

The Role of Urban Agriculture in Urban Organic Waste Management in The Hague, The Netherlands



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Executive Summary

This report describes the current situation of organic waste management and urban agriculture, with a specific focus on The Hague. Next to this, the potential of the recycling of organic waste in urban agriculture in The Hague is analyzed. The research is commissioned by Alterra, Wageningen as part of the FOODMETRES project. The analysis is done with studying relevant literature, conducting interviews and by conducting two case studies of urban agriculture initiatives in detail. Results show that the current situation of organic waste management in The Hague could be improved, through actions of both the municipality and the citizens. With several platforms focused on urban agriculture and many new arising initiatives, urban agriculture receives increasing attention from the public. Also the municipality has an increased attention to urban agriculture. Several innovative initiatives that use organic waste in urban agriculture are described. The current situation of using organic waste in urban agriculture is of small scale, which is the main limitation to its potential. But there are several positive externalities that can make the use of organic waste in urban agriculture a contribution to the society.



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List of Symbols and Abbreviations

ABCD: Asset Based Community Development

As: Arsenic

Cd: Cadmium

CO₂: Carbon Dioxide

CS: City Spices

CSA: Community Supported Agriculture

DDH: Duurzaam Den Haag

DIFTAR: Different tax rates for separated waste and unseparated waste

DSNY: Department of Sanitation

EDH: Eetbaar Den Haag

EM: Effective-Microorganisms

EU: European Union

GAP: Global Action Plan

GG: Gezonde Gronden

HMC: Haags Milieucentrum

HMS: Haagse Milieu Services

Hg: Mercury

IFAD: International Fund for Agricultural Development

MSW: Municipal Solid Waste

NGOs: Non-Governmental Organizations

NVLV: Netwerk Vitale Landbouw en Voeding

NME: Natuur- & Milieu-Educatie

NYC: New York City

PAHs: Polycyclic aromatic hydrocarbons

Pb: Lead

TWG: Technical Working Group

UN: United Nation



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Introduction

Waste management is an important issue worldwide, especially in metropolitan regions. Currently 3.4-4 billion tons of municipal and industrial waste are produced every year (Chalmin and Gaillochet, 2009). Organic waste is one of the major streams of Municipal Solid Waste (MSW). Organic waste is defined as organic material such as food, garden and lawn clippings, as well as animal and plant based material and degradable carbon (Environment Victoria, n.d.). Nowadays, organic waste is normally sent to landfills or incinerators, which is not just a problem of lost resources but also causes environmental problems.

This project will focus on the city The Hague, the capital city of the province of South Holland. With a population over 0.5 million inhabitants, it is the third largest city of The Netherlands. The Hague is situated in the metropolitan region of Rotterdam, that has a population of approximately 2.9 million and is the most populous region in the country. The Hague scores very low in waste management compared to other Dutch cities. Regarding organic waste, on average only 9 kg of organic waste per inhabitant per year is collected in The Hague (HMC, 2008). While in other highly urbanised areas in The Netherlands, an average of 19 kg of organic waste is collected per inhabitant per year (MWH, 2010).

New ways of organic waste management are urgently needed to achieve more sustainable cities. There are three main ways in which organic waste can be used: soil fertilization, animal feeding and energy production. The waste that contains high amounts of organic matter and nutrients can be reclaimed and used as a resource in urban agriculture (Van Veenhuizen, 2006.) Urban agriculture is defined as food production within and around the city. It provides an opportunity for better management of organic waste, because it has the potential to close nutrients cycles and make cities more sustainable.

This project is commissioned by Jeroen Kruit from Alterra Wageningen UR. The project is part of the European project, the Food Planning and Innovation for Sustainable Metropolitan Regions, better known as the FOODMETRES Project. The aim of FOODMETRES is to assess the environmental and the socio-economic impacts of food chains with a focus on opportunities for food chain innovation and the ecological footprint (FOODMETRES, 2012).

The problem is: *there is a lack of knowledge on the potential contribution of urban agriculture on organic waste recycling in metropolitan regions.*

The focus of this project is to describe the present situation of organic waste management in The Hague and to describe the potential contribution of urban agriculture in the management of organic waste in order to stimulate this process. This report may provide useful information for researchers, policy makers, urban agriculture initiatives and other relevant stakeholders.

The main research questions that will be addressed in this project are:

1. What is the current situation of organic waste management in The Hague?
2. What is the current role of urban agriculture in organic waste management in The Hague?
3. What is the potential role of urban agriculture in organic waste management in The Hague?

This report gives a description of organic waste management practices, developments in urban agriculture and the use of organic waste in urban agriculture. This is followed by a specific focus on urban agriculture and organic waste management in The Hague. Two cases, selected on innovativeness of organic waste reuse, are described in detail.



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Methodology

Methods used are literature review, key informant interviews and two case study analysis.

Literature review

For the literature review, reports, journals, websites and books about urban agriculture and about organic waste management were selected. The review is about urban agriculture in general, trends in urban agriculture, organic waste, the use of organic waste in urban agriculture with a focus on cities around the world and The Hague.

Key informant interviews

Several key informant interviews were conducted. Some key informants were visited, like the municipality of The Hague, Berit Piegras (specializes in mobile architecture, micro architecture and research of socio-economic processes and factors influencing the physical environment), dr.ir. Paul Römken (soil expert at Wageningen University), Arnold van der Valk (land use planning and urban agriculture expert at Wageningen University) and several other people involved in urban agriculture in The Hague. Other interviews were conducted by telephone or by e-mail. A list of interviewed persons is provided in Table 1, detailed information can be found in Annex 1.

Case study

Initiatives for in depth analysis were selected on relevance on the research objective, creativity and innovativeness of the project, availability of data and accessibility based on the information provided by relevant institution and key informants. The two selected case studies are city farmer Elemam Musa and Gezonde Gronden, a network of initiatives in The Hague. Elemam Musa was chosen because of the organic waste management in his urban gardening project and Gezonde Gronden had potential as promoter of urban agriculture in The Hague. Questions were prepared for the interview with the case studies (Annex 2), these questions served as a guide for the interviews, in the interviews an open discussion was used to gather the data. The phone application GPS essentials was used to shows the place of Elemam Musa's activities in a map.

Table 1 List of Interviewed Persons

| Name | Organisation |
|---------------------------|-------------------------|
| Berit Piepgras | March |
| Bessie Schadee | Gezonde Gronden |
| Elemam Musa | Cooperatief Eigenwijzer |
| Özgür Savas | De Schilde |
| Marcel Roeleveld | Entrepreneur |
| Ed de jager | Municipality The Hague |
| Ger Kwakkel | Municipality The Hague |
| Tom Voorma | Municipality The Hague |
| Paul Römken | Alterra Wageningen UR |
| Piazza New Babylon | Bar/restaurant |
| Boris Roodenburg | Urban Crops |
| Tom Pistra | Haags Mileucentrum |
| Conny Voordendag | Stadstuin Emma's hof |
| Annette Osinga | Zeeheldentuin |
| Mathilde Peen | City Spices |



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Chapter 1 Urban Agriculture

1.1 Definition and characteristics

It is not easy to define urban agriculture because a large variety of urban farming systems is encountered, based on the local socio-economic, geographical and political situation (ETC, 2003). According to World Food and Agriculture Organization (FAO, 2007) urban agriculture is defined as “the growing of plants and the raising of animals for food and other uses within and around cities and towns, and related activities such as the production and delivery of inputs, processing and marketing of products”. Veenhuizen (2006), reported that urban agriculture is generally characterized by closeness to markets, competition for land, limited space, and use of urban resources such as urban organic wastes, water, and others. In this report urban agriculture is defined as: *all food production (both animals and plants) in the urban and peri-urban area.*

Farming in and around the city is not the same as farming in the rural region in many aspects. It is possible to use various agricultural inputs such as artificial fertilizers, pesticide, insecticide, water (waste and/or fresh), soil and others however it needs firm regulation and inspection. Hence, to implement urban agriculture in and around the city specific conditions/policies are required such as institutional regulations, physical infrastructure, availability of space, and others in order to expand urban agriculture as well as to avoid the potential risks of contamination of produce (Mougeot, 2000).

1.2 History and trends

Urban agriculture has a long history throughout the world, but recently the phenomenon has gained more attention in several cities for various reasons (Smith *et al.*, 2001). The oasis towns of Iran are an early example of urban agriculture. The towns and cities of early civilizations on Java and in the Indus valley showed traces of urban agriculture practice (for example: raised-bed farming systems). The most important historic evidence of urban agriculture was discovered in Latin America: Aztec, Mayan, and Incan cities were self-sufficient in perishable fruits and vegetables that were produced in and around the cities (Smith *et al.*, 2001).

Each farming tradition is highly connected in local societal and cultural practices. During the 1980s and 1990s, the importance of urban agriculture increased throughout the world in both developed and developing countries. A study in Moscow in 1970 and 1991 indicated that a shift of families engaged in urban agriculture from 20% to 65%. Similarly surveys in Dar es Salaam, Tanzania in 1967 and 1991 showed an increase of urban family agriculture from 18 to 67 %. Reports from three cities such as Kinshasa, Kampala, and Maputo also indicated that a large change of urban land from open space to agricultural production. In Kenya and Tanzania, most families (three out of five families) in towns and cities are engaged in urban agriculture (Smith *et al.*, 2001).

The percentage of urban families engaged in agriculture varies from fewer than 10% (in North America) as many as 80% (in some Asian cities) (Smith *et al.*, 2001). In other cities like Cairo and London respectively 20% and 14% of the people are involved in urban agriculture. In the United States of America (USA) 25% of the households are involved in urban agriculture (Urban green-blue grids, 2014).

A survey in Bangkok found that 60% of the land was used for urban agriculture. In Havana, Cuba, one of the strongest and well established urban agriculture systems is located which covers 12% of the city area and is providing jobs for many people (Wortman and Lovell, 2013). In Berlin, more than 800,000 community gardeners are using municipal land (Deelstra and Girardet, 1987). In China, 14 big cities produced more than 85% of fresh vegetable (Urban green-blue grids, 2014). Singapore is self-sufficient in meat production and produces about 25% of the city vegetable demands (Deelstra and Girardet, 1987).



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With the rise of urbanisation, agricultural production also increases within metropolitan and adjacent areas (Smith *et al.*, 2001; Deelstra and Girardet, 1987). According to UN report (2010), nowadays, 15-20% of world food is produced in the city and this percentage will be doubled in the next 20 years. But, the development of urban agriculture farming is highly variable through the world. Urban agriculture throughout the world is changing in response to political, economic, environmental, and technological developments. Consequently, many variable forms of urban agricultural production systems exist. According to Mougeot (2000), urban farming systems can be classified by location (e.g. roof, road side, unused lots, river bank, etc), type of crops cultivated (e.g. vegetables, spices, fruits, etc), tenure modality, scale of production (e.g. commercial, community, etc) and product destination (e.g. local market, own use).

1.3 Opportunities of Urban Agriculture

Urban Agriculture is much more than growing food. It can bring multiple benefits in health, social, economic and ecological issues. Urban agriculture enhances urban food security and nutrition, local economic development, poverty alleviation and social inclusion of disadvantaged groups and sustainable environmental management in the cities (Cohen *et al.*, 2012). Some benefits of urban agriculture are:

Health

Urban agriculture increases food security and decreases malnutrition, self-produced food in cities provides nutritious food (Bakker *et al.*, 2000). People are motivated through involvement urban agriculture to consume fresh vegetables and fruits.

Social

Urban gardens provide public space, where people have the opportunity to meet each other. They also provide recreation opportunities and aesthetic appeal to the neighbourhoods. Some host public events such as music festivals, movie screenings or barbecues (Cohen *et al.*, 2012). The contribution of urban agriculture to environmental education is also important. Many workshops are organised in urban gardens for school students and young people. Urban agriculture enhances gender equality, because many women participate in it (Cohen *et al.*, 2012).

Economic

Citizens can also have economic benefits from urban agriculture. It is a source of self-provision found to benefit households (Mougeot 2000). Local residents who grow food in their backyards or in local community gardens, they can sell it in local markets, shops, or restaurants (Cohen *et al.*, 2012). Some community gardens hire people to help them to organize the market, where they sell their products. In many cities poor people work and collect organic waste from households, vegetable markets and agro-industries in order to produce compost or animal feed. Many young people who want to develop their environmental, agricultural and food careers are trained in urban gardens (Cohen *et al.*, 2012).

Ecological

Urban gardens increase greening in the cities and promote healthy eating. Green spaces improve air circulation, reduce summer temperatures and storm water runoff in the cities (Cohen *et al.*, 2012). Urban agriculture enhances plant biodiversity in the city (Pretty *et al.*, 2005). The potential of urban agriculture to recycle wastewater and organic materials contribute to solving waste disposal problems (Smit and Nasr, 1992). Capturing and reusing water by urban gardeners reduces rainwater floods in the city. Re-using of organic waste reduces the amount of trash in the cities (Cohen *et al.*, 2012). Some of the urban gardeners turn food waste into compost for food crops production instead of using chemical fertilisers. So, they prevent problems related to the contamination of groundwater. However further studies are needed to ensure the protection of human health. An additional ecological benefit of urban agriculture is the low amount of energy spending for food packaging and transportation (Cohen *et al.*, 2012).

1.4 Challenges of urban agriculture

Even though urban agriculture provide many opportunities and benefits, there is still a knowledge gap in food crop production in urban ecosystems including risks of soil pollution, compost quality and water scarcity and security. Urban agriculture faces multiple challenges which need to be studied further (Wortman and Lovell, 2013; Cohen *et al.*, 2012).

Soil contamination is a risk for the safety of food from urban agriculture. The improvement and monitoring of the soil quality of compost is a challenge



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(Corey and Routley, 2013). The potential soil contaminants consist of Lead (Pb), Arsenic (As), Mercury (Hg), Cadmium (Cd) and polycyclic aromatic

hydrocarbons (PAHs) in urban soils (Wortman and Lovell, 2013). Roadside soils are highly contaminated with Pb (Kay *et al.*, 2008). Studies found that most of the edible plant tissues in most species have low concentrations of Pb, but the Pb ingestion through aerosols is still a threat for urban gardeners and farmers. However, appropriate management practices for urban gardening can reduce these risks (USEPA, 2011). PAH's in the urban soil are delivered from the atmospheric deposition, but they can be mitigated through compost amendment and other management practices (Mumtaz and George, 1995, USEPA 2011).

Vegetables produced in cities, especially on places next to intensively used roads, appeared to have high concentrations of several heavy metals. This pollution mainly comes from traffic, the area of 50 next to the roads is often heavily polluted. At distances of more than 100 meter it is considered there is no increased pollution. Air pollution is often not considered a problem for urban agriculture, because these pollutants can be washed of the vegetables before consumption (Verhaeghe, 2014). For some vegetables, especially leafy vegetables, contamination risks are still relevant because the pollutant accumulate in the leaf tissue (Van Reemst *et al.*, 2013).

Water availability and security are other challenges for urban agriculture. Climate variability and the urban heat island effect, the effect where temperatures in cities are on average higher compared to rural areas, affect water inventories (O'Neill and Dobrowolski, 2011). In cities in the USA, many food crops are irrigated with rainwater from the rooftops, grey water (waste water from non-toilet domestic activities such as showering, dishwashing, and laundry), reclaimed wastewater, and stormwater (Li *et al.*, 2009). The different water sources require the maintenance and improvement of water safety (Wortman and Lovell, 2013).

Policy about urban agriculture has to be improved for the enhancement of urban agriculture benefits as well as the reduction of the risks associated with public health and environmental hazards. Policy integration should pay attention to issues such as urban land use planning, health, waste management, social housing, slum upgrading, park and nature management (Dubbeling and Zeeuw, 2011). The improvement of urban policy and planning could enhance the collaboration of different stakeholders (Dubbeling *et al.* 2010). Many urban gardeners want to expand their growing space, this is not an easy task because many different stakeholders are involved in land

ownership or there is a lack of space (Cohen *et al.*, 2012). Identifying suitable spaces for urban agriculture contributes to solving these problems (Cohen *et al.*, 2012). In some cities of the United States and in the city of Ottawa in

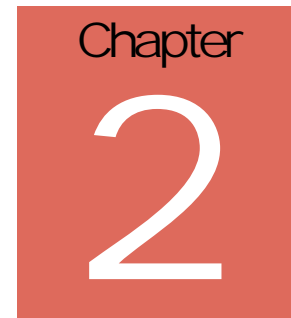
Canada, the integration of urban agriculture into zoning by-law provides both municipal staffs and citizens with clarity about what is, and what it is not, a permitted agricultural land use within the city (Corey and Routley, 2013). Funding initiatives to establish new urban agriculture projects is an additional issue that should be included in urban policy (Cohen *et al.*, 2012).



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Chapter 2 Organic Waste Management

2.1 Definition and characteristics

Municipal Solid Waste (MSW) is defined as everyday items that are thrown away, “such as product packaging, grass clippings, furniture, clothing, bottles, food scraps, newspapers, appliances, paint, and batteries” (US EPA, 2014). Since MSW contains high amounts of organic matter, composting this matter and use it in urban agriculture might be a solution for the waste problem in metropolitan regions (Sharma, 2003). Organic waste is defined as organic material such as food, garden and lawn clippings, as well as animal and plant based material and degradable carbon. Urban waste generally ends up on major dumping locations within or outside the city (in developing countries) or in incineration facilities (in developed countries). Organic waste is sometimes separated from the other waste and composted. However, in many situations it is burned or processed together with the other waste and consequently the potentially reusable nutrients from the organic waste are lost.

In The Netherlands, there is an increasing trend in the amount incinerated waste, while in landfilling there is a decreasing trend, the amount of digested/composted waste remains more or less stable (Figure 1). Regarding

organic waste, there is a decreasing trend in the collection of waste and also in the enthusiasm for separating the waste, the willingness to separate fruit and vegetable waste decreased from 80% to 65% from 1997 to 2011 (Vereniging Afvalbedrijven, 2012). The collection of organic waste showed a sharp increase in 1993 to almost 100 kg per person per year in 1996, but has decreased to less than 80 kg per person per year in 2011 (Vereniging Afvalbedrijven, 2012). This is an issue of concern, because organic waste is the largest part of the waste in The Netherlands, 41% of the produced waste is organic waste (Rijkswaterstaat, 2013a).

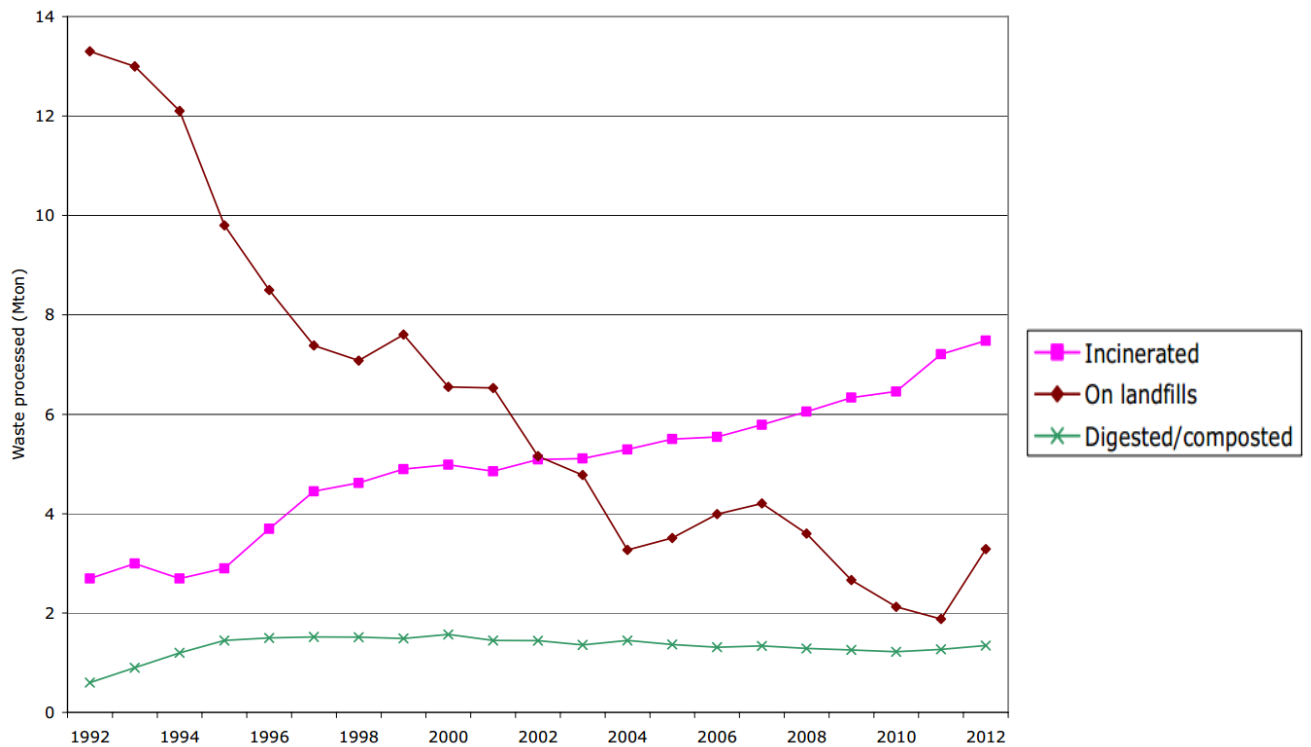


Figure 1 Trends in waste processed in The Netherlands from 1992 to 2012(Rijkswaterstaat, 2013b)

2.2 The Opportunities

Waste has to be seen not as problem to be disposed of, but as resource for sustainable development. Metropolitan areas have a vision to evolve primarily open cycle systems with one-way flows of resources (in) and wastes (out), to primarily closed cycle systems. Urban agriculture is a clear example that offers possibilities to convert the consume-dispose open cycle into consume-



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process-reuse closed cycle. One way to create a closed cycle in metropolitan areas is the use of organic waste as fertilizer for

urban agriculture. The use of fertilizer has been implemented in urban agriculture at both the household and community level. A household with a rooftop garden or a backyard can contribute in reusing its own organic waste. Urban farms, whether for animal production, vegetable production or other purpose, can be organized to collect and process as much of urban waste as possible (Smit and Nasr, 1992).

There are several options and examples for reusing the organic waste in urban agriculture. Due to the high content of organic matter in the solid waste and the amount of nutrients, especially phosphorus, the European Union have suggested to use the sewage sludge as an input for agriculture. Germany is the pioneer country in Europe for using compost in agriculture. Other EU member states are developing ideas and techniques to collect organic waste and produce compost for agriculture. It is known that organic waste helps to return valuable nutrients to the soils and to improve the conditions for a better plant growth. In developing countries, with a rapidly increasing amounts of organic waste, this option could be a positive solution with economic and ecological benefits. At the same time, in industrialized countries, the awareness of the public regarding the possible pollution of the food by using compost from organic waste is increasing and generating debate in the community (Düring and Gäth, 2002). Crecchio *et al.*, (2004), mentioned that MSW composts have been used to maintain the long-term productivity of agro-ecosystems and protect the soil environment from depletion, climate change effects and inadequate management. Moreover, reusing of MSW also have the additional benefit of reducing waste disposal costs.

If organic waste is separated, it can be used for different purposes like making compost or bioenergy. Ayuso *et al.* (1996) reported that it is important to comprehensively characterize organic waste streams for using them appropriately. It is the most common to use these waste streams as fresh waste or as composted waste. As fresh waste, it is rapidly metabolized by microorganisms. The high content of biodegradable organic matter (lipids, proteins, sugars, etc.) and the nutrients was found to increase the quantity of active biomass in the soil. Beside as fresh waste, solid waste can be used as compost which containing organic matter in a more stabilized form, and shows a greater capacity to absorb nutrients in a form that can be easily taken up by plants. This compost is suitable for maintaining the fertility of a soil.

Furthermore, organic matter from compost is of a much higher quality than an un-composted waste, resulting

in the production of organic matter that contains a larger amount of polymerized fractions with a higher iso-humic coefficient. The same report concluded that compost is safer (from an agricultural point of view) than fresh wastes. They contain a smaller amount of phytotoxic substances and organic matter is more stabilized compared to fresh residues. Moreover, the heating process in composting with temperatures up to 70⁰ C, will contribute to reduce problems with pathogenic organisms.

Anaerobic digestion is an alternative for composting organic waste. In anaerobic digestion, organic material is broken down by microorganisms which produces biogas that can be used for energy production (bioenergy), the remaining material can be used as compost. This process is also referred to as biogas production. Methane can be obtained from the organic waste, this energy source makes the organic waste management more profitable. After anaerobic digestion, the waste can be composted. It is suggested that the quality of the compost is better after it has gone through the process of anaerobic digestion compared to normal composting (HMC, 2008).

Other opportunities on organic waste management can be found in using organic waste at home. When composting is done at home, the chain is shortest. This avoids the requirement of the separate collection of organic waste. There are options for individually composting at home, but also composting on a community level (HMC, 2008).

People can ferment their organic waste at home, with the use of Effective-Microorganisms (EM). Freitag and Meihoefer (2000) describe the use of EM. Organic waste is put in the fermenting bucket with EM and sealed. During the fermentation process liquids are drained that can be put through the drain in the kitchen of the household. After about four weeks, the waste has “decomposed into an odorless fermented fertilizer” (Freitag and Meihoefer, 2000, p. 3). HMC (2008) states that the liquids can also be used for plant feed and with the products produced this method is ideal for the use in gardens or urban agriculture.

There are several developments in organic waste management that are opportunities for a better separation of waste at household level. A way to promote the separate collection of organic waste is the use of biodegradable waste bags. These bags make the separation easier and can help citizens to



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effectively separate their organic waste. Another opportunity is the DIFTAR system, DIFTAR refers to charging different tax

rates for separated waste and unseparated waste. The DIFTAR system for waste separation is used in several cities in the Netherlands, in these cities waste is separated more effectively.

2.3 Challenges

The main concern of MSW compost is loading the soil with metals that could result in increased metal content of crops, Table 2 shows the legal limits of heavy metals in compost. Moreover, in some cases, metals and excess nutrients can mobile through the soil profile into groundwater. Furthermore, MSW compost has also been reported to have high salt concentrations, which can prohibit plant growth and negatively affect soil structure.

Table 2 Legal Limits of Heavy Metals in Compost(from: ENC,2010)

| Heavy metals | mg/kg dm |
|--------------|----------|
| Cd (Cadmium) | 1 |
| Cr (Chrome) | 50 |
| Cu (Copper) | 90 |
| Hg (Mercury) | 0,3 |
| Ni (Nickel) | 20 |
| Pb (Lead) | 100 |
| Zn (Zink) | 290 |
| As (Arsenic) | 15 |

Anikwe and Nwobodo (2002) studied the effect of long term usage of MSW for agriculture. They reported that long term dumping of untreated municipal wastes, have potential toxic effects on the soil. Since MSW may contain heavy metals and other toxic compounds, amendments cannot only influence soil fertility, but may also affect the activity and composition of soil microorganisms.

Amlinger (2004), modeled the long term effect (200 years) of compost application on heavy metals in the soil. It was modeled for sand and clay soils, with high and low application rates (4.6 and 9.2 ton dry matter compost per hectare per year) and with low and high concentrations of pollutants (the high concentration are often set at a value a little under the legal limits of heavy metals in compost). He concludes that for most heavy metals there is no risk of reaching the legal limits of soil pollution. In clay soils, in the limits were not reached for all heavy metals after 200 years, except for zinc where the limit will be reached after 137 years. In sandy soils, with high application rates and lower quality compost, limits could be reached before 100 years for Zinc, Copper and Mercury. Copper at high application rates and Zinc are the only two elements of concern, but their contribution as trace elements to soil fertility also has to be taken into account. In general, the modeled results show there is very little risk of heavy metal pollution when legal limits of compost are observed.

Dr.ir. Paul Römken from the Sustainable Soil Management Department of Wageningen University, states there is sufficient legislation for compost application quality, soils quality and products quality to assure safe food

production. On the other hand, for urban agriculture, often these legislations are not relevant. The legislations only regulate commercial farms which sell their products to the market. An advisory standard is provided for the amount of nitrogen, phosphorus, heavy metal and other contaminations in the soil, which can be the basic insurance for the food product safety. Compost application is mainly regulated for the amount of nitrogen and phosphorus limitations, but not for heavy metal and other contaminations. All the products from commercial farms are checked for food safety standards. Besides from legislations, food products are also checked by processors and retailers. However, private gardens or small farms, where products are mainly for own consumption, are not regulated by legislation, neither on soil and input, nor on products. There only have advisory standard for soil contaminations calculated from the exposure amount of contaminations to users by consuming the products that are grown on the soil. There could be a risk in private production gardens or small farms depending on what they use for composting as an input and how much they applied.

To assess the risk of growing food in urban areas by using compost from organic waste, three questions should be asked:

The first question is: does the soil meet the criteria for food production? The pollution of urban soil is one of the most heated discussions in urban agriculture. There is no conclusion yet now, but there are ways that can avoid risks, such as using artificial soils or choosing plants that have little uptake of pollutants from the soil and not growing vegetables close to roads.

The second question is: what is the risk of pollution in the compost? If private gardeners only consume products from their own garden, use the waste as input for their garden and the soil is of good quality, there is a closed cycle and no hazardous components could accumulate in the soil. However, this assumption is not often seen in practice, most of the people get extra food from the market. All the food from the market should meet the standard of food safety should not exceed legal limits. The compost produced from organic waste is relatively clean in the Netherlands due to the good separation in Dutch waste streams. Nearly all compost from organic waste from households is certified under the name 'Keurcompost' and more and



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more green waste compost will be certified in future (European Compost Network, 2010). The risk of using organic waste compost mainly lies in private and small processors where there is no quality control of their compost, because they might use other inputs for composting besides organic waste.

The third question is: how much compost is added to the soil? Composting is a process of decomposition and concentration. All the components in the waste will be concentrated into a smaller volume. As mentioned before, there is no legislation for private producers, even though the compost itself is safe, adding too much compost into the plots will still result in pollution risks.

Chapter 3

Chapter 3 Examples of organic waste management in urban agriculture

3.1 The Developing World: A Community design process in Philippines

Tramhel (2011) described the case of Cagayan de Oro City in the southern Philippines. It has a population of approximately 500,000 with a growth rate of 4.4% per year. The rapid growth exacerbates problems such as urban waste disposal and increases sanitation and health problems. Ten vegetable gardens were introduced in the city as an effort to alleviate hunger and improve health among urban poor by using urban vacant land for food production. One garden with a minimum area of 3,000 square meters can accommodate 8 families with each a parcel of 300 square meters plus common areas for composting. It offers beneficiaries to acquire gardening skills, contribute to their livelihood, and serve as an social nodes for the community. Results shows that the gardens contribute significantly towards nutritional intake improvement and income generation for the neighbourhood .

In Cagayan, approximately 40-50% of the total waste is biodegradable, but organic waste is not effectively recoverable once it arrives at the dumpsite. A



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new national legislation was set up in 2000 which state that 'segregation and collection of solid waste shall be conducted at the barangay (community) level specifically for biodegradable, compostable and reusable wastes' and a Material Recovery Facility Station be established throughout the city at barangay level. The other non-recyclable materials and special waste shall be the responsibility of the municipality or city .

Engaging the community in the legislation is critical for the successful implementation. Three barangays were engaged to develop site plans for the integration of organic waste with urban agriculture using the Asset Based Community Development (ABCD) approach by focusing on the existing assets and strengths inside the community. The ABCD approach is based on the premise that by identifying and mobilizing resources that already exist within the community, it can better develop themselves from the inside out (McKnight & Kretzmann, 1993).

First of all, a Technical Working Group (TWG) comprised of representatives from several government departments (Public Services, Agricultural Productivity, Natural Environment and Resources, Public Health and Sanitation, Planning, Community Improvement, Economic Enterprise) enter the community as an official political leadership for the project (Tramhel, 2011). Second, community consultations were conducted in each of the three barangay with 50 participants in which they identify themselves and their own issues. They share accomplishments related to organic waste management, urban agriculture and community assets and indicated them on a map, for example, blue dots for major sources of organic waste and green dots for urban agriculture sites. This workshop encourage a shift to view 'waste' as a community 'asset'. In the end, participants develop a vision statement for their community to integrate organic waste management with urban agriculture. Thirdly, 7-8 persons who had participated in the consultations and showed interests and leadership were selected for a 5-day course to be trained as Community EcoAids. The training provide basic level knowledge to enable the participants to develop more realistic site designs and implementation plans. In addition, it build capacity and leadership for the participants in their community. In the end, the Community EcoAids present their result and get feedback from their communities (Tramhel, 2009).

All Community EcoAids from the three barangay have started implementation of their projects. In the barangay Lapasan, the garden has become the receiving facility for the biodegradable wastes and eventually created income

for local indigents (UNHABITAT, n.d. a). In the barangay Gusa in 2005, the community generated 27,000 PHP (the GDP per capita in 2005 was 52000 PHP (United Nations Statistic Division, n.d.)) from compost from biodegradables in 5 months, 3,000 PHP from recyclables every 45 days and 28.000 PHP vegetables from plot gardens (UNHABITAT, n.d.b).

3.2 Developed world: NYC Compost Project

New York City (NYC) is one of the most densely populated cities in the USA, with some of the highest real estate values. And yet, it is also a leader in the practice of urban agriculture. There are more than 700 urban agriculture sites in New York not only producing food but also creating a decentralized system of diverse, small-scale, community-based public spaces through all five boroughs of NYC . Activities in urban agriculture in New York include education programs, youth training, nutrition and cooking classes, environmental conservation through composting and many others. The biggest challenge the urban farmers and gardeners are facing now is obtaining critical resources especially availability of compost and land, which are the foundation elements for growing food (Cohen, *et al.*, 2012).

In 2009, more than 130 community gardens reported that they currently have composting system to collect food wastes or yard wastes (Cohen, *et al.*, 2012). Part of the composting activities is integrated with the existing city sanitation policy and plans. One-third of NYC's residential waste is organic material that is suitable for source-separated composting (NYC Department of Sanitation, 2005). Compost is produced and distributed in many ways in the city. The NYC Department of Sanitation (DSNY) sponsors numerous compost-related programs and several community gardens that make compost of organic waste from local residents (Cohen, *et al.*, 2012). For example, the NYC Compost Project (Figure 2) created by NYC in 1993 provides compost education and outreach to NYC residents, community groups, government agencies and non-profit organisations. It offers compost-related workshops and classes, provides technical support, distributes DSNY compost and mulch, develops urban farms and conducts outreach at public events throughout all five boroughs. The NYC Compost Project also operates neighbourhood-based

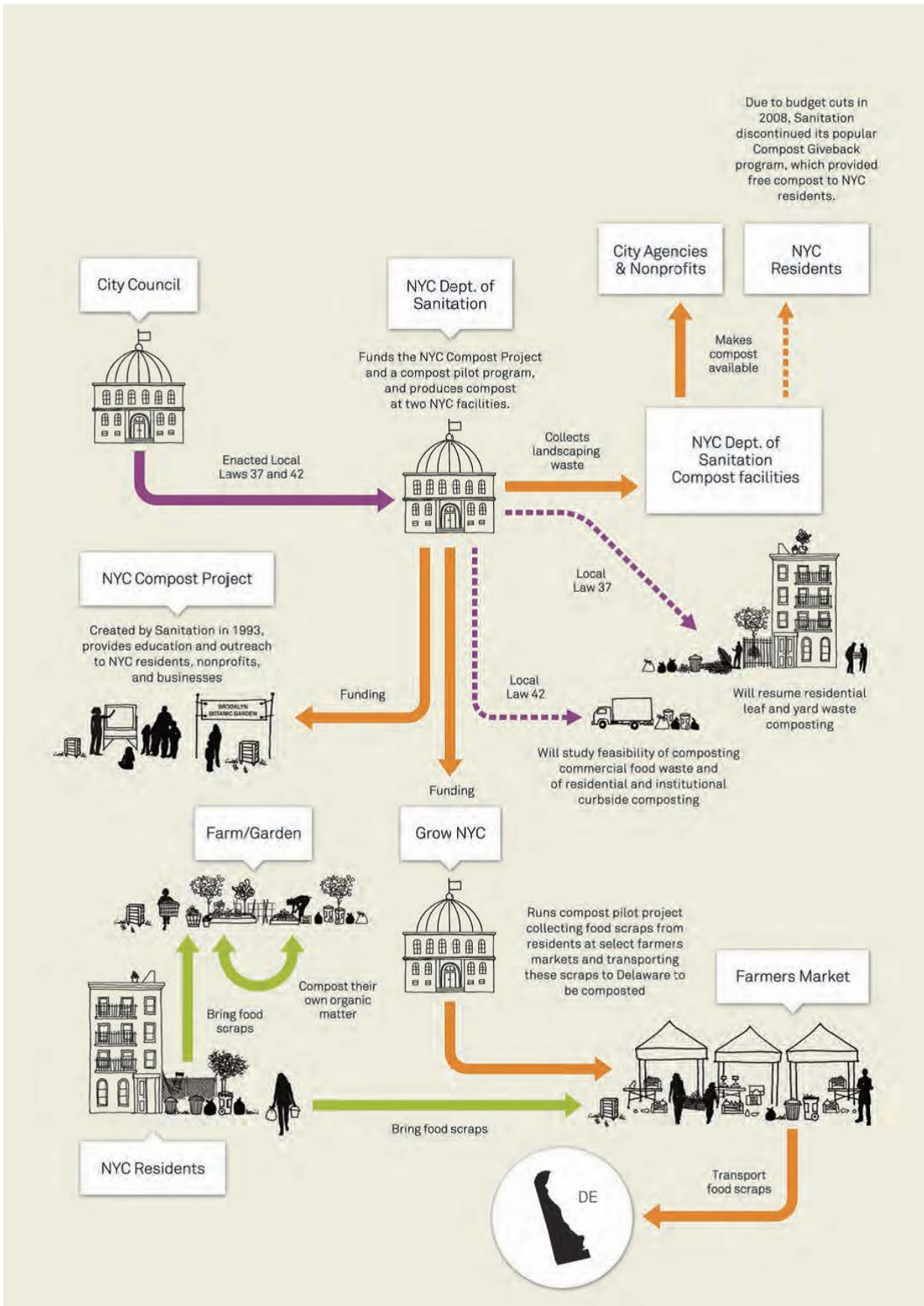
food scrap drop-off opportunities and ensures those food scraps are composted locally (NYC Department of Sanitation, 2013a). In Brooklyn, there



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are 20 *neighbourhood-based food waste drop-off site* including community gardens, parks, business farms and farmer's market. This waste is composted by the DSNY, composting related organizations or on the farms (NYC Department of Sanitation, 2013b). There are also 64 *community-based compost sites* including 45 community gardens, 7 school gardens and 3 business sites (NYC Department of Sanitation, 2013c). The Red Hook Community Farm managed by Added Value is the largest composting program in Brooklyn as part of the NYC Compost Project. It is both a drop-off site and a compost site, in addition, it also provide compost workshops for community. At their peak performance, the program processes over 225 tons of organic waste from their community and farm in a year and makes waste become a rich amendment to the soil for the farm (Added Value, n.d.). In addition, The NYC Compost Project also offers citizens household worm bins including worms for sale at a cost of \$44 or Worm bin starter kits, including one pound of red wiggler worms for \$55 (NYC Department of Sanitation, 2013d). There are clear guidelines for citizens about how to deal with their organic waste on the NYC Compost Project website and provide information such as where to buy composting equipment, compostable collection bags, and worms.



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Figure 2 NYC Compost Project



Chapter

4

Chapter 4 Urban Agriculture in The Hague

4.1 Current situation

During the last decade, urban agriculture has got more attention in cities worldwide as a movement that creates awareness for local food, health and environmental issues. In The Hague, this movement arose as well and for example it can be seen in the presence of Youth Food Movement Den Haag, the local youth wing of the international Slowfood movement. The attention for local food is for example visible in the success of Heerlijk Vers, a web-magazine with a digital map of regional food producers in the province of Zuid-Holland. The 'local food trend' is also visible in the growing amount of farmers markets, the presence of the Transition movement (Transition Town Den Haag) and the rising attention for *kringlooplandbouw* [English: recycling agriculture] from urban and peri-urban farmers.

These trends stimulated The Hague's citizens and municipality to take more initiative within the sector of local food production. Urban agriculture has been performed in The Hague since the foundation of the first community gardens in 1910. Currently, there are around 100 urban agricultural initiatives in the city, including 17 complexes with community gardens, 20 school gardens, 10 city farms and several other commercial or non-commercial



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initiatives (Figure 3). Some citizens cultivate edible plants in private gardens or balconies around their houses.

Many initiatives are initiated by individuals, citizen groups and entrepreneurs; some local platforms stimulate these developments with physical or educational support. The municipality followed the 'local food movement' just recently, with the launching of The Hague's Food Strategy. Currently, plans are being developed to start a local food platform that may collaborate all parties involved in the cities' food sector, in order to achieve the Food Strategy goals.

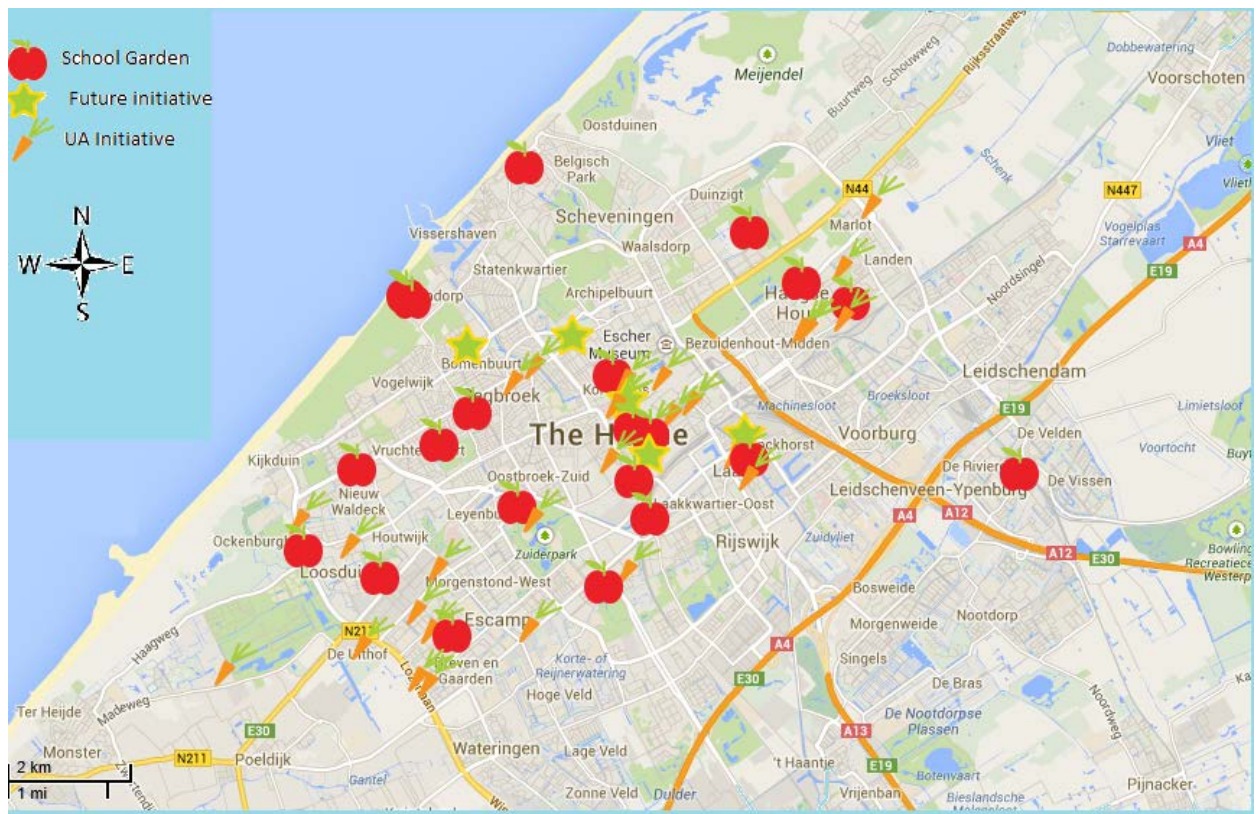


Figure 3 Map of The Hague with Several Urban Agriculture Initiatives (Piegras, 2013)

4.2 The Hague's Food Strategy

The Hague's Food Strategy was developed on the basis of the initiative proposal "*Sluit de voedselkringloop*" (2010). This report about the regionalisation of food production, distribution and consumption in The Hague and surrounding areas was published by Haags Milieucentrum (HMC) and Gezonde Gronden (GG). They argued that modern ways of food production and consumption generate environmental and social issues and therefore a more regional and sustainable way of food production is needed. Amongst many recommendations, the most important for the urban agricultural sector were:

1. Create a Food Strategy for the municipality of The Hague.
2. Create policy to stimulate citizen to grow their own food (Sufficient land supply in community gardens, school gardens and parks; allowing temporary use of vacant lots and empty office space; stimulate and allow development of edible balconies and rooftop gardens.)
3. Investigate the potentials to reuse urban organic waste for urban gardeners, urban farmers and peri-urban farmers (Compost the urban organic waste and regain phosphates from waste water.)

The municipality used these recommendations for the creation of *voedselstrategie Den Haag*, Food Strategy The Hague (2013). The main focus in the strategy is on health improvement, greening the city and giving impulses for spatial development and local economies. A short action plan was integrated in the document:

1. Health improvement: revise nature- and environmental-education programs, fruit and vegetable cultivation on schools and healthy food in sport clubs.
2. Greening the city: stimulate development of rooftop gardens, community gardens, courtyard gardens.
3. Giving impulses for spatial development and local economies: allowing temporary use of vacant lots and empty office space for urban agriculture, stimulate sale of sustainably produced food from urban and peri-urban areas, maintain rural landscape with farms, sustainable buying of municipality.



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4.3 Stakeholders

Municipality

Since the creation of the Food Strategy (2013), Ed de Jager is assigned by the municipality as responsible person for urban agricultural affairs within the city. The municipal department Natuur- & Milieu-educatie (NME) [English: Nature- & Environmental-education] offers education for The Hague's school children about nature, ecology, environment, landscape and sustainability. The main goal of the education is to create more involved, respectful and environmentally friendly action taking of (young) citizens, for a sustainable and liveable society. NME provides education for children from primary and secondary schools with classroom teaching material and outside locations for practical education. Classroom teaching material and suggestions for nature- and environmental education can be gathered at one of the 3 *milieu service punten* [English: environmental service points]. Outside education is done in 20 school garden complexes, where children have their own garden for a season and learn sewing, planting, maintaining and harvesting crops. The city contains 10 *stadsboerderijen* [English: city farms], that are open for visits from all citizens and function as a place to show daily routines on a farm with animals like goats, sheep, rabbits, chicken and sometimes even cows and pigs.

Platforms

Several platforms in The Hague have a role in and around the urban agriculture sector of The Hague. The four most important platforms in this research are Haags Milieu Centrum, Gezonden Gronden, Eetbaar Den Haag, Duurzaam Den Haag and City Spices.

Haags Milieucentrum (HMC) is a foundation for green and sustainable development of The Hague. With projects about nature, water, mobility, urban planning and sustainable building, the HMC spreads knowledge about sustainability among citizens in order to make it easier for them to live sustainably. Their website contains much information and tips about urban agriculture and how to become an urban farmer. They also give attention to recycling of waste and recommended the municipality to improve the cities' organic waste separation to stimulate nutrient recycling of organic waste and waste water.

Gezonde gronden (GG) is an initiative which supports city programmes to raise the awareness of the citizens about healthy soil and food. This initiative gives courses and trains people about healthy soil, permaculture and producing food on balconies and in the gardens of the city of the Hague. It supports schools programmes for the creation of green playgrounds and people who want to create gardens in public spaces or in their balconies.

Eetbaar Den Haag (EDH) is an informal platform for local organizations and projects that focus on local food, urban agriculture, urban-rural (re)connection and (edible) green in the neighbourhood. Together with HMC and GG, EDH was also involved in the creation of The Hague's Food Strategy and advised the city council on the content of the strategy. In order to stimulate achievement of the Food Strategy-goals, the platform currently attempts to create a local food-platform (Haags Voedselplatform) to stimulate cooperation between local partners and organizations.

Duurzaam Den Haag (DDH) is a platform for citizens, businesses, organisations and municipality to cooperate in the development of a more sustainable city. Among many sustainability projects, DDH promotes urban agriculture by spreading knowledge and a network-overview of urban agriculture initiatives on their website and in the meeting centre.

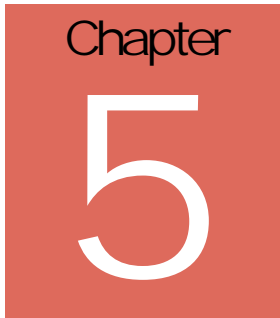
City Spices (CS) is a platform consisted of several partial projects. Many workshops, events and publications run through this platform. Besides them, City Spices support many locations of urban gardening in The Hague.



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Chapter 5

Chapter 5 Organic waste management in The Hague

The Hague scores very low on waste separation compared to other cities in The Netherlands, only 14% of the household waste is separated, while the nationwide goal is 43% (HMC, 2008). Because The Hague is an urbanised area, there is a lower proportion of organic waste compared to the rest of The Netherlands. The total amount of organic waste produced per inhabitant is assumed to be 73 kg per inhabitant per year. According to the Municipality of The Hague (2011), 15% of the organic waste was separated in 2010, an average of 11 kg per inhabitant, this means that 85% of the organic waste ends up in the residual waste. The municipality set itself the goal to increase this to 15 kg per inhabitant in 2015, an increase of 36%. The goal set by the municipality is low if compared to the average amount of organic waste collected in highly urbanised areas, which is 19 kg per inhabitant per year (MWH, 2010). This low separation rate in The Hague has caused problems for the municipality. The Hague joined in the construction of a composting factory in the Europoort, and with that it has the obligation to deliver 21.000 tons of organic waste per year, these amounts have not been reached in the years 2006 and 2007. The municipality has to compensate financially for missing the obligated limits. In 2006, the municipality had to pay 110.400 euros because only 4.506 tons of organic waste was supplied (AD, 2007).

Waste is collected by Haagse Milieu Services (HMS) in The Hague. In 2005 the municipality stopped collecting organic waste in areas with a lot of high-rise buildings including the centre of The Hague (around 150.000 households) because of the limited proceeds and limited environmental benefits. Instead of this, inhabitant could get a free subscription on collection of waste at home. Next to this, two times a year garden waste was collected. In the other areas (95.000 households), organic waste was collected weekly. In the areas with subscriptions on organic waste collection, only 10% joined the systems, this resulted in very low separation rates, an average of 3 kg per inhabitant per year. In the other areas this amount is a lot higher, 22 kg per inhabitant per year. In the subscription area the collection was considered not efficient, and low quality organic waste was collected. As of April 2013, no separate collection of organic waste is done in the former subscription area, instead, inhabitants can now bring their organic waste to one of the several collection places (Municipality The Hague, 2011).

Organic waste from municipal origin (e.g. parks) is collected on one location and composted. This compost is used again on municipal land such as school gardens (Municipality The Hague, 2013). Once a year, the compost from the collected organic waste from households is given away to the inhabitants of The Hague. At all city farms and gardens, people can come to collect one bag of compost. The quality is considered low by Gezonde Gronden, because of pollution and bad separation, but people are still eager to use it.

Table 3 CO2 emission reduction in gram resulting from the separation of 1 kg of the waste type (Municipality The Hague, 2011).

| Waste type | CO2 emission reduction (g/kg) |
|-----------------|-------------------------------|
| Paper/cardboard | 2010 |
| Textile | 3432 |
| Organic waste | 68 |
| Glass | 323 |
| Plastics | 780-2600 |

The municipality of The Hague has several points of focus regarding waste management. The focus lies on keeping the city and the streets clean, protecting the environment, providing services based on the demands of the inhabitants and keeping the cost of collection low. The focus on environmental benefits is mainly transferred to a reduction in CO₂ emissions. The municipality focusses on a reduction in CO₂ emission in the policy construction regarding waste management. Organic waste has a relative low contribution in reducing CO₂ emissions according to the municipality (Table 3), and therefore has a low priority concerning the environmental aspect. Possible other benefits such as added social cohesion, education and nutrient recycling are neglected.



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The Haags Milieucentrum (HMC) made a report in 2008 that advises the municipality on how to improve its waste policy (HMC, 2008). They state that The Hague wants to promote its inhabitants to increase the separation of waste, and increase the separate collection of organic waste, but compared to other cities, it has low results. The HMC states that not collecting the organic waste separately is financially disadvantageous for the municipality, because burning organic waste is three times more costly compared to composting. HMC concludes that composting organic waste is better for the environment as burning. HMC argues that because often large investments have been done in installations that burn waste, there is a lobby to continue with this practice and not shift to more sustainable solutions, because investments have to be earned back. HMC also argues that a lot more information has to be provided to the inhabitants of The Hague on how to compost and how to arrange this in the community. Also the HMC argues that The Hague municipality should subsidise buckets for fermenting organic waste at home to its inhabitants.

The municipality of The Hague now started a trial to investigate the possibility to alternately collect organic waste or plastics and residual waste. This means one week organic waste or plastic will be collected, and the next week residual waste. To test this, first a choice had to be made to collect organic waste or plastics (Municipality The Hague, 2011). First results of the trial concluded that separately collecting plastics has more financial and environmental benefits as separately collecting organic waste, and therefore further trial with alternately collecting waste will be continued with plastics, this trial will be done in the area “De Velden”, results are to be expected in 2014 (Municipality The Hague, 2013).

Furthermore, several studies are done now regarding alternative organic waste management. One studies the possibility to give households a shredder, and let them supply the organic waste to the sewage system so the waste can be treated at the sewage treatment plant. Another study follows from an example in Belgium, where people have been provided chickens at their house to eat the organic waste. It appeared to be very successful to reduce municipal waste, but in urban areas is seemed less feasible because of the lack of proper space for chickens. However, a trial with two families in The Hague has started where they have been given three chickens, there are options to upscale this project when it appears to be successful in The Hague.

Mayenburg and aan de Wiel (2007) investigated for Haaglanden (a conurbation of The Hague) the possibilities of bioenergy production from organic waste, but concluded that the current use of organic waste (mostly wood industry, compost and incineration facilities) is often more environmentally and financially beneficial compared to bioenergy production.

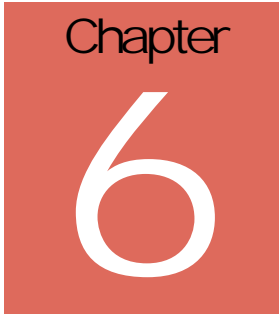
In Rijswijk, next to The Hague, a trial was done with biodegradable waste bags in which organic waste could be separated. This makes the collection of organic waste a lot easier for the inhabitants. The trial resulted in an increase of households that separated organic waste (from 32% to 76%), with less pollution (from 8% to 1%) and in a larger quantity (from 17 kg to 36 kg) (HMC, 2008).



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Chapter 6

Chapter 6 Organic waste management in urban agriculture in The Hague

Until now, there is almost no policy to use municipal organic waste within urban agriculture in The Hague on a large scale, except for the practices of the municipal department NME. Besides that, organic waste is mainly integrated in urban agriculture on a small scale by individuals, communities, organizations and businesses. The main urban agriculture initiatives in The Hague can be categorized as municipal initiatives, neighbourhood initiatives, permaculture initiatives, and commercial initiatives. Within these categories, the organic waste management of several urban agriculture initiatives in The Hague are described below.

Municipal initiatives

The municipal department NME enables and stimulates urban agriculture in school gardens, where food is produced and consumed by children and their families (if they bring it home). Besides that, NME manages the city farms, where mainly animals are kept. The organic waste of the school gardens (plant material) and the city farms (manure) is composted together and afterwards used as fertilizer for the school gardens. The composting process is not explicitly taking into the learning program of the school garden project, but children do see the use and purpose of compost when they apply it on their land.

The municipality also enabled the development of some community gardens, by allowing the use of public space for it. Within the community gardens, often garden waste is composted and compost is used in the garden. This is mostly initiated by the gardeners and not (stimulated) by the municipality.

In The Hague, about 10% of supplied office space is vacant (Seebus, 2012). In order to give these spaces a new function and to stimulate urban agriculture in The Hague, the municipality organized in 2013 an entrepreneur-challenge for urban agricultural initiatives to use space in the (partly) empty office building De Schilde. In November 2013, eight initiatives were selected to use the building for their start-ups. The plans vary from a rooftop greenhouse for fish and vegetable production, to mushroom growth on coffee residues and a beer brewery. Currently, the initiators are starting up their businesses. One of them is Özgür Savas, who is starting up a business with vegetable production in window-ledge greenhouses. Besides that, he has plans to cultivate insects and produce organic compost too. He is still investigating how to get enough and qualitative organic waste to make good compost that he can sell.

Neighbourhood initiatives

Neighbourhood initiatives are community gardens that are initiated, maintained and used by people from the neighbourhood, mainly for recreation and small-scale food production. The gardens are usually built on private vacant lots or in public spaces that are underused, such as stony squares or neglected green space. Gardens usually have a positive effect on the social cohesion and quality of life in the neighbourhood, as the gardens are a place to meet neighbours and as green places prevent area degradation, like vacancy, criminality and bleak streets (Piepgras, 2013).

An example of a successful community garden in The Hague is Emma's Hof, in the area Regentessekwartier. A group of citizens initiated Stichting Stadstuin Emma's Hof and bought the land in 2010 with money of subsidies from the EU, national government, municipality and other funds. It is a public place, designed as sustainable garden for recreational use of citizens from the surrounding multicultural neighbourhood. The garden contains herbs and fruit trees and functions as a resting place for adults, playing area for children and as location for small-scale concerts and events. The organic waste of the garden is composted and used as soil fertilizer within the garden.



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City Spices also supports several community gardens throughout the city. These gardens supply small plots for residents to cultivate some crops (mainly vegetables and herbs). One of the gardens is located in the unused zone along the railway, an interesting way to make efficient use of space but also potentially risky because of increased heavy metal pollution next to railways. The organic waste of the gardens is reused by composting. Participants compost the the organic waste from the garden and sometimes add to that the organic waste from their household. The compost is used in the community gardens to improve soil quality. Besides that, they sometimes recycle household waste (such as egg boxes or non-organic waste as bottles) and use this for the gardening practices.

Permaculture initiatives

Permaculture is the conscious design and maintenance of sustainable architecture and agriculturally productive systems which have the diversity, stability, and resilience of natural ecosystems. The principles of permaculture were created by the Australian ecologist Bill Mollison in the 1970's and are currently spread and applied worldwide. The design system is popular in urban agriculture, because it incorporates spatial and social circumstances, can be highly productive on a small plot and is relatively easy to maintain. As one of the main permaculture principle is "produce no waste", recycling of products and nutrients is integrated in the garden designs.

In The Hague, Permacultuurcentrum is the platform for permaculture stimulation and education in the area. Together with *Stichting Eetbaar Park*, they have three educational gardens: Eetbaar Park 1 (Zuiderpark), Eetbaar Park 2 (Nut&Genoegen) and Proeftuin Madestein (Pluk!). Concerning organic waste, the permaculture centre provides worm-composting workshops in the educational gardens. The workshops provide practical knowledge about techniques and organisation of individual as well communal worm-composting projects. The initiative Gezonde Gronden strives for local food production from healthy soils. The principles of permaculture are used as inspiration for their projects in creating edible gardens, school playgrounds, balconies and window-ledges. Besides that they provide official permaculture education, together with Permacultuur School Nederland.

Commercial initiatives

Urban agriculture is increasingly used within commercial businesses. These businesses can vary strongly in their goal, scale, consumer group and cultivation techniques. What they have in common is that they produce food to make money. Two examples are described below. The restaurant Piazza New Babylon, the aquaponic start-up Urban Crops and the coffee-recycling start-up Koffie Recycling Nederland.

Piazza New Babylon is a bar/restaurant on the top-floor of the building New Babylon, in central The Hague. The building is used for living, working, commercial business and community activities. The restaurant has a herb and vegetable garden on the rooftop of the building, where also the terrace is located. The cooks harvest the crops themselves and use it in the restaurant menu. A professional gardeners company maintains the garden. The use of self-grown herbs and vegetable is not only beneficial for the business because it attracts people that are into local food, but also gives the business a green image and makes the restaurant a little bit more self-sufficient. The organic waste of the restaurant kitchen is not composted or otherwise reused in the garden, but just processed within the regular municipal waste management system.

Urban Crops is a starting-up aquaponic company, runned by Boris Roodenburg and Karel van Zweden. They have plans to produce fish and vegetables with the high-tech innovative techniques of aquaponic systems. These systems have three levels with different organisms that form a closed loop of nutrient recycling and energy re-use: fish manure is converted by algae into nutrients for plants, that function as feed for the fish again. Well-thought design and precise controlling of the aquaponic system can deliver high quality fish and vegetables with few energy input and few waste products. Urban Crops has plans to do this on a large scale in greenhouses in the Westland (peri-urban area metropolitan region Rotterdam) and also on a small scale by placing aquaponics in household kitchens and in school. The large scale production is mainly for profit and the small scale projects are mainly for promotion and education of the innovative concept.

Koffie Recycling Nederland is a starting-up coffee-recycling company, runned by Marcel Roeleveld. He has plans to cultivate mushrooms on coffee residues from local café's and make biomass from the waste of that production

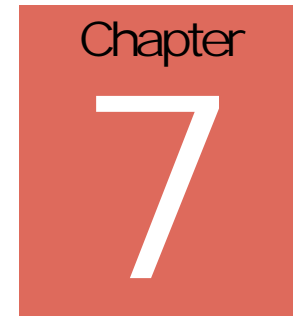


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process. Roeleveld mentioned that the most important and difficult part of using organic waste for urban agriculture is to get a grip on waste streams. This is mainly because organic waste is now taken by waste treatment companies and it takes effort to organise waste producers to step out of the conventional method and 'add value' to their waste.





Chapter 7 Case Studies

7.1 City farmer Elemam Musa

7.1.1 Introduction

Elemam Musa is a city farmer in The Hague. He is part of Cooperatief Eigenwijzer, a cooperative that started in 2008 as a project to guide long-time unemployed citizens of The Hague into independent entrepreneurs with training, coaching and financial support. The entrepreneurial projects should be focused on the concept 'by the neighbourhood, for the neighbourhood'. The cooperative currently contains the project coordinating team and the people that are in the track to become independent entrepreneurs. The cooperative is situated in a building with a large backyard in the area Laak and has contacts with the neighbourhood.

Musa was raised in an agrarian family and graduated from the Agriculture Faculty in the University of Al Gazeira in Sudan in 1995. After his graduation, he worked in Sudan within a United Nation (UN) project called International Fund for Agricultural Development (IFAD) as a supervisor. Due to conflicts and a continuous political crisis, all UN and Non-Governmental Organizations workers had to leave the country in 2002. Musa left his country and moved to The Netherlands. He studied Seed Technology at Wageningen University and Organic Farming at Scottish Agricultural College. In 2008, he wrote a project proposal to start an urban agricultural initiative within Cooperatief

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Eigenwijzer and received 850.000 euro from the Oranje Fonds. This was the starting point of his urban agricultural activities in The Hague.

The main objectives of the project are:

1. Produce healthy food for urban citizens
2. Greening the city
3. Create awareness about food production and consumption
4. Education about food production

7.1.2 Project

Over the last years, the project developed organic food production and education. Nowadays, Musa has three locations with different projects in the neighbourhood Molenweide (Laak) (Figure 4). This neighbourhood can be characterized as multicultural, with many low-income households, relatively high unemployment and a lot of infrastructure development of roads and houses. There are community gardens, school gardens, and a city farm. The backyard garden and one of the roof gardens are located behind/on the building of Cooperatief Eigenwijzer, where he also has his office. The other roof garden is located on the roof of restaurant Kobus. Musa has plans to develop a large greenhouse on a fourth location in the park Zuiderpark (Escamp).



Figure 4 Locations of Elemam Musa's Activities in the Neighborhood Laak

(Location 1 is the Kobus restaurant, Location 2 is where the neighbourhoods' community gardens, school gardens and city farm are located. Location 3 is the building of Cooperatief Eigenwijzer. (Drawn with GPS essentials using a basic map from maps.google.com)

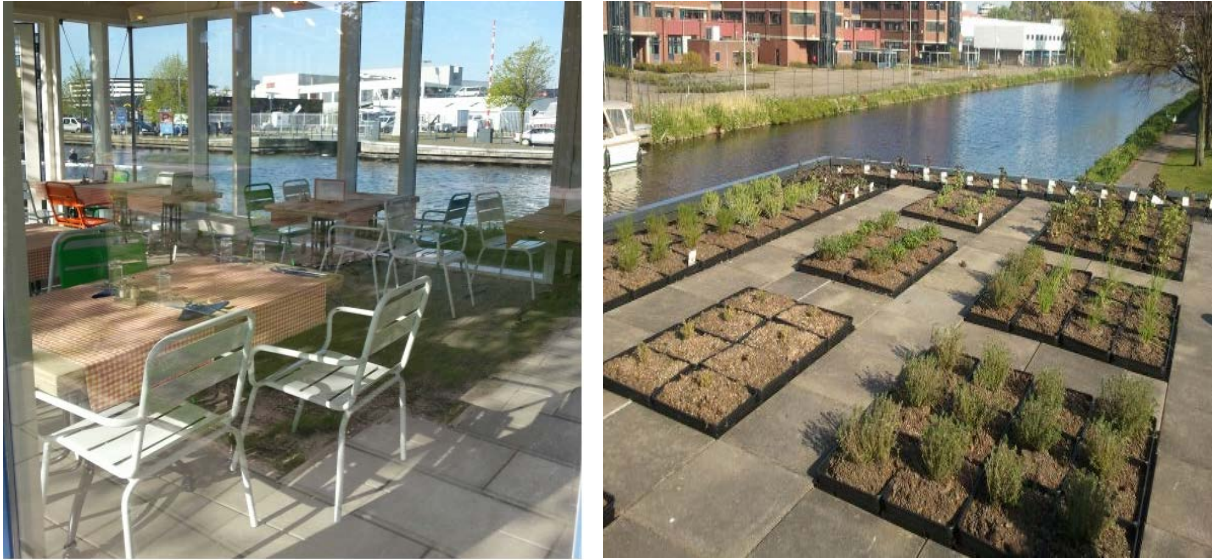


Figure 5 Kobus restaurant (1, Figure 4),

Located in the Laak neighborhood. On the roof (right picture), herbs are grown which are used in the restaurant (left picture).



Figure 6 Community garden (2, Figure 4) in the neighborhood Laak.

The community garden has several plots which people can rent. Furthermore, on this location a school garden and a city farm (with cows, sheep and pigs) is located. All these gardens and farms are not part of Musa's activities, but sometimes teaching activities take place in the school garden.



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Figure 7 Cooperatief Eigenwijzer (3, Figure 4) is located at the Ketelstraat

It has several rooms used by Musa together with other initiatives of the Cooperatief Eigenwijzer. At the backyard of the building, is his backyard garden (right picture) and a small greenhouse

7.1.3 Products

The production season is 8 months a year, from February till September. Musa has plans to produce year-round with the implementation of greenhouses.

The products that Musa provides are vegetables, herbs, seedlings and compost. Vegetables, seedlings and compost are mainly produced in the backyard garden (in the backyard of the building of Cooperatief Eigenwijzer) and the herbs are mainly produced in the rooftop gardens. The products are mainly for people from the neighbourhood and restaurants. The retail of the products is done in several ways. The retail for people from the neighbourhood is mainly done with the Community Supported Agriculture (CSA). People can get a CSA membership and pay either 250 euro per year in return for dinners and workshops during the year, or pay 11-18 euro per week in return for a bag with vegetables of the week. Besides this, vegetables and seedling can be sold directly in the backyard garden, during week-days. The compost is not sold but given to people from the neighbourhood in exchange for the organic waste they bring to the compost pile. Direct contacts with restaurants is the main retail method. A part of the vegetable and herb harvest is used in the restaurant kitchen of Kobus. The herbs from the Kobus roof garden will also be sold directly to the other restaurants, like Savelleberg in Voorburg. Musa has plans to compost the organic waste of the restaurants that buy his herbs and use the compost for the herb beds in the roof garden, in order to close nutrient cycles as much as possible.

In addition of these products, Musa provides education for school children in cooperation with NME (nature- and environmental education). Besides that, he sometimes gives workshops for people that are interested in urban gardening. Once a month he organizes a cooking workshop for young people from the neighbourhood with a dinner afterwards for elder people, to enhance social cohesion and share knowledge between generations. Volunteers work in the gardens to learn about food production and processing. Furthermore, Musa is involved in the project of Gezonde Gronden to create edible balconies in the neighbourhood. In this project, he shares his knowledge about urban gardening with the people that want to produce food on their balcony, backyard garden or on the roof.

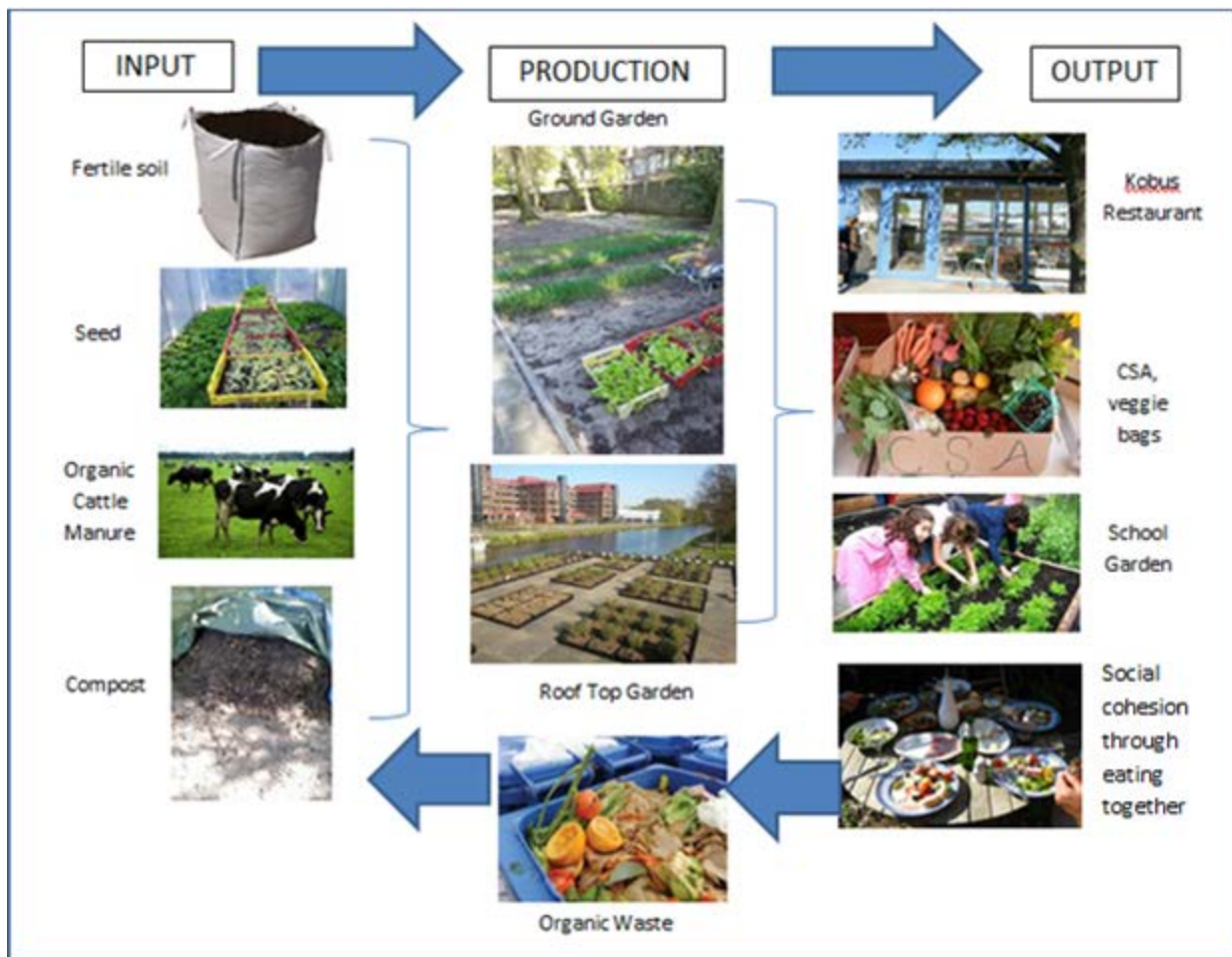


Figure 8 Resource Flows within and around the Urban Agriculture Initiative Elemam Musa

Inputs: fertile soil (bought), seeds (bought and some produced in his garden), organic cattle manure (from organic cattle farm) and compost (from organic waste of neighbours). Production: backyard garden (used for vegetable, seed and compost production), rooftop garden (Kobus restaurant), rooftop garden (no picture). Output: Kobus restaurant (that uses some crops from the gardens), CSA (members that buy vegetables), school garden (education of school children), social cohesion (once a month, the people from the surrounding neighbourhood gather in the cooperatief to eat together).



7.1.4 Stakeholders

Musa's gardens are managed by three permanent workers and around ten volunteers that come from different backgrounds and participate in various activities of the farm. The project has become popular in the city and has established a good network which enables him to work together with other organizations or groups in different urban agriculture activities. Furthermore, he is closely connected with Cooperatief Eigenwijzer and collaborates with people from these networks.

The popularity of the project was achieved rather spontaneously, which made the project successful. The only marketing that has been used in the project comes from the website, business card, and personal communication. The cooperative is currently improving the communal management skills and just established a worker that will be focused on the promotion and the public relations of the project.

7.1.5 Process

The organic waste that is produced within the project is composted in the backyard garden together with the organic waste of around 150 families that live in the surrounding neighbourhood. The families receive a part of the compost in exchange for the given organic waste. Additionally, animal manure and blood from organic farms are used to enrich the compost. These organic farms are located in the eastern part of The Netherlands (Drenthe). According to Musa the manure comes all the way from the east because it is difficult to find organic farms closer to The Hague.

Two types of compost are being produced. One is generated from organic waste of organic production; the second is generated from organic waste of conventional production. It is important to divide these different kinds of organic waste for Musa because he produces organically and avoids compost that might be polluted with chemical pesticides and fertilizers from waste of conventional production. The risk of pollution for the compost is relatively high, because organic wastes from households is not always properly separated.

The main part of the compost is used to improve soil conditions of the backyard garden. The garden soil is sandy and thus poor in nutrients with a high drainage rate. The compost is important for the enrichment of the sandy soil with nutrients, to improve the soil quality and potential to produce more and better crops. During autumn and winter the leaves of the large trees in

the garden are used as an input for the compost. The compost is used three times a year, in February, April and July. Crop rotation is used to neutralize the soil pH. To improve the water holding capacity of the sandy soil, cardboard is buried within the soil under the plants. The layer of cardboard under the plant roots holds on water and thus enhances the soil humidity. Above the cardboard, a mix of the sandy soil with compost functions as the plant bed. The cardboard degrades within one and a half year and is afterwards mixed with the soil.

Organic seeds and soil for the seedlings that they grow are bought. All the production is organic, so no chemical pesticides and fertilizers are used. The gardens are in the process of obtaining an organic certification. The conversion process started in 2008 with this certification process, that takes around seven years. If everything goes well, the backyard garden will receive an official organic certification label around 2015.

7.1.6 Potential

The start-up phase of the project was very challenging. However, the project developed and expanded with two new locations. Currently, Musa has three gardens locations: the backyard garden and the two roof gardens. Musa mentioned that he saw the project going into the 'second phase of growth and expansion'. He saw some challenges in producing food in the city, because of contamination risks from soil pollution, air pollution and compost. However, he mentioned some plans for the future that might be a solution to overcome these challenges (Table 4).

Table 4 Challenges of Contamination and Potential Solutions

| Challenge | Solution |
|--|--|
| Contamination risk from soil pollution | Roof based gardens to avoid ground soil |
| Contamination risk from air pollution | Greenhouses to avoid fine dust deposition |
| Contamination risk from compost | Separate waste from conventional and from organic agriculture and make separate compost piles. Use only the compost made from waste from organic agriculture |



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Musa also sees much potential in the exploitation of urban agriculture in The Hague, because of the positive influences of urban agriculture such as awareness, social cohesion and greening of the city. Additionally he sees much potential in the re-use of organic waste in urban agriculture.

The projects of Elemam have a positive effect on:

1. Health (fresh and healthy crops for the local market)
2. Organic waste management of the neighbourhood
3. Nutrient recycling
4. Social cohesion
5. Education about food production
6. Citizen participation in gardens and workshops

This case study showed the potentials of urban agriculture in general and the potential to use urban organic waste within urban agriculture. The recycling of organic waste into compost for food production does not only improve the local nutrient recycling, but also decreases local food production costs, increases social cohesion, stimulates citizen participation in the neighbourhood and creates a place for education about food production and waste management (Figure 9).



Figure 9 Schematic representation of the activities of Elemam Musa within and around his urban agriculture initiative in The Hague

7.2 Gezonde Gronden

7.2.1 Introduction

Gezonde Gronden is an initiative that supports city programmes in The Hague to raise awareness of citizens about healthy soils and food. This initiative gives courses and trainings in permaculture and in how to produce food on balconies and gardens in the city of The Hague. Some courses are given in the office of the initiative, in communities, in the balconies and others in the city



Permaculture Garden

gardens. They support school programmes for the creation of green playgrounds. They also support people who want to create gardens in public spaces in The Hague and Leiden. They have worked together with Foodprint project 2010 to construct a permaculture garden in the Zuiderpark (managed by Menno Swaak) in The Hague. This initiative also gives courses to dairy farmers around Leiden and The Hague about closing the nutrient cycle in agriculture.

Gezonde Gronden also collaborated with the Haagse Milieu Centrum on two reports, '*Sluit de voedselkringloop!*' [Close the nutrient cycle] and '*(H)eerlijk Haags'*' [Lovely/Fair The Hague] in 2010 and 2011 respectively. These reports have been handed to the municipality and were the basis for the food strategy of The Hague.

Gezonde Gronden developed out of the Aquarius Foundation, which is now called NVLV. Gezonde Gronden started in 2006. Until 2011 it was a citizen foundation about healthy soils, but from February 2011 it was renamed to a foundation with a board. In September 2006, Heleen van Haaften, Jelleke de Nooij-van Tol and Bessie Schadee discussed the worrying situation of the polluted Dutch soils. The awareness of the people was their main goal, because in their opinion, the government and the business sector payed little attention to the soil problem. In the summer of 2007 Heleen van Haaften and Bessie Schadee studied, with the support of Fonds 1818, the willingness of inhabitants of The Hague and the farmers from the surroundings of Leiden to work together. In November 2007, they sent the report to Fonds 1818 which



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included ideas on initiatives that could arise. Some of these proposed initiatives have already been realised.

There are four main projects where Gezonde Gronden is currently working on:



Edible Balconies

Edible Balconies

The Edible Balcony project is the major project of Gezonde Gronden which started in the summer of 2009. It consists a course of seven sessions, there are between 10 and 14 students per course. The courses take place close to the houses of people who are involved. Often these courses are (co-) financed by the municipality, the Housing Corporation (*woningbouwcorporatie*) or by the support of a fund.

Edible Schoolyard

The edible schoolyard project started at the end of 2010 in The Hague and was initiated by Fonds 1818. From 2011 a similar project began in the city of Leiden. Gezonde Gronden supported schools to create green

schoolyards. The green schoolyards also include edible vegetables. In this gardens, the children have the opportunity not only to play in a green environment with water and sand, but also to learn about planting, sowing, and harvesting on a healthy soil.

Edible Windowsills

The edible windowsill project is a part of the Edible Balcony project. The window sills can be used as a place for growing seedlings or vegetables, herbs and flowers.

Edible everywhere- Permablitz De Groene Mus.

Besides to the edible schoolyards and balconies, Gezonde Gronden also supports other projects related to the goals of the organisation, for example “guerrilla gardening” in The Hague and Leiden. Another project that is supported by Gezonde Gronden is the Permablitz De Groene Mus in which residents of the neighbourhood around *Meester de Bruinplein*, in the center of The Hague, converted a piece of unused land into an edible garden. In this garden there are many fruit trees and a strawberry tower. Many people also use this garden for social reason.

The inspiration for the Gezonde Gronden Foundation partly came from the ‘Global Action Plan’ (GAP), which started in 1986. Bessie Schadee was one of the founders of GAP. The project was initiated to raise awareness of citizens on the resources used in their daily life. It worked with groups from a same

neighbourhood, called Ecoteams. They measured the energy consumption and waste production for the whole team and gave feedbacks every month so the teams can share experiences and maintain their motivation. The project showed to people what they can do to live in a more sustainable way.

The vision of Gezonde Gronden is to have healthy soil in order to facilitate sustainable food production. The mission of Gezonde Gronden is to maintain fertile soils and rehabilitate them in The Netherlands, to provide knowledge to the society, to create a platform for sharing experiences and to improve the access to healthy and sufficient food.

The foundation tries to reach this by educating citizens about healthy soils and permaculture, by supporting people and schools in the creation of edible gardens and balconies in the city and by training people who want to teach gardening in these places. The underlying values are the promotion of a multicultural society and the principles of the Earth Charter (a statement to promote a just, sustainable and peaceful global society in the 21st century).

In the meantime, they also want to make people aware about food problems. Where the food comes from and how it is produced. They want to inform people about the soil problem in The Netherlands and motivate them to produce their food by themselves.

7.2.2 Edible Balcony Project

In this case study, the focus will be mainly on the Edible Balcony project which is the largest project of Gezonde Gronden. It started in 2009 in the cities of The Hague and Leiden. Now they are developing in the cities of Schiedam and Voorburg.

The Edible Balcony project consists of a seven session course to provide knowledge mainly about how to grow food in your own balcony. In the first three sessions, the whole group of participants get basic knowledge about growing food in balconies. In the 4th session, teachers go to participants' balconies and direct them to plant the seed they have germinated before in the healthy soil. After that, a cooking session will be held within groups to learn about cooking with vegetables and herbs from your own balconies. After six weeks, the teacher comes back to those balconies to receive feedbacks and provide further help. Few months later, in the final session, the teachers will help the participants to get ready for the next production season (Figure 10). Most of the time the courses take place in the participants' community or close to where they live.

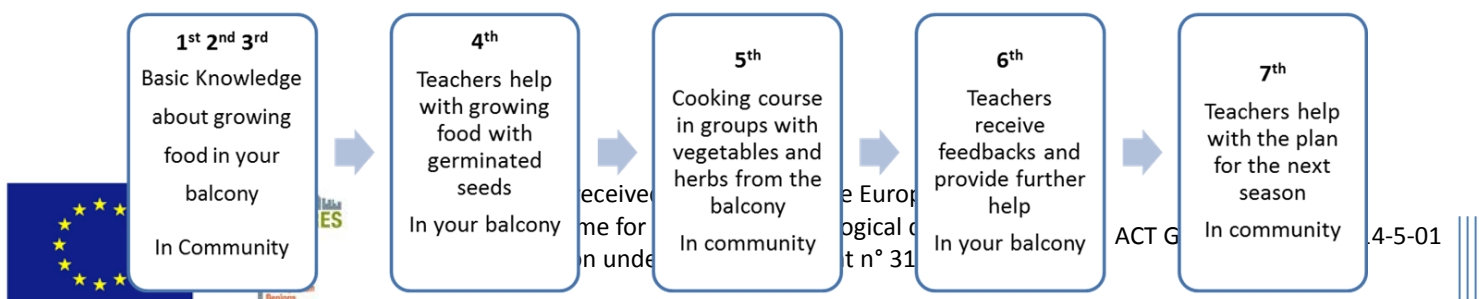


Figure 10 Course Description of Edible Balcony Project

7.2.3 Products

There are two kind of product in the Edible Balcony project which can be divided in direct and indirect products (Table 5).

Table 5 Products of the Edible Balcony Project

| Direct Product | Indirect Product |
|---|--|
| <ul style="list-style-type: none"> • Education Services • Awareness of healthy soil and healthy food • Multicultural Sustainable Society | <ul style="list-style-type: none"> • Food (vegetables and herbs) • Respects • Healthy Diet • Social Cohesion |

Direct product

The most important and direct product the project provides is the education services that they give to the society. By giving courses to a group from a neighbourhood or individual, they transfer knowledge and empower the citizens to grow food by their own. Besides the skills, the education also contributes to the awareness of the citizens about healthy soils and healthy food. By acquiring information about growing food and growing the food by themselves, citizens start to care more about food related issues and start to think about questions that they never asked before. These can be questions such as: where does the food comes from, how is the food grown or even what does the food look or taste like? This are basic questions about food that became invisible in the modern industrialized food sector. The raising of awareness about food and soil from the consumers can not only help them to live healthier but can also help to stimulate changes in the modern food industry. In addition, the Edible Balcony project promotes a multicultural sustainable society. A mixed culture group in the courses helps people to get to know the other culture. After the course, they become friends and learn to respect different cultures.

Indirect product

As a consequence of the courses, citizens start growing their own food and harvesting it. The food from the balconies is used for their own consumption and not for selling. Besides common vegetables that can be found in the market, Gezonde Gronden encourages citizens to grow vegetables that are disappearing from the market. These vegetables are grown for their taste, medical use or diversification of people's diet. Another kind of crop that is

normally grown are herbs, which are suitable for small spaces. Some of them are very beneficial for people who use herbs in their traditional food, as the herbs in the supermarket in The Netherlands are relatively expensive. In some cases, women gain more respects from their husbands because they save money for their families by growing herbs. With the harvest from participants' own balconies and the awareness about healthy food, people can obtain a healthier diet in their life and they can improve their livelihood. The social cohesion in the neighbourhood is an additional benefit of Edible Balcony project, because courses not only provide knowledge but also a platform for exchanging and sharing. Participants can exchange products, seeds and also share their harvests, experiences and knowledge. Through this process social cohesion is built among people.

7.2.4 Stakeholders

People who are related with the Edible Balcony project and form the network are mainly teachers, individual or groups of participants, the municipality, foundations and the housing corporations.

Teachers for the Edible Balcony project come from Gezonde Gronden or are trained by the initiative. By doing the training of balcony teachers, more people can help to spread information and knowledge. The teachers spread the philosophy of the initiative to the students of Edible balcony project.

Participants of Edible Balcony are often from very diverse cultures and often come from low income groups. Some of the Edible Balcony participants are low educated or not fluent in the Dutch language. Part of them are groups from a community and another part is consisted of individuals. All the participants can deliver information from the courses to their community and invite more people of their neighbourhood to grow food in their balconies.

The courses are often financially supported by the municipality. Participants have to pay only a small fee or nothing in some cases for joining the courses because of the municipal grants. Next to the municipality, Gezonde Gronden also works with private foundations and housing corporations (*woningbouwcorporatie*) in order to find funds for poor communities which want to start up their own balcony project.

7.2.5 Process

Seeds, seedlings and small vegetable plants

Gezonde Gronden promotes the participants to do the production organically and encourage them to use organic seeds. They deliver organic seeds at the first lesson of Edible Balcony hand by hand and one by one, to show to treat the seed as real treasure. Organic seeds are bought from The BOLSTER (a



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Dutch organic seed breeder and retailer). Some seeds are also provided by Gezonde Gronden, from their own plants. The seeds for their own plants also were bought from The BOLSTER. The same situation goes for the seedlings and small vegetable plants, which are always organic. Some are from their own crops and the other comes from organic growers.

Soil

Gezonde Gronden also offers soils to participants. They develop their own healthy soil, which is made from grass cuttings and other organic waste from an organic farm. They enrich the soil with living organisms, sea minerals and ground powder from different stones and clay. They also add some bacteria and other soil organisms to the new soil.

Waste: worm composting

In projects of Gezonde Gronden, in addition to delivering knowledge and skills on how to grow food and awareness of what to eat, also awareness of waste re-use is created in their education programs. They encourage the participants to use their food waste for composting, especially worm composting, in their balconies or gardens and use the compost for food production.

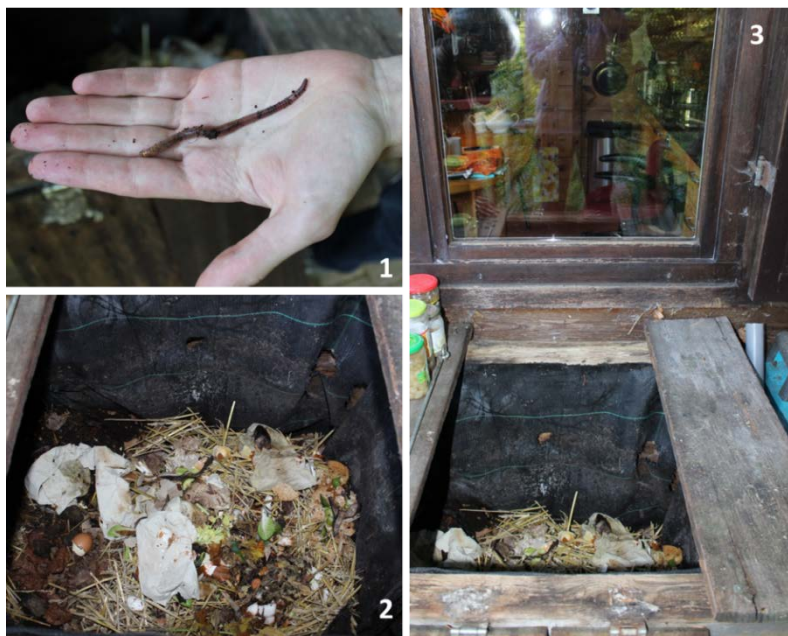


Figure 11 Worm compost

Picture 1: worm; Picture 2: compost bin; Picture 3: compost bin(waste can be throw from kitchen directly into the bin)

There are mainly three kinds of composting method: hot composting, cold composting and worm composting. The hot composting is fast but takes efforts. And the cold composting is easy but takes time. Comparing to the previous two, worm composting is both quick and easy to compost at home. By worm composting, it only take around 6 weeks to process waste into a fertile soil, worms go up and down in the waste, eat the waste and pull inside. In the end, the manure of the worms contributes to soil production.

Gezonde Gronden introduces worm composting in their balcony courses. They also implement a worm compost bin (Figure 11) in one of their Edible Schoolyard projects. In the future, they are planning to have a communal worm composting bin, to have a person collecting waste from the neighbourhood, compost waste together and give back compost to the residents.

7.2.6 Potential



Soil from worm composting

The special thing of Gezonde Gronden, is the promotion of creating healthy soils by providing knowledge about soils and food production. Gezonde Gronden also helps citizens to have access to healthy food. Their focus lies on the citizens, they want to achieve the goals in a bottom-up process. The initiative wants to increase awareness about how food is produced, and also the importance about sustainable food production. They help people to become self-sufficient and independent on food and gain pleasure from growing food. This initiative contributes also to a multicultural society by creating social cohesion between different cultural groups. People from different cultures can meet each other and work together through the mobile edible projects of Gezonde Gronden in gardens and balconies in many neighbourhoods. They respect each other's culture and learn agricultural knowledge from different cultures.

Gezonde Gronden promotes closed cycle agriculture and reuse of waste. They encourage worm composting and organic food production, all seeds that are used are organic and preferably the waste for compost production is of organically produced products. A typical example is the way seeds are given to the attendees of the balcony course to show that the seeds are a real treasure. It also teaches the people how to store the seeds for the next year. They also promote to grow vegetables that are disappearing from the market, they also provide cooking courses focussed on cooking from your own gardens, this lecture shows people acquainted with different recipes with vegetables from the balcony, but also makes people aware of less common vegetables and how they can be used in meals.

Another interesting thing about the Gezonde Gronden is that they search for funds from the municipality, private foundations and the housing corporations. The initial purpose of the housing corporations to provide grants is to construct public areas in the neighbourhood. However, with the help of Gezonde Gronden, this money can also support the participants to grow food in the green areas of the public environment.

The main risk of using organic waste in urban agriculture is pollution of the compost, according to Gezonde Gronden. In modern agricultural practices a lot of pesticides are used. These also end up in the organic waste from these products. These pesticides are harmful for the organisms in the composting process. Therefore only waste from organically produced products should be used in the worm composting process. The bad waste separation rates also create problems. People are demotivated to separate waste, partly because



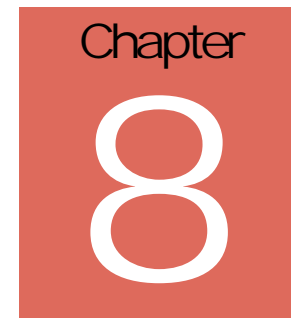
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the municipality did not collect the separated waste separately in the past. Nowadays there is an increase in efforts of the municipality in composting organic waste.

In the future, Gezonde Gronden wants to upscale the balcony project. So far around 350 balconies are transferred in the project, but there is still a demand for more training sessions. To do this, there are currently people educated on how to give the training sessions. The balcony courses are now available in The Hague, Leiden, Schiedam and Voorburg, but in the future more cities should follow.

There is also a plan for promoting the creation of a communal organic waste collection network. In an apartment building, one person gets a job of collecting organic waste from the apartments, and compost it at the apartment complex using worm compost. The person who collects the waste gets a small income from this, this way employment opportunities are created. The way the person collects the waste, by going to every apartment, creates a system of social control, the collector notices when things are wrong with an occupant. This person can act as a connection between occupants and increase social cohesion. The produced compost can be used on the balconies of the apartment building, but also around the building where gardens can be created. In these gardens people can work together and create a link between each other. This plan will be launched soon at a secondary school in Schiedam, where pupils will collect school garden waste and leftovers from lunch for composting. It is also planned to be discussed with a councillor from the municipality.



Chapter 8 Discussion and Conclusion

Current status of organic waste management

The organic waste separation and collection in The Hague is low compared to the national average and there is a declining trend in the organic waste collection from households. Several policy changes tend to decrease the separate collection of organic waste in The Hague instead of the planned increase of the municipality and changes in the organic waste management system encounters opposition from stakeholders that benefit from the current system and need to recoup their investments. These recent developments in the municipal organic waste management decrease the motivation of citizens to separate organic waste, which in its turn decreases the motivation of the municipality to collect organic waste separately, this may create a vicious circle. It is remarkable that the municipality in policy documents only refers to the CO₂ emission reduction benefits of separate waste collection, and with this puts organic waste at the lowest priority. The municipality does not look at other benefits of the separate collection of organic waste such as educational benefits, soil quality benefits as well as nutrient recycling. On the other hand, with projects such as the chicken pilot and school gardens, the municipality shows interest in innovative recycling of organic waste. The current status of organic waste management in The Hague can be improved a lot. One of the most promising improvements in organic waste management is urban agriculture.



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Current role of urban agriculture in organic waste management

Currently, there are already around 100 urban agriculture initiatives in The Hague that produce food in public spaces, community gardens, empty offices, schoolyards and private spaces. Some of these initiatives focus on education by providing courses and workshops about urban gardening, some enhance healthy food consumption with locally produced food, and some others are commercial oriented through innovative production. Different stakeholders consisting of citizens, organisations, businesses and the municipality collaborate with each other. Until now five platforms have been created that host many projects of urban agriculture.

The municipality of The Hague has an increasing interest in promoting urban agriculture. The municipality has established a Food Strategy for The Hague and is currently doing a study about urban agriculture activities in the city. Even though the municipality is aware of the economical, ecological and social benefits to use organic waste in urban agriculture, it is not (yet) much involved in the combination of both except for the composting project in the school gardens and the provision of free compost from municipal waste to citizens once a year. This lack of involvement is mainly because the municipality is waiting for the bottom-up movements to arise. Besides that, the municipality has a financial interest in the municipal waste, what limits their motivation and ability to stimulate the alternative use of the waste.

In this study, some urban agriculture initiatives are studied that make use of urban organic waste on an innovative way. These initiatives mainly reuse organic waste through composting. Some community based initiatives use organic waste from their communal garden and/or households for composting and use the compost for their communal and/or private gardens. These projects are all done on a small scale by the participants of urban gardens. Until now, most of them don't make use of external organic waste. Some entrepreneurs are experimenting with innovative ways to use organic waste for the production of marketable products. They mostly aim to use organic waste of other businesses, like coffee residues of cafe's, in order to increase the sustainability of the city.

The case of Elemam Musa reflects the potential to use urban organic waste within urban agriculture. Organic waste is recycled into compost for food production by collecting kitchen waste from household in the neighbourhood. The projects of Musa contribute to the provision of healthy local food, social cohesion and citizen participation in the neighbourhoods and create a place for education about food production and organic waste recycling.

The case study of Gezonde Gronden reflects the potential of urban agriculture to make people aware of problems with food production and soils. It promotes the closing of nutrients cycles in urban agriculture and the reuse of

waste. The most important characteristic of their projects are the promotion of organic production, worm composting, a healthier and diversified diet,

value organic wastes as a nutrient resources and to reduce their costs for food consumption.

Potential role of urban agriculture in organic waste management

There is a growing awareness and interest for local food production and an increasing amount of vacant lots in The Hague. Besides, a Food Strategy has been set up by the municipality. All these phenomena show the potential to stimulate further expansion of urban agriculture in this city. Although the organic waste management is not yet integrated in the Food Strategy, the attitude from the municipality is open to take it into account for future plans. Citizen initiatives are very important to increase the bottom-up movement and motivate the municipality to stimulate further development. Although few citizen initiatives take real actions in integrating organic waste management in their practices, most of them are already aware of the benefits and open to change.

The potential role of urban agriculture in organic waste management is that it offers a sustainable opportunity to reuse waste and produce food on a local level. It is promising that there are already quite a number of trials going on in The Hague that investigate a more sustainable organic waste management. Projects like the chicken pilot and De Schilde contest show the potential of organic waste recycling in urban agriculture and make it possible to expand these ideas in scaling-up.

Organic waste is mostly used in a composted form. Stakeholders have different views on the contamination risk of using compost that is derived from urban organic waste. Following from the data gathered in this study, it can be concluded that pollution with heavy metals is in general not a risk. Besides that, according to Paul Römken (Soil expert from Wageningen University), there is no significant risk of using compost from urban organic waste.

The most sustainable way of organic waste management is the composting of organic waste at home and using the compost in the garden or balcony at home. This way of composting assures no transportation and collection costs. Gezonde Gronden is now promoting this kind of organic waste management, which is very promising for the future. At this moment, the home composting is expected to have only a small contribution in the total flows of organic waste, but with a rising interest in growing food at home, this can potentially increase. Composting the waste at community level requires more effort of the citizens. At the same time, it create social cohesion among citizens and generate more social benefits.



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The example from the Philippines shows that a community participation approach can stimulate the integration of organic waste management into urban agriculture. The government participate initiatively in order to effectively promote the waste management on a community level. This shows that not only a bottom-up approach can improve the organic waste use in urban agriculture. The involvement and support of the municipality is also very important. This is confirmed by the New York case, where effective policy making and active support promoted urban agriculture and made the use of organic waste in urban agriculture more efficient. In The Hague, the municipality has shown its motivation for a similar approach, but a more active approach of the municipality is required. The combination of a supportive government and motivation of the citizens to take action by themselves is expected to stimulate the integration of organic waste into urban agriculture and make it happen.

This study showed that the current situation of organic waste management in The Hague could be improved. This requires action of both the municipality, as well as the citizens of The Hague. Urban agriculture receives increasing attention from the public, with several platforms focused on urban agriculture and many new arising initiatives. Also the municipality has an increased attention to urban agriculture. The use of organic waste in urban agriculture is currently of small scale, several innovative uses of organic waste in urban agriculture are described. The potential of the use of organic waste is mainly limited to this small scale, but has several positive externalities that make the use of organic waste in urban agriculture a positive contribution to society.

The use of organic waste in urban agriculture creates several positive health, social, economic and ecologic externalities, but the most important additional benefit is the educational effect, showing people how food is produced and making people aware of the benefits of recycling organic waste. Urban agriculture can create more awareness to citizens about organic waste and its potential to be used as a resource. This way, urban agriculture can contribute to a more effective waste separation and effective organic waste management.

Recommendations

This research shows that there is a potential of urban agriculture to improve organic waste management in the Hague. However, there are several issues that should be implemented from the different stakeholders in order to achieve an efficient organic waste management in The Hague. Our recommendations are the following:

- 1. The municipality should motivate citizens to properly separate the organic waste. This could be done by giving them household compost bags and by creating spots for organic waste collection.***
- 2. The municipality of The Hague should stimulate the organic waste management in urban agriculture and integrate it in the Food strategy.***
- 3. More initiatives in the city should integrate the use of organic waste in their food production and bring awareness and knowledge to the citizens. They should also quantify their input and their output in food production.***
- 4. Further research should be focussed on the following issues:***
 - The perception, awareness and motivation of citizens to separate the organic waste.***
 - The quantification of the benefits of using organic waste in urban agriculture.***
- 5. The cooperation of different stakeholders should be maintained and enhanced in order to achieve the integration of organic waste management within urban agriculture.***



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Annex 1. List of key informant interviews

| Name | Organisation | Date | Method | Description |
|--------------------|-------------------------|-----------|----------------------|--|
| Berit Piepgras | March | 10-4-2014 | Visit | Architect |
| Bessie Schadee | Gezonde Gronden | 16-4-2014 | Visit | Founder Gezonde Gronden |
| Eleman Musa | Cooperatief Eigenwijzer | 16-4-2014 | Visit | City Farmer |
| Özgür Savas | De Schilde | 17-4-2014 | Meeting municipality | Entrepreneur in De Schilde project |
| Marcel Roeleveld | Entrepreneur | 17-4-2014 | Meeting municipality | Entrepreneur |
| Ed de Jager | Municipality | 17-4-2014 | Meeting municipality | Urban agriculture |
| Ger Kwakkel | Municipality | 17-4-2014 | Meeting municipality | Head Nature- and Environmental-education |
| Tom Voorma | Municipality | 17-4-2014 | Meeting municipality | |
| Paul Römken | Alterra Wageningen UR | 23-4-2014 | Visit | Sustainable soil management |
| Piazza New Babylon | Bar/Restaurant | 5-4-2014 | Phone | |
| Boris Roodenburg | Urban Crops | 5-4-2014 | Phone | Entrepreneur |
| Tom Pistra | Haagsmilieucentrum | 6-4-2013 | E-Mail | Environmental activist/Expert |
| Conny Voordendag | Emmas'hof Stadstuin | 9-4-2014 | E-mail | Urban gardener |
| Annette Osinga | Zeeheldentuin | 8-4-2014 | E-mail | Urban gardener |
| Mathilde Peen | City Spices | 23-4-2014 | E-mail | Urban gardener |

Annex 2. Case studies - Interview questions

1. General part

- When did the project started?
- Who started with this project?
- Why do you started with this project?
- Can you give us a brief history of the development of the project? (location, ownership, farm size, expansion)
- What is the concept of this project?
- Do you have a mission/vision?
If yes,
- What is the mission of the project?
- What is the vision of the project?
If no,
- What do you want to achieve in your project?]

2. Production

- What are the main products that you produce?
- What do you do with your products? Are they for own use? Do you sell them? Where?
- How much do you produce?
- Is the production enough to cover all your costs or do you have any financial support?

3. Stakeholders

- What is the (spatial and social) situation/condition of surrounding neighbourhood?
- How many people are working directly in this project? What is their role inside the project?
- Which other persons/groups/organizations are involved in the project? How are they involved? (input (seeds, land, soil, fertilizer); output (consumers, shops); other UA initiatives, organisations, cooperatives, government etc.)



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- How is the relationship of these persons/groups/organizations with each other and with this project?
- What is the response of the consumers towards the product? (inputs/organic waste)
- Are you collaborating with the municipality? If yes, in which way?
- How were these connections created?
- Do you have any marketing strategy?
- Are you involved in other urban agriculture initiatives in The Hague? If yes, how??

3. Process

Organic waste

- Do you produce any organic waste? Where does it go to?
- Do you use organic waste in your production process?
- How is organic waste integrated in the production process?
- Where does this organic waste comes from?
- How do you collect the organic waste? How much?
- How often is this organic waste used?
- How much organic waste is applied every session?
- What are the costs of these organic waste? (if applicable)

Other inputs

- Do you use any other input in your production system?
- What kind of input do you use?
- Where does these input come from?
- How often are these input used?
- How much input is applied every session?
- What are the costs of these inputs?

4. Potential

- Are you satisfied with the way you manage the organic waste?
- What are your plans for the future to change the organic waste management?
- What is special about your project compared with other projects in The Hague?
- Do you think your system has the potential to be applied in other locations?
- Do you have other suggestions for Urban Agriculture initiatives of how to make use of organic waste?
- In your opinion, what is the potential/opportunities/benefits of Urban Agriculture to re-use organic waste? (financial, social, ecological)?
- In your opinion, what are the challenges/constraints/limitations/risks of Urban Agriculture to re-use organic waste?(financial, social, ecological)
- Do you know about possible contamination risks of using organic waste in agriculture? Do you have any solutions to prevent this in your project?

Extra

- Do you have additional documents, data, leaflets or brochures for us?



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