose expertise is on fruitcrops and gardening is more and more confronted with urban agriculture.

International Institute for the Urban Environment (IIUE)

IIUE deals with integrated urban planning and developing indicators for sustainable urban development.

Nickersteeg 5
2611 EK Delft
tel. +31-15-26.23.279

contact person: Tjeerd Deelstra

IIUE is working with the integrated concept of urban planning and is interested to create win-win-situations. The expertise of Tjeerd Deelstra is on integrated (strategic) urban planning and the relation between the city and the rural hinterland. At the moment he is not dealing with urban agriculture, but in the past he wrote several articles concerning urban agriculture and its potential role in sustainable urban development.

Tjeerd Deelstra has some future plans concerning urban agriculture:

- Cooperation with ETC Foundation in urban projects

- Contact in Peru: reconstruct irrigation works and using waste-water in urban agriculture
- Contact in China: using crops as fuel.

ILEIA

Information Centre for Low-External-Input and Sustainable Agriculture

Kastanjelaan 5,
P.O. Box 64,
3830 AB Leusden
tel: +31-33-49.43.086
fax: +31-33-49.40.791
telex: 79380 ETC NL

E-mail: ileia @ ileia.nl

ILEIA is an information centre for organizations/farmers in the South; it operates a documentation centre, publishes a quarterly newsletter, bibliographies and resource guides, holds workshops and supports regional networks in the Third World. Contact person for the library: Wietse Bruinsma.

Interesting issues of Ileia-newsletter are available for US$ 5:

Vol. 10, no. 3 (1994): Wastes wanted.
Vol.10, no. 4 (1994): Farming at close quarters.

KIT - Royal Tropical Institute

Institute for research and training

Mauritskade 63
1092 AD Amsterdam

Department of Agriculture and Enterprise Development (AED): tel. +31-20-56.88.269
contact person: Dr. Ir. Willem Stoop (tel. 56.88.387)

The Royal Tropical Institute has no activities on urban agriculture. However, the department of Economic Development of the institute is dealing with marketing horticultural crops.

LUW - Wageningen Agricultural University

Department of Agronomy

Haarweg 333
P.O. Box 341
6700 AH Wageningen
tel. +31-317-48.40.50
fax. +31-317-48.45.75

contact person: Louise Fresco

The department of agronomy has not been involved in agriculture; in the past prof. Fresco implemented a study on homegardens.

Mensen in Nood/Caritas

Funding Organization (aid-programs)

Hekellaan 6

P.O. Box 1041
5200 BA 's-Hertogenbosch
tel. +31-73-61.44.544
fax. +31-73-61.32.115

contact person: Sacha Kamil

For information: see SOH.

NOVIB, Dutch Organization for International Development Cooperation

Funding Organization

Amaliastraat 7
2514 JC Den Haag
tel. +31-70-34.21.625
fax. +31-70-36.14.461

contact person: Harrie Oppenoorth (urban environment)

NOVIB is funding several organizations in the South dealing with urban agriculture of which some are focusing on hydroponics. For more information: see SOH.

SNV - Dutch Development Organization

SNV intercedes for posting abroad, assists in finding financial support for projects and works actively on changing international relations.

Bezuidenhoutseweg 161
2594 AG Den Haag
tel. +31-70-344.02.44
fax. +31-70-385.55.31

contact person: Albert Heringa (staff member on environment, tel. 344.02.56)

SNV has at the moment one person stationed in a project dealing with urban agriculture. This project has to develop a new suburb/quarter of Lima, whereby attention is paid to the following issues:

- Participative method

- Environmentally safe

- Attention for agriculture: use of waste-water, fish ponds, frog nursery.

SNV used to focus on rural areas, but Albert Heringa tries to bring urban issues under the attention at SNV, because of the growing urbanisation and the relation between cities and rural areas (closing nutrient cycles, waste processing, pollution). His expertise is on general environmental issues.

SOH - Dutch Interchurch Aid

Funding Organization (aid-programs)

Cornelis Houtmanstraat 17
P.O. Box 13077
3507 LB Utrecht
tel. +31-30-27.10.614
fax. +31-30-27.10.814

contact person: Hans Heijs

Mensen in Nood/Caritas, SOH and NOVIB had a desk-study done concerning the VPO program `food security urban sector' as a preparation for a program evaluation. (See References in this report.)

Involved in the evaluation were:

SOH - Hans Heijs

Mensen in Nood/Caritas - Mrs. Sacha Kamil

Novib - Mrs. Trudy van Iterson and Adri Patma

DGIS - Eric Jansonius and Jacques Remmerswaal (DGIS-DPO/MP)

SOH is funding projects dealing with urban food security; food production is part of the activities in these projects.

Staring centre (SC-DLO)

Institute for Research of the Rural Areas

Marijkeweg 11/22,
P.O. Box 125
6700 AC Wageningen
tel. +31-317-47.42.00 (reception)
fax: +31-317-42.48.12
telex: 75230 visi-nl

contact person: Dr. L.M. van den Berg (tel. 47.44.35)

The Staring centre in cooperation with an Israeli institute and an organization from Nigeria have organised a seminar (1995) on "market-gardening in the urban fringe" at the Jos plateaux in Nigeria. The focus was on the situation of small farmers and the relation between landowners and immigrants. These immigrants irrigate their crops and are therefore able to practise market gardening in the dry season. All products are sold in nearby cities. Some of the issues were:

- Temporary land use rights

- How do the indigenous people take over the irrigation techniques

- Battle for land between the owners, the immigrants and the expanding city

- Marketing the products

- Organization of small farmers

The project is focusing on the urban fringe in the Jos plateaux in Nigeria; the project also returned the questionnaire (see Chapter 4 of this report).

TOOL - Technology Transfer Developing Countries

Information Centre

Sarphatistraat 650
1018 AV Amsterdam
tel. +31-20-62.64.409
fax. +31-20-62.77.489

contact person: Ilse Suikerbuik

University of Amsterdam

Department of Social Geography of Developing Countries

Prinsengracht 130
1011 HV Amsterdam
tel. +31-20-52.54.063

contact persons: Prof. Dr. Isa Baud and Marijk Huysman (AIO)

The Department of Social Geography is involved in research projects in the South on (solid) waste management. In Bangalore, India, Marijk Huysman has been doing research into the whole waste cycle, including composting (large-scale, as well as small-scale).

For the near future two research projects are planned:

- Indo Dutch Programme on Alternatives to Development; research on solid waste management will be done in small towns in India, whereby composting and the use of compost will be an important issue.

- Research project on the relation between organic waste and agriculture; it will be a comparison between Kenya and India, beginning of 1996.

SOME RELEVANT ORGANIZATIONS ABROAD:

AVRDC - Asian Vegetable Research and Development Centre

AVRDC Production Systems Program

P.O. Box 42
Shanhua
Tainan
Taiwan 74100
fax: +886-6-583.00.09

contact person: David Midmore (Director)

AVRDC has a special program on homegardens.

IDRC - International Development Research Centre of Canada

P.O. Box 8500
Ottawa, Ontario
Canada K1G 3H9
tel: +1-613-236-6163
fax: +1-613-238-7230
Cable: RECENTRE OTTAWA
telex: 053-3753

contact person: Luc J.A. Mougeot, Urban Environment Management Program

IDRC has implemented and funded several projects on urban agriculture and urban nutrition: many past studies have tested links between waste treatment and recycling with farming, others have analyzed urban food circulation systems

Mazingira Institute

P.O. Box 14550
Nairobi, Kenya

tel: +254-2-443.219/443.226/443.229
fax: +254-2-444.643

The Mazingira Institute implemented two surveys on urban agriculture in 6 Kenyan towns, in 1985 and 1987.

Results of the surveys are presented in:

* "Urban food production and the cooking fuel situation in urban Kenya: results of a 1985 national survey" by Diana Lee-Smith, Mutsembi Manundu, Davinder Lamba and Kuria Gathuru. 1987. Mazingira Institute.

* "A city of farmers: informal urban agriculture in the open spaces of Nairobi, Kenya" by D. Freeman. 1991. Results of 1987 survey.

The Urban Agriculture Network (UAN)

1711 Lamont St NW
Washington, DC 20010, USA
tel: +1-202-4838.130
fax: +1-202-9866.732
E-mail: 72144.3446@compuserve.com on Internet

contact persons: Jac Smit and Annu Ratta

The Urban Agriculture Network is a focal point and resource centre for promoting urban farming in low-income countries. It brings together over 1000 NGOs, researchers, farmers, government agencies and international agencies from over 25 countries. The network promotes urban farming as a strategy to empower the poor, reduce hunger and malnutrition, promote income-generating employment and enterprise development, and make the urban environment healthier. The network promotes increased interaction and cooperation among agencies working in urban farming at local, national and international level.

SOME EXPERTS ABROAD:

Julio Prudencio Böhrt

UNITAS
Casilla 6254
La Paz, Bolivia
tel: +591-2-391.365
fax: +591-2-379.632

Mr. Böhrt is an economist with UNITAS (La Unión de Instituciones de trabajo y acción social), which is an umbrella organization of 23 NGOs. He studied urban agriculture/nutrition in Bolivia and other Latin American countries.

Mr. Souleymane Diallo

Research Coordinator
Environnement et Développement du Tiers-Monde (ENDA)
54, Rue Carnot,
P.O. Box 3370
Dakar, Senegal
tel: +221-224.229/216.027
fax: +221-222.695

Mr. Diallo has done several studies on urban farming in West-Africa.

Dr. Axumite G. Egziabher

P.O. Box 30837
Addis Ababa, Ethiopia
tel: +251-1-185.932
fax: +251-1-510.545

Dr. Egziabher has done a study on urban agriculture in Addis Ababa. She stresses the role of urban agriculture in socio-economic structures.

Robin Marsh (socio-economist)

AVRDC/IICA
P.O. Box 55-2200
San Jose
Costa Rica
fax: +506-229-4741

Mrs. Marsh is involved in the AVRDC Home garden program and focuses on the nutritional benefits of homegardening.

Prof. Daniel G. Maxwell

Land Tenure Centre
University of Wisconsin
1357 University Avenue
Madison, Wisconsin
USA 53706
tel: +1-608-262.3567
fax: +1-608-262.2141

Prof. Maxwell has done an thorough study on urban farming in Kampala, whereby the emphasis was on the logics of urban agriculture.

Theobaldo Pinzás

Instituto de Estudios Peruanos
Horacio Urteaga 694
Lima 11
Peru

Mr. Pinzas has written a report on urban agriculture in Peru; he suggests that more attention be given to recycling of waste and sewage water.

Reverend Dr. Camillus J. Sawio

Geography Department
University of Dar es Salaam
P.O. Box 35049
Dar es Salaam, Tanzania
tel: +255-51-49.192 ext.2337

Dr. Sawio is an assistant lecturer in geography at the university of Dar es Salaam. He has studied urban agriculture in Dar es Salaam.

Dr. Yue-man Yeung

Director, Hong Kong Institute of Asia-Pacific Studies
The Chinese University of Hong Kong
Shatin, NT
Hong Kong
tel: +852-6.098.777
fax: +852-6.035.215

Dr. Yeung is a specialist in urban agriculture in Asia. He wrote several articles on this subject.

APPENDIX II: NAMES AND ADDRESSES OF THE ORGANIZATIONS

Organizations who returned the questionnaire:

Undugu Society of Kenya

Peter Njenga
P.O. Box 40417
Nairobi
KENYA

Undugu Society of Kenya (USK) was founded by Father Arnold Grol to assist and rehabilitate the needy street children. USK established a formal presence in the form of operational field offices in the slum areas from which youngsters started relating to the society. USK is committed to the principle of upholding human dignity, decency and freedom (preferential concern for children) and gives hope and confidence through the intergraded empowerment processes aimed at achieving self-reliance.

Help Self Help Centre

Elizabeth Munene
P.O. Box 40603
Nairobi
Kenya

The Help Self Help Centre (HSHC) aims at creating enabling environment for the rural and urban poor to empower themselves and thus influence development. HSHC was formed in 1989 after a 'Participatory Rural Appraisal' workshop, jointly organised by the Egerton University, Clark University and the Kenya National Environmental Secretariat, at which a group of participants followed the idea of forming an organisation that promotes the concept of Participatory Resource Management. It stresses the role of the community in the management of its natural resources and their sustainable development. The community should be involved in identifying the problems and priorities.

Bamenda Horticultural Society

Mrs. Rose Aben
c/o Divisional Delegation of agriculture
c/o Mr. Sanjou-Tadzong
P.O. Box 581
Mankon
Bamenda
Cameroon

Bamenda Horticulture Society (BAHORSO) is an NGO, non profit making, non political, sustainable self-help Agricultural organization:
Encourages the population to grow, consume and enjoy plants, environmental conservation, improve economic situation, markets (different kinds of activities).

Amateur Horticultural Association

Mr. John Musa
P.O. Box 5182
Bamenda
Cameroon

Amateur horticulture Association (AHA) was founded in 1990 for the promotion of organic horticulture and environmental awareness in Cameroon.

IIRR Bio-Intensive Gardening Association

c/o Normita G. Ignacio
Silang
Cavite 4118
the Philippines

IIRR is a non-profit NGO dedicated to improve the quality of life of the rural poor in the developing nations of Africa, Asia and Latin America. IIRR's mission is to improve the quality of lives of the rural poor in developing countries through rural reconstruction: a sustainable, integrated and people centred development strategy generated through practical field experiences.

GTZ-Urban Vegetable Promotion Project

Petra Jacobi
P.O. Box 31311
Dar es Salaam
Tanzania

Urban vegetable promotion project is a bilateral, research oriented GTZ Project.
Objectives of the project:

- Improving the nutritional situation of the urban poor through homegarden production

- Encouraging producer groups to make the best use of available resources (market price collection and broadcasting

PEDA

H.I. Ajaegbu

7, Murtala Mohamed Avenue
Jos
Nigeria

The Population, Environment and Development Agency (PEDA) is a non-profit NGO, established to complement the efforts of the governments and the communities improving the quality of live of these people. Since 1992 the Agency has assisted local communities and organizations in project formulation and execution on several aspects of population, environment and the general developing process.

City Farming Institute

c/o Dr R.T. Doshi
26th Road
Bandra
Bombay
400 050 India

INORA (Institute of Organic Agriculture)

c/o Dr R.T. Doshi
26th Road
Bandra
Bombay
400 050 India

INORA is mainly involved in extension, education and research of organic farming.
their objectives are: extension, education and research

PRAKRUTI

c/o Kisan Metha
620 Jame Jamshed Road
Fourth floor, Dadar East
Bombay
400 014 India

PRAKRUTI operates through two organizations; Save Bombay Committee (SBC) and Prakruti. SBC (formed in 1971-72) takes the extreme no-compromise stand on mega projects which create waste and degradation of natural resources, environmental pollution, marginalisation and deprivation of the poor, forcing unhealthy change in lifestyles etc, and it studies alternatives.

Prakruti (formed in 1988) takes up rural issues including agriculture, forestry, rights of people to land and life.

NOT INVOLVED IN ANY PROGRAMME OF URBAN AGRICULTURE, but has information about his campaign for turning city organic waste into soil conditioner/manure through vermiculture.

UNICEF

projet à Antohamadinika
B.P. 732
Antananarivo 101
Madagascar

UNICEF works on the subjects:
health, Nutrition, education, waster and sanitation and services on base urban.

ALPHALOG

Mr Seydou Diakité et Mme Anne Keita
B.P. 1881
Bamako
Mali

response of GIE (groupement d'Intérêt Economique) FASO KANU, Bamako, Mali.
Project KANA: neighbourhood activities to ameliorate city life by collecting household waste.

Project JIGINE: 9 ha of cultivation of legumes: banana, maize, gombo and a orchard of manso etc.

In future they would like to make this to project complementary.

ENDA America-Latina

Marie Dominique de Suremain y Maria Victoria Bojaca
Bogota
Colombia
fax. 00-57-2882567

ENDA is a Colombian NGO correlated to the net of all ENDAs. They set up and support the construction of a sustainable urban environment. ENDA works for a human city where they have respect for difference, help for insurance, equity etc and pretends the amelioration of the quality of life.

There are 3 areas of interest: communication and culture, sanitate and recycling and women and city.

Alternativa

Albina Ruiz Rios y Jorge V. correa Solis
Lima
Peru
fax. 00-51-1-4816826

The NGO Alternativa is organised in 6 departments: urban development, administration and regional development, employment promotion, health, lay and alimentation. Further more there is an information and documentation centre, planning department and administration department, and supporting groups.
Institutional objectives:

- To develop a method of planning and administration which incorporates the civil society

- Create instances to concert different agencies.

- Develop specific projects for the area

- Develop mechanisms to communicate

- Gender

Other organizations:

ENDA Zimbabwe

Davison J.Gumbo
Waterfield Road 1
P.O. Box 3492
Mt. Pleasant
Harare
Zimbabwe

Human Settlements of Zambia

Harrington Jere
P.O. Box 50141
Lusaka
Zambia

FARM Africa

David Catling
Cape Town
South Africa
fax 00-27-21-959-3242

CTOM Tohoue

Mme Véronique Gnanih
p/a Emmaüs Tohoue
B.P. 492
Porto Novo
Benin

Bakary Diakité

GERAD/IMRAD
B.P. 1988
Bamako
Mali

SNV Peru

Jaap de Vries
Lima
Peru
fax. 00-51-14-424 586

Cecopal

Miryam Arbomo
Avda Colon 1141-5014
Córdoba
Argentina

APPENDIX III: QUESTIONNAIRE URBAN AGRICULTURE

WE WOULD APPRECIATE IT VERY MUCH IF YOU COULD:

1. Answer the questions on a separate paper.

2. Number your answers according to the numbers of the questions.

3. Use a typewriter or computer, if possible.

4. Try to be as descriptive as possible.

5. Skip the questions on which you don't know an answer.

FURTHERMORE:

6. Sometimes suggestions of answers are given between brackets; this is only to help you understand the question, not to limit your scope of answers.

7. If some answers are well documented in project papers or research reports, please add a copy of the relevant parts of these papers.

8. All additional remarks are welcome.

QUESTIONS

A. Organization

1. Could you give a short description of your organization? *(if a flyer is available, please enclose it)*

2. Could you give a description of the project that is involved in urban agriculture?

a. What are the objectives of the project?

b. When did the project start?

c. In what city or quarter is the project operating?

d. Who is the target group? How many households/persons are involved in the project?

e. What are the activities of the project?

f. What are the plans for the future?

g. Is the project cooperating with other projects? Which projects?

h. What is the role of your organization in the project?

B. Urban agriculture

The questions in part B and C relate to urban agriculture in the project area!

3. Which goals do urban people hope to achieve with urban agriculture? *(e.g. income, better nutrition, employment)*

4. Who are the urban farmers? *(specify if relevant: origin, class, male/female, low- middle- or high-income, religion, recent migrants, etc.)*

5. What type of 'space' do the people use for urban agriculture? *(e.g. backyards, communal gardens, public land, roofgardens, balconies)*

6. What is the average size of the plots?

7. Which crops are grown?

8. Are there any special crop management practices prevalent in the area? (e.g. hydroponics: crops grown on water)

If yes, describe them.

9. If plots are near roads, piles of garbage or other polluted areas, are the crops protected against pollution? If yes, how?

10. Have measurements of heavy metals in the crops ever been done? What were the results?

11. What are the major constraints the 'urban farmers' face?

C. Use of compost

12. Is compost being used in urban agriculture in the project area? *(if not, go to question no.19)*

if yes

13. How do urban farmers obtain the compost?

a. Is composting part of the project?

b. What is the price of compost in relation to other (artificial) fertilizers?

14. What is the compost made of? What is the quality?

15. a. On which crops is the compost used?

b. How much compost is used?

c. How many people use the compost?

16. Are there problems with polluted compost? *(e.g. pollution from hazardous waste)*

17. Have measurements of heavy metals in compost ever been done? What were the results?

18. Are there any problems when using compost?

if not

19. Why are people not using compost? *(explain)*

20. Has the use of compost ever been considered? If yes, why did people not start using it?

21. Are other types of organic fertilizer used? Which?

D. Final questions

22. *If you have answered 'yes' on question no.12, please answer the following question:* are you willing to cooperate in future (field) research on the use of compost in urban agriculture? *(yes/no)*

23. The results of this questionnaire will be presented in a report in English. You will receive a summary of this report. Are you interested to receive a copy of the whole report as well? *(yes/no)*

24. Do you have any other remarks, suggestions or questions?

July 1995.

Please send us your answers, preferably before 15 September 1995

APPENDIX IV: CROPS CULTIVATED IN THE DIFFERENT PROJECTS

Organization	Crops
ENDA - Colombia	leafy horticultural crops, maize, potato and fruits (passion flower, *mora*, cherry, grapes)
ALTERNATIVA - Peru	leafy horticultural crops and some fruits (papaya, plantain)
USK - Kenya	potatoes, onions, spinach, *kales*, arrowroots, beans, cow peas, sugar canes, bananas, sweet potatoes and amaranth.
HSHC - Kenya	cabbages, *sukuma wiki*, spinach, maize, beans, potatoes, citrus, papaya, peas, etc.
BAHORSO - Cameroon	vegetables, fruits, flowers and lawns.
AHA - Cameroon	vegetables, cocoyams, fruits, plantains, bananas, cassava, sweet potatoes, yams, corn and beans.
GTZ - Tanzania	maize, beans, amaranth, chinese cabbage, swiss chard and pumpkin (leaves) as vegetable.
PEDA - Nigeria	potatoes, carrot, cabbage, lettuce, beet, celery, eggplant, spinach, tomatoes, pepper, onions, avocado, pear, guava, mango
UNICEF - Madagascar	flowers, tomatoes, carrots, beans, beet, cucumber, courgette, lettuce.
IIRR - the Philippines	mostly vegetables, but also root crops, medicinal herbs and small trees (source of green manure, botanical pesticide and as fence).
CFI - India	vegetables and fruits
INORA - India	vegetables, fruits and flowers.