

(Economically viable) urban agriculture for environmental sustainability

How could it fit in The Hague?



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sustainability
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Abstract

Cities need to become environmental sustainable, they have to reduce their ecological footprint by reducing waste, CO² emissions, use land sustainably and take care of the biodiversity. This research took The Hague as an example to investigate the possibilities for an urban agriculture initiative to contribute to this urban development towards environmental sustainability. Secondly it looked for possible interests of urban stakeholders in such an initiative. Finally it aimed to identify a set of design criteria for to develop an urban agriculture initiative that contributes to environmental sustainability in The Hague and functions in the interest of urban stakeholders.

Trough interviews with potential stakeholders six functions other than food production have been identified:

- 1) Sustainable land-use
- 2) Enhance ecological citizenship
- 3) Reduce food miles
- 4) Production of green energy
- 5) Closing urban waste cycles
- 6) Improve urban climate

With the support of a literature review for each function a first set of design criteria have been identified that reflect requirements such as suitable production methods, and type of locations for a potential initiative. Furthermore the interests and expectations of potential stakeholders in such an initiative have been identified.

The research concludes that urban agriculture has potential to contribute to environmental sustainability and stakeholders are interested to participate in an urban agriculture initiative. However in order to develop an initiative it is necessary to set preferences as not all functions can be combined on every type of location and not all stakeholders have an interest in all functions. The research also identified a potential conflict between the interest of an organization as supporter or as participant. Although the organization recognized potentials of urban agriculture for their business they did not yet take responsibility. It therefore recommends to first start to identify a type of location. Than it is possible to more specifically discuss the interests of potential stakeholders in an urban agricultural initiative.

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This research demonstrates why and how The Hague can integrate urban agriculture in its urban development. It demonstrates urban agriculture is multifunctional, and therefore can connect different economical sectors.

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Introduction

In the book 'Hungry Cities' (Steel, 2008) it is described how food shaped cities; for a long time the boat was the cheapest method to supply cities from foods such as grains. But the introduction of the train made it possible to easily transport products, also living animals, over land and this has changed the design of cities. Cities were no longer dependent on a location next to water. Nowadays aviation is a common means to transport food all over the world, and cars a common transport mean to collect our food. As a result cities can develop and the physical distance between food production and consumption is large.

Scholars as well as consumers are critically reviewing the globalization of food production and consumption, together with the developments in the food sector. In the meantime farmers are under pressure, the economics of scale puts small scale farmers out of business as they cannot compete to the world market price. In reaction to these developments urban agriculture is an upcoming phenomena in Western Europe. Urban agriculture is argued to localize food production, make food production transparent and reconnects producer and consumer. But urban agriculture has more values, in developing countries urban agriculture is accounted to reduce poverty and increases the resilience of the poor. In western countries urban agriculture is argued to create social cohesion and offer education. (Bryld, 2003)

So urban agriculture seems to do more than just producing food. In this context InnovatieNetwerk, an organization that develops innovations in the green sector, commissioned Stroom to identify possible contributions of urban agriculture to the urban development in The Hague, to identify the requirements of stakeholders that are could participate in such urban agriculture initiative and to develop design(s) of urban agriculture initiative(s). Stroom The Hague is an independent centre for art and architecture and focuses on urban environment. This project is part of their program Foodprint, food for the city that started in 2009 and aims *"to increase people's awareness of the value of food and to give new life to the way we view the relationship between food and the city. The program invites artists and designers to develop appealing proposals on the subject, while at the same time establishing a clear connection with entrepreneurs, farmers, food experts and the general public."* (Website foodprint)

The project took current urban development pillars; health, education, social cohesion, employment food security and environmental sustainability as a starting point to investigate possible contributions of urban agriculture. One of these pillars; environmental sustainability, has been the starting point for this research.

Innovatienetwerk and Stroom thought urban agriculture could contribute to these pillars, and stakeholders could therefore have a potential (economical) interest in urban agriculture. This research is a first attempt to connect the urban development pillars with the potentials of urban agriculture. Finally this research 1) investigates the relation between environmental sustainability and urban agriculture, 2) aims to identify design criteria in order to illustrate a possible urban agriculture initiative, and 3) aims to identify interests and expectations of potential stakeholders.

Potential stakeholders of an urban agricultural initiative have been interviewed, the collected empirical data is than reinforced with literature.

First from this two data sources possible design criteria were deprived for an urban agriculture initiative. Secondly from the empirical data the interests and expectations of

stakeholders in and of an urban agricultural initiative were identified. Finally recommendations are given on how to use the data and continue to in the project.

The first chapter contains an introduction in the themes on urban agriculture, sustainable cities and environmental sustainability and a description of the current situation in The Hague concerning environmental sustainability and urban agriculture, it further explains the objective and questions stated for the research. Chapter two explains the methods used to collect the data. Chapter three is a literature review, which gives a short elaboration on the identified functions for urban agriculture in The Hague, The chapter aims to demonstrate how and why an urban agriculture initiative could contribute to the mentioned functions. Chapter four contains the results of the empirical data structured per identified function. Chapter five, discusses the collected data in order to identify design criteria. The conclusions are demonstrated as design criteria per potential function, the related products scale and locations. Finally chapter six ends with a set of recommendations for the continuation of the project.

1 Setting the scene: urban agriculture and sustainable cities

In this chapter starts with background information about the context of the research topic, followed by the problem definition and research objective. Then the concepts that will be used in the research are discussed; finally the research questions are identified.

1.1 Urban agriculture and sustainable cities

Cities and sustainability

The relationship of cities with the environment has drastically changed over the last two centuries. For centuries the access to food and other resources limited the economic growth of cities. The required energy came from human labour that was dependant on food produced on the land. The growth of human population and therefore of cities was directly related to the land use; the more people the more land was required to extract resources. The introduction of fossil fuels as a source for energy reduced the costs of labour and transport dramatically and as a result cities could expand. In one century the total urban population expanded from 15 % to 50% of the total population (Deelstra & Gerardet, 2000). The low transport costs have made the distance of a city to its required resources irrelevant, yet cities still use land to acquire resources. Basically cities are “plugged into an increasingly global hinterlands”. (Deelstra & Gerardet, 2000 pp43).

Everyday products from all over the world are daily imported to the city. The distance between production and consumption means that the origin and (final) destination of consumed products is often unknown to the end consumer. As a result the dependency of urban dwellers on nature is more and more invisible for them. They live in a “virtual” world (Low 2005).

The urban metabolism system is basically linear. The city, with its inhabitants, employees, producers, retailers etc. consumes nature in a very efficient way; resources such as food, water and energy from all over the world are funnelled through the urban system and after that various (waste) products leave the city to another final destination. Citizens including businesses, and governmental organizations do not have to draw a relation between inputs, such as food energy and construction material and outputs such as sewage and waste and CO², because the relationship is invisible (Deelstra & Gerardet, 2000). Yet due to this linear metabolic system the world is running out of valuable resources. Cities need to create environmentally sustainable.

In order to become environmentally sustainable cities need a holistic approach. All activities carried out in a city, from construction to education to urban planning, need to adopt sustainability in their approach. Therefore the city, its inhabitants and its business have stake in the urban development objectives towards (environmental) sustainability.

The city of The Hague has already set objectives to become more sustainable. From which their objective is to ‘be CO² neutral’ in 2050 as a city. To reach this objective the municipality of The Hague requires cooperation of its inhabitants, business and citizens.

Food and cities

Food production in urban areas has always taken place, but with the intensification and increasing scale of agriculture in the 19th century agriculture moved more and more to the countryside. With the increased world wide urbanization, urban agriculture became again widely practiced in the 1980's. By the 1990's up to 25 % of the urban population in Africa and 70% of the urban population in Asia were involved in urban agriculture (Bryld, 2003). Urban agriculture is also practised in Europe on allotment gardens, school gardens and backyards usually for home consumption or income enhancement (Nugent, 2000). The value of urban agriculture for the city and the urban dweller was neglected for a long time. As a result urban agriculture did not receive much support from the government or other institutions. Even so, the shift towards more sustainable cities has put urban agriculture back on the political agenda. Urban agriculture has potential to re-localize food production or to solve urban waste problems. Even though urban agriculture has potential to plug into the objectives for environmental sustainability in The Hague urban agriculture is not yet on the agenda of most stakeholders; most companies neither the municipality. Therefore this research will look for the (potential) contributions to environmental sustainability of urban agriculture in The Hague, specifically contributions that can help stakeholders to reach the objective of environmental sustainability. It would like to identify criteria to design an example of such an initiative. This research is the first step and aims to give an inventory of the expectations and interests of stakeholders and set design criteria. This way it hopes to open the discussion on the potentials of urban agriculture in The Hague other than food production.

1.2 Environmental sustainability and urban agriculture in The Hague

Main challenges in environmental sustainability for the municipality of The Hague

The Hague has the objective to be CO² neutral in 2050. The municipality aims to reduce their energy consumption as a city and to replace all energy sources with green energy sources. (Contour nota: Tien voor Milieu 2006-2010).

The municipality already started to set an enabling environment to enhance environmental sustainability, first they have created policies on the reduction of (heavy) transport in the city and secondly the municipality fosters 'green' in the city. Furthermore the municipality aims to motivate citizens to improve the environmental sustainability of the city.

For example the municipality has one project where inhabitants can plant a tree in the garden for free. They can choose between a list of 20 selected trees, within this list two productive trees are included (an apple and a pear tree).

Also since the 1st of May 2010 citizens can apply for a subsidy to install a green roof, a roof that is covered with plants. Green roofs are said to take up particulates, and also create a basin for storm-water.

Furthermore the municipality motivates urban dwellers to 'green their area'; citizens receive financial support to realize 'green' ideas for their neighbourhood.

The objectives and activities on sustainability are summarized in table 1. This table also demonstrates food production is not mentioned in any policy.

Table 1 Sustainability objectives of the municipality of The Hague

Objective	Activity
CO ² Neutral	New urban developments are CO ² neutral executed. Use of green energy Compensation of CO ² emissions
Air quality (to reduce NO ₂ concentration)	Promote biking Promote sustainable transport (electrical cars) Subsidy for green roofs and the plantation of trees (one tree free per inhabitant)
Clean water	Storage, disconnection drainage water of sewage system and increase quality of groundwater
Clean city	To increase revenues out of collected wastes. Green waste: from 7 to 21%; Paper from 27 to 37%; glass from 49 to 54%; fabrics from 5 to 25%.
Healthy indoor climate	To reduce and avoid health risks due to bad indoor climates.
Functional soils	Improved soil management

Existing urban farms in The Hague

The Hague has 12 ‘urban farm sites’. These locations mainly function for environmental education purposes as well as recreational purposes and do not produce food. In the past, one city farm demonstrated two methods of poultry production; one according to the bio-industry and one according to ‘free range’ production system. Protest led to a forced removal of the first example, the bio-industry production system (environmental department). This example shows animal welfare is a sensitive issue for citizens.

The Hague has 2900 allotment gardens on a total of 86Ha. The existences of allotment gardens are under constant pressure (Nota Volkstuinen 2008). Recently the foundation of allotment gardens has proposed a plan that integrates allotment gardens in neighborhoods, by making the gardens more accessible for recreational and educational activities.

Furthermore the Hague has one grass root organization working on urban agriculture. This organization Gezonde Gronden has one garden in Madestein. Here they use the Permaculture a method that: “mimics the architecture and beneficial relationships between plants and animals found in a natural forest or other natural ecosystem” (permaculture.org). They also offer workshops where people can learn about Permaculture and horticulture. Their goal is to educate and involve citizens.

1.3 Problem definition

At the moment there is a lack of information about the vision of different stakeholders concerning the potential contribution of urban agriculture towards (environmental) sustainability of The Hague, their idea's about forms of urban agriculture and on possible interests of the stakeholders in an urban agricultural initiative in The Hague.

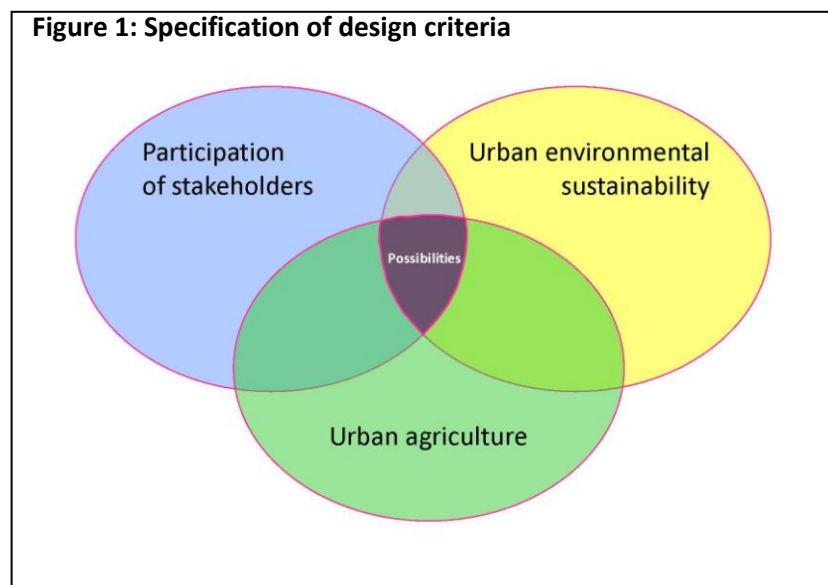
1.4 Research objective

This research aims to contribute to the project: The potentials for urban agriculture in The Hague by identifying the possibilities in the form of design criteria for an urban agriculture initiative, which contribute to the environmental sustainability of The Hague.

The two involved organizations InnovatieNetwerk and Stroom want to design an urban farm that fits two requirements:

- 1) it enhances the environmental sustainability of the city and;
- 2) induce stakeholders in The Hague to participate in the project.

Therefore the overlap of three dimensions determine the field of possibilities as reflected in figure 1:

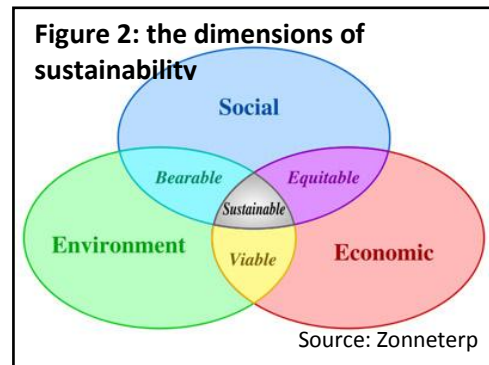


1.5 Conceptual framework

The conceptual framework aims to determine the concept environmental sustainability and to identify environmental problems. Secondly the concept of urban agriculture is discussed and determined. Then the concept of stakeholders and their link to environmental sustainability and urban agriculture is explained, finally the requested topics for input for design criteria are stated.

Environmental sustainability in cities

Sustainability has three dimensions: Social, economic, and environmental. If all dimensions are taken into account one can talk about sustainability (see figure 1). For the identification of design criteria this research will aim for the yellow field: economically viable environmental sustainability. Economically viable means an urban agricultural initiative should meet “the needs of the present without compromising the ability of future generations to meet their own needs (Brundtland 1987.” both environmentally and financially .



The sources of global environmental problems are among others well described by Vonkeman (2000 pp9). He argues that “the earth initially was characterized by a number of dynamic equilibria and bio-geochemical cycles. Gradually mankind has created a technosphere within the biosphere with its own processes and events that, unlike the biosphere did not have a complete system of cycles and equilibria. This system did not pose a serious problem until lately this techno-sphere began to rival that of the bio-sphere.”

As a result Vonkeman (2000, pp 9) argues that: “the development of the technosphere took place at the cost of **space** of the biosphere reducing the volume within which the natural cycles could take place.” This argument critically reviews current land use. Cities are covering land with buildings and roads, hardly leaving space for the biosphere and thus interfering with natural cycles and putting pressure on the **biodiversity** in the bio-sphere.

“The technosphere materials such as fossil fuels and minerals where extracted from the geosphere. The materials are then emitted into the biosphere effecting the insulation capacity of the biosphere; for example the uptake of CO² as a result of the burning of fossil fuel but also the uptake of heavy metals and synthetic chemical compounds (Cadium, CFC’s etc).” Vonkeman (2000, pp 9). This last argument critically reviews the large amounts of **CO² emissions** of cities due to the burning of fossil fuel for energy production. But it also the lack of a **cycles** in the (urban) technospere creating “**waste**” for the biosphere that disturb the equilibrium of the bio- and geoshperes.

To conclude Vonkeman (2000) has mentioned the main problems related to environmental sustainability namely: unsustainable land use (space), decreasing biodiversity, CO² emissions, the lack of material cycles and the resulting production of waste.

It is the challenge of human society to overcome the above mentioned problems and create a society that is *environmentally sustainable*, defined by Goodland (1995, pp 6) as :

“Environmental sustainability seeks to sustain global life-support systems indefinitely (this refers principally to those systems maintaining human life).

Source capacities of the global ecosystem provide raw material inputs-food, water, air, energy; sink capacities assimilate outputs or wastes. These source and sink capacities are large but finite; sustainability requires that they be maintained rather than run down.”

This definition puts the above mentioned problems into solutions. This research will therefore use the problems as stated by Vonkeman (2000) as a guideline. Reducing the problems will enhance environmental sustainability in The Hague.

Urban Agriculture

As mentioned before, the push for sustainable cities has put urban agriculture back on the political agenda. However, urban agriculture has not yet been extensively conceptualized. Although agriculture is related to the urban scope, whether this is because of its connection to the urban area's or just because of the location the agricultural production side is still debated.

United Nations Development Program (UNDP) 1996 has tried to define a key area: *“the entire area which a city's sphere of influence comes to bear daily or directly on its population.”* But cities are not isolated areas, and neither is the agricultural sphere. It is therefore almost impossible to set spatial boundaries for urban agriculture.

Mougeot(1999, p 10) has tackled the problem of spatial boundaries. He uses the *integration* into the city as a criteria instead of location per se. According to Mougeot(1999) urban agriculture is significant for *its integration* in the urban metabolic system that produces, trades and consumes resources:

“In order for agriculture found in cities to become more urban in character, they must innovate to cope effectively with city constraints and tap no less effectively on urban assets and flows found and generated by the city. In turn, it benefits this (and others) with its products and services on a daily basis. Agriculture will be more or less urban, according to the extent to which it will use the urban ecosystem and, in turn, be used by the same urban ecosystem.” Mougeot (1999:11).

The integration is therefore a criteria for urban agriculture in this research.

The necessary adaptations to the urban ecosystem have resulted in many different forms of urban agriculture. The concept of urban agriculture needs therefore to be dynamic and diverse Bryld (2003). Urban agriculture can exist in different forms for example as poultry, aquaculture or horticulture, and it can be organized in differently, for example the Netherlands has a garden butler. The garden butler uses land of owners from allotment gardens and produces vegetables in cooperation's with these owners. (more examples, see annex 5 (in Dutch)).

Due to its integration in the city urban agriculture connects well to the sustainability objectives of The Hague. Urban agriculture includes social (supply of human resources), economical (supply of products and services) and the environmental ((re-)using urban resources) aspects. Urban agriculture is therefore interesting for sustainable development of a city as The Hague.

Finally, scholars debate the economic viability of urban agriculture. Some scholars argue that every form of food production is urban agriculture, be it food production on a balcony or shepherding in the road side. In their brochure on urban agriculture the University of Wageningen mentions urban agriculture should provide a proper image of current agriculture (PPO Lelystad 2000). This is an undefined statement and suggests a certain level of economical self reliance instead of the food production for self-sufficiency.

In the literature urban agriculture is argued to contribute to the food security and poverty alleviation for the low-income urban residents. People that produce their own food save money on food. This would imply that urban agriculture, while not guaranteeing an adequate income can contribute to an economically viable livelihood (Baumgartner&Belevi 2001, Binns 1998). However, for InnovatieNetwerk an initiative agriculture initiative in The Hague should be profitable and create a substantial income.

A definition on urban agriculture should be dynamic and not limited by space. It should integrate the environmental system of the city, making the definition suitable for the identification of contributions for the environmental sustainability of The Hague

For this research Mougeots (1999) definition of urban agriculture will be used:

“Urban Agriculture is an industry located within (intra-urban) or on the fringe (peri-urban) of a town, a city or a metropolis, which grows or raises, processes and distributes a diversity of food and non-food products, (re-)using largely human and material resources, products and services found in and around that urban area, and in turn supplying human and material resources, products and services largely to that urban area.”

However the economical viability is not included in this definition. Therefore for this research the following is added to the definition: urban agriculture is an economical viable industry, profitable for an entrepreneur.

The stakeholder approach

The identified environmental problems require a change in the technosphere, as stated by Vonkerman (2009). Companies, organization and the government are part of this technosphere. They therefore are supposed to carry a corporate responsibility to care for environmental sustainability. Yet the relationship between responsibility and the care for the environment is complex.

The question on corporate responsibility is linked to the Stakeholder Theory developed by Friedman in 1984. Bazin (2008, p. 637) summarized his theory as follows:

“ The theory of stakeholders attempts to find out the origins of the requests addressed to the company and also tries to determine which requests the company should primarily take into account. “ According to Friedman(1984) a stakeholder in an organization is (by definition) any group or individual who can affect or is affected by the achievement of the organization’s objective”.

Companies work in the interest of their clients and other stakeholders, yet the environment is not an official partner; nature cannot defend its interests (Bazin, 2008).

Notwithstanding in order to be environmentally sustainable organizations have to consider nature as a party in their decision making process. The definition of Friedman (1984, p 64 cited in Bazin, 2008 p 637) can be used for the determination of stakeholders of environmental sustainability. Bazin (2008) talk about requests from stakeholders of a company, yet one can argue an ‘objective’ such as environmental sustainability also has

stakeholders. The stakeholders as defined for this research are the organizations and businesses in a position to affect environmental sustainability of the city and a potential urban agricultural initiative. To ensure their future participation in an urban agriculture initiative their interests and requirements need to be known.

The requested design criteria

The definition of Mougeot(1999) in urban agriculture does not, except for it's integration in city, design criteria for urban agriculture.

The following design criteria aim to specify possibilities for an urban agricultural initiative. Together with the commissioners of the research the following aspects of a an potential urban agricultural initiative have been identified:

- 1) The possible functions, related to environmental sustainability
- 2) The type of products produced
- 3) The possible locations
- 4) The suitable scale
- 5) The production methods of an urban agricultural initiative.

1.6 Main research question

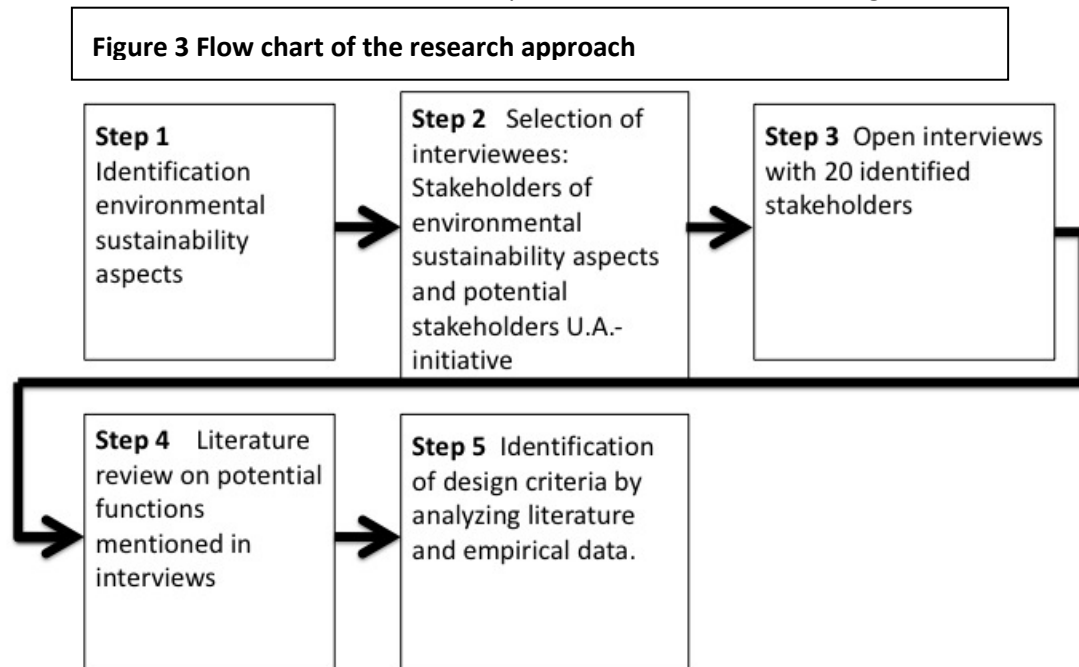
What are the possibilities for urban agriculture in The Hague?

1.7 Sub questions

- What functions could urban agriculture take up in order to contribute to environmental sustainability?
- How could an urban agriculture initiative, with the identified fuctions look like?
 - What products and products (methods) could an urban agriculture initiative produce that fit these function(s)?
 - What locations are suitable for an urban agriculture initiative that fit function (s) and product(s)?
 - What scale is suitable for an urban agriculture initiative that fit function (s) and product(s)?
 - What possible production methods of are suitable for an urban agriculture initiative that fit its function(s)
 - What scales are possible for an urban agriculture initiative that fit its function(s)
- What are the interests for participation in an urban agriculture initiative in The Hague of stakeholders?

2 Methods used to collect data

The order and methods used to collect and process data is shown in the figure 3



2.1 Identification of the interviewees

Step 1 Identification aspects of environmental sustainability

In order to find possible contributions to environmental sustainability, the aspects of environmental sustainability have been identified: land use, biodiversity CO² emissions (related to energy) and the lack of cycles.

Step 2 Identification of interviewees

For the identification of stakeholders, two criteria were taken into account.

First it was important to identify possible contributions to environmental sustainability, therefore stakeholders had to be *active* in the fields of environmental sustainability; land use, biodiversity and resource management as identified in the conceptual framework.

This selection criteria was used because the research will link environmental sustainability to urban agriculture, and therefore aims to link the stakeholders of environmental sustainability to urban agriculture (see research questions).

Secondly, the research aimed to identify criteria for a design that would include the participation of a varied set of potential stakeholders. Therefore it was important the interviewees had a potential stake in an urban agricultural initiative.

Grimm (2009) has identified stakeholders of urban agriculture, his study used in this research. Grimm (2009) looked for different food systems using a food network analyses.

For this analysis he identified the following stakeholders:

- The government (destination plan, (urban)planning, and policies)

- The market (for the sales: retail, shops restaurants etc.)
- The local producers
- The processors
- Supporter organizations

However in his research Grimm (2009) has not identified suppliers for an urban agricultural initiative as part of the food network.

Urban agriculture is significant for its integration in the urban eco- system (Mouegot 1996). So ideally an urban agricultural initiative should also be supplied from the city.

Therefore possible suppliers are identified

- Energy supplier
- Supplier of potential resources (urban waste)

It is expected that these stakeholders are related to urban agriculture. However this research mainly focused on possible contributions of organizations and businesses.

Finally for the identification of interviewees networks of Stroom den Haag and the project leader of Erasmusveld were used.

Table 2 List of respondents

Theme	Stakeholder
Spatial planning	1 Urban planner 2 Real estate agencies
Environment	2 Persons department environment and education Municipality
Potential purchasers	2 Restaurants 1 Butcher 1 Retailer
Urban ecology	1 Urban ecologist
Local producers	1 diary farmer 1 greenhouse producer
Waste firm	1 National waste firm
Energy firm	1 National energy firm
Advise organizations	1 Local initiative 1 Consultancy firm on Sustainability Environmental Centre, the Hague 1 Consultancy firm on processing
Expert Urban agriculture	1 Expert on urban agriculture
Finance	1 Funding agency

Selected but not interviewed due to time constrain

1 National catering company

1 National bank

2.2 Methods of data collection

Step 3 The Interviews

For the stakeholders, the transition from agriculture as a rural activity to agriculture as part of urban development strategy is new. In order to make stakeholders want to participate, it is necessary to know their interests, ideas and requests about a potential urban agricultural project.

Therefore 20 stakeholders were interviewed for 1 to 1,5 hours each. One set of open interview questions was used for all stakeholders (see annex II for questions in Dutch). The interview questions were used as a guideline during the interview. The questions were open, because the topics were new for the stakeholders. They were therefore encouraged to 'brainstorm' in order to express their ideas.

Step 4 Literature review on possible functions for urban agriculture

For each proposed function, suggested by stakeholders, information that could support and define design criteria for an urban agriculture initiative was collected. This literature study was carried out only after the interviews because the final design criteria should fit the ideas of stakeholders. It was therefore the ideas of stakeholders that steered the literature research.

2.3 Data processing

Step 5 The identification of design criteria

The research aimed to identify design criteria for an urban agriculture initiative that would contribute to environmental sustainability according to the stakeholders. Therefore, the results of interviews, the collected empirical data, and the literature were analyzed per topic, e.g. potential functions, products, scale, location and production methods. All primary data was analyzed on valuable information and regularities per theme. The most mentioned function is listed first in the results chapter, the second most mentioned function is second and so on.

Because specific products and locations were not mentioned very regularly, all mentioned products and locations are mentioned in the report in no fixed order.

Additionally, the stakeholders' interests and requests for participation in an urban agriculture initiative were identified

Finally arguments of the stakeholders and the results of the literature study were combined to set the final design criteria.

2.4 Limitations to the research

This research was part of a bigger project. This project had a deadline before the deadline for this research; therefore the time to have interviews was limited as a result two identified stakeholders could not be interviewed.

The selection criteria for the identification of stakeholders also put limits to the research. Firstly, not all potential stakeholders were identified; there are more rural estate agencies, but for this research only stakeholders of the municipality were identified. Therefore this research was not able to reflect the interests of all stakeholders in The Hague

Furthermore for the identification of the stakeholders the networks of Stroom and of the development project Erasmusveld (a neighbourhood in The Hague) were used. This could have an impact on the outcomes of the research.

One stakeholder group missing from the list are the citizens of The Hague, they will be affected by an urban agricultural initiative and are therefore also stakeholders. However in order to limit the research in cooperation with InnovatieNetwerk and Stroom they have been left out. Nevertheless, citizens' interests and requirements for an urban agriculture initiative could be different from those of the chosen stakeholders. These requests and interests will be ignored in this research.

3 Literature review on identified functions

With the aid of theory and literature, this chapter explains why and how an urban agriculture initiative could contribute to environmental. It therefore discusses each potential function as identified by the stakeholders.

3.1 Function 1 Sustainable land use

Urban space is rare and therefore costly, especially in the Netherlands where the price is about 500 Euros per square meter for land allocated for housing. The green spaces in cities are under constant pressure because, they are also valuable locations for construction. In his article Campell (1996, p. 299) describes this as a 'recourse conflict':

"The tension between the economic utility in industrial society and the environmental utility in the natural environment of natural resources."

He states in his article that, this resource conflict should be solved by collaboration and by implementing complementary uses. Meaning that, because of the pressure on available space in cities, in terms of economical sustainability, urban green space should therefore be multifunctional.

In the destination plan of the municipality the functions of space is divided into either recreational, agricultural or 'nature'. The Hague has 987ha. of forest and nature in its municipality, which counts for 10% of the total land use (CBS <http://openbaar.haaglandenincijfers.nl/>). This means that despite the pressure on space in The Hague, it relatively has a lot of green space. Furthermore, The Hague has 12 ecological networks of protected areas. In these areas certain species are protected. These zones are mostly integrated into park zones. Urban green space does therefore in some places also contribute to the biodiversity of the city.

In the introduction of this research urban metabolism is shortly discussed. It's linear system results in a large 'footprint' as it uses a lot of natural un-replaced resources. In 1998 it was calculated that The Hague had an environmental footprint of 4,46 ha per inhabitant in 2001 with it's total of 441.000 inhabitants at that time (Juffermans, 2006). Even though it is difficult to exactly calculate the amount of land used per citizen per municipality, the numbers demonstrate the demand for land outside the city needed to sustain a city.

In fact, globally, human society uses more space than is available on earth. To become sustainable, the human society, including cities, have therefore to reduce their impact and use land efficiently and effectively. By producing food *in* the city, the city will use less land outside the city, making the city more sustainable. It could therefore add food production as a function of green in the city. The multiple functions of urban space will then reduce pressure on other (hinter)lands.

3.2 Function 2 To enhance ecological citizenship

The distance between food production and consumption is argued to result in uninformed consumers. Uninformed consumers do not know where their food comes from and therefore cannot connect to it. Finally this disconnection is one of the reasons why people consume unsustainable.

Urban agriculture shortens the distance between producer and consumer, and is therefore argued to create awareness about environment and food production. This awareness supposedly will stimulate consumers to take responsibility for their impact on the environment and adjust their behaviour in order to minimize this impact.

The ecological consumer is defined *as a citizen that is aware, and aims to reduce his/her impact on the environment.*

It is difficult to set requirements that guarantee a behavioural change in a citizen to become an ecological citizen.

Numerous researchers have tried to identify the characteristics of the current 'green consumer' (a.o. Olli, et al., 2001 ; Fielding, et al., 2008, Roberts, 1996) . Gilg et All (2005) have summarized earlier research in order to identify the sustainable consumer with the following results:

In their analysis, scholars have set three indicators to identify sustainable behaviour;

- Environmental values
- The socio-demographic situation
- Psychological factors

According to Gilg et all (2005) several studies have shown that older age groups, with an on average higher income or people that have satisfied their personal needs are more likely to consume in a more sustainable way than younger groups with lower education. The indicators are useful in identifying design criteria to enhance ecological citizenship, as they will have an influence regarding a suitable form of an urban agriculture initiative.

In his report Gilg et al (2005) confirmed that non-environmental consumers in the UK, defined as consumers that do not undertake environmental actions such as waste recycling, sustainable food consumption (local and/or organic) etc, were most likely to believe in "no limit to growth" and believe that mankind rules over nature. This while the environmentalists are less concerned with material wealth, and place nature in an equal position with humans."

These results suggest that environmentally sound behaviour is the result of a set of *social and environmental values and beliefs.*

The theory of Ajzen & Fishbein (1980 cited in Kollmuss & Agyeman (2002 pp. 242) says:

"The ultimate determinants of any behaviour are the behavioural beliefs concerning its consequences and normative beliefs concerning the prescriptions of others."

However different sets of values can relate to different expressions and levels of environmental sustainability. One can choose to consume local but not organic; one can have solar panels but not separating waste. For an urban agriculture initiative that wishes to encourage pro-environmental behaviour, it is important to take these difference in values and beliefs into account.

Other studies on sustainable consumer behaviour show that there is empirical evidence consumers are more likely to purchase in a more sustainable way if they perceive that what they are buying is actually going to contribute the environment (Kollmuss & Agyeman, 2002; Gilg, et al., 2005).

It is therefore important for an urban farm to set goals to which it can contribute to the environment, and to *communicate* this to the consumer.

Agency of the citizen

The research of Gilg, et al. (2005) and Kollmuss & Agyeman (2002) also confirmed the theory of the link between personalization of responsibility and the effective environmental action. According to Gilg et al. (2005), this is because unlike the current environmentalists, current non-environmentalists think environmental problems are the responsibility of the government. Kollmuss & Agyeman (2002) refer to the theory of Hines et al. (1986-87) who argues about the 'locus of control' that influences environmental behaviour.

"People with an 'external locus of control' feel that their actions are insignificant and feel that change can only be brought about by others", (Kollmuss & Agyeman (2002 p. 243).

Therefore, one of the indicators of environmental behaviour and their willingness to change is one's perception on their 'power to change'. People need agency to develop a *will* to change and to *be able* to change.

Seyfang (2005) continues on the topic and argues that governments and social movement organizations have identified a potential force for sustainability in the responsibility citizens can take through their choices they make as consumers.

This would mean that these organizations do not agree with the people with an 'external locus of control'.

In other words, when looking for means to change consumer behaviour, it is important to keep in mind, whom is said to be responsible for what actions, and what this will mean for the possible inclusion or exclusion of different target groups.

Education as a Tool

Often education is used as a tool for creating awareness. By educating people they learn and adapt their behaviour.

Scientists identified a gap in the link between the given knowledge and the expected change in behaviour. It is proven however that experience will increase the possibility to change one's perception on sustainability. This in comparison with education through visual passive material: "Direct experiences (seeing dead fish in water) have a stronger influence on people's behaviour than indirect experiences (learning in school)" (Kollmuss & Agyeman, 2002 pp 242).

In other words the productive urban agriculture initiative increases the possibility for consumers to learn from direct experiences. Therefore, it is questionable whether education alone is enough to contribute to the objective; 'to enhance environmental citizenship.'

3.3 Function 3 The reduction of Foodmiles

The globalization of the food chain has led to environmental problems among them the increased CO² emissions and waste production.

To address these concerns, Tim Lang, a professor on food policies in London introduced the concept of "Foodmiles" in the early nineties. The concept encourages people to purchase products that did not travel over long distances; products with a low amount of food miles such as local and in seasonal products. By selecting products that travelled only for short distances, the concept argues these products needed less energy to be produced, and therefore reduce carbon emissions.

The food miles concept addresses (Hogan & Thorpe 2009):

- Environmental issues: The carbon emissions in transport and storage, and the environmental impacts of packaging and processing.

- Health issues: The long distance transport increases the time from farmer to consumer and can therefore reduce the nutritional value of the food.
- Social issues: The imported food can be sourced from countries with inadequate environment and health standards; and few regulations to protect workers from contamination

However, the concept has received criticism lately:

Food miles are argued to be a poor indicator for the environmental impact of food production. According to reports of Smith et al. (2005) and of UK cabinet office (2008) local produce is not always low-impact (on the environment) and resource efficient. Coley, et al. (2009) argued that, as a result of the spread distribution of local products, consumers travel more when purchasing local products. The environmental costs of the travelling consumer then equalizes the required energy for a local or international produced product to be consumed.

Furthermore an airplane produces more CO² per km than any other means of transport. Despite of the high environmental costs air transport is the fastest growing transport mode. (AEA technology 2005, Australian report, Smith et al 2005) therefore 'Foodmiles' is not necessarily about the *distance* between consumption and production but also about the *means* used for production and transport.

To conclude, 'Foodmiles' is a concept that addresses concerns about the globalization of food production, its large travel distances and high energy demand. However the name refers literally to the distance over which a product is transported, but the method refers to the direct environmental impact through CO² emissions. This results in confusion as a product that has travelled over a long distance might produce less CO² than a locally produced product. When 'Foodmiles' are discussed in relation to localized food production one has to realize that it is about emissions and not necessarily about the distance. Therefore as a general concern the CO² emissions should be taken into account in urban agriculture.

3.4 Function 4 Production of bio- and thermal energy for the city

The importance of energy has already been shortly presented in the introduction chapter of this report. Not surprisingly energy is an important focus point in environmental sustainability.

From the 18th hundreds coal was introduced on large scale by the steam engine. This was the start of an era of (cheap) fossil fuels. In this era the economical wealth increased tremendously. But fossil fuels are not endless available.

Furthermore fossil fuels are a store of carbon. Burning fossil fuels increases the CO² concentration in the atmosphere and disturbs the CO² balance of the biosphere. Scholars argue this disruption of the biosphere will have an effect on the climate. Besides fossil fuels will be finished in the near future as they are not renewable. Therefore they are now looking for alternatives to fossil energy; green energy or renewable energy.

Many forms of renewable energy do nowadays exist; wind energy, solar energy, (geo)thermal energy, bio-energy etc.

In the next paragraph only bio-energy and thermal- energy are shortly explained as urban agriculture potentially could integrate these two types of energy.

The production of bio-energy is a process where biodegradable material is burned and treated through a process of gasification or fermentation. During this process biogas is produced.

A biomass power plant requires a regular input of organic waste; the more carbohydrate the waste contains the more energy it will produce. Hence it is important that the input for a biomass power plant does not compete with food production. On that account this method of energy production is suitable in case there is an excess of organic waste material available. In the Netherlands, biomass power plants are mainly located next to livestock farms. For example, 15000 tons of animal sludge and co-products can produce 3-5 KW/h of biogas per year.

The installation needs however space; a tank of 15000 m³ and one of 600 m³ in this example (Senternovem, 2005).

The second method of alternative energy production in agriculture is thermal energy by greenhouses:

In a closed greenhouse abundant heat is stored in the soil for the winter. In the winter water (18-20 °C) is pumped up to the surface and heated up to 45°C. The heat can be either used in the greenhouse or by the city. (See figure, unfortunately only available in Dutch)

To give an estimation, one research calculated a greenhouse with a surface area of 30.000m² can produce heat for 1,260 houses based on the modern energy norm (Jansma, et.al 2010). This means the urban agriculture initiative has to produce on large scale horticulture basis, in case it aims to produce thermal energy for the city.

3.5 Function 5 Closing cycles

In order to make the urban metabolism 'circular' therefore sustainable, it is necessary to close material cycles.

Urban solid and liquid waste from sanitation as well as green waste contain valuable nutrients and could be reused in agriculture (Baumgartner & Belevi 2002.; Deelstra & Gerardet, 2000).

Especially in the context of developing countries scholars talk about the potential for recycling urban waste, as waste streams are not organized by the government (Bryld, 2003). But in the Netherlands, a waste collection system does exist; most waste is collected and burned, this process produces energy for housing. But the problem is not solved by burning valuable nutrients for the production of energy. The loss of nutrients is a problem on global scale; for example lettuce, containing water and nutrients from the let's say Ghanaian soil is imported to the Hague. There the lettuce is consumed; the nutrients end up in the sewage system of the compost. As a result the worldwide soil quality is decreasing. Smaller nutrients loops of urban agriculture therefore increase local soil quality and avoid deterioration of soil quality in other parts of the world.

Therefore environmental technologists are designing systems where the sludge is separated into dry and wet matter (Baumgartner & Belevi 2002). The dry matter is currently used for biomass production; the filtered water could be used for irrigation. This way the sewage can be useful for an urban agriculture initiative. Nevertheless further research is needed to identify strategies that will avoid risks for contamination of bacteria.

Apart from composting, waste could be reused as food for livestock farming. Feeding livestock with food remainders is a tradition in Asian and African countries, but also in North-western Europe (Deelstra & Gerardet, 2000). For example in the Netherlands some pig farmers use residues of the brewery for feeding their animals.

3.6 Function 6 Contribution the urban micro climate

Air pollution

The boost in the motor vehicle population has led to air pollution. The air quality is measured among other things by its oxides of nitrogen (NO_x) concentration and particulate matters (PM₁₀, PM_{2.5}) in the air. High percentage of oxides of nitrogen and particulate matters are damaging the health of human beings. To overcome these problems plants, shrubs and trees are argued to mitigate air pollution (Currie et al, 2008, Isshi 2004). To reduce the air pollution, an urban agriculture initiative could therefore produce food using shrubs and trees.

However food production might be contaminated by the air pollution. Especially in animal production dust concentrations are higher than in greenhouse production (Rodon, et al., 2002). Livestock farming might therefore contribute instead of mitigate the air pollution and will not reduce air pollution. Horticulture however could do so, in case the contamination risks are well managed.

Urban Climate

In the report of Rahola et al (2006 pp. 3-4) described the current situation of the urban heat island (UHI) effect in the Netherlands:

“This urban heat island effect states that cities accumulate heat and consequently are warmer than their surroundings. The UHI effect arises because higher levels of solar radiation are absorbed by the materials used in the city than by the natural vegetation and soils of the countryside. Another cause of the UHI effect is the lack of vegetation in urban areas. Vegetation provides shade and provides cooling by evapotranspiration; shade prevents heat from accumulating and the evaporation of water withdraws heat from the environment. Water bodies such as ponds, canals and especially fountains and cascades stimulate evaporation and thus have an important cooling effect.”

Furthermore heat also enhances air pollution known as smog because hot periods usually come without wind. Last but not least, the UHI effect increases energy consumption through the use of air conditioning to suppress excess heat in cities. The air conditioning market is growing rapidly, also in the Netherlands the air conditioning market is expected to grow in the future (Rahola et al (2006).

Vegetation is one important means to reduce urban temperatures. Strategies are therefore to cover locations without vegetation, including roofs, with shading plants, shrubs and trees. Deciduous trees and shrubs are the most suitable as they do not block the sun in the winter when heat is needed (Rahola et al (2006).

As mentioned before urban agriculture can give vegetation a productive function. Also ponds could be used efficiently for Aquaculture. However the interest in the UHI effect has been low in the Netherlands, therefore the last published research on UHI effect was in 1975. As a result the effect, and existence of a UHI effect is not known in the Netherlands neither in The Hague (Rahola et al (2006).

4 Results

In this chapter the results are presented. The results have been grouped and reflect the arguments of stakeholders. First the results on sustainable aspects important for the stakeholder are presented than the chapter continues to present results per mentioned function, product, scale and location. In annex 1 an overview is given of the results.

4.1 Sustainability: aspects important for the stakeholders

Within environmental sustainability most stakeholders focused on specific parts within sustainability:

To start with the topic 'use of energy' was mentioned by the majority, eleven stakeholders. The stakeholders aim to reduce CO² emissions by using alternative sources of energy, for housing (real estate), or for production (producers).

Secondly six stakeholders mentioned, sustainability means closing cycles.

With 'closing cycles' they aim to no longer produce waste as waste is argued to be an end product, while in a sustainable system every product has to be part of a cycle.

Third, six stakeholders mentioned 'water'. They worked on different elements of water: water quality, efficient water use and the development of storm water buffers. According to the respondents especially for the urban ecology water storage is an important issue in recent urban development. With the changing climate, cities need to create space to capture large volumes of water in a short time period.

Furthermore good quality water is becoming scarce in cities while in the main time cities use good quality water for all purposes. As one real estate agency explained: "We have to think of alternatives that are acceptable for the consumer. For example rainwater tanks for the garden."

Then, five stakeholders mention the localization of food production. They argue local food production increases sustainability if it is locally produced; it adds value to the region, can make optimal use of the regional resources, reduces travel costs and brings the producer close to the consumer. However it's not clear what is exactly considered to be 'local'.

However four organizations do not think the localization of food production increases sustainability because it is not possible to produce enough food on a local scale. Finally four stakeholders focus on mobility. Mobility is related to the air quality, and to the CO² emissions in a city. The urban ecologist mentioned the city is nowadays designed for cheap transport, it is therefore important to design cities more compact reducing the need for transport.

4.2 The possible functions of urban food production in The Hague

In this paragraph the results of the identified functions for an urban agricultural initiative are stated. Per functions the proposed production methods are indicated.

The interviewed stakeholders have given arguments for six potential functions for urban agriculture. Sustainable land use, to enhance ecological citizenship, reduction of foodmiles,

closing cycles, the production of energy for the city, and the improvement of the urban climate. In addition two potential functions were mentioned by two stakeholders: to add value to storm water storage through aquaculture and the contribution to the urban biodiversity. Nonetheless these functions were only heard indirectly and were not prioritized by the stakeholders in their argumentation for potential functions.

Function 1 Sustainable land use

Nine out of nineteen respondents argued urban agriculture could contribute in one way or another to public space in the city.

The real estates argued the most important function for urban agriculture should be its contribution to the amenity value. As an increased amenity value would increase the value of houses and apartments. Six out of nineteen argued urban agriculture could be part of the urban park system. As this could possibly reduce maintenance costs of green spaces in the city. But three stakeholders mentioned that urban agriculture should *increase* the 'green' areas in the city and not replace them.

Six out of nineteen respondents also argued urban agriculture could be attractive for the citizen as a place for recreation. Parks have in that case, next to the recreational function also a food production function. Finally the stakeholder concerned with urban planning was interested in the mix functions of public spaces.

Proposed methods for implementation

All the stakeholders argue to make an urban agricultural initiative accessible. It should create comfort for citizens and should not request extra efforts.

A producer proposes to combine the tasks of public security (of parks and buildings) with a gardener. Finally several of the above mentioned stakeholders proposed to place 'eatable green', such as fruit trees, grape trees etc on public spaces.

Function 2 To enhance ecological citizenship

The stakeholders argued sustainability is still perceived as something extra, there are still major steps to make in order to make sustainability the basis in a decision-making process; the environmental centre of The Hague mentions people do not see urgency in the global problems concerning the environment (CO2 emissions, loss of biodiversity etc). One potential purchaser argues sustainability and especially organic agriculture has an alternative 'wollen sokken' image.

Several stakeholders think they will profit from an ecological citizen. Ecological citizens are argued to be the key to reach the stakeholders objectives in environmental sustainability. In other words, the stakeholder wishes to educate the citizen, to create awareness and finally create ecological citizenship.

Two stakeholders argued urban agriculture could close the current gap between the citizen and nature. It could create awareness about the food production chain among the citizens. This is necessary as the lack of knowledge about the origin of products results in overproduction and consumption that is an environmental problem.

Because at the moment people are "illiterate ecologists"; people are not aware of their impact on the environment and therefore form a risk for the future society. For this reason the main function for urban agriculture should be its contribution to the awareness of citizens on their environment according to the stakeholders.

Four stakeholders argued by returning the knowledge of food production to citizens they become aware of their environmental food print, and their impact on the environment. When re-connected with their food citizens reduce their environmental food print. In consequence behavioural change, for example the reduction of meat consumption, will have

a big impact on the global energy and water consumption (urban ecologist). Also one consulting agency in food processing argues: “the result of a consumer that is aware of its environmental impact, is sustainability.”

To summarize twelve out of nineteen stakeholders mentioned an urban agricultural initiative should primarily aim to develop awareness among citizens, awareness about their environmental impact and the food production chain. Therefore the main function would be the ‘behavioural change’ towards an environmental citizen; a citizen that is aware of its environmental impact and aims to reduce its impact in it’s daily life.

Proposed methods for implementation

The stakeholders mention ‘education’ as a mean. It is not clear what type of education. But in the conditions stakeholders state the participation of citizens is very important. Also transparency of an urban farm, visually and on an organizational level, is often stated as a condition.

For example the energy company proposes a place for education about energy consumption. The topsoil of cities almost reached its maximum capacity to store pipes and cables. One of the companies objectives are to make supply more people with energy on the same capacity. To do so they need a behavioural change of the consumers, as the consumers have to optimize their energy consumption.

As second example the consultancy agency in sustainability argues urgency of sustainability has to be *communicated*.

Function 3 Localization of food production: Transport concerns

Several reasons are given to reduce transport of food products. One of the stakeholders on environmental policies argued the shorter the chain the less impact food production will have on the environment.

One potential purchaser claims the localization of food production makes it possible to transport purchased products by bike; a cheap means of transport that does not emit CO².

Two other potential purchases mentioned the localization food production reduces food miles and also shortens the time between delivery and consumption of products, which increases the food quality.

Finally nine out of nineteen stakeholders said food production should be local in order to reduce the food miles.

To summarize urban agriculture could reduce transport costs, CO² emissions and reduce the time between production and consumption.

Proposed methods for implementation

The localization of food production is obviously mentioned as a mean to reduce Food miles, transport cost and the time between production and consumption.

Function 4 Energy and thermal production

Nine out of nineteen thought about energy production in urban agriculture. Nonetheless the amount of energy an urban agricultural initiative should produce is debated.

One energy advisory organization argued energy production could be an 'extra function' of urban agriculture in the city. While three stakeholders, the waste firm, energy firm and one potential purchaser argued the urban agriculture initiative should only be self-sufficient in energy. They think it is not efficient to produce more energy. Because, as the energy firm explained, in the city the energy consumption is not consistent but has peaks, over a large urban area these peaks are equalized. Therefore energy supply is more efficient on a larger scale. The energy firm therefore advises the urban agricultural initiative should only produce for the itself. Additionally the energy firm advises to focus on thermal energy production instead of the production bio-energy, as thermal energy is easier to store for a longer period of time. But interestingly the interviewed expert argued the opposite to all other stakeholders. The expert argued an urban farm should make use of urban thermal energy.

Proposed methods for implementation

Stakeholders see potential in energy production with a bio-mass power plant. But interestingly the waste firm argues against this option. The waste firm argues green waste should be used for the production of compost and fertilizers.

Also the energy company argues against this option for several reasons:

- A bio-mass power plant needs input on a regular basis. Most probably one urban farm will not produce enough regular input for a bio-mass power plant. In that case external sources such as waste from other companies have to be 'fed' to the bio-mass power plant. For logistical reasons the urban agriculture initiative should then be placed on the fringe or outside the city preferably close to an organic waste producing company.
- Theoretically from all collected green waste in the Netherlands, a bio-mass power plant could only produce 250 megawatt per year (energy firm).
- A bio-mass power plant produces a bad smell; therefore extra costs have to be taken into account when placing a bio-digester in the city.

The nine stakeholders, proposing energy production for the urban agricultural initiative prefer for this reasons the production of thermal energy with greenhouses.

Function 5 Closing cycles: waste treatment

Eight stakeholders argued urban agriculture could contribute to the 'closing of material cycles' in The Hague by using urban waste for food production.

Two stakeholders, think it is possible to integrate urban agriculture in the urban waste system. Because the use of urban waste for fodder or composting would shorten and localize material cycles.

However about the scale and origin of the urban waste stakeholders have different opinions: Two potential purchasers; thought it would be possible to use green waste from especially restaurants for urban food production. Food leftovers from restaurants are argued to be more suitable for food production (animals) than green waste of households.

However another potential purchaser argued the collection of green waste from households and businesses in the city will not be economical viable only waste from large companies and the auction could potentially be used.

Two stakeholders, one producer and the waste firm think the sewage could be potentially treated and used in urban agriculture.

The environmental department of the municipality argued urban agriculture could reduce the production of waste as it (should) reduces the need for packaged foods. This department did not yet see possibilities to use green waste of households in the food production chain due to the current strict regulations on the use of 'waste' in food production. Secondly they argued the collection of green waste for urban agriculture separate to other wastes would increase logistical costs.

Proposed methods for implementation

Finally the waste firm argued a farm should, first of all not produces waste itself. It could potentially use green waste from the cities. But the waste firm explained currently collected green waste *is* processed into compost, nevertheless this compost could be used in urban agriculture. Another option is to connect urban agriculture directly to large-scale waste producers such as the auction, or the sewage treatment installation.

Function 6: Improvement of the urban climate

The energy company and one producer mentioned the possible contribution of urban agriculture to the urban climate. The vegetation could contribute to an increased air quality in building or outdoors.

The energy firm argued for a possible contribution of urban agriculture to 'urban heat island effect'. Last year in the Netherlands the energy firm measured, for the first time, a peak in energy consumption in the summer. This increase is argued to come from the increased use of air-conditioning.

Proposed methods for implementation

Use trees and shrubs in urban agriculture, as they produce shade.

Produce on flat rooftops

4.3 The type of products and production methods

In order to develop models for urban agriculture in The Hague the stakeholders were asked what products and production methods they thought to be suitable for urban agriculture. The stakeholders were specifically asked about their vision on animals in the city for food production purposes.

It was difficult for stakeholders to give a specific answer to this question, also because most were not experts in agriculture. However the stakeholders had some ideas for products, and had an opinion about the potential for production of animal products in a city.

The Urban ecologist mentioned an urban agriculture initiative should express biodiversity and should show different varieties of species; for example it could show different colours of tomatoes or cucumbers.

The environmental department of municipality proposed mushrooms as they can be produced on dark places in city such as basements and in industrial buildings. Another example they proposed where tropical plants because of their uniqueness.

One real estate agency suggested fruit trees and grape trees in parks. The consultant for food processing argued the produced product(s) should be unique for example river-crab or Surinam spinach.

Finally the majority of stakeholders argued for a divers set of products to be produced on the farm, for example energy, care and several food products.

All interviewed stakeholders had no objections to greenhouses in the city.

Animals in the city

Eleven of the nineteen stakeholders thought animals such as cows, pigs and chickens could be kept in cities for food production. Ethical issues were the main reason for stakeholders not to have animals in city centre. Only one stakeholder, a producer, argued animals couldn't be produced in the city because of health risks such as 'transmissible' bacteria and fine dust.

Four out of nineteen stakeholders thought flats for livestock farming would be possible in the city. Though the environmental department of the municipality explained on current 'children farms' the municipality has forbidden to slaughter animals. Therefore they argue small animals such as poultry will have a higher probability to be accepted in a city.

Another two stakeholders, a potential purchaser, a consultant organization and an expert, argued large animals, as cows need a lot of land. Therefore they argue it is more efficient to keep smaller animals such as pigs and chickens or bees in a city.

Finally the stakeholders that did not agree on the vertical production system argued animals could be kept as 'waste processors' so only small scale. They propose to 'integrate' animal husbandry in the agricultural system and not only keep them for food.

All stakeholders argued animals have to be kept 'animal friendly'. 'Animal friendly' mean for them that the animals should be able to express their natural behaviour. The stakeholders that agree with animal production in the city, also argued that in case animals are kept in the city for food production the urban agricultural initiative should also have a slaughterhouse.

All stakeholders, pro-and contra animals in the city thought the city offered opportunities for aquaculture. Aquaculture is argued to not interfere with the ethical beliefs of most citizens

Table 3 products that were specifically mentioned:

Mushrooms (in basements)
Tomatoes (in 'stadhuis')
Rucola (in 'Stadhuis')
Fruit trees (in Parks)
Surinam Spinach
Ethnical food products

4.4 Scale

As urban agriculture was not in their field of experts, most stakeholders had no specific idea about the maximum size of urban agriculture.

One producer and the waste company mentioned it is not possible to produce one product on a large scale only for The Hague. The urban agricultural side should produce for the three big cities in the west, Amsterdam, The Hague and Rotterdam.

However one potential purchaser argued large-scale food production is not possible. In cities urban agriculture sites will be too scattered making the food production inefficient in comparison to agriculture in the countryside. On the other hand nine stakeholders requested urban agriculture should be and can be only 'small scale', because the urban agricultural initiative is new, and people need time to adjust to it.

4.5 Locations for urban agriculture in The Hague

The main threat for urban agriculture is the availability of space in cities. But still most stakeholders had some ideas for possible locations of urban agriculture in The Hague.

Nine stakeholders mentioned urban agriculture could be integrated in the existent green structure of the city. However two stakeholders explicitly mentioned not to do so, they think urban agriculture could *increase* the green areas in The Hague instead of sustaining them.

The urban ecologist thinks an urban agricultural initiative should have possibilities to grow and therefore probably has to be located in the urban fringe.

Another mentioned option is to integrate urban agriculture in buildings, for example aquaculture in water basements or greenhouses on top of apartments. Buildings with a lot of glass like the city hall of The Hague are suitable for horticulture, but according to one producer it is also possible to produce with alternative light, access to sunlight is therefore no condition for the identification of a location.

The interviewed specialist argues an urban agricultural initiative should be on a location that is already paid for as it is impossible to produce for the value of urban land.

For example as suggested by a local initiative, spaces between flats and construction sides.

Environmental department of the municipality mentions the possible location depends on what you would like to produce. In case of production on natural soil, the urban fringe is possible, horticulture is everywhere possible also on roofs.

The real estate companies, one potential purchaser, suggest locating agriculture on industrial sites and/or Brownfield's.

Because large scale food production like the current bio-industry is difficult to place in the city because the city is focused on mobility work and transport argues one real estate agency. The waste company suggests a location that does not bother citizens (with sound or smell). One potential purchaser agrees but points out *is* important to attract visitors and therefore location *should be* visible for citizens

Tabel 4: List of possible locations mentioned by the stakeholder

Location	Region	Reason	Times mentioned
Binnen tuintjes zuidwest	Centre	Closed	1
Oude ADO stadion den Haag	Centre: close to Zuiderpark	Unused	1
Clingendael	Centre	Park	2
Buitenom (230-300 m ²)	Centre (empty construction area)	Unused	1
Binckhorst	Centre (industrial area)	Industry	2
Vlietszone (3 ha)	Urban fringe (bought by municipality)	Industry Is empty land	1
Westduinpark	Urban fringe	Park	1
Madestein	Urban fringe	Allotment gardens	1
Harnaschpolder	Urban fringe	(Business area, close to sewage digester)	1
Erasmusveld	Urban fringe	New construction area	NA
Town-Hall The Hague	Centre	Building with a lot of glass	1

4.6 Possible production methods of urban agriculture

The stakeholders could express their ideas about forms of urban agriculture. Therefore the stakeholders were asked to visualize an urban agricultural initiative.

The topic of urban agriculture was new to the stakeholders; therefore the results are based on a brainstorm with the stakeholders.

Than three stakeholders, the urban ecologist, funding agency and potential purchaser, had the idea to develop a network of food- producers and processors from the rural area are surrounding The Hague. In the centre of The Hague food could be produced on a small scale, and next to that producers surrounding The Hague could supply products to sell on the urban agriculture initiative.

As method three stakeholders, the local initiative, the expert and one possible purchaser, suggested Permaculture as this method covers the topsoil the entire year. This makes the agricultural land look attractive for the entire year.

One producer had the idea to integrate the function of security guards of parks and buildings with horticultural activities. At the moment people are employed to maintain plants in buildings, and people are employed as security guards. These functions could be combined. The money spent on these two services are enough input for an entrepreneur to organize food production. In that case businesses could have an edible office garden where people could harvest the Rucola for their lunch.

The consultant on sustainable energy suggested to carry out aquaculture in the water basements necessary to collect storm water.

Two stakeholders, the environmental department of the municipality and the urban ecologist suggested in case of a flat to make it possible for people to walk through the flat. The visitors would then be able to see all parts of the production process.

The two real estates suggested a production system that is temporal, or can be moved.

Two stakeholders visualized a restaurant that will produce its necessary inputs (vegetables meat etc.) according to the idea of Vila Augustes, Dordrecht)

On potential purchaser thought the concept of the backyard farm (see annex x) seemed very feasible as a form of Urban agriculture in The Hague.

For a financial system, one producer suggested to organize a financial system like the community supported agriculture system. In this case the producer and consumer invest once a year in a company. The consumer then receives for one year a certain amount of food products (harvested at the urban farm).

4.7 The interests of the stakeholders

Who should take the initiative?

All the stakeholders thought the urban agriculture should be initiated by citizens.

One real estate mentioned for example that the success of the urban agriculture initiative will totally depend on the participation of citizens. .

The stakeholders have expressed their requirements and interests for possible participation in an urban agricultural initiative. The results are reflected in table 5

Table 5 Requirement and interests of the stakeholders

Stakeholder	Expectations and Interest
1 Urban planner	<ul style="list-style-type: none"> To combine functions of public space
2 Real estate agencies	<ul style="list-style-type: none"> Partner in the supply of vacant space in the city Demand or in interest of the consumer UAI is supported by citizens <i>Education</i>
2 persons of department environment and education Municipality	<ul style="list-style-type: none"> Education: UA al chains are transparent for visitor Participation of citizens
Restaurants	<ul style="list-style-type: none"> Locate UAI close to restaurant or deliver products Produce for wholesaler price
Butcher	<ul style="list-style-type: none"> Organic certified production
Retailer	<ul style="list-style-type: none"> Consistent supply
Urban ecologist	<ul style="list-style-type: none"> Education on biodiversity Public space: recreation UAI as part of park system The Hague
Livestock farmer (Diary and meat)	<ul style="list-style-type: none"> Participation of citizens Space for development of initiative
Greenhouse producer	<ul style="list-style-type: none"> <i>Long term commitment of politicians (destination plan, legislation and subsidies)</i> UAI In new developed areas
National waste firm	<ul style="list-style-type: none"> Supply of (up cycled) construction material. Facilitation in waste management UAI is self sufficient (energy and water)
National energy firm	<ul style="list-style-type: none"> Facilitation in energy construction Customer of thermal energy Partner in energy production Netto the potential energy production should reduce CO²emissions (incl. transport)
Local initiative	<ul style="list-style-type: none"> Participation of citizens in UAI Permaculture as production method
Consultancy firm on Sustainability	<ul style="list-style-type: none"> Communication (education and information) on sustainability
Environmental Centre, the Hague	<ul style="list-style-type: none"> Education on environment and sustainability Close urban material cycles
1 Consultancy firm on food processing	<ul style="list-style-type: none"> UAI produces unique product Set up network from existing processors that cooperate with UAI
1 Funding agency	<ul style="list-style-type: none"> UAI has a social function UAI has recreational function UAI Not instead of existing nature

5 Discussion

In this chapter the results and methodology are discussed. In the first paragraph the used methods to collect data are discussed. In the second paragraph the literature review and the results are compared and discussed in order to identify suitable design criteria for a design of an urban agricultural initiative. The discussion in this second paragraph is structured per identified function for urban agriculture.

5.1 Discussion of the research method

The interviews had open questions, for example the stakeholders were requested to visualize a farm, the use of this method made it hard to quantify information. For example one stakeholder did not come up with the idea to use aquaculture to contribute to the urban climate, but might have an opinion when asked about this specifically. Nevertheless the results have been quantified in the results chapter to demonstrate without questioning the participating stakeholders' ideas.

The research objective and approach was not specific enough to be able to draw specific design criteria. Since sustainability and urban agriculture are subject with multiple definitions and views, the stakeholders were not able to define suitable products, or give an exact scale. Also the literature review could only explain the possible contribution on a very general level. In order to identify more specific design criteria the research project could have been narrowed down to one potential function within environmental sustainability. Nonetheless the approach used in the research project has had a holistic view, which was successful in explaining the multiple options of urban agriculture for organizations and businesses in The Hague.

5.2 The potential functions for urban agriculture

In addition to the function mentioned in the result chapter and the ones that will be discussed in this paragraph one potential function; only one stakeholder mentioned storm water storage without mentioning specific criteria. Therefore in the literature review this function was not discussed. Secondly the potential contribution of biodiversity to urban agriculture has not been discussed for the same reason despite of the fact the municipality has twelve ecological connection zones where biodiversity is protected.

For the other stakeholders the problem of biodiversity was, as reflected in paragraph 3.3 not part of their objectives in environmental sustainability, this could be an explanation of the absence of this function. Also the interest of the stakeholders in biodiversity seems less apparent as their interest in other environmental problems for example like energy.

Function 1: Sustainable land use

The majority, of the stakeholders thought urban agriculture should have a recreational function, and could be part of the existing urban park system. As 10% of the land use of The Hague is nature; The Hague does not seem to lack green space in the city. Integration of urban agriculture in the parks is therefore a realistic option.

Urban agriculture could give urban spaces an extra function. For example stakeholders suggested combining urban agriculture with space for recreation. Furthermore two stakeholders mentioned the possible contribution of urban agriculture to the biodiversity in the city. In order to do so urban agriculture could be integrated in the 12 ecological

protected areas of The Hague. Finally the real estate agencies suggested to use temporal vacant locations, in buildings or industrial areas. For urban agriculture this option offers an alternative to the use of existing green space, which is under constant pressure according to Campbell (1996). However it is necessary to further investigate the amount of vacant locations, and the average time these locations are vacant. In this situation an urban agriculture initiative should consist of a transportable construction. Multifunctional land use in urban agriculture could therefore add value to a location by producing food. The multifunctional land use fits in the recommendation of Campbell (1996) hence could contribute to the resource conflict in cities.

Furthermore urban agriculture could contribute to the reduction of the ecological food print of The Hague as it produces food in the city reducing pressure on the Hinterlands. Yet The Hague has, with 4,9 Ha per inhabitant, a large footprint at the moment (Juffermans, 2006). In case an urban agriculture initiative wishes to significantly contribute to the reduction of the ecological footprint a large percentage of the consumed foods should be produced in the city. This implies (intensive) large scale agriculture which is not in the interest of all stakeholders.

Function 2: To enhance environmental citizenship

Stakeholders mostly mention the function 'change the citizens' lifestyle'. In other words according to interviewed stakeholders the biggest change leading to environmental sustainability has to happen at the level of the citizen and/or the consumer. Scholars call this group of people the non-green citizen/consumer, or the non-environmentalist.

The environmental education department of the municipality of The Hague has already activities that aim to create 'awareness' among citizens especially children. However the city does not offer facilities where the complete food production chain is visualized. Stakeholders are suggesting designing a place where people can 'see' and 'experience' all stages of production from the breeding to the slaughter, from planting to harvesting to processing and consumption.

But changing behaviour is not so easy. Scholars have studied the environmental behaviour of citizens and concluded people have different values and ideas towards the environment and society. Kollmuss & Agyeman (2002) talked about the difference in "locus of control". The people that do not behave 'sustainable' are according to them having an 'external' locus of control. They feel that their actions are insignificant and feel that others can only bring about change. It means that this group of people thinks other institutes have or should have the power and responsibility to change. Hence in order to change citizens' behaviour it is not enough to make the food production chain transparent. It is necessary to think about the perceived roles and responsibilities of stakeholders and consumers as well as their power to change, their agency.

To identify design criteria for an urban agriculture initiative that can contribute to the behavioural change of the citizens it is important to involve people with different beliefs and values on the environment and society who feel they can identify themselves with the urban agricultural project.

Furthermore as a method to reach environmental citizenship the stakeholders mentioned education on citizen's environmental impact. But still scholars such as Kollmuss & Agyeman (2002) identified a gap in the link between knowledge and the expected change in behaviour.

As mentioned above to visualize the food production chain will not be enough to change citizen's behaviour. Therefore, as people are more likely to live more sustainable if they perceive their behaviour will actually contribute to the environment (Kollmuss & Agyeman

(2002), Gilg, et al., 2005) one tool to change behaviour is the perceived effectiveness from people's behaviour. For urban agriculture initiative this is important realize as it means they have to communicate with citizens about their environmental impact.

Function 3: Localization of food production: Transport concerns

The majority of the stakeholders mentioned the reduction of food miles to be a good reason to initiate a urban agriculture initiative in The Hague. This can be explained because their main concerns for environmental sustainability are energy and the related CO² emissions.

But as stated in the literature in chapter 3 the concept of food miles and its contribution to environmental sustainability is not clear, local food production, such as urban agriculture does not always imply less energy consumption. This could be a reason why not all stakeholders agree on the possible contribution of local food production to the reduction of urban CO² emissions. Basically stakeholders debate if the local food production chain produces less CO² than the global food chain. To avoid this discussion urban agriculture in The Hague should have a CO² neutral production system to start with.

The second debate among stakeholders is about the *substantial* contribution of urban agriculture to environmental sustainability. If an urban agriculture initiative wishes to significantly contribute to the reduction of CO² emissions in food production and consumption a large percentage of the consumed foods should be produced in the city. Like in function 1, this implies (intensive) large-scale agriculture, which is not in the interest of all stakeholders.

Function 4: Green energy production

In order to contribute to the development of alternative energy resources urban agriculture has two options, it can produce bio- energy or thermal energy.

The energy company had several arguments to not produce bio-energy in the city but rather in the urban fringe preferably close to an organic waste producer. The literature did not identify arguments against producing bio-energy in the city but did confirm that biomass power plants require regular voluminous inputs. This means that current biomass power plants are therefore located close to organic waste producers. Consequently biomass power plants in an urban setting should be located close to organic waste producers.

The urban agriculture initiative should in that case produce organic waste in the form of sludge through livestock farming. However stakeholders are not in favour of livestock production in the centre of The Hague. Since the manure from livestock production is an important resource for the production of bio-energy livestock farming should not be located in the city centre. Therefore production of bio-energy will only be possible in the urban fringe and not in the city centre.

Unlike the livestock farming in the city, stakeholders have no objections to greenhouses in the city centre. Therefore urban agriculture could further explore how to produce thermal energy next to horticulture in a greenhouse.

The examples in the reports of Senternovem (2005) and Jansma, et al. (2010) indicate that in order to produce thermal heat the greenhouse requires a large surface, large technological constructions as well as soil to store the heat. Therefore for a significant contribution to the energy supply of The Hague, an urban agriculture initiative has to produce energy through large-scale horticulture. Secondly because of its technical requirements and investment, an urban agriculture initiative should preferably be integrated in an urban development project.

The possibility to use heat from the city in urban agriculture is only mentioned by one interviewee. However this option is worth mentioning because The Hague has an excess of thermal energy, using this thermal energy could therefore also improve the urban climate.

Function 5: Close material cycles

In order to close material cycles the (re)use of organic waste was mostly mentioned by the respondents. They suggested using organic waste either as fodder or as organic nutrients. The potential use of liquid waste as input for urban agriculture mentioned by Baumgartner&Belevi (2001) was less known among stakeholders, or was rejected. Therefore the (re)use of liquid wastes, such as sewage, is not advisable. Also opinions about the viability and need to reuse organic waste in urban agriculture differ. This might be because the current waste collection system seems to be efficient.

The two methods mentioned by the respondents, composting and waste for fodder are in coherence with the possibilities mentioned in literature. However feeding livestock from urban waste seems to be difficult in the Netherlands according to one stakeholder unless the waste comes from large industries. Urban agriculture therefore preferably use organic waste from industries; and these industries are mostly located in the urban fringe. Using fodder also means urban agriculture has to produce livestock and again according to the stakeholders livestock farming should not be located in the city centre. Consequently, in case the urban agricultural initiative aims to contribute to the close urban material cycles by (re)using urban waste for fodder, the urban agricultural initiative should be located in the urban fringe. Composting urban organic waste offers therefore more possibilities for urban agriculture more central in The Hague. Yet the requirements to compost waste in the Netherlands was not studied in depth for this research, it is therefore not possible to set more specific criteria but with the current knowledge the urban agriculture initiative could at least make use of compost produced by the municipality.

Function 6: Improvement of the urban climate

The argument that vegetation could contribute to the improvement of the urban climate, by reducing air pollution and reducing the urban temperature, is coherent with the findings of Currie (2008), Isshi (2004) and Rahola et. al., (2006). However these scholars do not link the vegetation specifically to urban agriculture.

Agriculture does not always improve the air quality, for example Rodon (2002) argued that urban agriculture, especially livestock farming, could possibly increase air pollution. This was not mentioned by stakeholders but should be taken into account, as livestock farming will most probably not contribute to the improvement of the climate.

Furthermore only the energy company mentioned the urban heat island (UHI) effect. Also only one report on the UHI effect has been published in the Netherlands. This means, the urban heat island effect is not yet apparent in The Hague something that is also stated by Rahola (2006). Nonetheless if urban agriculture would like to improve the urban climate it is important to realize it should *improve* the urban climate though vegetation, it therefore should *increase* the amount of bushes and shrubs in The Hague.

5.3 Livestock farming in The Hague

Despite of the recent animal diseases as Q-fever and the bird flue, the main reason for stakeholders not to have animals in the city centre are ethical. The stakeholders are afraid that citizens will not accept livestock farming in the city. For example on already existing city farms in The Hague it is illegal to slaughter animals. According to the educational department of the municipality of The Hague this law is a result of protests of citizens. Because urban livestock farming is so sensitive the majority of the stakeholders do not advise livestock farming in the centre of The Hague.

In any situation stakeholders stated livestock farming has to be 'animal friendly', yet this is an undefined term that needs further research. Even among the stakeholders already two views on livestock farming exist; one group agrees on livestock farming in flats in the urban fringe or on industrial sites, the other group only accept livestock farming as side activity of the initiative. Interestingly the first group are larger organizations that focus on the whole city or even the whole country. The second group are the consultancy firms, producers and retailers. This group of stakeholders are the organizations promoting environmental sustainability, instead of integrating environmental sustainability in its existing management. For this last group it comes down to the fact that stakeholders suggest to keep livestock identical to current city farms but than for meat production, because urban agriculture in the city has to be *attractive* for visitors rather than productive.

As a consequence difference in values and believes related to environmental sustainability as discussed by Gilg, et.al. (2005) does exist among the stakeholders as well. Therefore some criteria can be set but they will not be in the interest of all stakeholders.

5.4 Suitable location for different functions

The type of locations oppose limits to possible products to be produced as well as possible functions; animal production could best be carried out in the urban fringe or industrial sides and thermal energy production on newly developed areas. In other words the objective of environmental sustainability is not specific enough to identify a suitable location.

5.5 What scale is suitable for urban agriculture?

Stakeholders could not indicate a precise suitable scale for urban agriculture. They did however talk about small and large scales. Stakeholders that did not agree on vertical farms are the same as the ones requiring a small-scale urban agriculture. This suggest a link to values and believes concerning environmental sustainability as stated by Gilg, et al. (2005).

The different opinions on scale reflect a various visions on the potential of urban agriculture. Again it is not possible to identify one suitable scale for urban agriculture. For future participation of the stakeholders in an agriculture initiative the different visions of companies and organizations should be taken into account.

For some functions large-scale agriculture is a criteria; for a significant reduction in CO² emissions (function 3), for energy production (Function 4) and the to close material cycles (function 5).

5.6 Who should take the initiative?

The stakeholders argue the citizens have to take responsibility and change their behaviour. However as discussed in the literature it is not only the responsibility of the citizen.

Gilg, et al. (2005) argue that one group of the society, the group that is not yet active in environmental activities such as waste separation, sustainable consumption etc. feels that their actions are insignificant and do not contribute to the environmental sustainability of the city. They feel only others with power can make a change. As a result this group of citizens do not perceive themselves to be responsible but think the powerful, the government as well as (large) companies and organizations, are.

However as the research has shown this companies and the municipality, think *the citizens* have the agency. The citizens should take the initiative and they have to participate.

This is an interesting phenomenon and is not necessarily specific to The Hague. As Seyfang (2005) argued the government and social movement organizations have identified the power of the citizen as consumer. These institutes argue the citizens do have agency and power to change through their consumer behaviour. But as studies have demonstrated only the current sustainable consumer does feel 'responsible' as it has an internal locus of control, and this group does not have to change.

It can be concluded the municipality, (non) profit organizations and citizens have conflicting ideas about their responsibility towards environmental sustainability and their agency.

In fact the stakeholders focus on pro-active citizens, with an internal locus of control and neglect the group with an external locus of control. The stakeholders are waiting for citizens to take initiative. Stakeholders are in the need for active citizens willing to carry out activities. Stakeholders have ideas, are willing to give support; now they are waiting for a person that will take up the responsibility, whom will carry the initiative and will carry the economical responsibility. At this point discussion is back to the start, because the citizen does not always feel they are able to carry this economical responsibility because they can not influence the perceived others with power. (Kollmuss & Agyeman, 2002).

6 Conclusion

The stakeholders were able to identify six functions for urban agriculture that contribute to urban development of the environmental sustainability of The Hague. Functions that fit to most of the problems in environmental sustainability; Un)sustainable land-use (space), CO² emissions including energy use, the lack of material cycles and the resulting produced waste and the pressure on biodiversity including the climate effects

It can be concluded that stakeholders recognize the potential role of urban agriculture in urban development strategies concerning environmental sustainability.

This means in The Hague agriculture can have more functions than only food production. Urban agriculture could be a new approach towards designing food production systems as well as a new approach to the development of urban strategies concerning environmental sustainability. It has proved to be valuable and cleared the road for the development of new strategies. Urban agriculture has the capacity to link different aspects of environmental sustainability, and therefore link stakeholders active in a city; urban agriculture has a connecting ability. Therefore urban agriculture can enhance a holistic approach towards urban development in environmental sustainability in The Hague.

It was not possible to identify design criteria that are specific enough for the development of a single urban agriculture initiative because the identified criteria are in contrast with each other. Especially the location puts limits on the possible functions of an urban agricultural initiative as not all functions can be integrated on one location.

But also interests of stakeholders are conflicting; The energy company shows interest in buying green energy and therefore needs to have a fixed location to guarantee it's investment of infrastructure but the real estate would like to use its owned vacant sites in the cities (brownfields) and needs a flexible food production construction.

Finally below in table 6 all functions are mentioned followed by a set of criteria identified in the discussion and results. It then demonstrates potential production methods and suitably types of locations for each potential function.

This table is visualized in a map, enclosed in the last page of this report. This map reflects all possibilities (function and production methods) per type of location. This map shows the urban fringe offers most opportunities for urban agriculture to contribute to environmental sustainability.

However the possibilities on the map can only be read as suggestions because the exact design criteria for a design of an urban agriculture initiative will have to depend on the interest and expectations of stakeholders as well as citizens that are willing to take up the initiative, and these differ per function.

To conclude, although this research was not able to reach its objective to set design criteria to design an urban agricultural initiative, the research will be valuable input for the decision-making process of future initiators of an urban agricultural initiative of The Hague.

Table 6 Conclusion: the design criteria, production methods and suitable location per potential function.

Function	Criteria	Examples of suitable products and production methods	Requirements for- and type of locations	Interested stakeholder
Function 1: Sustainable land use	<ol style="list-style-type: none"> Integration in recreation: <ul style="list-style-type: none"> Urban agriculture site should be accessible for visitors Offer recreational activities. Integration in urban park system <ul style="list-style-type: none"> Urban agriculture could be integrated in the 12 environmental structural adjustment zones of the Hague Integration in vacant locations <ul style="list-style-type: none"> It has to be able to move easily physically 	<ol style="list-style-type: none"> landless crop-production Permaculture non-landless crop production small scale livestock 	<ol style="list-style-type: none"> Visible for citizens Accessible for citizens In park Vacant location is on industrial site (brownfield) 	<ol style="list-style-type: none"> Urban planner Urban ecologist funding agency Real estate agencies
Function 2: To enhance environmental citizenship	<ul style="list-style-type: none"> People with different believes en values on the environment and society can identify themselves with the urban agricultural initiative Communicate the environmental impact of the urban agriculture initiative with citizens. 		<ul style="list-style-type: none"> Visible for citizens Accessible for citizens 	<p>Real estate agencies</p> <p>Department environment and education municipality</p> <p>Urban ecologist Producers</p> <p>Local initiative</p>

Function	Criteria	Examples of suitable products and production methods	Requirements for- and type of locations	Interested stakeholder
				Consultancy firm on sustainability Funding agency
Function 3: Localization of food production: Transport concerns	<ul style="list-style-type: none"> A CO² neutral production system Large-scale urban agriculture 			
Function 4: Green energy and thermal energy production	<ol style="list-style-type: none"> Production of bio-energy Production of thermal energy: 	<ol style="list-style-type: none"> Livestock production Vertical farming Greenhouse production 	<ol style="list-style-type: none"> Bio-energy: Urban fringe Close to organic waste producer In new developed areas 	<ol style="list-style-type: none"> Energy firm Producer
Function 5: Close material cycles	<ol style="list-style-type: none"> Collected waste is used as fodder Collected waste used for compost 	<ol style="list-style-type: none"> Livestock farming Horticulture 	<ol style="list-style-type: none"> Urban fringe Close to organic waste producer 	Facilitation: waste firm Environmental centre
Function 6: Improvement of the urban climate	<ul style="list-style-type: none"> Increase vegetation 	Horticulture and orchards	On rooftops Locations currently without vegetation	

7 Recommendations for implementation

This research has been a first step in the development of a platform working on urban agriculture in The Hague.

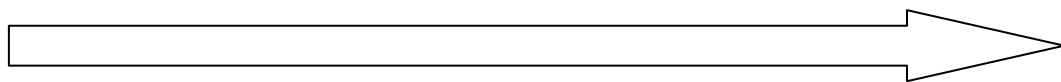
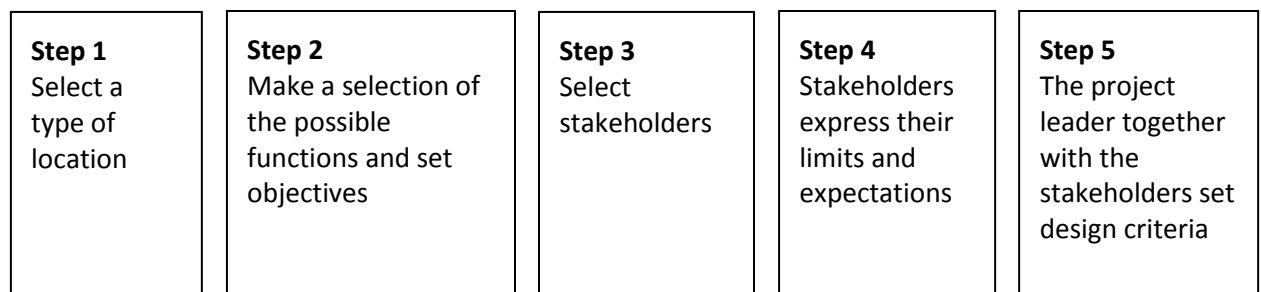
As a follow up on the research already a first workshop with a selection of stakeholders has taken place. This workshop was not specifically focused on the objective of environmental sustainability instead it focused on all urban development problems (Health, food security, employment, livelihood and social cohesion environmental sustainability). In this workshop stakeholders of those problems have expressed their interests and possible actions in an urban agricultural initiative.

Stakeholders where, in the interviews and in the workshop struggling with the level of responsibility in an agricultural project. They are willing to participate and think along but were not ready to pull a project. Hence for further development of an agriculture initiative, leadership of an organization or a person is needed. One organization has to take the responsibility to pull the project be the project leader.

In order to avoid conflicts it is advisable to make a selection of the possible functions and set objectives; to what environmental problems should the initiative at least contribute? However this approach is limiting the holistic approach towards urban development for environmental sustainability.

The Following decision path is advisable:

Decision path:



- One organization has to take the responsibility to pull the project.
- Stakeholders have to express their limits; they have to express the amount of time and (economical) responsibility they would like to carry.

Involvement support organizations

Parts of the interviewed organizations for this research were consultants working on environmental sustainability. However they were not involved in the workshop. These organizations have a strong ambition to improve the environmental sustainability and they have close relations with the active citizens. They are the organizations that can activate people willing to carry out an initiative. One could argue these organizations are close to the

citizens with an internal locus of control, the group so much desired by the other stakeholders. Therefore it is advisable to also include these organizations in the process.

Finally the project of Agromere has used the DEED framework (Giller, et al. 2008) in the development of an urban agriculture initiative in Almere. This framework follows set a research cycle with the steps: describe, explain, explore and design; together with stakeholders. This method could be suitable for a project in The Hague as well.

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Annex 1 Summary of the results

Annex 2: List of interviewed stakeholders

Theme	Stakeholder
Spatial planning	<p>Municipality Urban planning The Hague Project leader Andre Everts</p> <p>Real estate: Panagro, Cor Mooy</p> <p>Real estate: Bouwfonds ontwikkeling, Gert van der Hooning</p>
Environment	<p>Municipality Olle Mennema, Department urban-farms: Pien Gelder</p>
Potential purchasers	<p>Restaurant Watertanden: Toon van Mierlo Hagedis: Freya Wageningen</p> <p>Buthcher Slagerij Ruud de Ruijter: Ruud de Ruijter</p> <p>Retail: Willem en Drees, Willem Treep</p> <p>Catering: <i>Albron Henk Voormolen.</i></p>
Urban ecology	Urban ecologist: Johan van Zoest
Local producers	<p>Boerderij t Geertje, Wim van Rijn</p> <p>Jack's Trial, Jack Alblas</p>
Waste company	Van Ganzenwinkel: Otto Friebe
Energy company	Eneco: Andre Treffers
Advise organizations	<p>Local initiatives: Gezonde Gronden: Menno Swaak</p> <p>Sustainability: energy Platform Duurzaam Den Haag: Astrid Homan</p> <p>Environmental centre, the Hague Haags Milieu centrum, Ton Pitstra, Job Suijker and Frans van Steen</p> <p>Processing: Innovations in Food, Paul Den Dulk</p>
Expert Urban agriculture	LEI institute, Jan Willem van den Schans
Finance	<p><i>Rabobank, Hans Biemans</i></p> <p>Fonds 1818 (ASN): Carien Janssen van Raay</p>

Annex 4 Interview questions (Dutch)

Algemene interviewvragen voor instanties:

1. Wat verstaat u onder het concept Duurzaamheid: ecologische duurzaamheid?
2. Wat ziet u als de belangrijkste problemen binnen dit thema?
3. Hoe wordt er naar oplossingen gezocht of aan oplossingen gewerkt in uw bedrijf?
4. Zou u zich voor kunnen stellen dat een voedselproducerend bedrijf in de stad bij kan dragen aan de oplossingen voor deze problemen in de stad? Zo ja, hoe? Welke kansen ziet u? (*functies, producten, faciliteiten, dienstverlening*)
5. Welke bedreigingen ziet u?
6. Op welk gebied zou een SVPB nog meer kansen of bedreigingen bieden?
(*Wellicht heeft de kandidaat ideeën die niet direct binnen van toepassing zijn op zijn eigen werkterrein.*)

Het bedrijf

7. Hoe zou zo'n bedrijf er volgens u uit moeten (kunnen) zien?
8. a. Wat voor voedsel zou er geproduceerd kunnen worden? (Aquacultuur (viskwekerij), veeteelt (zuivel, vlees), akkerbouw (aardappelen, wortelen, kool), fruitteelt, kruiden, pluimvee, groenteteelt, kasteelt)
b. En welke nevenproducten zou het bedrijf kunnen leveren dan wel verwerken (productie van compost, energie, natuur; verwerking van gft afval).
9. Hebt u ideeën over de vorm en omvang van het bedrijf?
c. Welke potentiële stakeholders komen daarbij kijken?
10. De nieuwe 'duurzame' wijk Erasmusveld, tussen Morgenstond en Wateringse Veld, is een potentiële locatie. Daar liggen kansen omdat duurzaamheid een van de speerpunten van de nieuwe wijk is. Wellicht heeft u zelf ook ideeën over het soort locatie dat geschikt zou zijn. Ziet u concrete locaties in Den Haag?
11. Welke rol kan uw bedrijf in zo een bedrijf hebben?
12. Wat moet er gebeuren voordat het te realiseren is?
(*Economisch, sociaal, politiek*)
13. Welke eisen of wensen heeft u nog meer?

- Annex 5** **Examples of methods for urban agriculture (Dutch)**
- Annex 6** **Conclusive map: Possibilities for urban agriculture in The Hague**

