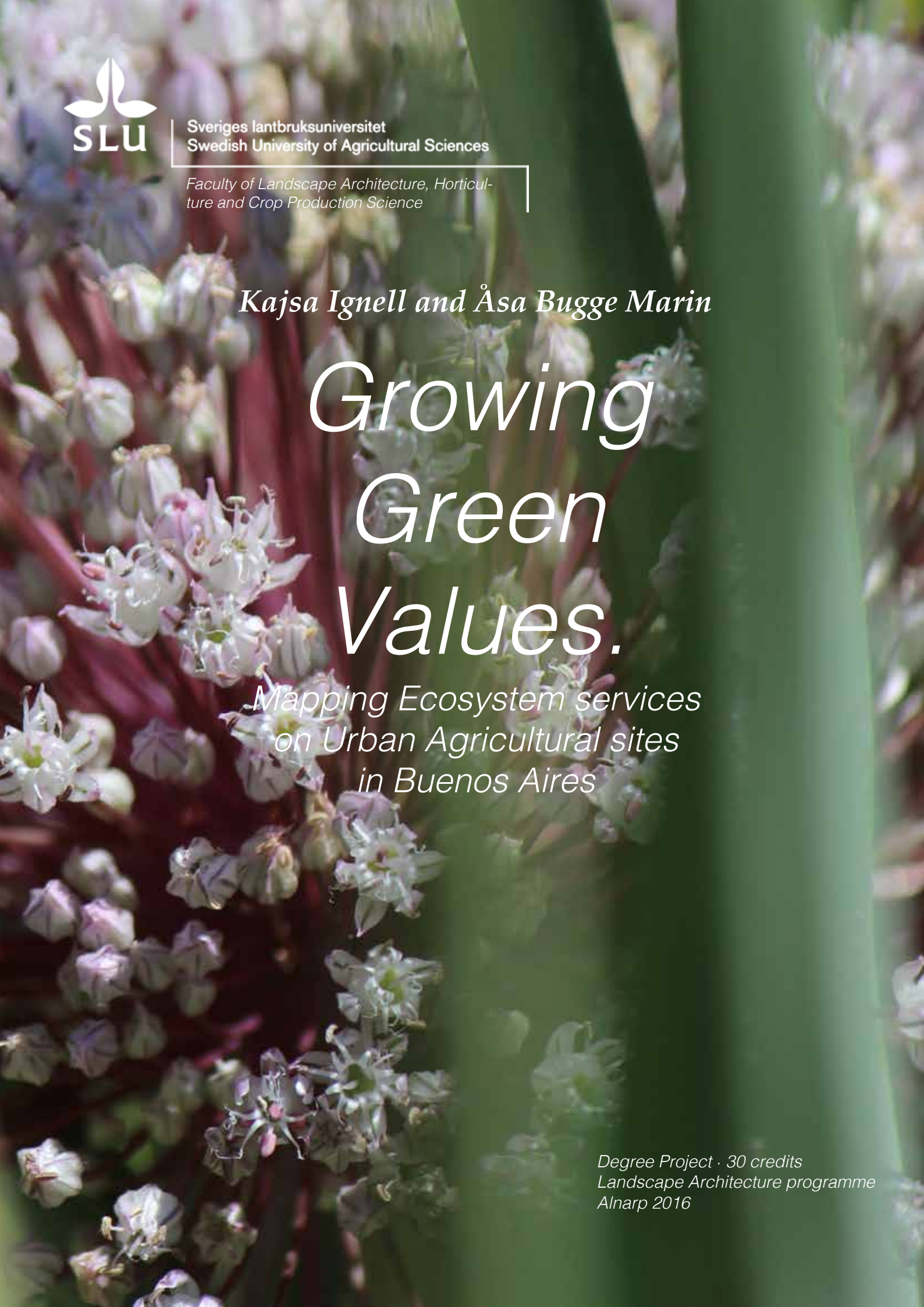

Sveriges lantbruksuniversitet
Swedish University of Agricultural Sciences

Faculty of Landscape Architecture, Horticulture and Crop Production Science

Kajsa Ignell and Åsa Bugge Marin

Growing Green Values.

Mapping Ecosystem services on Urban Agricultural sites in Buenos Aires

Degree Project · 30 credits
Landscape Architecture programme
Alnarp 2016

Growing green values - Mapping Ecosystem Services on Urban Agricultural sites in Buenos Aires

Odlade gröna värden - Kartläggning av ekosystemtjänster på stadsodlingsplatser i Buenos Aires

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Abstract

Buenos Aires, the capital city of Argentina, face some of the same problems as all megacities across the world. Increased land-use and a higher amount of built areas in and around the city of Buenos Aires leads to losses in ecosystem services. Argentina's economic situation has also led to an insecure food market, especially affecting the poor population. Apart from providing food security, urban agriculture connect people and can help to create a sense of community. Urban agriculture also facilitate several ecosystem services. With the growth of dense urban structures, loss of ecosystem services and need for food security, urban agriculture could play an important role for a future sustainable development. Based on this, we were interested in urban agriculture and its chances to strengthen the adaptive capacity and resilience in Buenos Aires.

The aim with this project is to map ecosystem services at urban agricultural sites in Buenos Aires. Therefore, the objective is to study literature on urban agriculture, ecosystem services and Argentina and to conduct a field study to map ecosystem services in Buenos Aires. The objective is also to create a matrix to give an overview of the findings on the sites.

The field study consist of six case studies on urban agricultural sites in Buenos Aires, where ecosystem services are mapped at a small scale. The study was conducted in November and December 2015 as a Minor Field Study, realized by a stipend from SIDA. A theoretical framework on ecosystem services and research on urban agriculture, as well as a background study on Argentina, serve as a foundation for the empirical study.

Our mapping of ecosystem services on sites and research show that urban agriculture provide many ecosystem services. Urban agriculture create a sense of community and other social values. Also, the sites contribute with urban temperature regulation, added biodiversity and infiltration water, which might function as an important part of the green structure in the city. Lastly, urban agricultural sites could in an indirect way provide food security for the citizens. These are all aspects interesting for future research.

Terminology

Ecosystem services

Ecosystem services is defined as the indirect and direct contribution by ecosystems to human well being

(TEEB, 2010; Naturvårdsverket, 2012).

Food security

" Food security exists when all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life." 1996 World Food Summit

(FAO, 2008)

Sustainable development

"A development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

(World Commission on Environment and Development, 1987)

Urban Agriculture

"...an industry located within, or on the fringe of a town, a city or metropolis, which grows and raises, processes and distributes a diversity of food and non-food products…"

(Mougeot, 2000).

See further definition on Urban Agriculture at page 32

“ The environment - land, sea, air and creatures - does change; and so the question arises, can the environment be changed intentionally to make it more fit, to make it more fitting for man and the other creatures of the world? Yes, but to do this one must know their environment, its creatures and their interactions - which is to say ecology.“

Design with nature
McHarg, 1992 (1969), p.52

Åsa Bugge Marin and Kajsa Ignell

Preface

The study is a master degree project in landscape architecture at the Swedish University of Agricultural Sciences (SLU) Alnarp. A Minor Field Study was conducted in Argentina, during autumn 2015. This was realized by a stipend from The Swedish International Development Cooperation Agency (SIDA). The field study aimed to map ecosystem services at urban agricultural sites, the mapping was made in collaboration with University of Flores (UFLO) in Buenos Aires.

In Spring 2015, we were involved in a participatory design project on urban agriculture in the NGO Architecture Sans Frontièrs Sweden. As project members we held a series of workshops on participatory design with people living in a marginalized part of the city Helsingborg. The project aimed to create a fair design process and enable people, regardless previous knowledge in design, to be part of a process to create new structures for gardening in a public space. During the project we learned more about the values urban agriculture can have, as the outcome of the agriculture seemed to be much more than just crops and flowers. Among other things, the project contributed to an engagement in the community and a connectivity among the participants. With this background we were ready to explore urban agriculture in the megacity Buenos Aires.

The work process can be divided into three main phases; the preparation work in Sweden, the field study in Argentina and the final work back in Sweden. We worked in a close collaboration through the whole process. Being two persons working together we have tried to get the best out of combining our previous experience and pre-knowledge.

We divided responsibilities and tasks, for example in terms of searching for information and writing parts of the thesis, but we also discussed, made changes together and shifted responsibilities, therefore we see no need to further specify who did each task in the thesis. The work was carried through with curiosity and an open mind, by internal discussions and reflections on the subject.

Kajsa Ignell & Åsa Bugge Marin, 2016-09-09

Acknowledgement

We would like to thank all people we met at the gardens in Buenos Aires for help and guidance, also, we would like to thank Colleen, Megan, Chiara and Manuel for the support during our stay in Argentina, and a special thanks to:

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For help and support while preparing for the field study

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For academic guidance and feedback

Juan Carlos Peirone, Sofia Böhmer and Anne Löfgren
For the help with Spanish translations

The Swedish International Development Cooperation Agency, SIDA

Content

Introduction

This chapter gives a background to the project. The aims and objectives, research questions and method for the study are described.

Background

Urbanization is increasing all over the world, and Argentina is no exception. The country has one of the highest proportion of urbanization and nine out of ten Argentinians lives in cities (UN, 2014). Buenos Aires, the capital city, face many of the problems megacities of today are forced to cope with. Following problems are examples of some of the issues partly caused by urbanization. Increased temperature in dense urban areas, is a common problem in larger cities during the summer months, known as the heat island effect (Gaston, 2010). Changes in land-use and a higher amount of built areas in and around the city of Buenos Aires leads to losses in ecosystem services (Morello, 2003). The changes in land-use and increased amount of hard surfaces in the cities also leads to a fragmentation of habitat for different species (Grant, 2012).

With one of the best land for agriculture the national economy of Argentina is highly depending on the exporting of agricultural goods (Morello, 2003). However, 5.5 million people, around 11 per cent, of the population suffers to some degree of food insecurity (Feeney & MacClay, 2016). With a history of economic crises and problems with high inflation (Cerro & Meloni, 2013), the food prices are constantly changing leading to an insecure food market and raising prices (Feeney & MacClay, 2016). The poor suffer the most when the official food market become more expensive and in Argentina, approximately one fourth are estimated to live under the poverty line (Landguiden, 2015).

Urban agriculture could help to combat many social problems in developing countries. The city of Rosario, Argentina, a program initiated by the municipality enables food security for the people by letting families grow food on left over land in the city (FAO 2015a). Apart from providing food security, urban agriculture connects people and can help to create a community feeling, build social capital and resilience in a neighbourhood (Zeeuw et al, 2011, Firth et al., 2011). As a green structure, urban agriculture facilitates many ecological functions and ecosystem services (Zeeuw et al., 2011).

Aim and research objectives

Aim and objectives

The aim of this project is to map ecosystem services at urban agricultural sites in Buenos Aires, Argentina. The aim is to gain knowledge on urban agriculture and the ecosystem services that are important in Buenos Aires. The aim is also to contribute to further research on if and how urban agriculture could strengthen the resilience and adaptive capacity in Buenos Aires to meet challenges such as ecological, social and economical problems.

Therefore, the objective is to collect and study literature on urban agriculture, ecosystem services and Argentina. It is also to conduct a field study to map ecosystem services in Buenos Aires. Furthermore, the objective is to produce a matrix to give an overview of the findings on the mapped sites. Lastly, the object is to analyse and systematize the collected information.

Research questions

- How can urban agriculture and its ecosystem services, help to combat social, ecological and economical challenges in the context of Buenos Aires, Argentina

Specific research question for the field study

- Which ecosystem services can we find on urban agricultural sites in Buenos Aires?

Limitations

The ecosystem services are investigated at a plot-scale. Possible connections to ecosystem services in a larger context are to some extent discussed. The physical boundaries are set to small scale sites for gardening in Buenos Aires, based on data from previous research on sites from the BioDesign-Lab at University of Flores UFLO. We make no economic valuation of the mapped ecosystem services.

Method

Research approach

The research approach is to gain knowledge on a specific problem area and to collect data by several methods, an approach inspired by explorative studies (Patel & Davidson, 2011, p.12). It is described as a type of study where the main purpose is to gain a wide knowledge on an issue, which could be used for further research (Patel & Davidson, 2011, pp.12-13). The methods for the thesis are both theoretical and empirical. A theoretical framework serve as a foundation for the empirical study in Buenos Aires.

Theory

Literature review

The literature review on the subject is made with an iterative method. Main search tools are SLU's web search Primo, Google scholar and also articles and literature referred by the supervisor. Most of the material is from online sources in English, also literature in Swedish and Spanish is used.

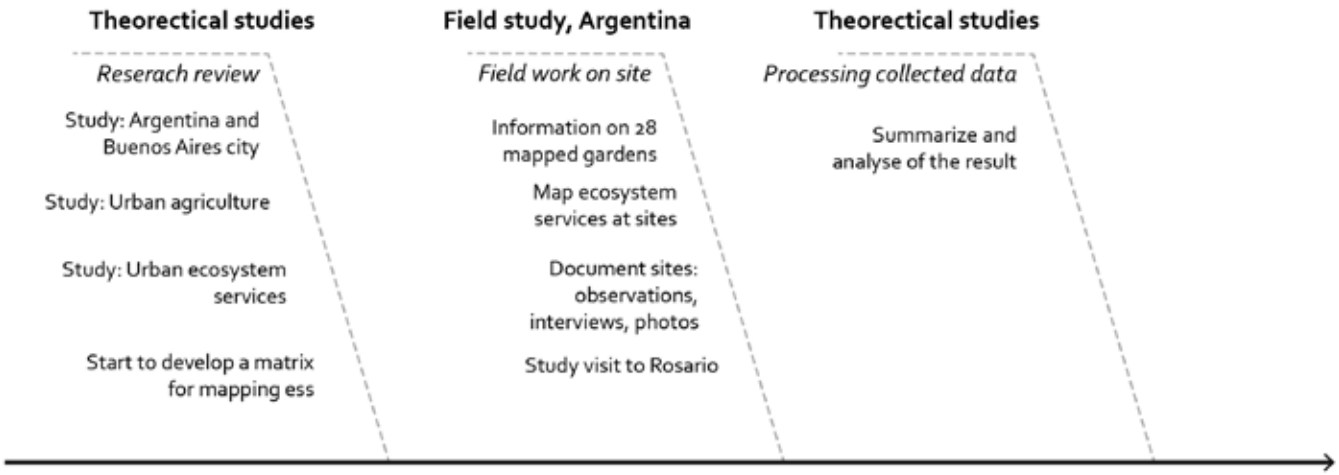
Field work

Case studies

During eight weeks, November and December 2015, a field study on urban agriculture in Buenos Aires, Argentina was conducted. Six urban agricultural sites was chosen and used for case studies. At the sites we mapped ecosystem services. A case study defines a study on a certain case, which is limited to focus on for example a group, a situation or an organization (Patel & Davidson, 2011, p.57). Within case studies it is common to gather different kind of information, for instance to combine observations, questionnaires and interviews (Patel & Davidson, 2011, pp.57-58).

None of us are fluent in Spanish, therefore translation might be an issue and to solve this we will get help from interpreters. Furthermore, as the field work is in a foreign country and culture, we need to be aware of our western-perspective and consider these kind of aspects, while preparing for our roles as researchers and interviewers[1].

The study is qualitative and for qualitative research there is no specified method (Patel & Davidson, 2011, p.120).



The illustration show the planned work process for the project

[1] *Anne Ouma, MFS-preparation course, 2015-09-15*

Mapping of ecosystem services

A matrix of ecosystem services has been developed by us and then used in the case studies in Buenos Aires. The procedure of mapping ecosystem services will be further explained on p. 46. The matrix is based on the theoretical framework and also influenced by our own evaluation of what we can be able to investigate on the sites. However, instead of collecting precise data, we use our own non-valuated method where our and others expertise will be the main source of information (Schägner, 2013). Main references for mapping ecosystem services are TEEB (2010), C/O City (2014), Gómez-Baggethun & Barton (2013) and De Groot (2010).

Questionnaire

We made a questionnaire on two pages with structured questions, with optional answers, to reduce barriers in the interpretation. The questionnaire was written by us in English and then translated to Spanish, with help from an Argentinian teacher at SLU. The questionnaire enabled us to get in contact with people involved in gardening and to understand what values the gardens offer them.

We handed out the questionnaire during visits together with contacts from UFLO, at three of the gardens: Pro-Huerta Parque Roca (2015-11-09; 5 respondents), at Pro-Huerta Centro Demostrativo (2015-11-10; 18 respondents) and at the Pro-Huerta University garden at UFLO (2015-11-17; 7 respondents). In total we got 30 answers on the questionnaire and all of the respondents were part of courses held by Pro-Huerta.

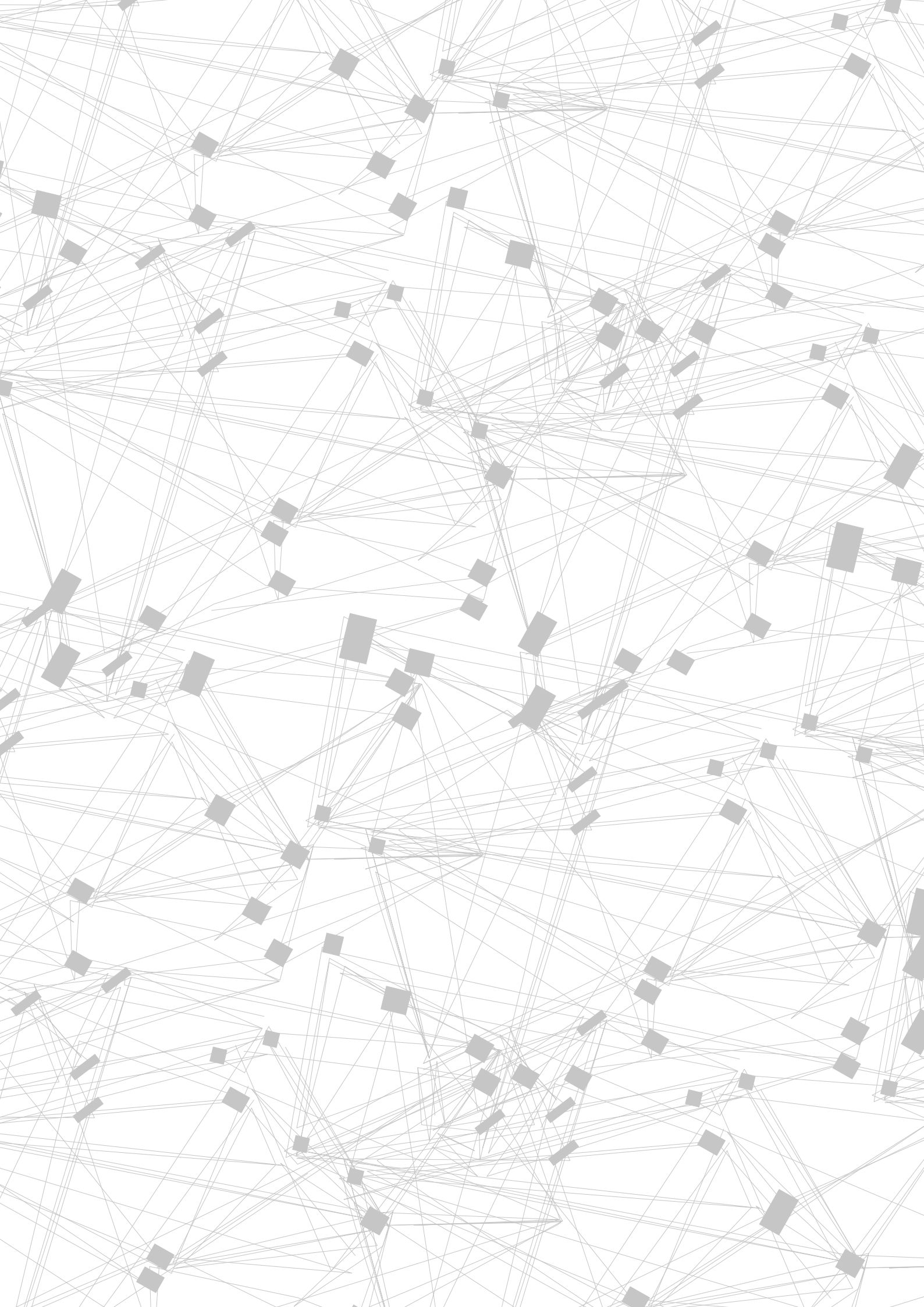
Based on the answers from the respondents and our experience in field, we adapted the questionnaire. We made some changes as adding new questions and information to further explain some of the concepts used in the questionnaire. The updated version of the questionnaire was for interviews with a consistent set of questions, which we did at the gardens Huerta de Garay (2015-12-17), El Galpon (2015-12-05) and El Brote Urbano (2015-12-03). The garden El Brote Urbano was not selected to be part of the case studies. However, here we had the possibility to make an interview in English with a person engaged in gardening with a individual based approach. We did not make an interview at the garden Espacio Cucoco.

Inventories

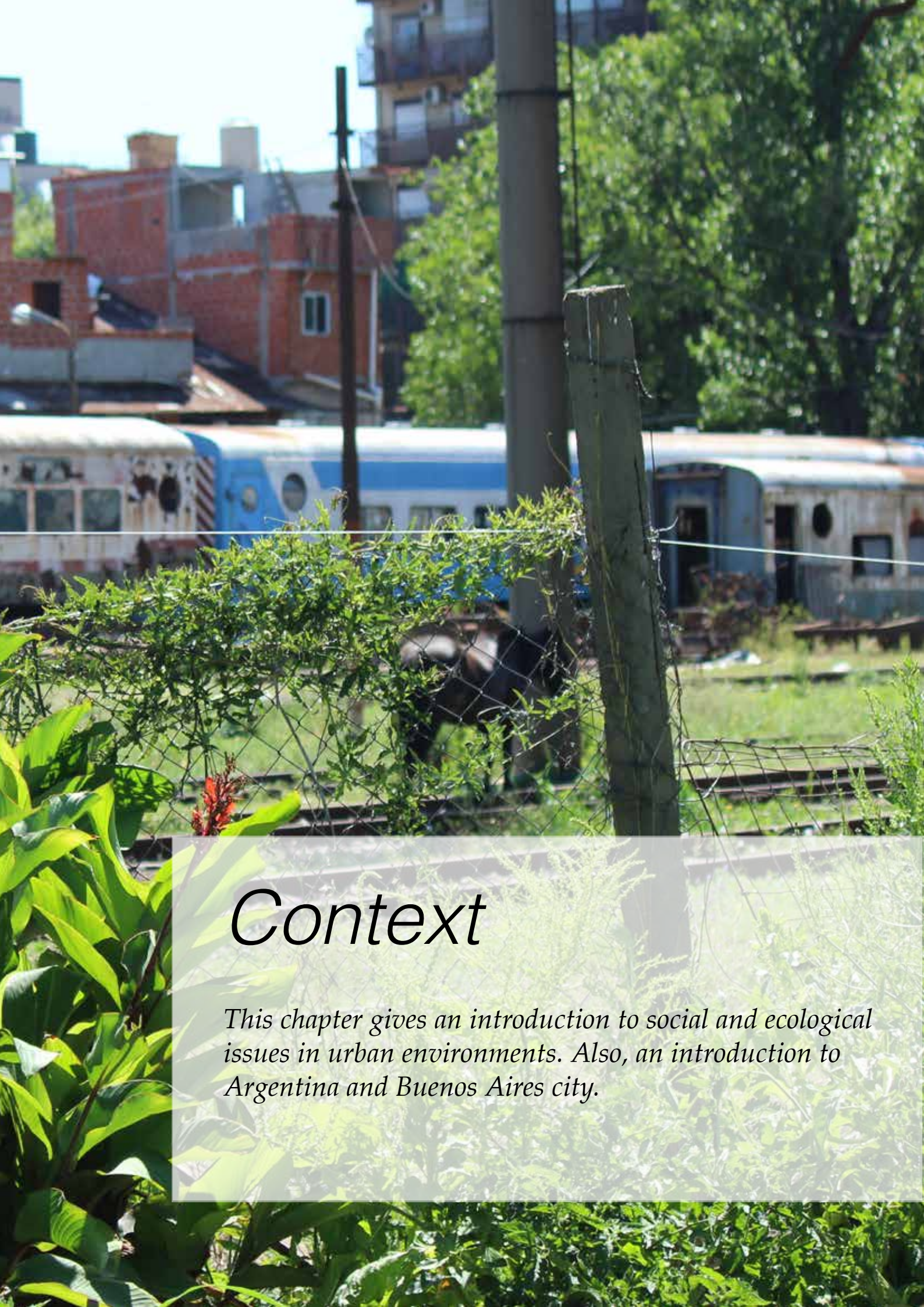
We made own inventories and observations at the sites. The sites were documented by photographs, sketches and notes. In some cases we used audio and video recordings.

Study visit Rosario

A study visit to Rosario, a city located north-west of Buenos Aires, was planned. The idea was to meet farmers and visit some of the gardens around the city. Due to safety reasons we couldn't visit the gardens at that time. We went to Rosario one more time to attend a lecture about the Pro-Huerta program and to visit an event for the farmers in Rosario. At the event we talked with Javier Couretot who was involved in the network Agricultura Urbana Rosario and helped us with further readings. Also, Lucho Lemos, engaged in the network and being the coordinator and guardian of the seed bank project Banco de Semillas Nanderoga (Arguello, 2010).



Theoretical Framework



Context

This chapter gives an introduction to social and ecological issues in urban environments. Also, an introduction to Argentina and Buenos Aires city.

Issues in urban environments

14 million people live in Buenos Aires. This is approximate one third of the total population of Argentina. Buenos Aires is rapidly growing and expanding its territory. Many of the ecological problems facing Buenos Aires city are the same for megacities all across the world.

Urbanisation and poverty

In many developing countries the rapid urbanization is caused by high birth rates and migration from rural areas. The move from rural areas is done to escape poverty, hunger and insecurity (FAO, 2015b). Moreover, the growth of cities is often associated with the growth of the slums and an increased poor population (Zeeuw et al, 2011). In fact, the poor population is even considered to urbanize faster than the non-poor (Ravallion, 2002). Poor people in cities also have less access to green space and therefore gain less of the health benefits, which are associated to green areas, instead the lack impacts their health in a negative way (Dover, 2015).

Urban ecology

In terms of ecology, there are some aspects that cities have in common in comparison to the countryside. For example, cities are warmer, retain less amount of water, emit more carbon dioxide and have lower biodiversity (Dover, 2015). The sealing of ground, artificial drainage systems and removal of soil leads to a change in the micro climate with higher temperature and lower humidity (Grant, 2012).

Climate change

The change of the global climate is by most scientists seen as caused by human activity, by the emission of greenhouse gases which has increased since the pre-industrial era and affects the global climate system (IPCC, 2007). Characteristic trends for Central and South America is a change in temperature and precipitation, and the region has been seriously affected by the climate variation and extreme events. Significant for south east of South America is an increase in yearly rainfall during the years 1950-2008 (IPCC, 2014). By 2100 climate models indicate an increase in temperature and a decrease/ or increase in precipitation, specific for the south east of South America is an increase of precipitation by 25 % and also more days and night with warm temperatures (IPCC, 2014). Societies adaptive capacity to climate change depends on socioeconomic conditions and poor people are more vulnerable for climate variations and extreme events (IPCC, 2014).

Fragmentation and loss of habitat

Development of cities often takes place at already exploited land, usually agricultural land that offers some remains of old structures as trees, woods, field margins and provides healthy soils and functioning water systems. The urban development leads to a direct loss of habitat and also fragmentation, and by that a decrease in the population of animals and plants. The urban habitats often consists of isolated areas with similar characteristics. This creates a lot of edge zones, which are beneficial for some species, whereas other species need larger continuous zones. These kind of species are more vulnerable and need habitats found in pre-development areas. Species such as birds which can fly are able to move between different habitats and are thereby less affected by the fragmentation (Grant, 2010).

Noise

Noise from traffic and other activities lead to health problems for inhabitants in cities, such as stress and hearing loss, it has also negative impacts on the wildlife (Bolund & Hunhammar, 1999; Grant, 2012). The amount of the noise depends on the distance to the source and type of ground surface (Bolund & Hunhammar, 1999, p. 296). Noise problems are aggravated by poor urban planning, as for example residential houses located next to large roads or airports (Grant, 2012)

Temperature and air

The phenomenon of increased temperatures in cities is known as the urban heat island effect which creates unpleasant temperatures, especially during summer (Dover, 2015; Gaston, 2010). For the cities inhabitants the heat is most disturbing at night-time and can lead to heat stress, circulation and sleeping problems (Dover, 2015). The urban heat islands effect depends on physical factors as topography, the structure of the city, density and building materials. Hard surfaces (roads, buildings) retain stored heat energy longer than vegetation. The release of heat is influenced by the density (height of buildings) and tall buildings creates less sky view and prevents the radiation towards the sky. The warm temperature also increases other problems in the city such as air pollution (Dover, 2015). Air pollution in cities is a large environmental and public health issue (Bolund & Hunhammar, 1999). Our cities are polluted by emissions from factories, power plants and vehicles and in many developing countries the use of mechanical vehicles is increasing (Grant, 2012). How much a city is effected by air pollution depends on the topography and wind. Cities that are lower than the surroundings are more affected. The wind can disperse some of the pollutants. Smog creates acid rain which negatively affects urban vegetation and water. Small particles can be carcinogenic for humans and also lead to respiratory diseases. Globally, air pollution is estimated to be the reason for 1 million premature deaths every year. (Grant 2012)

Water

The quality of water in rivers and streams is generally declined by urbanisation, which is due to many reasons as biochemical processes, thermal water pollution and by water pollutants from wastewater, sewage and fertilizer (Gaston, 2010). The change in the water flow and storm water contributes to the decline by transporting pollutants from surfaces into the water (Grant, 2012). Moreover, cities demand high amount of water supply which leads to a change in the water hydrology, outflow and drainage. In terms of mass, water is what cities consumes the most, far beyond fuel and food (Gaston, 2010). The transport of water from sites outside the city contributes to that the surrounding landscape gets warmer and dryer (Grant, 2012).

Waste and soil

Cities produce a lot of waste. The waste was during pre-industrial era to a large extent recycled and reused. Moving forward, the waste was often dumped in for example rivers, but with increasing knowledge on the cause environmental damage shifted info sealed landfills. Today, cities capacity to reduce the amount of waste varies (Grant, 2012). The soil in cities is often contaminated and compacted by construction work and vehicles. This causes problems for roots to grow and trees capacity to store water, the soils ability to drain water is also reduced. Exposed soil with no vegetation is vulnerable for erosion by heavy rain and wind (Grant, 2012).

Argentina - an introduction

Brief history and economical crises

The modern history of Argentina starts when Juan Díaz de Solís found the La plata bay in year 1516 (NE, 2016). Argentina gained its independence in 1816, but suffered from conflicts with neighbouring regions during the first 50 years. Six million people migrated to Argentina during a period of two decades, 1810 - 1830, and most people came from Italy and secondly Spain (Blouet, 2009). The years 1862 - 1913, during the Bartolomé Mitre administration, is considered as the golden years for Argentina with an increased immigration and economical growth (Cerro & Meloni, 2013). Since then, internal conflicts and economical problems has affected Argentina. In 1930 the first *coup d'etat* hit the country, the beginning of a period with many interruption of the constitutional order by the military junta. This ended in 1983 when the democratic and civilian rule returned (Global edge, 2016).

Argentina has also a history of several economical crises, beginning already during the golden years (Cerro & Meloni, 2013). The economic crises in year 1989 and 2001 are some of the worst and has led to great loss in human capital, institutional changes and greater economic inequalities (Cerro & Meloni, 2013). The last crisis, in 2001, hit Argentina hardest and led to a 15 per cent decrease in the gross domestic product (GDP) and the crisis in 1989 dropped the GDP with 9 per cent. The main reasons for many of the crises are political decisions and poor fiscal management, leading to hyperinflation (Cerro & Meloni, 2013). There are also other reasons involved; the global economy, corruption in the country and transnational cultural trends affecting the situation in Argentina (Morello, 2003).

In 2001, the international debt was raised from 7.5 billion to as much as 243 billion dollar (Morello, 2003). After this the currency has been set free, the inflation has been lowered and the export has increased (NE, 2016). This has helped to stabilise the country and today Argentina is one of the strongest economies in South America. With exports of agricultural products Argentina has had an average of 8 per cent growth of GDP since 2003 (NE, 2016) and today Argentina has a GDP higher than 540 billion US dollar (World bank, 2016b).

Is Argentina a developing country?

Generally speaking, based on a country's Gross National Income per-capita, countries can be divided into low, middle and high income countries, and low and middle income countries are referred as being part of the developing-world (World bank, 2015a). Argentina is classified by the World bank (2016a) as a high-income economy, with a GNI per-capita over $12,476 for the fiscal year 16, however, the Swedish government agency SIDA classify Argentina as a developing-country, since it is a possible country for conducting a Minor Field Study, a classification based on the OECD's DAC-list.

The United Nations uses the terms developed, developing and least developed regions, and categorizes whole South America as a developing region (UN, 2013). In the World Economic Outlook, by The International Monetary Fund IMF (2014) the world's countries economies is divided into two groups; advanced economies and emerging market and developing economies, a classification made with no strict economic criteria. Argentina and many countries in Latin America and in the rest of the world are categorized as emerging market and developing economies, whereas 36 countries is categorized as advanced economies (IMF, 2014). However, it could also be argued that this division between developed and developing countries is no more accurate, as Hans Rosling emphasizes, and argues that is better to make more precise definitions of countries status and that the simple division of the world is lazy (World bank, 2015b)

Social issues and food security

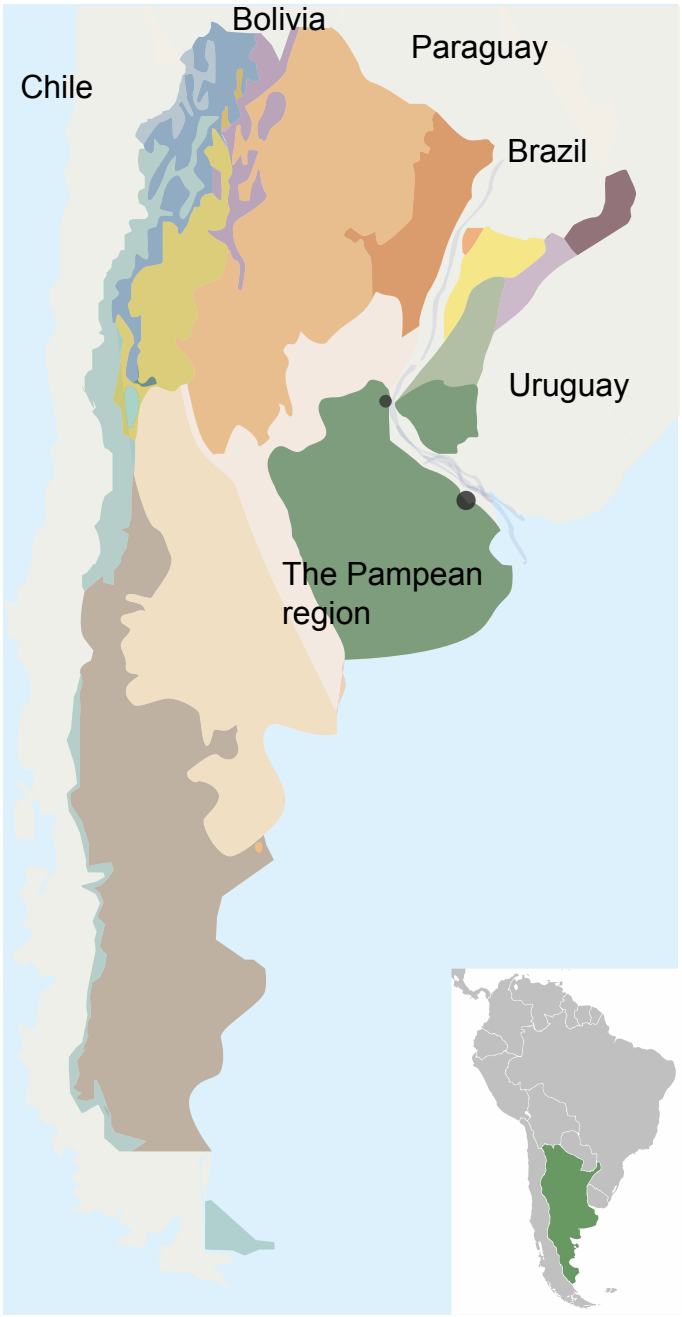
During the years 1991 - 2001 the social conditions got worse in Argentina and the unemployment rate raised up to 18 per cent in October 2001 (Morello, 2003). In 1991, as many as 19,7 per cent of the population lacked access health care and ten years later, in 2001, the figure raised to 26, 2 per cent (Morello, 2003). In 2002, 25.4 per cent of the population in urban areas had less than 3,8 dollar income per day (World bank, 2016a). Human Rights Watch (2015) state in a report that there are still great social and economical inequalities in Argentina, problems as lack in freedom of expression and lack of

indigenous rights are still present (Human Rights Watch, 2015). The number of poor was declared to be under 5 per cent by the government in 2015 (International Business Time, 2015). However, this figure was criticized since it was calculated with a very low inflation index, leading to the cost for a good living standard seemed to be lower than the reality (Economist, 2014). A more accurate estimation, according to the Catholic University in Argentina, UCA, is that as one out of four lives below the poverty threshold (Landguiden, 2015).

Even though Argentina is a country with great agricultural assets and a possibility to feed its inhabitants, as many as 5.5 million people, 11 per cent, suffers from some degree of food insecurity (Feeney & MacClay, 2016). It is estimated that around 700 000 children under 12 years old suffers from chronic under nutrition. At the same time, around 58 per cent of the adults are overweight and meat as beef and pork are some of the main parts of a typical Argentinian diet. There is a lack in education about nutritious food to help the population with better eating habits, but that's not the only solution. There are also problems in terms of accessibility and availability to nutritious food, with raising prices affecting the most vulnerable groups in the society (Feeney & MacClay, 2016). Argentina could enable food security for it's population but as Feeney & MacClay (2016) states, the country needs to solve the social problems to enable food security for all:

" In spite of the country's capability to produce enough food for its population and foreign markets (as it produces sufficient food to ensure 2000 kcal per day to 442 million people), there is a high number of people without sufficient incomes or healthy nutritional habits, depriving them from access to a healthy food basket."

Feeney & MacClay, 2016



Geography, Weather and Climate

Argentina is the second largest country in South America, with an area of 2.8 million sq km. The country is located in the south and west hemisphere, and stretches from the Atlantic sea in the east to the Andean mountains in the west (Argentina gobierno, 2016). Argentina borders to Chile in the west and to Bolivia, Paraguay, Brazil and Uruguay in the north. The country is highly urbanized where nine out of ten of the total 42,98 million inhabitants live in cities (Landguiden, 2015; World bank, 2016b).

Argentina has a diverse set of landscape types; ranging from the forest and the jungle in the north, to the Andean mountains in the west and the Arctic regions in the south (Argentina gobierno, 2016). Of the total 2.8 million sq km in Argentina, the total area used for agriculture consists of 1.5 million sq km, which is more than half of the size of the country. In comparison, the total area of forests only consists of around 300 thousands sq km (FAO, 2015c). As Argentina has four different types of climate; warm, moderate, arid and cold, the temperature and climate varies a lot both geographically and during the seasons (Argentina gobierno, 2016). The region where Buenos Aires is located has mild winters and it rarely gets below 10 degrees Celsius (Morello, 2003).

Extreme events

Changes in land use put higher pressure on the ecosystems leading to more frequent extreme events as flooding. The expansion of both formal and informal settlements has resulted in increased flooding due to lack of buffer capacity, which affects both the population, as well as the agriculture in the Pampas region (Morello, 2003).

The urbanization has led to an increased population living in the lower lying areas in the Pampean region close to the great river and when flooding has occurred in the area, it has led to great damage (Morello, 2003). One example is the flood lasting from november 2002 to July 2003, when about 2,350 000 hectares were flooded and about 70 000 persons had to be evacuated (ibid). Since the agricultural land was affected, it also led to losses in crops and economical production which in turn led to lowered living standards for the poor population (ibid).

When it comes to entire Argentina, the most common disasters leading to mortality reported nationally between 1990 and 2014 were fires, storms and floodings (Prevention web, 2014). The greatest economic losses during the same time period came from flooding and drought. By international standards of disasters, EMDAT, the most frequently reported disasters during the same period are mainly floods, storms and extreme temperatures (ibid).

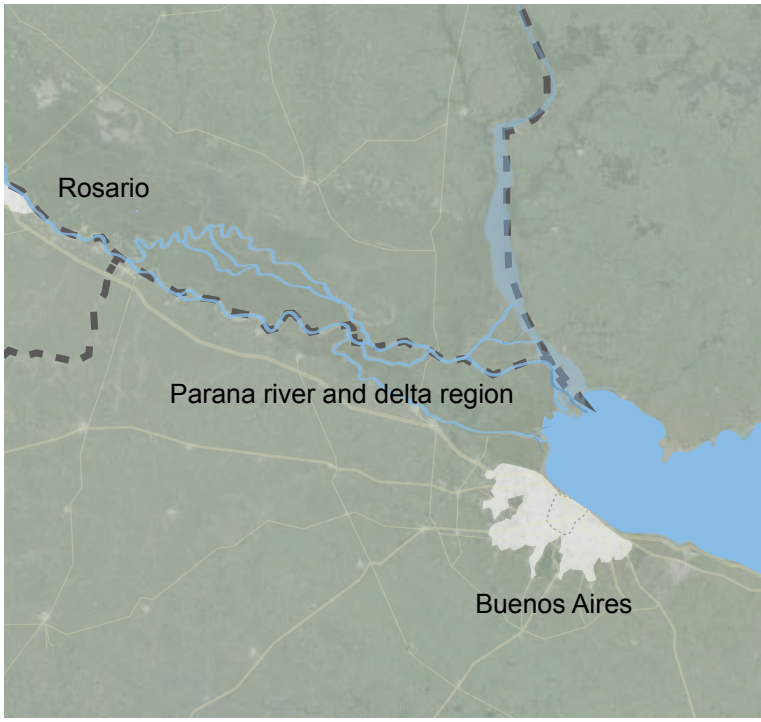
The Pampean region

Argentina has a long history of farming and holds some of the best land for agricultural use. However, changes in land-use and increasing population in the cities puts high pressure on the ecosystems and have contributed to loss in many ecosystem services.

Land use

The central-east of Argentina, from Cordoba down to the North part of Buenos Aires, is part of the rolling Pampas and holds one of the world's richest land for agriculture use (Morello, 2003; Barral, 2010). In total the size of this eco-region is 44.000 sq kilometres. This is also where the river Parana is situated leading to several industrial ports, where agricultural goods are shipped out of the country. In this region two of the main cities, Buenos Aires and Rosario, are situated. The growth in this region puts high pressure on land for agricultural, industrial and urban use (Morello, 2003).

Argentina is one of the leading exporters of beef and soy-bean cake and soy has increased during the last years. Other important products include sunflower seeds, the traditional maté and lemons (World bank, 2016b). A lot of the agricultural products are exported to China, which has boosted Argentinian export industry (World Bank, 2016b). Most of the soy beans are grown in the St Fe Province and processed in Rosario (FAO, 2015b). The land areas in the outskirts of Rosario is know as the city's vegetable belt, however, the land is under pressure from urban development and also threatened by the increasing soy bean production (FAO, 2015b). Farmers lease their land for soy production, with lower cost for labour and easilier management (FAO, 2015b). This has resulted in land use conflicts in Rosario[2].



Map over Buenos Aires and the surrounding region

The Parana river seen from the city centre in Rosario

[2]*Lucho Lemos, Banco de Semillas Ñanderoga, 2015-12-12*


Zanella

Buenos Aires

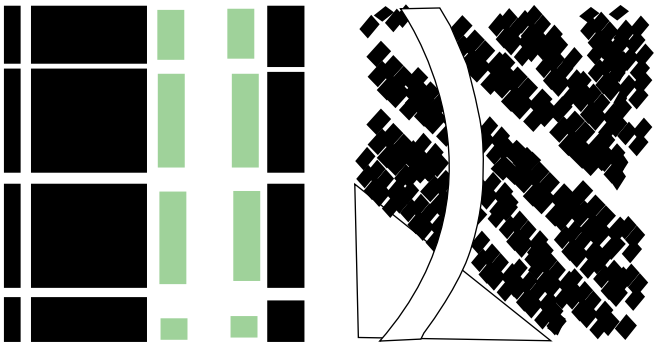
History and urban planning

The city of Buenos Aires became capital city of Argentina in 1880, and from the beginning the city served as an important bay (NE, 2016) . The city expanded drastically from 1880, and in the beginning of 20th century about 1,5 million people (NE, n.d.). Many immigrants came to Buenos Aires, mainly from Spain and Italy, which affected the architecture of the city (Cardinal-Pett, 2016). Because the rapid growth, Buenos Aires was one of the fastest urbanized cities in South America and also first to build tall buildings. Many of the immigrants were farmers and when arriving in Argentina, most of them stayed in Buenos Aires to work with agricultural industry (Cardinal-Pett, 2016).

In 1870, a strike from the yellow fever killed many people in Buenos Aires which led to the government taking control over the urban planning of the city (Cardinal-Pett, 2016). The infrastructure was mainly founded by British investors, but the urban planning was French and followed the Parisian model. This led to a transformation from a colonial Spanish city to "another Paris" with boulevards crossing the colonial street structure (Cardinal-Pett, 2016). For example, the avenue Avenida de Julio was built around 1937 and has a width 137 meters with as much as sixteen lanes for cars and buses (Jacobs et al., 2002).

Today, more than 14 million lives in the whole region of Buenos Aires, and about 2,8 million lives inside the federal district, Ciudad Autonoma de Buenos Aires CABA (INDEC, 2010).

Map showing Buenos Aires city and region.



To the left, typical block structure and the avenue Avendia de Julio in Buenos Aires. To the right, informal settlements. Same scale.


TALLE
DE HUER
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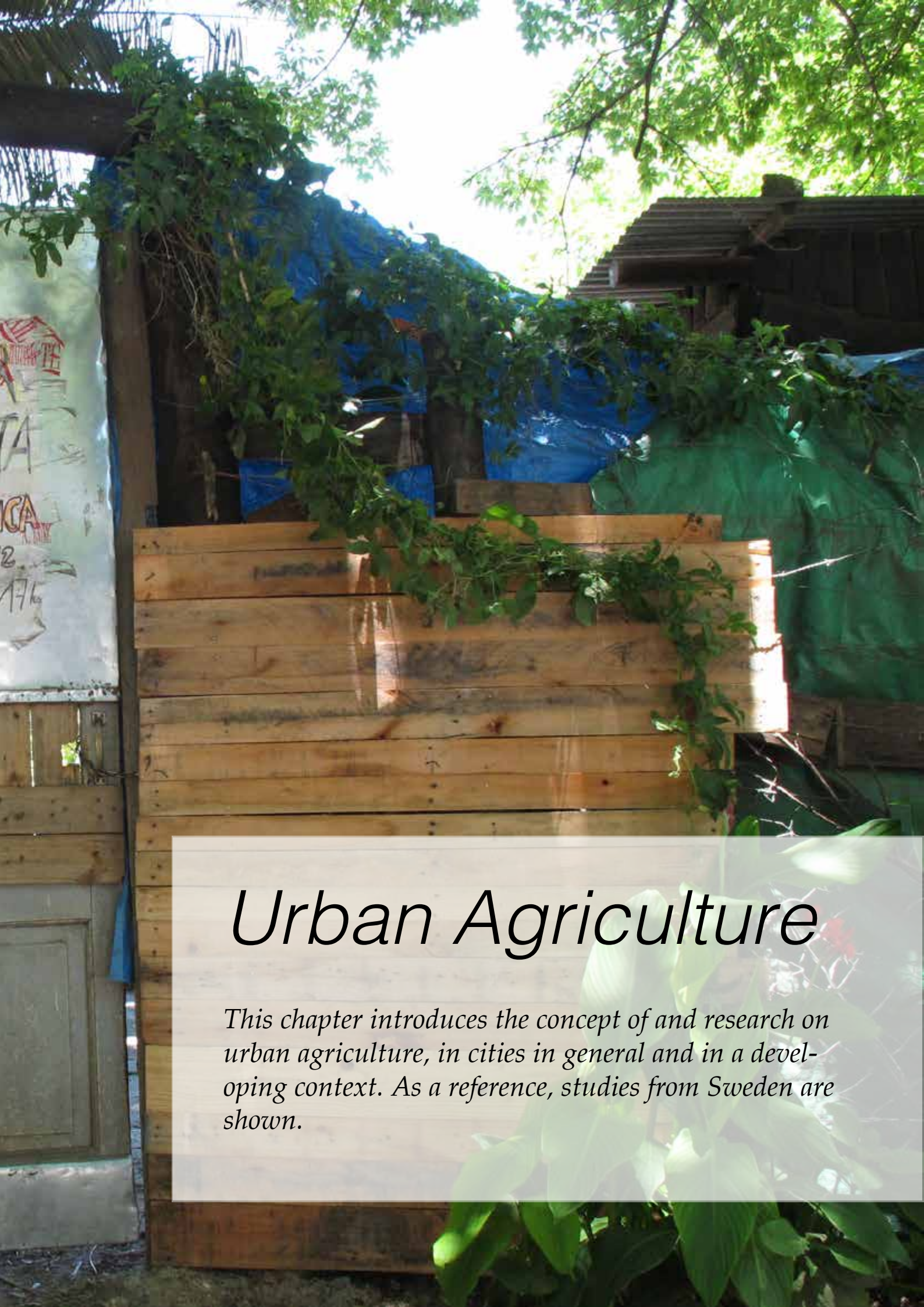


Urban Agriculture

This chapter introduces the concept of and research on urban agriculture, in cities in general and in a developing context. As a reference, studies from Sweden are shown.

The role of Urban Agriculture in cities

The importance of urban agriculture in developing countries has raised during recent years, especially for the poor. As a concept urban agriculture could help with many of the ecological as well as social problems in contemporary cities.

What is Urban Agriculture?

There are many different definitions to small scale farming within or in the outskirts of the city. The Food and Agriculture Organization (FAO) of the United Nations often uses the word UPA which stands for Urban and Peri-urban agriculture. According to this definition, Urban agriculture happens within the city whilst the Peri-urban agriculture takes place just outside of the borders of the city (Nugent 2000 in Veenhuizen 2011). While this suggests that urban or peri-urban agriculture is defined by the location of the activity, Mougeot (2000) suggests that urban agriculture rather depends on if it is connected to the social, ecological and economical structure of the city (Veenhuizen, 2006 p.2). This is described as

"An industry located within, or on the fringe of a town, which grows and 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" .

(Mougeot, 2000)

The study include structures of urban agriculture both on the fringe of and inside the city. Furthermore, it investigate how sites with urban agriculture affect the social, ecological and economical landscape of the city. The concept described by Mougeot (2000) is also the one most often referred to in the previous research presented in this study. For these reasons, the concept of Urban Agriculture described by Mougeot (2000) is used.

Swedish theoretical context

There has been several studies on urban agriculture at the Swedish University of Agricultural Sciences, SLU. The research has mainly focused on the social and recreational values of urban agriculture.

A study on urban agriculture in Malmö identifies three different types of urban agriculture: the private small scale gardening, the collective gardening for social values and the peripheral farming for commercial purposes (Delshammar, 2011). The small-scale farming is most for food supply and recreation, but plays an important role in a crisis. To enable this, there is a need to spread knowledge. This is the main purpose of the collective gardening, where there is little or no food supply but an important network and education about farming. There is a risk though, that this type of gardens are inaccessible to the people not enrolling in the gardening activities. The peripheral gardening is important since it creates a connection to the rural areas, serve the city with locally produced vegetables and prevent from further urban expansions on agricultural land (Delshammar, 2011).

Larsson (2009) discusses the value of community gardens as a bottom-up activity, where ideas from the people can be tested and the places can serve as "laboratories" in the cities (Larsson, 2009). The role of the community gardens are mainly to create a community feeling and to let people take initiatives by themselves to form, change and organize the gardens. In this way the people, as bottom-up initiatives, can be part in creating the sustainable city. As sort of laboratories, these community gardens tend to be a more open collaboration with the municipality. In this way, the gardeners get to use their creativity and at the same time the local potential is being used (Larsson, 2009).

Who is farming in the cities of developing countries?

As a concept, urban agriculture could play an important role for different marginalized groups in the society. Groups as older people without a pension, unemployed youth, refugees and people with disabilities, get included in the society and given a place in the city. Urban agriculture could also help to raise their self-esteem and enhance their possibility to provide an income for themselves (Bailkey et al., 2007). Many studies show that women and children are important actors in activities connected to urban agriculture in developing countries (Redwood, 2009). An important issue is that the labour often is considered to be unequal split between men and women, since women tend to work both during work hours on the fields and in the household (Redwood, 2009).

Farming for food security

To end world hunger is one of the goals for sustainable development, formulated by the United Nations (UN, 2016). Most hungry people live in developing countries (UN, 2016). To address the issue there's a need for food security and FAO (2008) mention four dimensions of food security: availability (physical availability to food), access (physical and economic access to food), utilization (nutrient uptake of food) and stabilization of the previous mentioned categories. Aspects as economy, politics and weather conditions can influence the stability of food security (FAO, 2008). The opposite, known as food insecurity, regards three types of insecurity; chronic, transitory and seasonal insecurity. The chronic stretches over a long time span whereas the transitory is temporary and could happen suddenly. The seasonal is temporary but often possible to predict and relates to seasonal climate variations; what crops that can grow, upcoming diseases and also what kind of jobs that are available (FAO, 2006).

Urban agriculture play an important role for the poor population when it comes to food security and nutrition (FAO, 2011). The formal network of food supply offers a reliable and affordable source of food to the urban population living in the cities. However, this formal network is often inaccessible to the urban poor because of their low income together with constantly rising food prices. This often leads to informal systems of food supply as street markets, home-based enterprises and urban agriculture (Korth et al, 2014). In this way urban agriculture helps improve food security in two ways; improved access to food and an increased income by selling grown products. Land tenure has shown to be important when it comes to food security, which raises the question about discrimination in urban policies and the need to legalize agriculture in the cities (Korth et al, 2014). Though urban agriculture often tend to be informal, according to the FAO (2011) it has great capacity of being an important formal structure and strategy when it comes to food and nutrition strategies for cities.

Studies indicate that urban agriculture could provide food and nutrition security and add supplying incomes (Gómez-Baggethun & Barton, 2013). An example of this in Argentina is the Programma Agricultura Urbana in Rosario, where a municipal project facilitates vacant lots and an urban agriculture program for the poor population in the city (Zeeuw et al, 2011). A study on sack gardening in the Kiberia slums of Nairobi in Kenya show that urban agriculture could lead to improved food security, a diet with more vegetables and the feeling of being more food secure than the non-farmers (Gallaher et al., 2013).

Although many studies indicate that urban agriculture contributes to food security and food nutrition, Korth et al. (2014) raises the need for further research on this subject, since no real measurable empirical evidence has been found.

Social capital and building resilience

In developing countries, urban agriculture can help build resilience, reduce poverty and help combat different environmental challenges (Zeeuw et al, 2011). Social capital can be described as the ties and network between groups or people in a neighbourhood or society (Firth et al., 2011) and is one way to describe community feeling and social cohesion.

By providing a 'third space' urban agriculture could contribute to a stronger social network in a community, but there is a discussion whether this social capital is available to all or not (Gallaher et al., 2013). The negative effect of social capital could be that a group of farmers become stronger within the group and thus distant from other neighbours. The positive effect with increased social capital could be a more inclusive community which strengthens the neighbourhood and gives the farmers stronger ties and a network of people to turn to in crises (Firth et al., 2011; Gallaher et al., 2013). Studies has shown how urban agriculture can be important for adaptive capacity and resilience as allotment areas have helped people to organise during crisis (Gómez-Baggethun & Barton, 2013). An increased social capital through urban agriculture has also shown to indirect contribute to food security (Gallaher et al., 2013).

The study by Firth et al. (2013) found four ways in which community gardens could contribute to an increased social capital. By bringing people with similar purpose together, by offering a meeting place, by arranging activities as parties or cooking classes, and finally by creating links between farmers and institutions and authorities. Another conclusion was that the organizing of the community garden play an important role when it comes to the success of an improved neighbourhood:

" If the core aim of the community garden is to promote community development, it is essential that the community garden is initiated and managed by individuals from within the local community. "

(Firth et al., 2013).

Urban Agriculture and ecosystem services

There are many values from urban agricultural sites, these values can also be described as ecosystem services, a concept introduced in the next chapter. Sites for urban agriculture generates and enhances different types of ecosystem services as food, social cohesion, recreation, local climate regulation, habitats for animals and plants, and pollination (Andersson et al., 2007; Barthel & Isendahl, 2013; Gómez-Baggethun & Barton 2013; Langemeyer et al., 2016). A study by Camps-Calvet et. al (forthcoming) in Barcelona, Spain, urban gardeners identified 20 ecosystem services from urban gardens. Cultural services are perceived as most high valued and appreciated by the gardeners. For example social cohesion and integration, exercise and physical recreation and place-making (Langemeyer et al. 2016). Urban agriculture can also be an important part of a city's green structure and facilitate many of the internal ecosystem services in the cities. Allotment plots and community gardens can contribute with regulating and supporting services, by adding biodiversity, maintain green open space and control storm water flows in the city (Zeeuw et al., 2007).

Urban Agriculture in Argentina

The word huerta is the Spanish word for orchard or garden and describes the small allotment plots or community gardens with urban agriculture in Argentina[3]. National and regional programs has during recent years aimed to help especially the poor population to grow their own food and to educate people in farming.

Pro-Huerta

The Program "Pro-Huerta" is a national program initiated around 1990 by the National Agrotechnology Institute (El Instituto Nacional de Tecnología Agropecuaria, INTA) and organized together with the Ministry of Social Development (Ministerio del Desarrollo) in Argentina (Fernandez & Erbetta, 2007). By encouraging the poor population to grow their own vegetables, Pro-Huerta aim to reduce poverty through self production and increase the knowledge about healthy food. This is done by handing out seeds, plants, materials, holding courses and providing huertas for urban agriculture in the cities (INTA, 2011). Around 3.5 million people are connected to the program and grow their own vegetables in about 148,000 huertas across the country (Diaroc, 2010).

Brief history of Pro-Huerta

In 1990 Argentina suffered from an economic crisis and hyperinflation, which affected the access of food (INTA, 2011). Between 1965 and 1985 the intake of nutritious food had also decreased among the poor in Argentina. Because of this, there was a need for social interventions to help those below the poverty line and the idea of small-scale farming was raised. Because the effects on food intake from small-scale farming was considered to be marginal and previous experience suffered from lack of scale and continuity, the program was an unconventional idea. The idea was to both provide technical solutions such as farming techniques and education, but also to build social networks by community participation and the help of volunteers (INTA, 2011). In 2003 Pro-Huerta became part of the National Plan for Food Security (PNSA) and the Federal Program for Sustainable Rural Development Support (ProFeder), both programs to promote nutritious food with technical or social interventions (INTA 1, 2016 and Desarrollo Social 1, 2016).

Part of the success of the program has been the bridging between the social and the technical solutions and the trust built by the continuity of the program (INTA, 2011). More than 10,000 institutions and organizations, as for instance schools, municipalities, hospitals, health centres and non-government organizations are part of this network. Roberto Cittadini, National Coordinator of Pro-Huerta by INTA state:

" In addition to self-production, a line of work that is taking hold in the Pro-Huerta is the marketing of surpluses. The gardeners usually associated to sell the surplus on trade in social, agro-ecological economy, or in their own gardens. Generating very strong social networks "

(Diaroc, 2010).

Note, translated from Spanish to English by the authors.

[3]*Laura Tanzariello, Pro-Huerta, 2015-11-10*

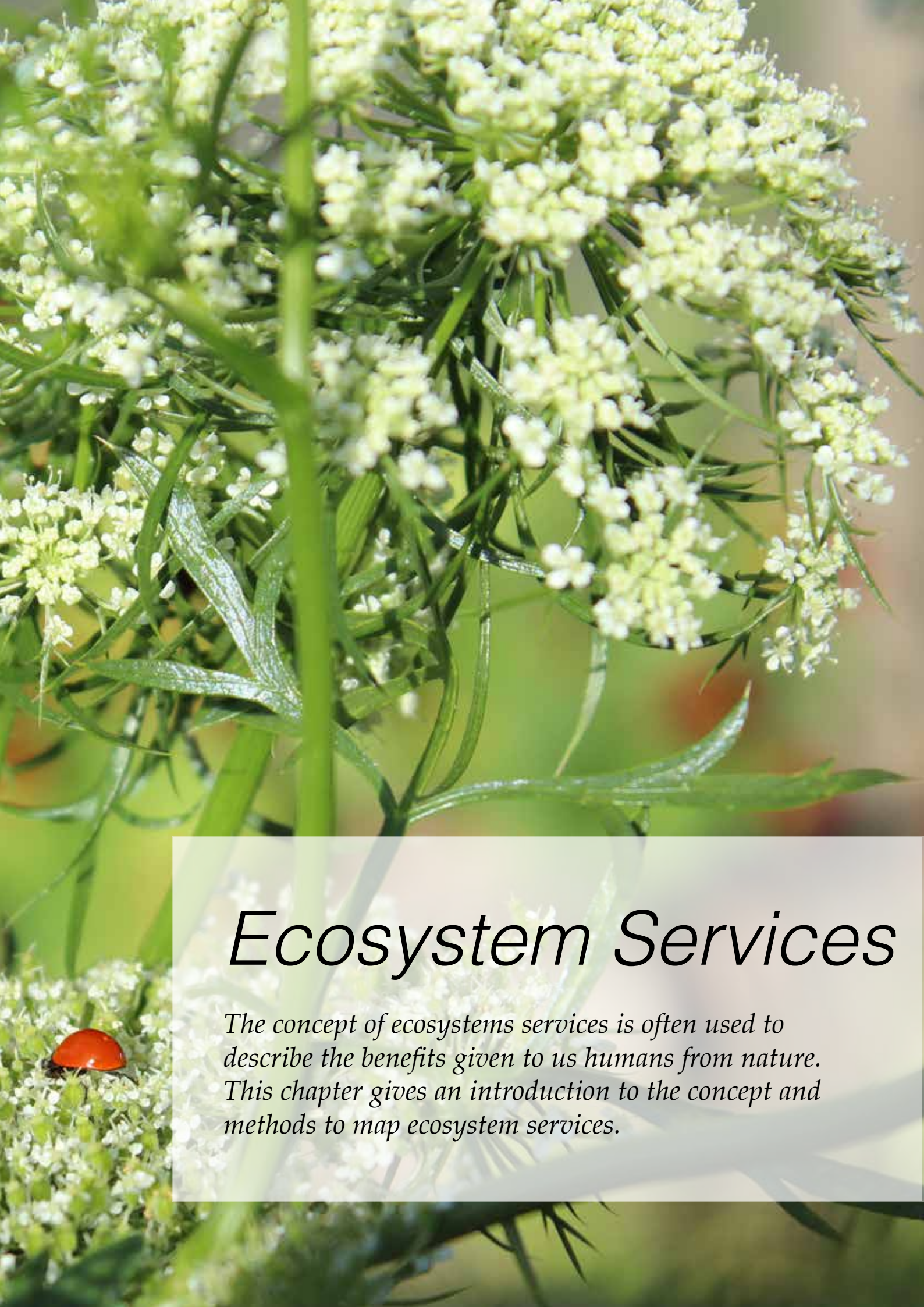
Rosario: Programma de agricultura urbana

By letting vacant land in the city of Rosario become urban agricultural sites for the marginalized in the society, the program Programma de agricultura urbana (PAU) helps to enable food security and an alternative income for the poor of the community (Inclusive cities observatory, 2010). The program started in 2002, but has it's roots in earlier experiments and projects with urban agriculture starting around 1990 in Rosario. Today the program is connected to other similar projects in the region of Santa Fe.

These vacant lots are located in strategic places close to where the poor population lives and consists of both private lots and lots owned by the municipality suitable for agricultural use. By revitalizing degraded lots in the city these huertas increases the amount of green areas in the city and becomes important social and productive spaces. Six local markets are held one day a week in different parts of the city. This is where the farmers can sell both the vegetables they have grown but also the products they produce from the crops in their gardens as for example marmalade and cosmetics (Inclusive cities observatory, 2010).

Some of the results from the program PAU are "providing food security and additional income for roughly 2000 citizens; regenerating urban waste spaces for productive and sustainable use; fostering self-esteem and social integration of marginalized groups"(Inclusive cities observatory, 2010).

Event held for farmers in Rosario.



Ecosystem Services

The concept of ecosystems services is often used to describe the benefits given to us humans from nature. This chapter gives an introduction to the concept and methods to map ecosystem services.

Defining ecosystem services

Introduction

Healthy ecosystems are the base for sustainable cities and the benefits from ecosystems are known as ecosystem services (TEEB, 2011). Ecosystem services is a socio-ecological concept and describes the values that nature and its ecosystems have for humans well-being (MEA, 2005). The concept is anthropocentric and visualizes the processes within the ecosystems beneficial for humankind (Naturvårdsverket, 2014). As there today are several interpretations on the concept of ecosystem services, the concept can also be useful different contexts (Costanza, 2008).

The Economics of Ecosystems and Biodiversity (TEEB, 2010), continuation of the research by Millennium Ecosystem Assessment (MEA, 2005), divides ecosystem services in four main categories; provisioning, regulating, supporting and cultural. Provisioning services are the products we gain from the ecosystems, for example food, fresh water. Regulating services are the benefits from regulation of the ecosystems for example, water regulation. The supporting services are the basis for all other services. Cultural services are the non material benefits from ecosystems, as health, recreational and social values. Within these categories 17 ecosystem services are identified (TEEB, 2010). However, this categorization of ecosystem services is not easily transferred into practical work and feasible in landscape management (Jansson 2013).

Local and global scale

" Understanding a complex system, such as a global ecosystem, requires an understanding of all the levels in a hierarchy and the relations among them "

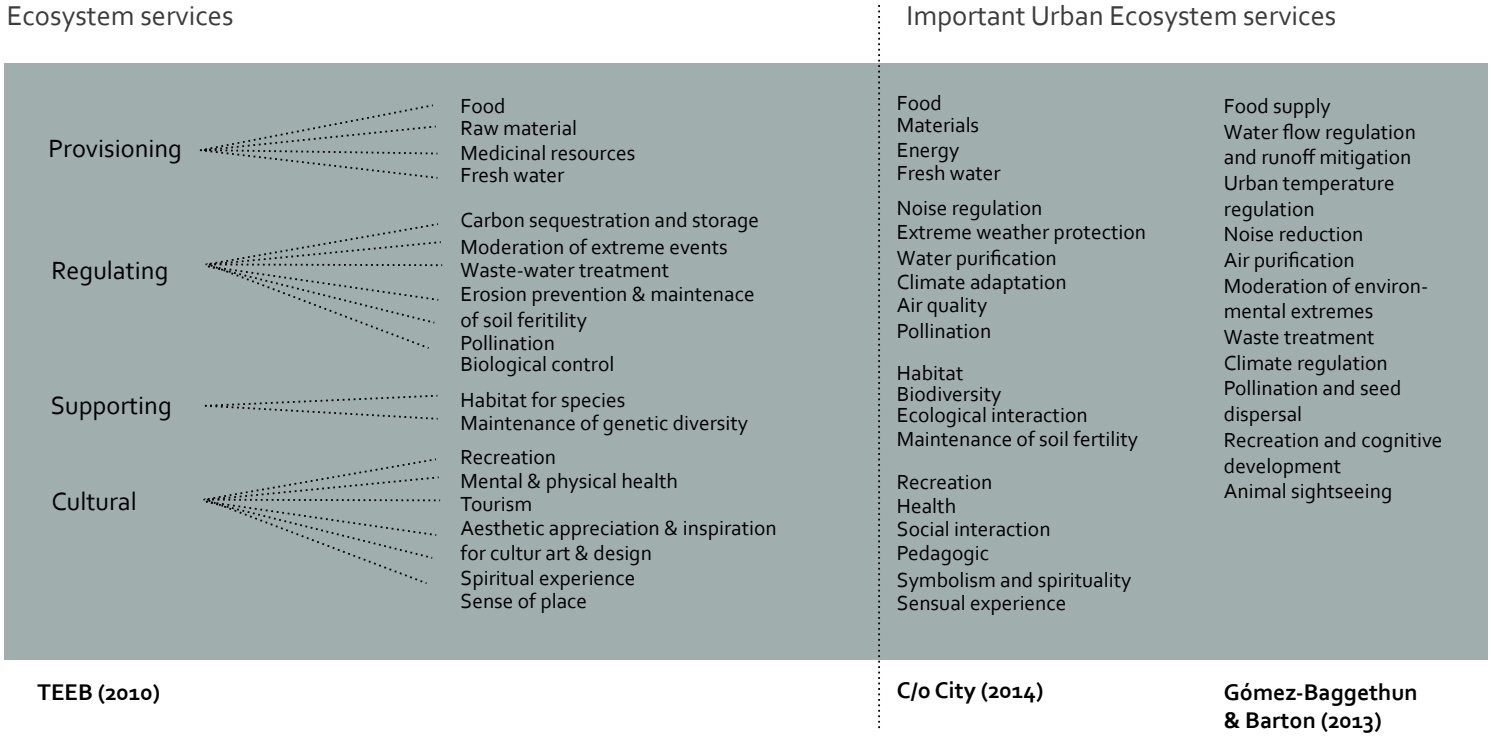
Wildbanks, 2006, p.315

Our cities depend on a range of ecosystems outside of our cities for support and supply, but the city's internal ecosystems also matter for our well-being (Bolund & Hunhammar, 1999). Jansson (2013) suggests a division between ecology 'in' and ecology 'of' the cities; the flow of benefits produced inside and outside the cities, to highlight cities relation and dependence on the surrounding areas, but also to emphasize the necessity of having both services. Which is agreed by Bolund & Hunhammar (1999) as there are many reasons to integrate ecosystem services into our use of urban areas, for efficiency and also for educational and ethical grounds. Local ecosystem services can be the solution for local generated problems, such as traffic noise and air pollution, where the ecosystem services can decrease the effects and increase quality in the cites. Anyway, global ecosystem services are still important for people living in cities (Bolund & Hunhammar, 1999).

Ecosystem services in cities

Gómez-Baggethun & Barton (2013) identifies 11 important ecosystem services in urban areas. The main findings from their review on urban ecosystem services are the benefits of cultural services; such as recreation and health, as well as regulating services; such as noise reduction, air purification, urban cooling and regulation of water flow and runoff mitigation. Though, the authors also emphasizes that relevant ecosystem services are related to the given environmental and socio-economic context (Gómez-Baggethun & Barton, 2013). An attempt of identifying important ecosystem services to use as a basis for urban planning is the publication Ekosystemtjänster i stadsplanering - en vägledning (Authors translation, A guide to Ecosystem services in urban planning) from C/ O City (2014). It is a collaboration between Malmö and Stockholm municipality. In the publication several relevant ecosystem services in cities are identified.

The illustration below show types of ecosystem services and which that could be important in urban environments



In cities, urban ecosystem disservices could also be found, as air quality problems, view blockage, allergies, incidents, fear and stress indicators are for example dark parks, damages on infrastructure such pavement and habitat competition with humans indicators are for example lots of rats and insects (Lyytimäki & Sipilä, 2009).

As a tool for landscape analysis - how to map?

The variation of ways to map and measure ecosystem services and at numerous scales makes the research lack in precision (Schägner, 2013). As Crossman states "... there is much uncertainty in what is mapped and the methods used to map the services." (Crossman, 2013). Schänger also concludes that many mappings of ecosystem services differ widely in scale and method (Schägner, 2013).

Research by Crossman et al (2013) reviews a number of methods used to map different ecosystem services. Many methods use data to simulate or calculate amounts and flows of ecosystem services where for example GIS or other modelling programs are commonly used tools (Crossman, 2013).

Schägner (2013) recognizes five different categories of methods for mapping the supply of ecosystem services:

1. One-dimensional proxies for ESS, such as LCLU,
2. Non-validated models : ecological production functions (or models) based on likely causal combinations of explanatory variables, which are grounded on researcher or expert assumptions
2. Validated models: ecological production functions, which are calibrated based on primary or secondary data on ESS supply,
3. Representative data of the study area: data on ESS supply that is collected for the specific study area, and
4. Implicit modelling of ESS supply within a monetary value transfer function: the quantity of ESS supply is modelled within the valuation of the ESS.

(Schägner, 2013)

The non-validated method could be used for a general conclusion using the best accessible knowledge, but this method lack in precision (De Groot et al, 2010; Schägner, 2013) The representative data is a good way to analyse smaller areas, but time consuming if used for larger landscapes (Schägner, 2013). In the thesis the conducted inventories during the field study are influenced by these two methods to map the supply of ecosystem services.

For further mapping of ecosystem services, suggestions to enhance the consistency and precision is being made (Schägner 2013; Crossman, 2013). For example, Crossman suggests a blueprint for mapping ecosystem services which could create a more comparable database of ecosystem services (Crossman, 2013).

Inventory and mapping

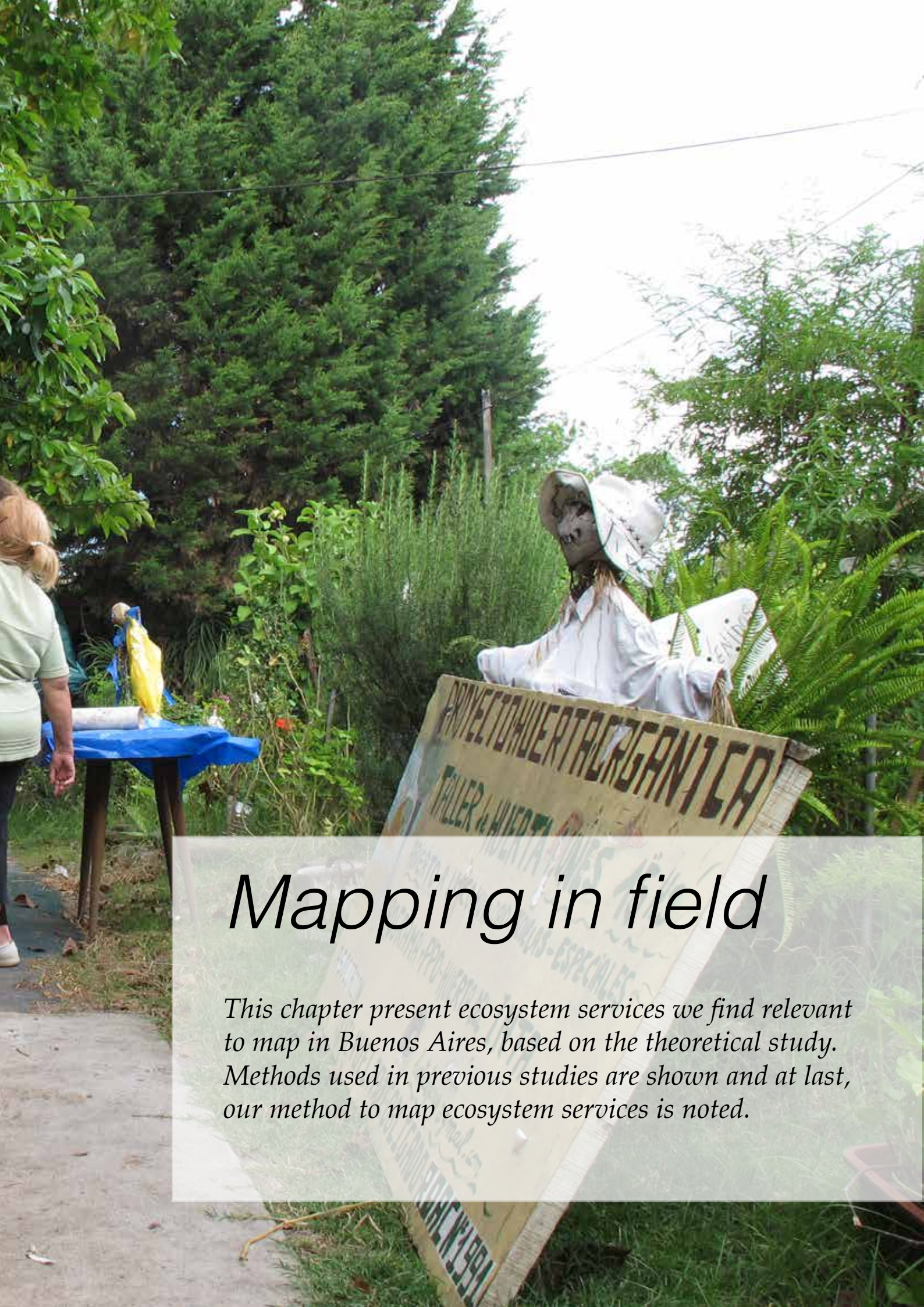
De Groot (2010) mentions examples of ecological processes providing ecosystem services and how these could be mapped or measured. A suggestion is to map the indicators of state and performance, which shows how much is present and how much that is used (De Groot 2010). This could be seen as the supply and the value for humankind. The list gives a range of quantitative indicators as for example amount of harvest and number of people using the site (De Groot, 2010).

The SCB (Swedish statistical institute) report Inventory of data sources for quantification of ecosystem services discuss different data for inventories of ecosystem services in landscapes as agricultural land, forests and cities (SCB, 2013). In the report, the cultural ecosystem services are considered to be the most important in the cities but also the ones most difficult to map due to changes over time and a lack of data supply. Indicators as amount of green space per person and distance to green spaces are suggested data for some cultural services. For noise reduction, for example, areas of vegetation compared to infrastructure data as high traffic is one suggested method for quantification (SCB, 2013). In the review by Crossman, data for mappings depends on the ecosystem service but could for example be binary land cover

or kilo kcal per hectare for the ecosystem service food (Crossman et al., 2013).

Gómez-Baggethun & Barton (2013) emphasizes that there is a lack in studies on urban ecosystem services, as "most studies on the topic have focused on single ecosystem services and/or value dimensions." (Gómez-Baggethun & Barton, 2013). Crossman et al. (2013) also stresses the need to map more than one ecosystem service in one study. Assessments of cultural and social values often demands a qualitative approach (Gómez-Baggethun & Barton, 2013, p.240). However, there are examples of quantifications of some cultural ecosystem services such as sense of a place (Gómez-Baggethun & Barton 2013, p.240) but the quantitative approach might be either to no use or difficult. One conclusion drawn by Crossman et al. (2013) is that more work needs to be put into investigating cultural services and especially in Central and South America where these types of services are relatively less mapped (Crossman et al, 2013, p.12). Gomez Gómez-baggethun & Barton (2013) suggests a deliberative process at a local scale is preferable. There is also indicators that the mix of people living in urban areas also generate a more diverse perception of cultural and social values, compared to in wild and rural areas (Gómez-Baggethun & Barton, 2013).


FIELD STUDY



Mapping in field

This chapter present ecosystem services we find relevant to map in Buenos Aires, based on the theoretical study. Methods used in previous studies are shown and at last, our method to map ecosystem services is noted.

What can we see in the landscape?

Identifying important services

A list of important ecosystem to map in field was made for the case studies in Buenos Aires. Main references are TEEB (2010), Gómez- Baggethun & Barton (2013), C/O City (2014), and De Groot (2010). The list was adjusted by our own conclusion of what we are able to investigate on the sites. One ecosystem service; the moderation of extreme events, which we find important in the context but difficult to map, was excluded. Instead of mapping the capacity to buffer extreme events, we look at indicators for vegetation to offer protection from sun, heat, wind and rain as well as the capacity to infiltrate water. This could give some indicators to the importance of the site for buffering extreme events, although is it not in the checklist for the field study.

The cultural ecosystem services are difficult to map since they tend to be subjective. For example, the service aesthetic appreciation was only part of the mapping through the first questionnaire.

Checklist for the field study

The checklist below presents relevant ecosystem services and different approaches to map them, and finally the method chosen for the matrix we used in the field study.

Food supply

Edible plants grown for eating provide the ecosystem service food (TEEB, 2010). Even though only a small amount of food supply is considered to come from urban agriculture, it is still an important source for many people living in urban areas as supplementary food and income (Gómez-Baggethun & Barton, 2013). A study by McPhearson (2013) map the ecosystem service food, and only noted when a community garden was present, assuming that food was grown on the site. In the field work, we observe if there are plantings beds for cultivation and/or fruit trees, what kind of vegetables that are grown on the sites and who harvest them. We ask, in a questionnaire, if the persons involved in the gardening see themselves as self-sufficient by any measure. By observations and questionnaire we make a brief estimation on the food supply from the gardens.

Water flow regulation and runoff mitigation

Green surfaces as grass, trees and planting beds infiltrate water to different amount depending on the soil underneath (Sjöberg & Slagstedt, 2015). Studies show that trees play an important role when it comes to water runoff mitigation. For example, trees in a natural planting are significant more capable of handling runoff water than other surfaces in the urban environment (Sjöberg & Slagstedt, 2015). The leaf cover on trees also plays an important role since it slows down the drainage of rainwater, a process called interception (Sjöberg & Slagstedt, 2015). In the field work, the type of surface and amount of trees are the most important features investigated.

Urban temperature regulation

Vegetation as trees and shrubs can protect from wind and rain depending on position and planting composition (Sjöberg & Slagstedt, 2015 p. 265). A common composition is called windbreaks or shelter break and apart from protection, this construction could also be a habitat for wildlife species (University of Minnesota, 2012). The mix of plant species can be an appreciated aesthetic value and the high amount of vegetation also contributes to carbon storage (USDA National Agroforestry centre, 2012). Tall and well established trees can play an important role for providing shade from the sun. By the evaporation process vegetation plays an important role in cooling our cities and preventing heat island effects (Sjöberg & Slagstedt, 2015). In the field work, key elements as trees and windbreaks, and their placing according to climate and the landscape are investigated.

Noise reduction

A study called HOSANNA have estimated the actual effect as well as the perceptual effect of noise reduction from vegetation (Greener Cities, 2013). Dense shrubs, trees, grass, green roofs, and even crops have shown ability to improve the sound scape. Trees can for example both scatter sound with their leafs while the chunks can absorb noise. Even though the amount of actual noise reduction is quite small, from around 2-3 dB per type of vegetation, a combination of different vegetation for noise reduction could play an important role. The perceptual effect that vegetation can have on noise reduction is to change the experience, to make the noise less annoying. Studies show that vegetation can have aesthetic value and reduce the negative experience of

noise (Greener cities, 2013). Since actual noise reduction require advanced tools or data simulation, our field work investigate the perceptual effect vegetation has on noise reduction.

Air purification

Studies on green roofs and urban forests indicate that vegetation helps to improve air quality, although the effects often are overstated and not enough documented (Jansson, 2013). Vegetation helps air purification through spread, uptake and detain of the particles. But trees and vegetation could also contribute to an unwanted holding and concentrating of air pollution, depending on how they are placed. There is a lack in studies on vegetation and air purification, but some species can hold particles better which for example are species with hairy leafs (Gustavsson, 1994). In the field study we investigate amount of trees at the sites.

Climate regulation

Trees and plants are important for carbon sequestration and storage (TEEB, 2010). McPhearson et al. (2013) suggests the CO2 sequestration by trees, as an indicator for climate regulation. In the field work we investigate amount of trees at the sites.

Pollination

Pollination by wind and animals is a necessity for many species, a necessity for the growth of seeds, fruits and vegetables. Main pollinators are insects, although some birds and bats also can provide pollination of plants (TEEB, 2010). In the field work we look for seen pollinators at the sites, as bees and bumblebees.

Biodiversity

Many biotopes for animals and plants are connected to trees. The variation of trees and their ages are important when it comes to the quality of this ecosystem service (Sjölund & Slagstedt, 2015). In a study by McPhearson (2013) connectivity between different habitats is assumed to be important for habitat provisioning for biodiversity and ESRI GIS was used to make a buffer analysis of the connection between green space, the distance was set to 500 meter. In the field work we investigate if there is layered vegetation and a mix of species (different kind of vegetation) and do observations of the connecting green areas.

Recreation and aesthetic appreciation

Outdoor activities in green space can make people feel relaxed and there is an increasing level of recognition for green space influence on health, although it is difficult to assess (TEEB, 2010). McPhearson (2013) suggests a measurement of recreation by taking the amount of green public spaces (ha) and divide it by citizen, alternatively to divide it by every 1000 citizens. A study by Stigsdotter et al. (2003) shows a link between quality in health and green space. In the Danish study, the respondents living more than one kilo-meter away from a green area had a poorer health status. In the field work we observe how people are using the site and through the questionnaire, we investigate the gardeners perception on urban agriculture and health. The aesthetic appreciation of the sites was mapped through the questionnaire in the three gardens organised by Pro-Huerta.

Social interaction and sense of place

To value the social cohesion and sense of place could be difficult to measure. As Gómez-Baggethun & Barton (2013) writes: "Articulation of social and cultural values into decision-making processes can be particularly challenging in urban areas because of the very high cultural and social heterogeneity". In the field work, we make observations of social interaction and through the questionnaire we investigate the gardener's perspective on the sites contribution to social values.

Animal sighting

Belaire et al (2015) made a study on people's view on birds in their nearby surroundings. It shows, that certain aspects of the birds, such as aesthetics and the role of the bird in the ecosystem are appreciated. However, the sound of birds and birds appropriating people's property was seen as negative aspects. Belaire et al (2015) suggest that animals as birds could re-link citizens to nature. Animal sighting can also be to spot other animals appreciated by humans for example butterflies (Gómez-Baggethun & Barton, 2013). In the field work, we investigate if we can find valuable animals as birds and butterflies on the sites.

Overview of urban agriculture in Buenos Aires

Introduction to the sites

Sebastian Miguel and Leslie Vorraber at The Bio Environmental Design Lab, at the university UFLO, started in 2014 to map urban agriculture in Buenos Aires. The main purpose was to map sites for gardening as a first step in their research on urban agriculture in Buenos Aires. In November 2015, 28 sites has been mapped with basic information regarding the type, size, what is grown, how the garden is organized and by whom.

The organisation of the gardens varies, many of them are connected to some kind of organisation and most commonly is Pro-Huerta. The gardens often offers some kind of educational possibilities, as courses in gardening. Most often this is organized through Pro-huerta as a top-down initiative. In the gardens which are based on bottom-up initiatives the gardeners mainly grow food for themselves.

Preparation and visit to sites

The inventories of urban agricultural sites in Buenos Aires, by Miguel & Vorraber (2015) enabled us to choose a few gardens as subjects for our case studies. Our contacts at UFLO suggested three gardens which we visited together and then we visited gardens by ourselves, and chose three more gardens. Altogether, six gardens are subjects for the case studies.

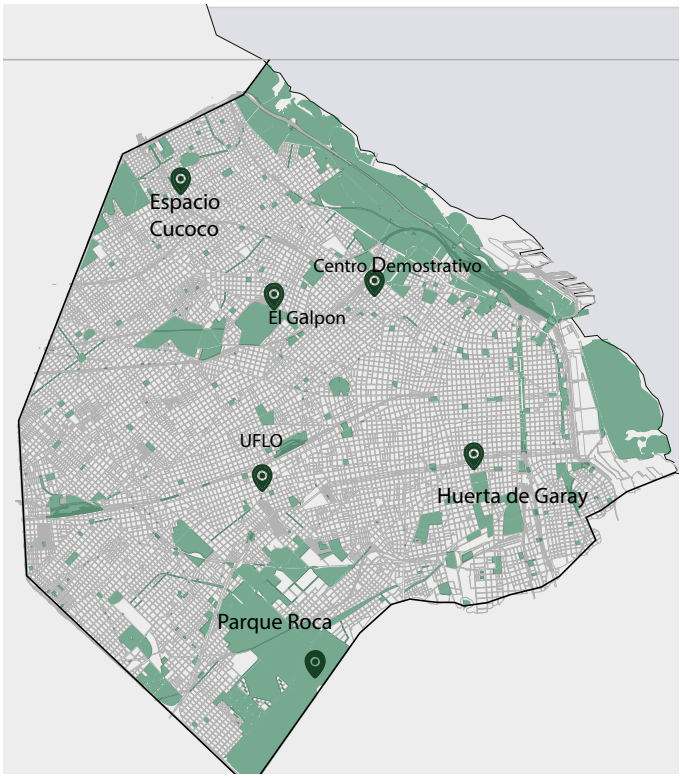
The map show urban agricultural sites which been mapped by UFLO. It also show the main green areas in Buenos Aires City. Large green areas are located along the coastline.

Gardens we visited

We chose gardens with diversity in features and scale, located in different parts of the city. The selection of sites was also determined by geographical distance and personal security. Before the visits, we got in touch with contact persons at the gardens by telephone, email and social media. In general, the contact persons at the gardens did not speak English.

Three of the gardens we visited were organised by Pro-Huerta, with a top-down approach. In relation to the other cases, these gardens have more place for outdoor education, as seating and shelters. The other three gardens are organised through bottom-up approaches. In general, they are more unstructured in the design and performance. But all gardens a pedagogic purpose and are used commonly, by a group of people. Many of the gardens are driven by a few passionate and engaged persons whom invite and inspire others to be part of the gardening.

Together with our contacts at UFLO, we visited the gardens Pro-Huerta Centro demostrativo in Palermo (2015-11-10), Pro-Huerta Parque Roca in Villa Soldati (2015-11-09) and the University garden at UFLO in Flores (2015-11-17). During these visits the organisation Pro-Huerta held courses on gardening open for the public. The gardens not connected to Pro-Huerta are the gardens Espacio Cucoco in Saavedra (2015-12-09), Huerta de Garay in Barracas (2015-12-08; 2015-12-17) and El Galpon in Chacarita (2015-12-05; 2015-12-16).

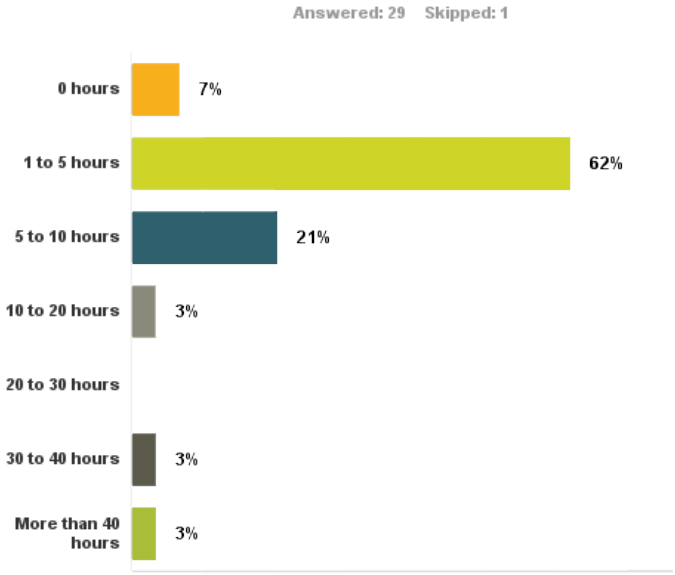


The map show the gardens we mapped during the field study

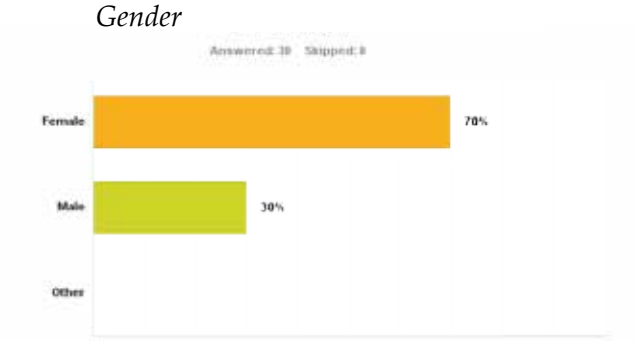
The respondents in the survey

Many of the respondents, 70 per cent, are women. The average time per week spent during the growing season in the garden is 1-5 hours.

How much time per week do you spend in the garden during the growing season?



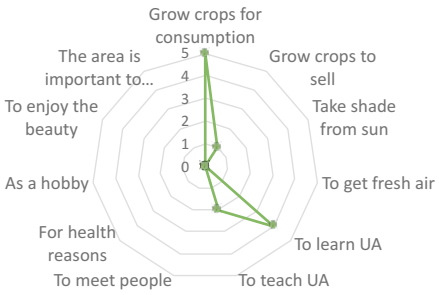
Gender



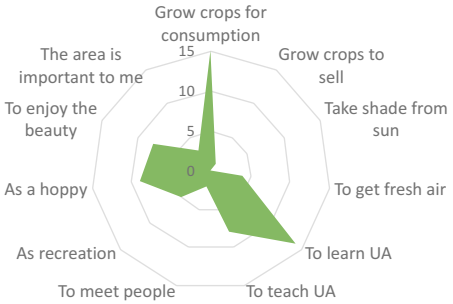
Huertas

This chapter introduces the huertas, gardens, in the field study. The gardens are presented individually with images, illustrative plans and data from the questionnaire.

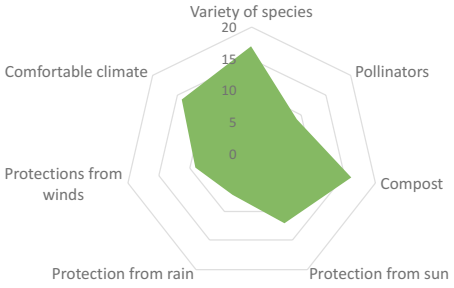
*What is **your main reason** to visit the garden?*



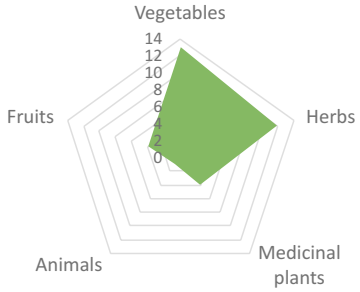
Why do you visit the garden?



Which functions can you find in the garden?



What is produced in the garden?



Centro Demostrativo

The garden is located next to an open courtyard and the building of the social department of the city Buenos Aires and a few NGOs, situated in the neighbourhood Palermo. Originally the building was used as a horse stable for the military and some structures still remain.

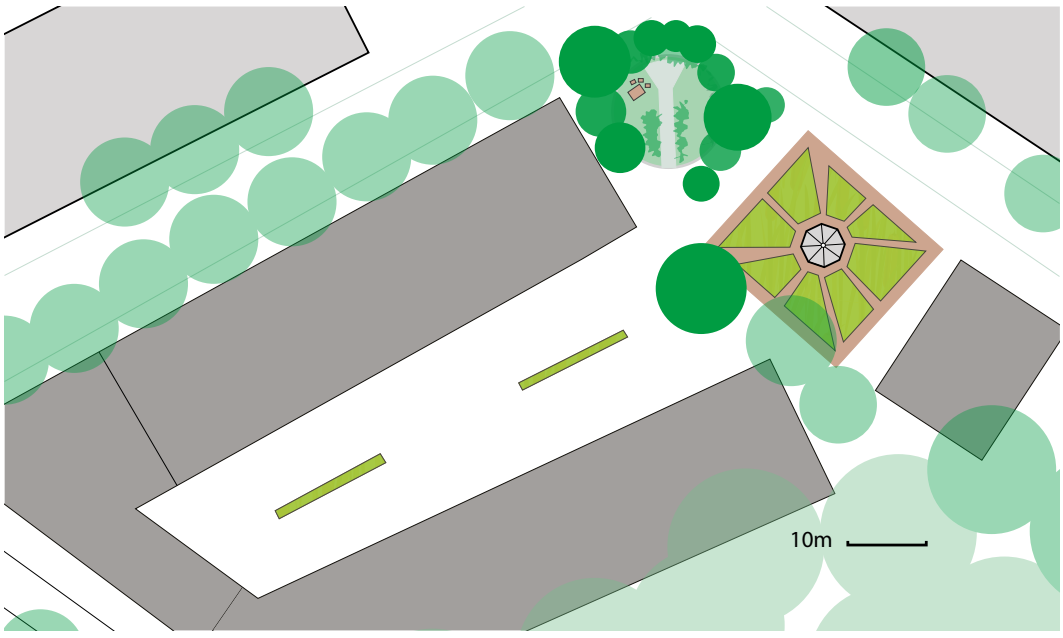
Own experience on site

The garden is used for courses held by Pro-Huerta, and when we visit the garden a group of people are gathering to take part in a lecture. The garden is divided in two main parts, a lush area with layered vegetation and an open planting area with beds for cultivation. The lush forest garden has tall trees, a few shrubs, drought-tolerant grass and other plants for a dry climate, such as lavender (*Lavandula officinalis*), cypress (*Chamaecyparis*), and some plants native for South America. There are also a couple of avocado trees (*Persea*). Under the trees there are a table and seatings placed. The open, cultivation garden has planting beds designed in a geometrical pattern with paths of decked wood in between. In the center of the garden there is a greenhouse used for cultivation of various plants, annuals and perennials. In the garden mostly edible plants grow, for example lettuce (*Lactuca sativa*), tomato (*Solanum lycopersicum*) and potatoes (*Solanum tuberosum*). There are also herbs such as Oregano (*Origanum vulgare*) and flowers such as pot marigold (*Calendula officinalis*).

In the middle of the courtyard an old water fountain is reused with planting beds, here grows for example lavender (*Lavandula officinalis*) and rosemary (*Rosmarinus officinalis*). The fasads of the buildings are used for experimental vertical farming, plants grown are for example strawberry (*Fragaria × ananassa*) and garden nasturtium (*Tropaeolum majus*).

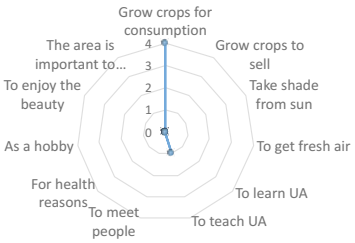
Answers from the questionnaire

The two most important reasons for visiting the garden is to grow crops for own consumption and to learn about urban agriculture. In the garden a variety of species, pollinators and compost can be find. Many of the respondents also think that the garden offers a comfortable climate, with protection from different weather conditions. In the garden are most vegetables and herbs, but also fruit and medicinal plants produced.

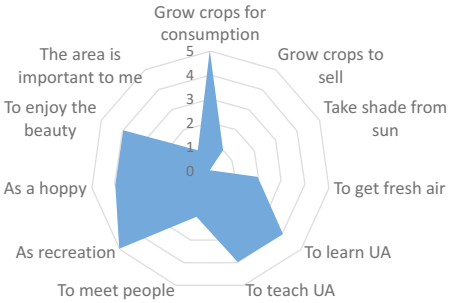


Illustrative plan of the garden.

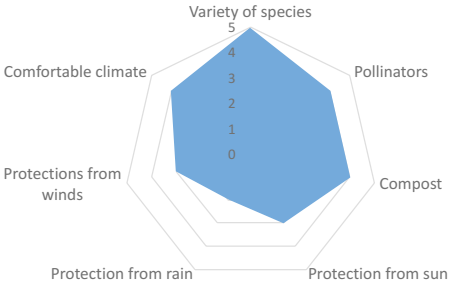
*What is **your main reason** to visit the garden?*



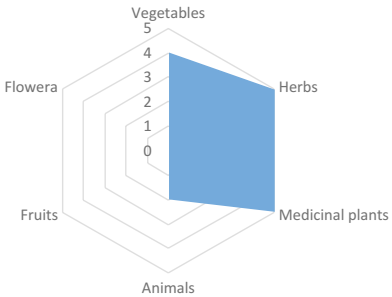
Why do you visit the garden?



Which functions can you find in the garden?



What is produced in the garden?



Parque Roca

The garden is situated in the neighbourhood Villa Soldati, in the outskirts of Buenos Aires city. The area is dominated by a variety of sport facilities and a larger green space.

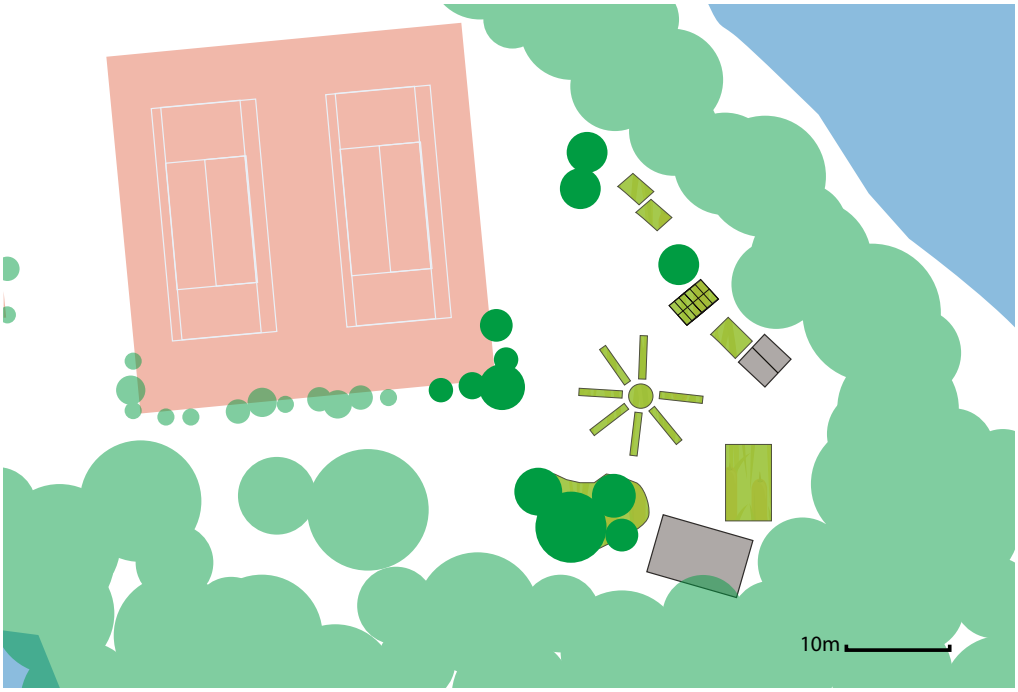
Own experience on site

At the time for the visit, 16 persons are taking part in a course held by Pro-Huerta. Betty, the woman introducing us to the garden, holds a class on how to make cosmetics, toothpaste and deodorant by plants grown on site. The garden is also visited by schools. There are several built structures which provides for outdoor education. The garden consists of planting beds on bare soil, open green space, some trees, a small building and a roof to take shelter under. There are mainly medicinal plants and vegetables grown in the garden. There are also plants grown in containers, used in a project to support the native flora.

Plants grown here are for example lettuce (*Lactuca sativa*), different types of tomato (*Solanum lycopersicum*), different types of cabbage (*Brassica oleracea*), carrot (*Daucus carota subsp. sativus*), onion (*Allium cepa*) and leek (*Allium ampeloprasum*), peas (*Pisum sativum*), ginger (*Zingiber officinale*) and eggplant (*Solanum melongena*). Furthermore, lemon balm (*Melissa officinalis*), chamomile (*Matricaria chamomilla*), different kinds of salvia (*Salvia officinalis*), anise (*Pimpinella anisum*) and borage (*Borago officinalis*). There are also flowers, for example pot marigold (Calendula officinalis), geranium (*Pelargonium hirsutum*) and also sunflower (*Helianthus annuus*) grown for the seeds.

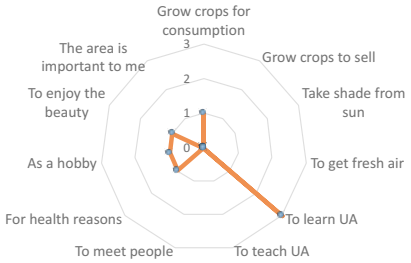
Answers from the questionnaire

The main reason to visit the garden is to grow crops for own production. The respondents also come to the garden for social values, as recreation, hobby, to enjoy the beauty, and to teach and learn about gardening. The garden offers a comfortable climate, with protection from unpleasant weather-conditions. It has several ecological functions. In the garden grows medicinal plants, herbs and vegetables.

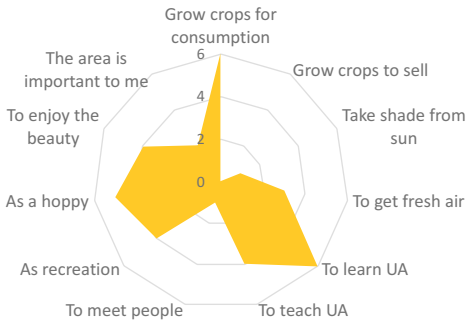


Illustrative plan of the garden.

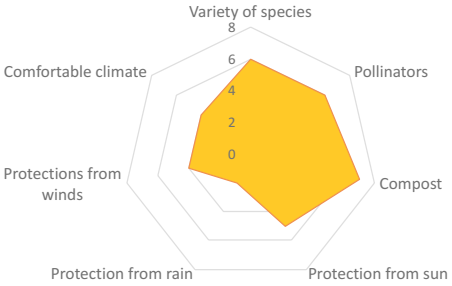
*What is **your main reason** to visit the garden?*



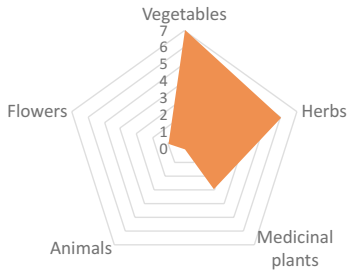
Why do you visit the garden?



Which functions can you find in the garden?



What is produced in the garden?



University garden UFLO

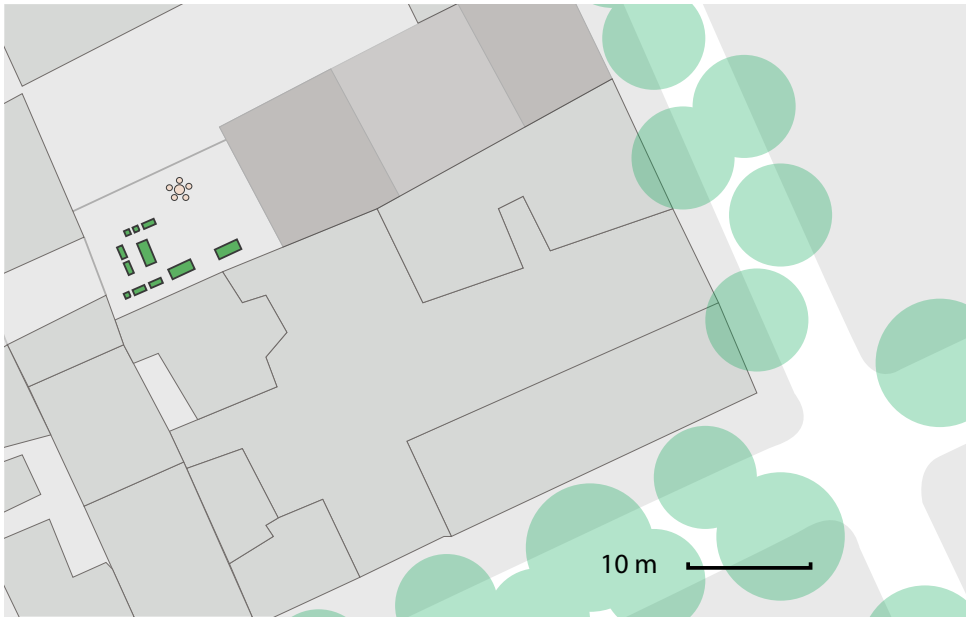
On the backyard of the university UFLO there is a small garden used for courses held by the organisation Pro-Huerta and the university. The garden is situated in the neighbourhood Flores.

Own experience on site

The garden is mainly used for educational learning and by students at the university having a lunch break, as it is located just outside of the university's cafeteria. The walls are colourfully painted with motives of trees. Outside the university building, there are tall trees planted along the street A few blocks away, there is a park, approximately 100x100m, with a cut lawn and trees. The garden is exposed to sunlight, rain and wind and surrounded by concrete walls and tall buildings. The ground consist of sealed surfaces. In the garden a mix of medicinal plants grow, flowers and vegetables in planting boxes. The garden also has a compost. Different kind of edible plants are grown, for example pot marigold (*Calendula officinalis*), lettuce (*Lactuca sativa*) and garden nasturtium (*Tropaeolum majus*).

Answers from the questionnaire

The main reason for visiting the garden among the respondents is to learn about urban agriculture. Other reasons for visiting the garden are to grow crops, and soft values as for health, as a hobby and to enjoy the beauty of the garden. The garden is perceived as having pollinators, a variety of species and compost and offers protection from sun, wind and rain to some extent. In the garden, vegetables, herbs and medicinal plants are grown.



Illustrative plan of the garden.


Tomates

El Galpon

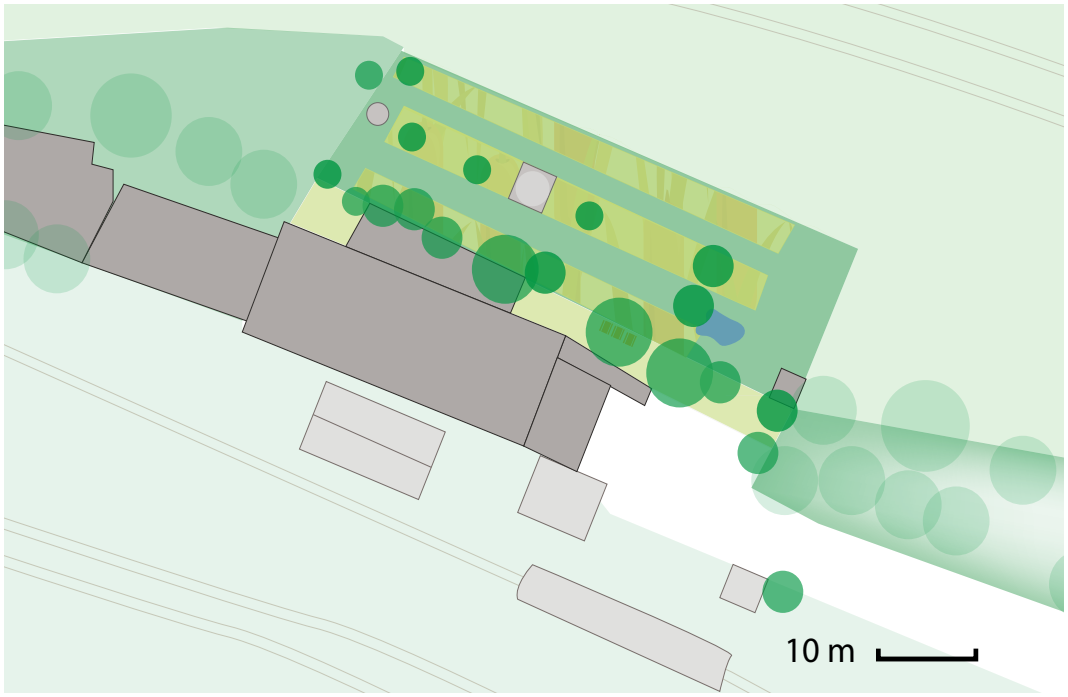
The site is located within the old structures of the, still in use, railway station Lacroze, in the neighbourhood Chacarita. At El Galpon there is an indoor marketplace where farmers from urban and peri-urban areas come to sell their goods twice a week. The garden is next to an informal housing area.

Own experience on site

Outside of the main building courses in gardening are advertised. There is also a small stand outside of the market where one can purchase edible plants grown by volunteers working in the garden. The garden is located next to the main building and open to the public on certain occasions but otherwise closed. Here are the courses held and the vegetables grown are used by a café in the marketplace. Next to the garden there are open green areas with ruderate land, and there is also large cemetery within 500 meter.

The garden is on bare soil, with planting beds and paths of grass. There are also a lot of weeds, wild plants and tall grass. The garden produces a variety of herbs, flowers and vegetables and there are also fruit trees. Example of crops are lettuce (*Lactuca sativa*), tomatoes (*Solanum lycopersicum*), corn (*Zea mays*), leek (*Allium ampeloprasum*) and fennel (Foeniculum vulgare). Herbs as parsley (*Petroselinum crispum*) and a bush of rosemary (*Rosmarinus officinalis*) grow in the garden. A distinctive flower found is for example a flowering red Canna.

Trees as banana (*Musa*), avocado (*Persea*), fig (*Ficus*) and lemon (*Citrus limon*) are grown on the site. A huge Jacaranda tree (*Jacaranda mimosifolia*) grow just outside of the garden. On the fence towards the railway station a great amount of wild passion fruit grow (*Capparis spinosa*).



Illustrative plan of the garden.

Huerta de Garay

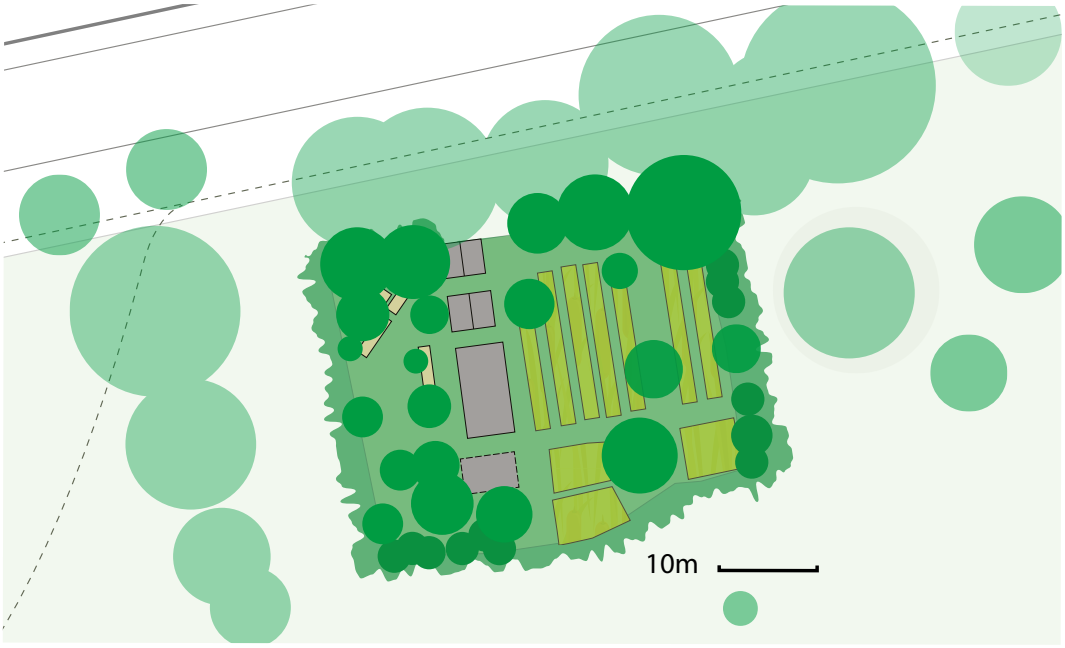
Huerta de Garay is situated in a park in the neighbourhood Barracas, a lower-income area in the southwest part of the city. The garden started as an initiative during an economic crisis in the beginning of the 21st century to help poor people to grow their own food, today the main focus is to learn children about farming, there are also courses open for the public[4].

Own experience on site

The garden is hidden behind a fence with climbing plants and bushes. It is not possible to see the garden from the outside. Since the garden is about 15 years old, some of the trees are tall and this has turned the garden into an oasis in the middle of an open field.

In the central part of the garden there are planting beds, a few buildings used for classes and meetings. One of the buildings are built with clay. The other are made of wood, and built with reused material. There is also an area under construction, with wooden planks and pallets laying on the ground.

Planting beds consists of a large variety of vegetables as tomatoes (*Solanum lycopersicum*), chive (*Allium schoenoprasum*), corn (*Zea mays*), fennel (*Foeniculum vulgare*), eggplant (*Solanum melongena*), zucchini and pumpkin (*Cucurbita*). Fruit trees as banana (*Musa*), avocado (*Persea americana*), lemon (*Citrus x limon*) and also passion fruit (*Capparis spinosa*) grow on the site. Other trees on site are for example eucalyptus (*Eucalyptus obliqua*), different type of avocado (*Persea*) and fig (*Ficus*). There is a lagre variety of flowers, including common species as pot marigold (*Calendula officinalis*) and garden nasturtium (*Tropaeolum majus*) and geraniums (*Pelargonium*).



Illustrative plan of the garden

[4]*Nelida Santa Maria Preto, Huerta de Garay, 2015-12-17*


PARA SEMILLA


HUERTA

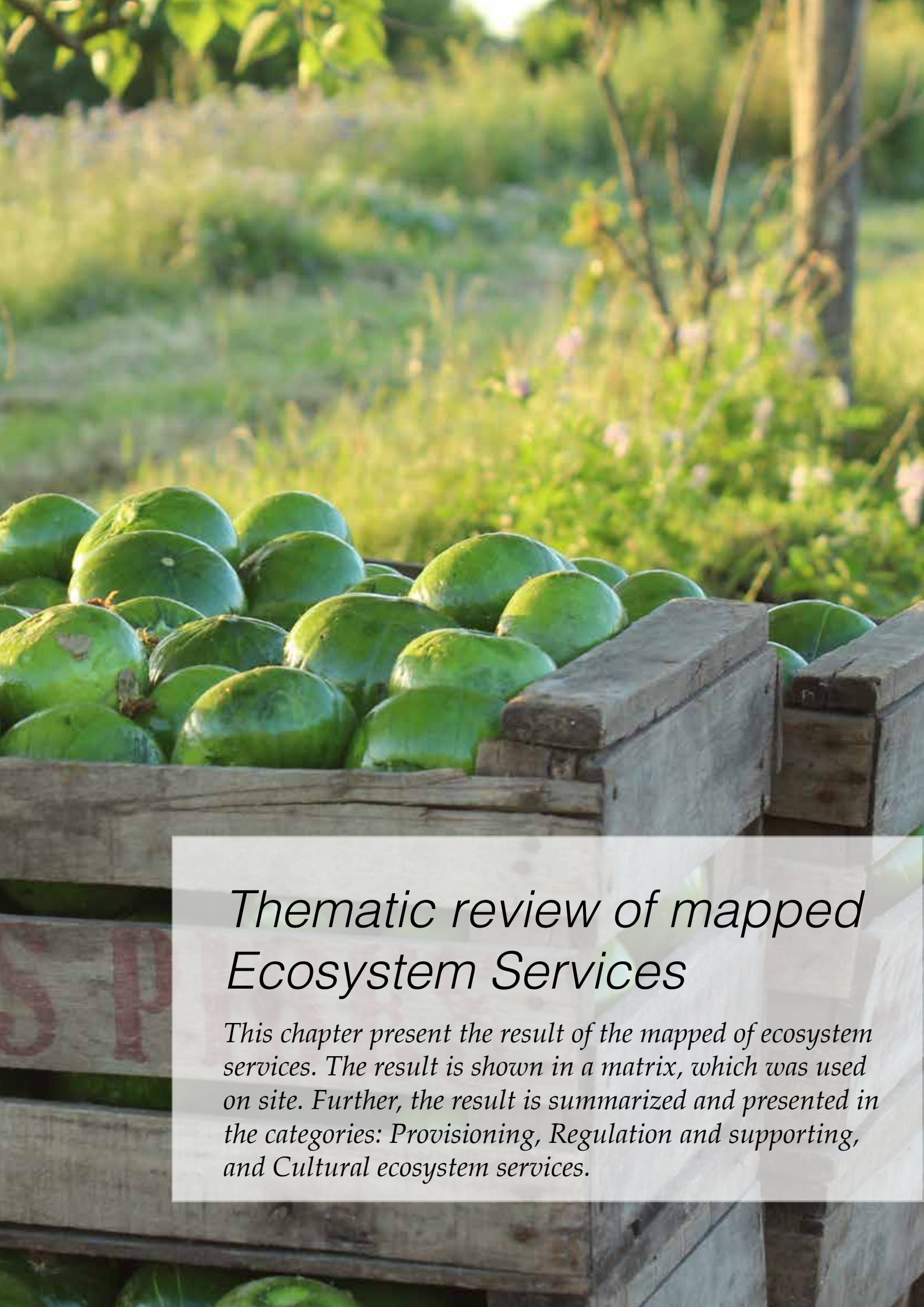
Espacio Cucoco

The garden Espacio Cucoco started in 2002, by a group of people of the neighborhood Saavedra and was reactivated in 2008 (Miguel & Vorraber, 2015). It is located in the north-west of Buenos Aires city, in a small scale housing area with most 1-2 stories buildings, next to a road and a railway.

Own experience on site

The garden is divided in two parts, one compact kitchen-garden with most edible plants and a small garden in the courtyard of the facility. In between there is a building where courses and other activities are held. In the kitchen-garden grows a lot of edible plants and a couple of small fruit trees, for example lemon tree (*Citrus × limon*). There are narrow paths on grass, old logs of woods and almost nowhere to stand or sit in the garden. Wild passionfruit (*Passiflora edulis*) climbs on the fence which separates the garden from the sidewalk outside. Vegetables as beetroot (*Beta vulgaris*), leek (*Allium ampeloprasum*), herbs as borage (*Borago officinalis*) and lavender (*Calendula officinalis*) as well as garden nasturtium (*Tropaeolum majus*), sunflower (*Helianthus annuus*) are found in the garden. In the courtyard, there are a few tall trees and a small dam with water-plants.

Illustrative plan of the garden

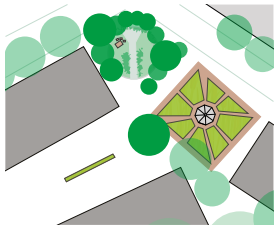


Thematic review of mapped Ecosystem Services

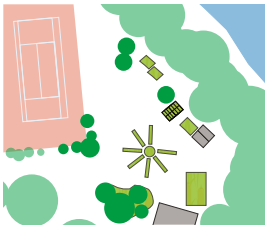
This chapter present the result of the mapped of ecosystem services. The result is shown in a matrix, which was used on site. Further, the result is summarized and presented in the categories: Provisioning, Regulation and supporting, and Cultural ecosystem services.

Matrix of mapped gardens

The matrix include the ecosystem services and the data that were mapped at the six gardens. To the left, the ecosystem services are presented and how we measure these services. To the right, the data for each garden is shown.



Category	Ecosystem service	Deifnition by	Main method	Ecological functions	Measurement	Pro-Huerta Centro Demostrativo
Provisioning	**Food**	TEEB (2010), Gómez-Baggethun & Barton (2013), C/O city (2014)	Observation, interviews, dat a from UFLO	Are there **edible plants**?	**Amount of cultivated area, Type of crops** (vegetables, herbs, fruits), **Harvest, Compost**	Cultivated area: 60 m2, Type of crops: Vegetables, Herbs. Harvest: The crops are given to volunteers working in the garden. Compost: Yes
Regulating	**Water flow regulation runoff mitigation**	Gómez-Baggethun & Barton (2013)	Observation	Is there **open water, vegetation** and/or **permeable surfaces**?	**Total area, Type of land cover, Amount of trees,** measured by: >5, 5-10,10-20, 20-30, 30< **Estimated capacity for infiltration,** measured by: >10%, 10-25%, 25-50%, 50-75%, 75-90%, 90%<	Total area: 1800m2. Land cover: Most of the site is covered by asphalt, the majority of the planting areas are on bare soil, there is some trees, shrubs and grass areas. On the courtyard there are several planting systems in pots, on walls or on built structures, on hard surfaces.Since most of the site is covered by asphalt, 10-25% of the area is estimated to infiltrate water.
Regulating	**Urban temperature regulation**	Gómez-Baggethun & Barton (2013)	Observation	Is there **vegetation** providing protection from weather as wind, rain, sun?	**Amount of trees**, measured by: >5, 5-10,10-20, 20-30, 30< and **placing at the site**	Yes, 5-10 trees. The trees are tall (25-30m) and provides shade in one part of the garden, also protection from wind and rain to some extent. People are gathering in the shade under the trees.
Regulating	**Noise reduction**	Gómez-Baggethun & Barton (2013)	Observation	Is there **vegetation** contributing to noise reduction?	**Perception** of noise reduction	Yes, perceived noise reduction. The area seem distant in the lush, green part of the site.
Regulating	**Air purification**	Gómez-Baggethun & Barton (2013)	Observation	Is there **vegetation** contributing to air purification?	**Amount of trees**, measured by: >5, 5-10,10-20, 20-30, 30<	Yes, 5-10 trees
Regulating	**Climate regulation**	Gómez-Baggethun & Barton (2013)	Observation	Are there **trees** for carbon sequestration?	**Amount of trees**, measured by: >5, 5-10,10-20, 20-30, 30<	Yes, 5-10 trees
Regulating	**Pollination**	C/O city (2014), TEEB (2010)	Observation	Are there **pollinators** seen on the site?	**Seen pollinators**	Yes, bees on site
Supporting	**Biodiversity**	C/O city (2014)	Observation, Questionnaire, data from UFLO and CABA	Are there signs for biodiversity as a **mix of species (grass, cultivated plants, shrubs, trees)**? Are there any **connecting green areas**?	**Seen number of species**, measured by: very low variery >5, low 5-10, medium10-20, high 20< Ground cover: number of grass and herbs, Field layer: number of cultivated plants, Under growth: number of shrubs, small trees,Tree layer: number of trees. Analyze in AutoCAD of the connecting green areas within a 500 m **buffer zone**.	Ground cover: >5 types of grass and herbs. Field layer: 10-20 types of cultivated plants. Under growth: >5 types of shrubs and small trees. Tree layer: >5 types of trees
Cultural	**Recreation & aesthetic appreciation**	C/O city (2014), TEEB (2010)	Observation, Questionnarie at garden 1-3	Is the site **used** for recreation?	**Perception of people** using the site for recreation. **People perceive** the garden important for recreational values	People are visiting the site
Cultural	**Social interaction**	C/O city (2014)	Observation, Questionnarie at garden 1-3	Do people **interact** on the site and does the site in any way **contribute to social cohesion**?	**People interacting** with eachother at the site and/ or **indicators** of the site being used for social events. **People's perception** on the social aspectes of the garden. **Public/private accessibility**	People taking part of a course, sitting together and talking, there are seating areas and meeting places. Courses are held by Pro-Huerta. The garden is next to a courtyard surrounded by offices for the government and NGO's. Garden is open to the public.
Cultural	**Sense of place**	TEEB (2010)	Interview, Questionnarie at garden 1-3	Is the **site** important for people?	**People percieve** the garden as important	Respondent in questionnaire state that the area is important.
Cultural	**Animal sighting**	Gómez-Baggethun & Barton (2013)	Observation	Are there **valuable animals** on the site?	**Seen animals**	Yes; Birds





Pro-Huerta Parque Roca	Pro-Huerta UFLO	El Galpón	Huerta de Garay	Espacio Cucoco
Cultivated area: 45 m2, Type of crops: Vegetables, Fruits. Herbs. Harvest: the crops are given to the volunteers working in the garden. Compost: Yes	Cultivated area: 9 m2, Type of crops: Vegetables, Herbs. Harvest: The crops are given to the people working in the garden, part of the university. Compost: Yes	Cultivated area: 100 m 2, Type of crops: Vegetables, Fruits, Herbs. Harvest: the crops are used by the café located in the nearby marketplace, and also given to the volounteers working in the garden. Compost: Yes	Cultivated area: 500 m 2, Type of crops: Vegetables, Fruits, Herbs. Harvest: the crops are given to the volounteers working in the garden. Compost: Yes	Cultivated area:120 m 2. Type of crops: Vegetables, Fruits, Herbs. Harvest: the crops are given to the volounteers working in the garden. Compost: Yes
Total area: 900m2. Land cover: The garden is placed on grass, in a large green reational area, therefore it has more than 90% permeable surfaces. It is surrounded by water on two sides, a damm and a river.	Total area: 140m2. Land cover: Sealed surfaces (concrete), planting beds in cultivation boxes. Less then 10% is estimated to infiltrate water.	Total area: 600m 2. Land cover: the garden is on bare soil, with planting beds, grass, trees, shrubs and a small dam. More than 90% of the area is estimated to infiltrate water.	Total area: 1800m 2. Land cover: the garden is on bare soil, with planting beds, grass, trees and shrubs. More than 90% of the garden is estimated to infiltrate water.	Total area: 400 m2, Land cover: the garden is on bare soil, with planting beds and small paths, a few trees. More than 90% of the garden is estimated to infiltrate water
Yes, 5-10 trees, a couple of them are small fruit trees but there's a few taller trees (15-20m) offering shade and protection from wind and rain.	No trees	Yes,10-20 trees. Most of the trees are placed in a row and there are seatings underneath. Trees are offering shade and protection from rain, wind.	Yes, 20-30 trees. Trees offering shade and protection from rain, wind. The trees, together with shrubs and climing plants, creates a screen around the garden.	Yes, less than 5 trees. The green lush vegetation offers shadow and seems to reduce heat and protection from rain, wind to some extent.
No	No	Yes, percevied noise reduction. Probably from surrounding buildings	Yes, percevied noise reduction. Possible due to visual screening from the road next to the garden	No
Yes, 5-10 trees	No trees	Yes, 10-20 trees	Yes, 20-30 trees	Yes, 5-10 trees
Yes, 5-10 trees	No trees	Yes, 10-20 trees	Yes, 20-30 trees	Yes, 5-10 trees
Yes, bees on the site	No	Yes, bees on site	Yes, bees on site	Yes, bees on site
Ground cover: >5 types of grass and herbs. FIeld layer: 10-20 types of cultivated plants. Under growth: >5 types of shrubs and small trees. Tree layer: >5 types of trees.	Ground cover: No existing ground cover. Field layer: 10-20 types of cultivate plants. Under growth: No existing shrubs and small trees. Tree layer: No existing trees.	Ground cover: >5 types of grass and herbs, Field layer: 20-30 types of cultivated plants, Under growth: 5-10 shrubs and small trees, Tree layer:5-10 types of trees.	Ground cover: 5-10 types of grass and herbs, Field layer: 20-30 cultivated plants, Under growth: 5-10 shrubs and small trees, Tree layer: 5-10 types of trees	Ground cover: >5 typers of grass and herbs. Field layer: 10-20 types of cultivated plants. Under growth: >5 types of shrubs and small trees. Tree layer: >5 types of trees
People are visting the site. There is also a tennis court and sport field next to the garden.	There are people at the site and it is used by the students at UFLO. The site is the only outdoor open space and it is accessible from the universty's cafeteria.	People resting in the shade, walking in the garden. Volounteers working in the garden.	Volounteers are working in the garden.	Volounteers are working in the garden.
There are courses held at the garden, held by Pro-Huerta. Garden is open to the public. Courses are held at the garden and there is a meeting place close to the garden with chairs and tables.	People are sitting together and walking at the site. People are taking with eachother in a course held by Pro-Huerta. The garden is not public.	People taking part in coursers on gardening, people talking with eachother. Garden is open to the public.	Volounteer (Nelida Santamaria Preto, 2015-12-17) state that groups of children/ school children come to garden every day. The garden is shown for the children and they get a pot with a seed or a bouquet of flowers to bring to their mothers. Garden is not public, but open on certain times.	Garden is not public but open during courses on gardening, the courses are held by volunteers at the site.
Respondent in questionnaire state that the area is important. Volounteers seem fond of the garden.	Respondent in questionnaire state that the area is important. Students at the university seem to come often.	Volounteers state that they feel connected to the site. Visitors seems to come often	Volounteer (Nelida Santa Maria Preto, 2015-12-17) state that she feel connected to the site	Volunteers state that they feel connected to the site.
Yes; Birds	No	Yes; Birds, hens and horses	Yes; Birds and butterflies	Yes; Birds

Provisioning services

Food supply and food security

In all of the gardens crops are grown. We found no statistics on the total outcome of the food production from the gardens. However, our inventories show that there is a very small extent of food supply from the gardens and that the gardens mainly are for pedagogical or recreational use. In the gardens citizens and school children are taught how food is grown and how to grow vegetables in their own gardens, on balconies or terraces. All the gardens offers courses in gardening. Therefore, the gardens could lead to food security in an indirect way.

Three of the gardens is founded by Pro-Huerta, and as one of the goals of the Pro-Huerta program is food nutrition lectures and classes are held on the subject. This we encountered at UFLO 2015-11-17, where a nutritionist taught gardeners about eating healthy.

The garden Huerta de Garay was constructed during an economic crisis to secure access to food for poor residents in the area. Today the garden is used for pedagogic purposes, courses without any fees are held and the site is also visited by a lot of children from nearby schools. The garden has the largest amount of cultivation area, with availability and access to food during the harvest, but again, there is no figure on the extent of the production.

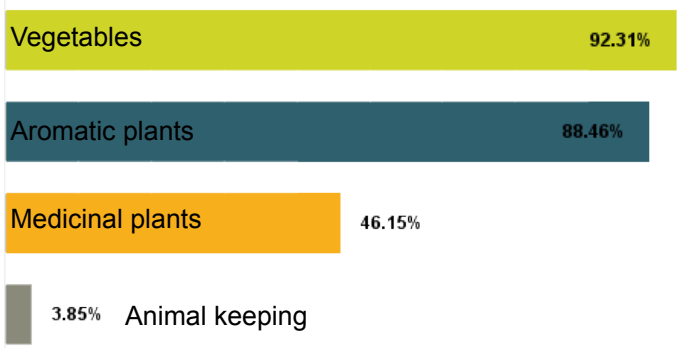
By claiming physical space in the city and reusing green waste, as all of the garden have composts, the gardens could be part of creating a buffer for food production in the city,. However, Johana Sapoznik[5] mention that a lot of the gardens are on short term contracts or on plots with no legal rights, which means that the farmers could be evicted from the land. Another issue she mention is that the sun cannot reach many areas in the city, as it is so dense built, with also is an issue for the cultivation.

In the questionnaire, we asked if the gardeners eating habits changed and in which way, after they started to grow their own vegetables. All of the respondents answered that their habits have changed and that they eat healthier than before.

Apart of eating healthy, we wanted to know if the garden supplied the farmers with enough food for them to be self-sufficient by any measure. This question is answered with greater variety. The diagram shows that most of the respondents are only a little or not at all self-sufficient, about one fifth answer that they were more than 50% self-sufficient. We also wanted to know if the food that they grow in any way could contribute to their economy, by selling vegetables or products from their garden. Only a few per cent sell, whereas most answer that they don't sell anything from their garden.

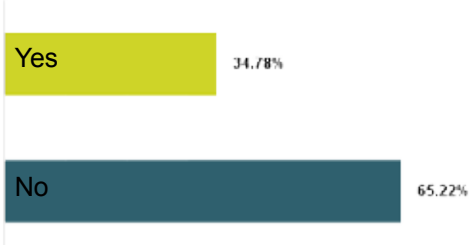
What do you produce in the garden? Choose all correct options

Answered: 26 Skipped: 4



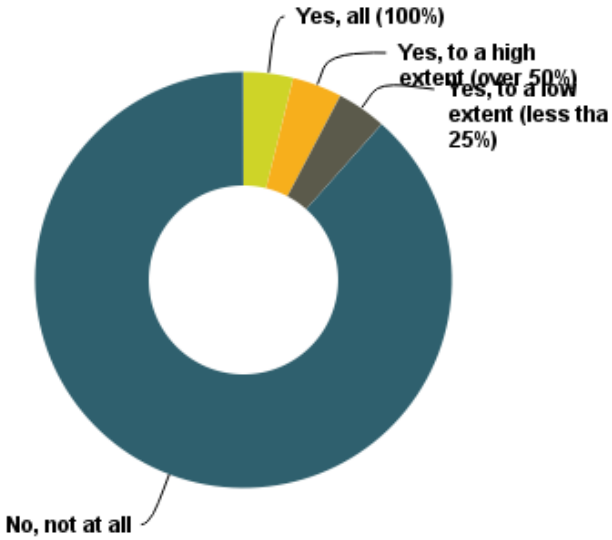
Do you grow anything in the garden, that is not listed above?

Answered: 23 Skipped: 7

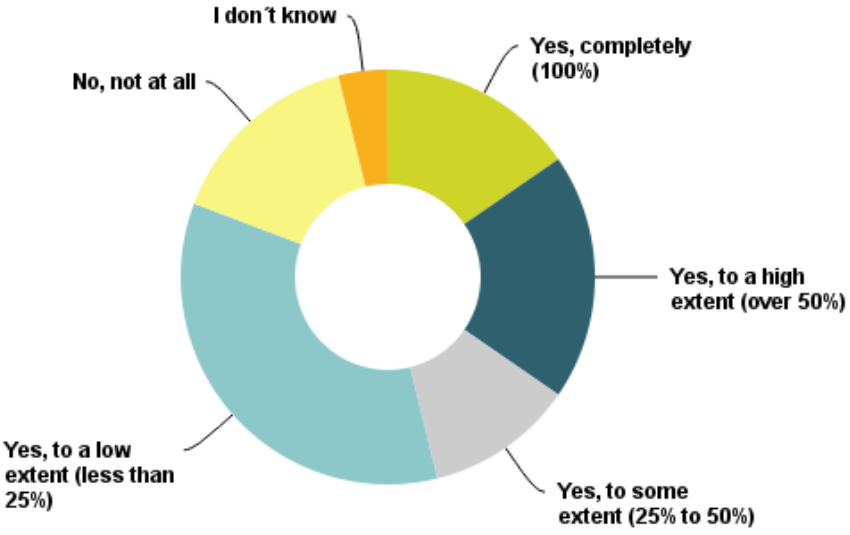


[5] *Johana Sapoznik, El Brote Urbano, 2015-12-03*

Do you sell crops that you have grown? Try to estimate



Are you self-sufficient on your farming? Try to estimate



Do you think the gardening influences how healthy you eat?

Yes, I eat more healthy

Supporting and regulating services

Water flow regulation and runoff mitigation

All of the gardens, except the university garden at UFLO, are placed on bare soil. The setting is in a dense built environment with lots of hard surfaces. There is a difficult to measure the significance of the sites when it comes to water flow regulation, but a conclusion could be drawn that the gardens on bare soil and also having tall trees can contribute to water flow regulation and runoff mitigation to some extent. However, factors as the state and compactness of the soil, the hydrology and sewage system are unknown and information is needed to further understand the value of this service.

Urban temperature regulation

The gardens with trees and a high amount of vegetation can be considered to contribute to a temperature regulation. This is especially the garden Huerta de Garay. The small garden at UFLO with no trees do not impact the temperature in any significant way. Many, about two thirds, of the respondents think that there are vegetation offering protection from sun and that there is a comfortable climate in the garden. Vegetation that offers protection from rain and wind can also be find.

Noise reduction

The visual effect from vegetation had a positive effect on the surrounding noise in the lush areas at the gardens Centro demostrativo, Huerta de Garay and El Galpon. In the gardens the visual screening effect creates a feeling of being far away from the traffic. The sound of trees and birds in these gardens affected the perception of noise from surrounding areas in a positive way.

Air purification and climate regulation (CO2)

All of the gardens, except the university garden at UFLO, have trees and therefore we could draw the conclusion that this service is present. The amount of trees varies among the gardens, where Huerta de Garay, El Galpon, Parque Roca and Centro Demostrativo have the biggest amount of tall trees in and next to the garden.

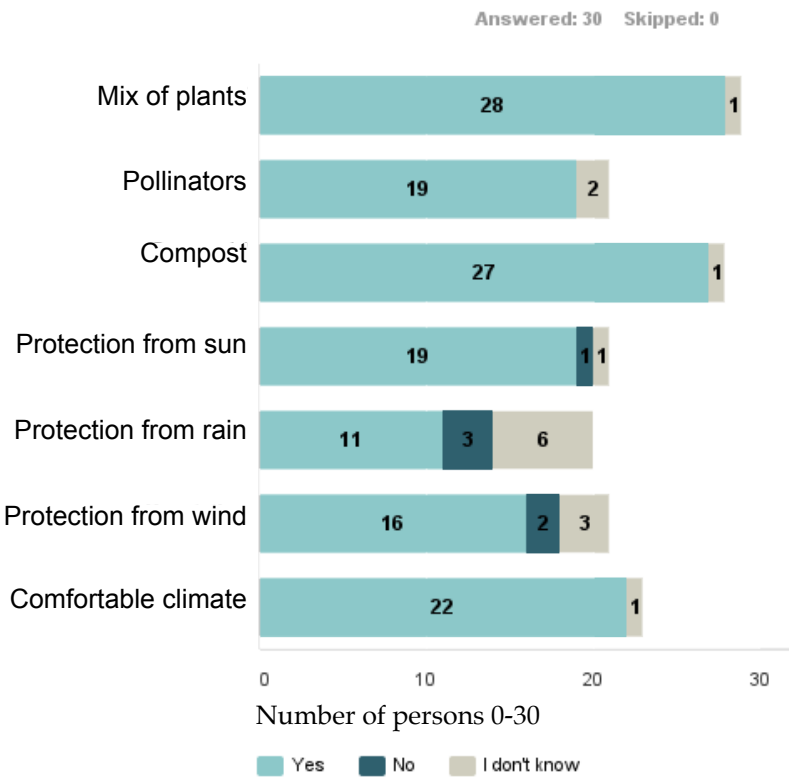
Pollination

In almost all gardens insects as bees or other pollinators were present. Of course, the amount could differ from time to time and we can assume that there are more bees than what we could see. About two thirds, 63 percent, of the respondents think that there are bees or other pollinators in the gardens.

Biodiversity

All gardens are perceived as more or less lush, with a wide variety among the grown plants in the field layer. The result from the questionnaire, also indicates that the gardens are seen as having a mix of different plants. Even the small garden at the university UFLO has a big variety of plants considering the small size of the garden. The gardens with most variation of plants considering all layers were Huerta de Garay and El Galpon. Huerta de Garay offers the greatest variety of trees and bushes. Espacio Cucoco is perceived as the most unstructured garden with a lot of weed growing among the cultivated crops and flowers in the field layer.

In your opinion,
What functions can be find in the garden?



Cultural services

Recreation

Around half of the respondents answer that they visit the garden for health reasons or to relax, for personal enjoyment and to enjoy the beauty of the garden. To grow crops and to learn about gardening could also be seen as a recreational activity, if so, recreation could be seen as one of the most important reasons why people are spending time in the garden.

Social interaction and social cohesion

As urban agricultural sites, the gardens offers a place t meet for people with a common interest. There are alsc structures in or next to many of the gardens as seating areas, playgrounds and buildings used for courses. Thi indicates that social interaction takes place at the sites. In the questionnaire, 17 per cent respond that they cor to the garden to meet other people.

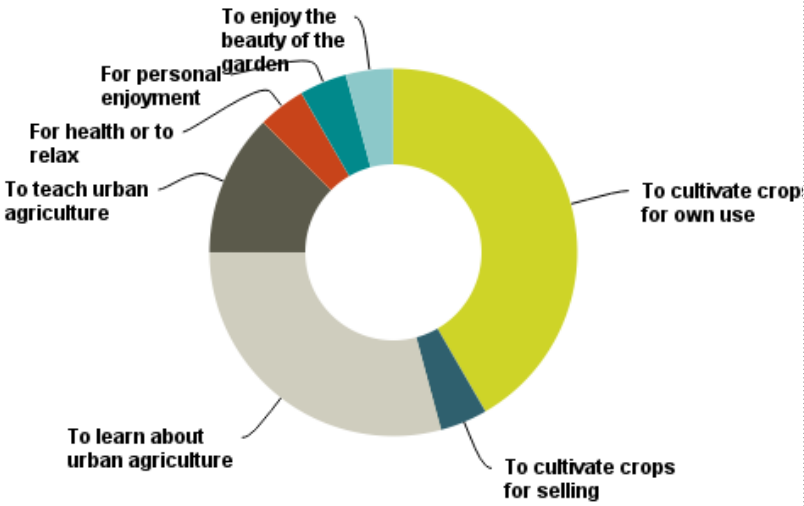
When it comes to social cohesion, the questionnaire offered an open question to whether the respondents thought the gardens contributed to the social climate in the neighbourhood, and if so, how. 80 per cent respond that the gardens contribute to the social climate in the neighbourhood. Two main themes in how urban agriculture affects the social climate are health and community feeling. The gardening contributes to better health, as affecting the mood in at good way, but also nutrition and eating habits. Moreover, the gardens are perceived to contribute to social interaction, participation, solidarity and creating a stronger community. Respondents also mention aspects as economy, fresh air and a public interest for nature.

Animal sighting

In all gardens, except the garden at the university UFLO, birds were heard or seen on site. Some domestic animals as horses and hens were seen at El Galpon. Other wild animals were mainly insects as different types of butterflies. At Huerta de Garay the sounds of birds was extra noticed.

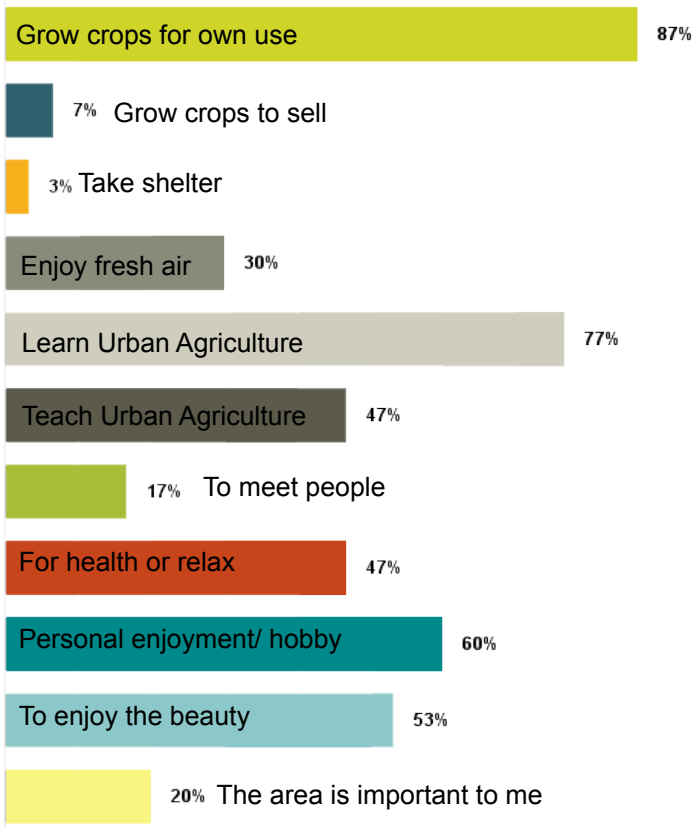
Why do you come to the community garden?
A main reason

Answered: 24 Skipped: 6



Why do you come to the community garden?
All reasons

Answered: 30 Skipped: 0



Sense of place

In the questionnaire, 20 per cent respond that one of the reasons that they come to the garden is because the area is important to them. When talking to the key persons working at the sites it was clear that they were very fond to the gardens. At El Galpon, visitors seem to come because of the market. We perceive the garden as adding extra value for the visitor at the market place. At Huerta de Garay, it is also possible to assume that the lush garden in the open park area is important for residents and especially for the children, as it provide a safe and inspiring zone for them with lots of small rooms and paths. Many of the gardens are run by enthusiastic volunteers, which could be considered to contribute to a sense of place for the gardeners. This is especially observed at Garay, El galpon and Espacio Cucoco as well as the Pro-huerta garden Parque Roca.

Some voices from the respondents

" En la salud, en el entorno ambiental, en las relaciones familiares y sociales, en la economía, en el propio estado de ánimo "

It affects the health, the surrounding environment, family relationships and social relations, the economy, the own mood. (Respondent, UFLO 2015-11-17)

" Hay más interacción, entre vecinos, surgen proyectos, se comparte la alegría de ver creces lo sembrado y recolectarlo "

There is more interaction, among neighbours, projects arises, you share the joy in watching what's planted grow and to harvest it (Respondent, Palermo 2015-11-10)

" Ayuda a relacionar a las personas, la belleza de la vecindad, a fomentar la identidad barrial "

It helps to connect people, the beauty of the neighbourhood, to form the identity of the area (Respondent, Palermo 2015-11-10)

" Creo que nos agrupa en beneficio del medio ambiente, además comemos más sano, sin agroquímicos "

I think it helps us to come together for the environment, additionally we eat healthier, without agrochemicals " (Respondent, Parque Roca 2015-11-09)

Do you think urban agriculture affects the social climate in the neighbourhood?


"CAPIB"
ESTABLECIMIENTO
EL MONTECITO
AÑO 20
LUIS (XV)
CITRUS

Discussion

In this chapter, the research questions on urban agriculture and ecosystem services are discussed. The discussion is followed by reflections on the project. Last, suggestions for further research.

Discussion

Research questions

For the research, a main research question is raised:
- How can urban agriculture and its ecosystem services, help to combat social, ecological and economical challenges in the context of Buenos Aires, Argentina?

In order to answer the research question during the field study, a more specific question was raised:
- Which ecosystem services can we find on urban agricultural sites in Buenos Aires?

Summary of ecosystem services on sites in the field study

The result of the field study show that the sites contribute with several ecosystem services. All of the sites provide the provisioning service food supply. Apart from being a source of food, the sites contribute with regulating and supporting, and cultural services. We found indicators of the regulating and supporting ecosystem services biodiversity, pollination, climate regulation, air purification, noise reduction, urban temperature regulation and water flow regulation. One of the gardens was situated on a hard surface, with no trees, which provided few regulating and supporting ecosystem services. The cultural services we found were recreation and aesthetic appreciation, social interaction, sense of place and animal sighting. Even though the amount of indicators varies among the sites, all sites can provide some or all of these services.

Local engagement create a sense of community

In this part, the role of urban agriculture to help combat social issues in Buenos Aires is discussed.

In Argentina there are in general large social inequalities and an increasing poor population. In our study, we don't have some much information on respondents background or their socio-economic context.

We found that the gardens organised with a bottom-up approach were driven by enthusiasts, also engaged in the local community. These key-persons engagement seemed to contribute to a sense of community in the neighbourhoods. Our mapping also show that a vast majority of the respondents perceive the gardens to have a positive effect on the social climate in the neighbourhood. The gardening impact people's mood and contribute to a community feeling.

In the research we found that Firth et al. (2011) mention the organisation of the garden as an important aspect when it comes to building a community feeling. Further, we observed that there was a strong connection to the sites run completely by the volunteers, which we also can find in Firth et al. (2011), who mention that engaging people from the neighbourhood is important to establish a sense of place.

Many of these gardens were experimental with a permissive attitude and a bit untidy. Larsson (2009) mention that creativity is allowed when local forces are in charge of the gardens. This turns the sites into sort of laboratories, where people don't wait for the municipality to help out, rather a "do it yourself" attitude, which gives not only creativity but also responsibility to the volunteers.

Green comfortable climate

In this part, the role of urban agriculture to help combat ecological issues in Buenos Aires is discussed.

Buenos Aires, as all megacities, face many ecological issues as shown in the research by Bolund & Hunhammar (1999), Dover (2015), Grant (2012) and Gaston (2010). Climate projections estimate an increase in precipita-

tion and in days with warm temperatures (IPCC, 2014). Moreover, Buenos Aires have site specific issues as storms and flooding, which get worse because more people are vulnerable for the effects by flooding (Morello, 2003). This address a need for many ecosystem services, as urban temperature regulation and infiltration of water, but also a biodiversity, pollinating insects and several other services.

Our mapping show that trees and vegetation at the sites offer shade and protection from wind and rain, infiltrate water and contribute to air purification and climate regulation. In the gardens a comfortable micro-climate is created. The gardens can contribute to, at least, a perceived noise reduction. Our mapping also show indicators for pollinators and wide mix of species, in contrast to nearby mono-cultural green areas and hard surfaces. The result is also found in studies by Zeeuw et al. (2011), Gómez-Baggethun & Barton (2013) and Andersson et al. (2007), which show that urban agricultural sites can contribute with many regulating and supporting ecosystem services in our cities. But still, the extent and impact of these services has various complexity.

Farming for food security

In this part, the role of urban agriculture to help combat economical issues in Buenos Aires is discussed.

In Argentina many people are living under the poverty line. Due to high inflation and raised prices, there are problems with food security. Therefore, according to Feeney & MacClay (2016) enabling food security is one of the main challenges for Argentina.

Our mapping show a food supply from all the gardens, although the extent seem to be small. That urban agriculture could, and already function as, a solution to food security is indicated in the research by Inclusive cities observatory (2010), INTA (2011), Zeeuw et al. (2011), Redwood (2009), FAO (2011) and Gomez-Baggethun & Barton (2013).

The result from our mapping show that all of the gardens offer courses on how to grow crops. Many of the respondents state that come to the garden to grow crops for own use and that they are self-sufficient to some extent in their farming. This could indicate that the courses held at the sites support private small scale farming, which in turn could contribute to food supply and food security. The role of the collective gardening for education and to create networks, which lead to an increase in private small scale farming, is shown in the research by Delshammar (2009).

Even though research indicate that urban agriculture contribute to food security there is often a lack of real empirical evidence in research on the subject, which is shown by Korth et al. (2014). The same criticism could be raised to our findings, since the respondents answered based on their own perception. We do not know to what extent urban agriculture contribute to food security, but we could find indicators that urban agriculture are improving the food security, or at least the feeling of food security. This is also shown in a study by Gallaher et al. (2013), where people involved in gardening perceived themselves as more food secure.

Our mapping indicate that the respondents eat more healthy. This is also one of the goals of the national program Pro-Huerta in Argentina (INTA, 2011). It could be, that the work by Pro-Huerta and local networks who offers education on nutrition, has contributed to awareness and better eating habits.

At the mapped gardens the grown vegetables were given to the volunteers working at the sites. In the city Rosario, Argentina, families can get an extra income through selling products at markets every week (Inclusive cities observatory, 2010). In fact, lack of accessibility and availability to food often leads to informal food markets, including urban agriculture and a market to sell their own grown crops, which is shown in the research by Korth et al (2014).

The garden Huerta de Garay was constructed during an economic crises, to enable people to grow their own food, which might also be important for future challenges, where urban agriculture can function as a source of income for poor people, increase the food availability and access, and in this way combat economical challenges and crises in Buenos Aires.

To adapt during crises

In our study, all of the gardens offered courses open to the public. At the courses people gathered and learned about gardening. A study in Gómez-Baggethun & Barton (2013) indicates that allotment areas can help people to organise during crisis, which also is supported by Firth et al. (2011) and Gallaher et al. (2013). In this way, the sites could be seen as hubs for people to create social networks which in turn could strengthen the society and its adaptive capacity.

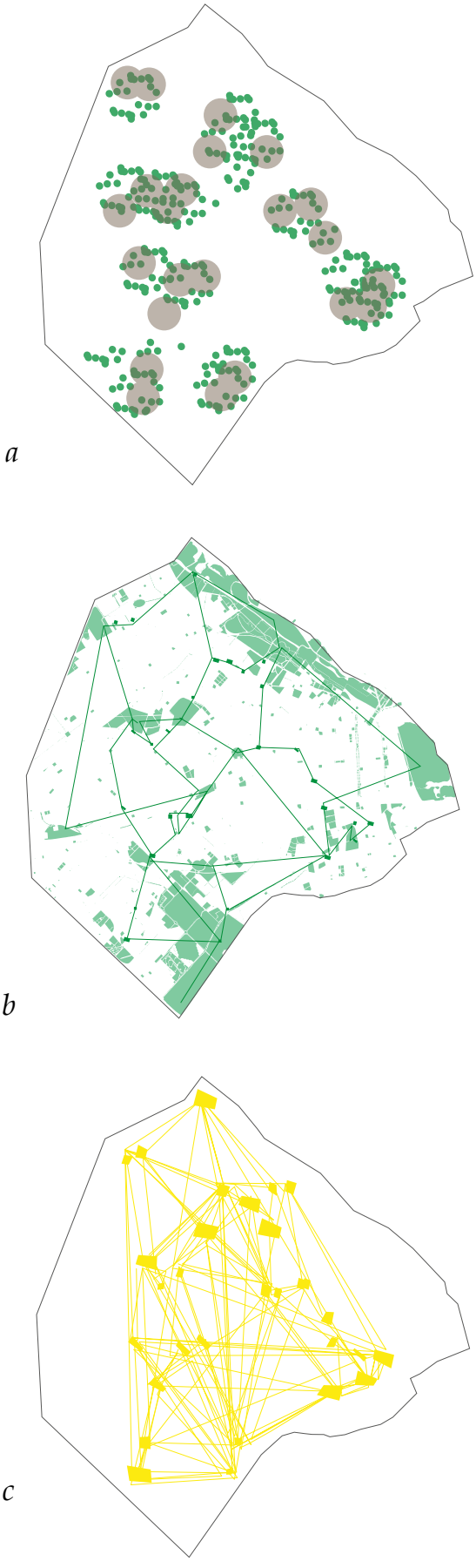
Conclusions

In this project, ecosystem services were mapped at a plot-scale, but it is likely that the impacts goes beyond the boundaries of the sites and people involved in the gardening. Aspects as a greater biodiversity and climate regulation could be important in a large scale context. Studies also show that urban gardening can create networks which could strengthen the community and be important during crises.

The gardens we mapped offer places for people to meet, exchange ideas and be closer to the environment. The courses enable people to connect through a common interest. Gardening is perceived among the respondents to have a positive effect on the social climate in the neighbourhood. Cultural values of the gardens are also appreciated, which also is found in research.

The result from our study show that there is a food supply from the gardens, also, that people take part in courses on gardening and lectures on food nutrition. In a wider perspective, the activity on the sites can contribute to food security by supporting small scale farming. Studies also show that urban agriculture function as a tool to provide food security and an income for poor citizens.

To summarize and conclude, the literature and our mapping of ecosystem services show indicators for provisioning, supporting and regulating, and cultural services at urban agricultural sites At a small scale, these gardens can provide a mix of ecosystem services with various complexity. Urban agriculture can, by providing food supply, contribute to food security, it can also create a sense of community and lastly, by adding biodiversity, pollinators, regulation of temperature and water, contribute with several important ecological functions in the city.



a

b

c

The illustrations aim to visualize
a) The courses held at the gardens could contribute to an increase of small-scale farming. b) The urban gardens ecological function as part of the city's green structure. c) The social networks which could be created at the urban gardens.

Reflections

To explore a new context

A challenge for us during the field study in Buenos Aires was the language barrier. Many people did not speak English at the gardens. However, it was helpful to speak English with the staff at the university UFLO. It would have been useful to have a more advanced level of Spanish before entering Argentina, in order to gain a deeper understanding on the subject. But, we still managed to understand and talk to people and improved our knowledge in Spanish during the period in Argentina.

Case studies

The choice of gardens for the case studies were determined by the access to gardens, as some areas in the city were inaccessible for us due to personal security. Many of the gardens were also behind fences or in courtyards, not possible for us to reach without a first getting in contact with people working in the garden. The gardens we visited might therefore not be representing urban agricultural sites in Buenos Aires. In Rosario, where we went for study visits, we couldn't visit any of the gardens. In the end, the case studies in Buenos Aires and the study visits to Rosario gave us understanding on national and regional gardening programmes and hint of urban agriculture in Argentina.

To use the concept of ecosystem services in field

The field work show the complexity to interpret and use the concept as a mapping tool. But since we conducted the study in a new context, we also asked a few questions with complex concepts as "self-sufficiency", which we have realized was misunderstood or not understood at all. However, the mapping has helped us as landscape architects to think wider and look for more values than what we usually look for during site-analyses. We learned that relevancy is a key aspect regarding ecosystem services, and to ask questions as: What kind of services are important here? Which structures can provide it?

The matrix visualizes and highlight the multi-functionality of urban agricultural sites. To use a wide approach and an organisation of results in a matrix could contribute to further research on how urban agriculture can combat challenges faced by all megacities. The matrix is also feasible to adjust for mapping of other types of green space. Therefore, we find our study important in today's discussion on how to interpret the concept of ecosystem services in urban design and planning.

Critique of sources

In our research we use a variety of sources as scientific papers, newspaper articles and online sources. Books and articles that summarizes many studies regarding for example urban agriculture, ecosystem services and background information about Argentina were needed to understand the concepts as a whole. Some material was only available in Spanish, which sometimes was difficult to understand and translate into English.

The work process

During the work process we have learned to find our way to best collaborate together. In Buenos Aires we planned and performed the field study together. From the first steps in the process, we have discussed and taken decisions together. It has been a creative process, where we have tried out various thoughts and ideas, and pushed the project forward.

Suggestions for further research

At last, research could further develop and investigate the matrix and methods to map ecosystem services at a local scale.

Images from the field study in Buenos Aires, Argentina 2015.

References

Sources

Andersson, E., Barthel, S. & Ahrne, K. (2007) Measuring social – ecological dynamics behind the generation of Ecosystem Services. *Ecological Applications* 17(5), pp.1 267-1278

Argentina gobierno (2016) *Argentina*. Available at: http://www.argentina.gob.ar/advf/documentos/4e5ced44183aa.pdf [2015-07-20]

Arguello, M., Baumgratz, F., Benedetto, V., Couretot, J., Lemos, L., Pagani, V., Pogonza, R. & Valenzuela, F. (2010) *Manual de Producción de Semillas*. Availible at: http://www.agriurbanarosario.com.ar/archivos/manual-de-semillas.pdf [2016-08-30]

Barthel, S. & Isendahl, C. (2013) Urban gardens, agriculture, and water management: Sources of resilience for long-term food security in cities, *Ecological Economics* 86, p. 224-234

Bolund, P. & Hunhammar, S. (1999). Ecosystem services in urban areas, *Ecological Economics*, 29, pp. 293–301

Cardinal-Pett, C. (2016) *A History of Architecture and Urbanism in the Americas*, New York: Routledge

Cerro, A.M. & Meloni, O. (2013). Crises and Crashes: Argentina 1825-2002, *Journal of Iberian and Latin American Economic History*, Vol. 31 (No.2), pp. 219-252

Costanza, R. (2008). Ecosystem services: multiple classification systems are needed, *Biological Conservation 141*, pp. 350–352.

Delshammar, T. (2011) Urban odling i Malmö, *Stad & Land,* nr 181

Desarrollo Social 1 (2016) *Seguridad Alimentaria.* Available at: http://www.desarrollosocial.gob.ar/pnsa [2015-07-20]

Diarioc (2010) *Un recorrido por la historia del Programa Pro-Huerta*. Avaliable at: http://www.diarioc.com.ar/produccion/Un_recorrido_por_la_historia_del_Programa_Pro-Huerta/141580 [2016-04-17]

Dover, J. W. (2015), *Green Infrastructure: Incorporating plants and enhancing biodiversity in buildings and urban environments*, London: Routledge

Economist (2014) *Statistics in Argentina*. Avalible at: http://www.economist.com/blogs/americasview/2014/04/statistics-argentina [2016-07-08]

FAO (2015a) *Grower greener cities in Latin America and the Caribbean*. Available at: http://www.fao.org/ag/agp/greenercities/en/GGCLAC/rosario.html [2016-07-04]

FAO (2015b) *Growing greener cities: Cities of despair - or opportunity?* Available at: http://www.fao.org/ag/agp/greenercities/en/whyuph/index.html [2016-07-04]

FAO (2015c) *Land resources, Land use, Emissions by sector*. Available at: http://faostat3.fao.org/browse/area/9/E [2016-05-02]

FAO (2011) *The place of urban and peri-urban agriculture (UPA) in national food programmes.* Available at: www.fao.org/docrep/i2177e/i2177e00.pdf [2016-04-25]

FAO (2008). *An Introduction to the Basic Concepts of Food Security.* Available at: http://www.fao.org/docrep/013/al936e/al936e00.pdf [2016-04-07]

FAO (2006) *Food Security.* Available at: http://www.fao.org/forestry/13128-0e6f36f27e0091055bec28ebe830f46b3.pdf [2016-05-02]

Firth, C., , Maye, D., & Pearson D. (2011): Developing "community" in community gardens. Local Environment: *The International Journal of Justice and Sustainability*, 16:6, pp. 555-568

Feeney, R. & MacClay, P. (2016) Food security in Argen tina: A production or distribution problem. *International Food and Agribusiness Management Review*, Vol. 19, Issue 2

Gallaher, C., et al. M., Kerr, John M., Njenga, M., Karanja, Nancy K. & WinklerPrins, Antoinette M. G. A. (2013) Urban agriculture, social capital, and food security in the Kibera slums of Nairobi, *Kenya Agriculture and Human Values* 30:389–404

Gaston, K. J. (red) (2010). *Urban Ecology.* New York: Cam bridge University Press

Global edge (2016) *Argentina: history.* Available at: http://globaledge.msu.edu/countries/argentina/history [2015-07-20]

Gómez-Baggethun, E. & Barton David, N. (2013) Clas sifying and valuing ecosystem services for urban planning, *Ecological Economics* (86), pp. 235-245

Grant, G. (2012) *Ecosystem Services Come To Town: Greening Cities by Working with Nature*. Somerset, GB: Wiley-Blackwell

Greener cities (2013) *Novel solutions for quieter and greener cities.* Avalible at: http://www.greener-cities.eu [2016-07-20]

Jacobs, A., Macdonald, E., & Rofé, Y.; (2002) *The Boulevard Book: History, Evolution, Design of Multiway Boulevards,* Massachusetts Institute of Technology: United States of America

Jansson Å. (2013) Reaching for a sustainable, resilient future using the lens of ecosystem services, *Ecological Economics* (86), pp. 285-291

Humans Right Watch (2015) *World Report 2015: Argentina, Events of 2014.* Avalible at: https://www.hrw.org/world-report/2015/country-chapters/argentina [2016-07-08}

IMF (2014) *Statistical Appendix*. Avalible at: https://www.imf.org/external/pubs/ft/weo/2014/01/pdf/statapp.pdf [2016-08-30]

INDEC (2012) *Mapas temáticos Censo 2010* (GEOCENSO) Available at: http://www.sig.indec.gov.ar/censo2010/ [2016-09-10]

INTA 1 (2016) *Profeder.* Available at: http://inta.gob.ar/documentos/profeder-programa-federal [2016-04-07]

International Busisness Time (2015) *Argentina's President Raises Eyebrows With Claims The Country's Poverty Rate Is Among Lowest In The World.* Available at: http://www.ibtimes.com/argentinas-president-raises-eyebrows-claims-countrys-poverty-rate-among-lowest-world-1958859 [2016-07-08]

IPCC (2014) Climate Change 2014, Synthesis Report: Summary for Policimakers http://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf [2015-08-30]

IPCC (2007) Central and South America. http://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIIAR5-Chap27_FINAL.pdf [2015-08-30]

Landguiden (2015) *Argentina.* Available at: http://www.landguiden.se/Lander/Sydamerika/Argentina?p=1 [2016-08-14; 2016-03-21]

Larsson, M. (2009) *Stadsdelsträdgård; Plats för gemenskap och kreativa processer*, SLU Service/Repro, Alnarp

Lyytimäki, J. & Sipilä, M. (2009). Hopping on one leg—the challenge of ecosystem disservices for urban green management. *Urban Forestry & Urban Greening* 8, pp. 309–315.

MEA (2005) *Ecosystems and Human Well-being: General Synthesis*

Miguel, S., & Vorraber, L. (2015) *Relevamiento y determinación de diversas categorías de espacios productivos para la agricultura urbana en el ámbito de la Ciudad de Buenos Aire*s. Universidad de Flores, Buenos Aires, Argentina

Morello, J. (2003) Sustainable Development and Urban Growth in the Argentine Pampas Region, *The ANNALS*, 590, November 2003

Mougeot, J. A. L. (2000) Urban agriculture: Concept and definition. *Urban Agriculture Magazin vol. 1* (no.1) http://www.ruaf.org/urban-agriculture-concept-and-definition [2016-08-2016]

Nationalencyklopedin (n.d.) *Buenos Aires.* Available at: http://www.ne.se/uppslagsverk/encyklopedi/lång/buenos-aires [2016-09-10]

Patel, R. & Davidson, B. (2011). *Forskningsmetodikens grunder: Att planera, genomföra och rapportera en undersökning.* Edition 4:3. Lund: Studentlitteratur AB

Prevention web (2014) *Argentina Disaster & Risk Profile*. Avalible at: http://www.preventionweb.net/countries/arg/data [2016-07-08]

Ravallion, M. (2002) On the urbanization of poverty, *Journal of Development Economics*, 68 pp. 435-442

Redwood, M. (2009) *Agriculture in Urban Planning: Generating Livelihoods and Food Security.* Edited by Mark Redwood. Ottawa: International Development Research Centre, 2009. Earthscan, London; Sterling, VA

SCB (2013) *Inventory of data sources for quantification of eco system services*. Available at: http://www.scb.se/statistik/_publikationer/MI1301_2013A01_BR_MI71BR1303.pdf [2016-07-08]

Stigsdotter, U., Ekholm O., Schipperijn., Toftager, M. Kamper Jorgensen F. Randrup, T (2010) Health promoting outdoor environments – Associations between green space, and health, health-related quality of life and stress based on a Danish national representative survey. Scandinavian Journal of Public Health, 2010; 38: 411–417

TEEB (2010) Mainstreaming the Economics of Nature: A Synthesis of the Approach, Conclusions and Recommendations of TEEB

TEEB (2011) TEEB Manual for Cities: Ecosystem Services in Urban Management

Veenhuizen, R. van (2006) *Cities Farming for the Future: Urban Agriculture for Green and Productive Cities, Philippines,* RUAF Foundation

TEEB (2016) *Ecosystem Services.* Available at: http://www.teebweb.org/resources/ecosystem-services/ [2016-04-27]

UN (2016) *Sustainable development goals: End hunger.* Available at: http://www.un.org/sustainabledevelopment/hunger/ [2016-05-02]

UN (2014) *Country profile: Argentina*. Available at: https://esa.un.org/unpd/wup/Country-Profiles/ [2016-08-14]

UN (2013) *Composition of macro geographical (continental) regions, geographical sub-regions, and selected economic and other groupings*. Avalible at: http://unstats.un.org/unsd/methods/m49/m49regin.htm#ftnc [2016-08-30]

University of Minnesota (2012) *Selecting trees and shrubs in windbreaks*. Available at: http://www.extension.umn.edu/environment/agroforestry/selecting-trees-shrubs-windbreaks/docs/windbreaksrevised_1.pdf [2016-07-20]

USDA National Agroforestry center (2012) *What is a wind break?* Available at: http://nac.unl.edu/documents/workingtrees/infosheets/wb_info_050712v8.pdf [2016-07-20]

World bank (2015a) *Should we continue to use the term "developing world"?* Avalible at: http://blogs.worldbank.org/opendata/should-we-continue-use-term-developing-world [2016-08-30]

World bank (2015b) *Beyond Open Data: A New Challenge from Hans Rosling. A*valible at: http://live.worldbank.org/hans-rosling-beyond-open-data [2016-08-30]

World bank (2016a) *World Bank Country and Lending Groups.* Avalible at: https://datahelpdesk.worldbank.org/knowledgebase/articles/378834-how-does-the-world-bank-classify-countries [2016-08-30]

World bank (2016b) *Countries, Argentina, Overview.* Avalible at: http://www.worldbank.org/en/country/argentina/overview#1 [2016-09-09]

World Commission on Environment and Development (1987). *Our Common Future*. Oxford: Oxford University Press. p. 27.

Zeeuw de H., Van Veenhuizen R. & Dubbeling M. (2011) *The role of urban agriculture in building resilient cities in developing countries*, Journal of Agricultural Sciences, 149, pp. 153-163

Appendix

English version of the questionnaire used in the field study

QUESTIONNAIRE ON URBAN AGRICULTURE

This questionnaire is part of research on Urban Agriculture, done by two students from the Swedish University of Agricultural Sciences (SLU) and in collaboration with Universidad de Flores (UFLO). The result of this research will be presented in a master thesis of Landscape Architecture. We would appreciate your help by answering the following questions. *Thank you!*

Age: _____

Gender: Female ☐ Male ☐ Other ☐

1) What is your relationship to the garden?

Volunteer ☐ Student ☐ Teacher ☐ Visitor ☐ Resident in area ☐ Other: _____

2) How much time do you spend in the garden during growing season?

0 hours ☐ 1-5 hours ☐ 5-10 h ☐ 10-20 h ☐ 20-30 h ☐ 30-40 h ☐ 40+ h ☐

3) Why do you come to the community garden?

	Choose **all** correct options	Choose your **one main** reason
To cultivate crops for your own use	☐	☐
To cultivate crops for selling	☐	☐
To take shelter from the rain or sun	☐	☐
To enjoy the fresh air	☐	☐
To learn about urban agriculture	☐	☐
To teach urban agriculture	☐	☐
To meet people	☐	☐
For health or to relax	☐	☐
For personal enjoyment/ as a hobby	☐	☐
To enjoy the beauty of the garden	☐	☐
Because the area is important to me	☐	☐

4) In your opinion, what functions could be found in the garden

	Yes	No	Don't know
A mix of different plant species	☐	☐	☐
Bees / other pollinating species	☐	☐	☐
Compost / use of biological waste	☐	☐	☐
Vegetation that shades from the sun	☐	☐	☐
Vegetation providing shelter from rain	☐	☐	☐
Vegetation providing protection from wind	☐	☐	☐
Comfortable climate and fresh air	☐	☐	☐

5) Do you think urban agriculture affects the social climate in the neighborhood?

Yes, in a positive way ☐
Yes, in a negative way ☐
No it doesn't ☐
I don´t know ☐

*5b) If **yes**, how does it affect the social climate in the neighborhood? Please describe!*

If you work in the garden, please answer the following questions:

*6) What do you produce in the garden? Choose **all** correct options*

Vegetables ☐ Aromatic plants ☐ Medicinal plants ☐ Animal keeping ☐ Nothing ☐

7) Do you grow anything in garden, that is not listed above? (for example. Materials)

Yes ☐ If so, specify: _____
No ☐

8) Are you self-sufficient in your own urban agriculture? (Try to estimate)

Yes, completely (100%) ☐
Yes, to a high extent (over 50%) ☐
Yes, to some extent (25% to 50%) ☐
Yes, to a low extent (less than 25%) ☐
No, not at all ☐
I don´t know ☐

9) Do you sell crops that you have grown? (Try to estimate)

Yes, all (100%) ☐
Yes, to a high extent (over 50%) ☐
Yes, to some extent (25% to 50%) ☐
Yes, to a low extent (less than 25%) ☐
No, not at all ☐
I don´t know ☐