



# Internship Report

Evaluation of the Master's programme in 'Food and Landscape' and analysis of the potential of urban agriculture as a means of addressing the social, environmental and economic challenges facing cities

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Swedish University of Agricultural Sciences, SLU And Paris Sciences & Lettres University, PSL Sustainability Sciences Bachelor's 2024 Evaluation of the Master's programme in 'Food and Landscape' and analysis of the potential of urban agriculture as a means of addressing the social, environmental and economic challenges facing cities

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# Glossary

<u>Foodscape</u>: a food production geography with specific combinations of biophysical characteristics and management attributes, including the political, cultural, and economic influences of food production.

<u>Food justice</u>: food justice seeks food security by advocating change in the food system and to reduce hunger, malnutrition and diet related illness that are endemic. Moreover, food justice aims to improve a long-term access to and availability of food that is healthy, high quality and culturally appropriate for those living in underserved areas.

<u>Food security</u>: human beings have, at all times, the physical, social and economic ability to acquire sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.

<u>Food sovereignty</u>: the right of local peoples to control their own food systems, including markets, ecological resources, food cultures, production modes, and land tenure.

<u>Food desert</u>: a geographic region whose inhabitants do not have access to certain food products deemed healthy at affordable prices. Food desert can be in the middle of the city, for example in disadvantaged neighbourhoods where the distribution only offers industrial products and little or no fresh produce.

<u>Guerrilla farming</u>: the act of gardening – raising food, plants, or flowers – on land that the gardeners do not have the legal rights to cultivate.

<u>Landscape</u>: an area whose character is the result of the interaction of natural factors and human productive, environmental, and social cultural values.

<u>Urban agriculture</u>: the production and transformation of food and other outputs on land and other spaces within cities. (*source: Food and Agriculture Organization*)

# **1** Introduction

The Master's programme in 'Food and Landscape' is designed to provide students with a comprehensive understanding of the intricate relationships between consumers and producers, the origins and the role of food in shaping cultural identity. The curriculum encompasses a range of topics, including the planning, design, and maintenance of urban and rural landscapes from a sustainability perspective, with a particular focus on food consumption and production. The curriculum begins with the "Foodscapes 1" course that corresponds to Foodscape studies in the first semester of the first year of the Master's programme. Subsequently, in the second semester of the first year, students must select one of the following courses: "Agroecology and Sustainability of Food Production Systems", "Food Planning", and "Urban Agriculture and Social Interaction". In the second year, all students are required to take the same courses. The secondyear courses are called "Foodscapes 2", which include critical food studies, and "Innovation and Implementation", in which students are engaged in an applied group project involving the application of strategic solutions to Foodscape related challenges. Finally, the curriculum ends with the "Independent Project in Food Studies", which corresponds to the master's thesis that may be either cross-disciplinary applied case studies or deepened theoretical studies of a Foodscape related subject.

The Master's programme in 'Food and Landscape' is a new Master's programme launched in 2021 on the Alnarp campus of the Swedish University of Agricultural Sciences (SLU). The number of students that ended or are still enrolled (they are following the Master's programme courses, writing their thesis or taking a break) in the Master's programme is small and some students have stopped following the Master's courses. The first purpose of the study was to carry out an evaluation of the Master's programme in 'Food and Landscape' commissioned by Anna Peterson, Director of the Master's programme, and under the supervision of Caroline Hägerhäll, Doctor in Landscape Architecture in the Department of People and Society. The evaluation of the Master's programme in 'Food and Landscape' included the reasons why the students chose to follow this programme, their level of satisfaction with the programme, their career prospects after obtaining the Master's degree and the identification of possible ways of improving the programme. Moreover, I was interested in knowing how sustainability questions are approached within the programme and by the students.

The second objective of the study was to understand the potential of urban agriculture as a means of addressing the social, environmental, and economic challenges currently facing cities. Indeed, food supply and food security in some cities are challenged by growing climate crises and growing urban population. Moreover, the fast-paced and urbanized lifestyles present a challenge for social interaction between residents, and their physical and mental health. The development of the

local economy is also sometimes hampered by the lack of local food production, and the increasing artificialization of urban land is jeopardizing the development of biodiversity and the resilience of cities to climate change. I chose to study the potential of urban agriculture in solving these challenges currently facing cities because one third of students that responded to the survey that I sent out during my internship believe that urban agriculture is an important element that they learned during the Master's programme in 'Food and Landscape' for setting up sustainable food systems. Moreover, I followed during my internship period the "Urban Agriculture and Social Interaction" course taken by some of the first year 'Food and Landscape' Master's students. The "Urban Agriculture and Social Interaction" course discusses urban agriculture as a social and political expression in society from a global and national perspective in Sweden. The possibilities for urban agriculture are analyzed, including what is allowed in urban areas, how to consider the identity and cultural values of the site, what can be cultivated and how, as well as the types of risks and of possible results.

I will answer the following research question in this study: "What are students' perceptions on the recently launched Master's programme in 'Food and Landscape' and the potential of urban agriculture as a means of addressing the social, environmental, and economic challenges currently facing cities?"

Firstly, the materials and methods will be presented, followed by the results, that will be discussed in a third section.

# 2 Materials and methods

The project started with gaining an orientation of the topic covered in the Master's programme in 'Food and Landscape' by reading the "Routledge Handbook of Landscape and Food" book edited by Josha Zeunert and Tim Waterman. Thereafter, an online survey was sent to get information on students' perceptions on the Master's programme in 'Food and Landscape' and on the way sustainability questions are approached within the programme and by the students. This was then complemented with in-depth semi-structured interviews with the students to get more knowledge on the evaluation of the Master's programme and students' opinions on the potential of urban agriculture as a means of addressing the social, economic and environmental challenges currently facing cities. Each step of the methodology is further explained under the following separate headings.

## 2.1 Reading of the "Routledge Handbook of Landscape and Food" book

The first method chosen was to read the "Routledge Handbook of Landscape and Food" book edited by Josha Zeunert and Tim Waterman in order to acquire in-depth knowledge of the important concepts related to the notion of sustainable food system and covered in the Master's programme in 'Food and Landscape': Foodscape, food security, food sovereignty, food justice, food production, consumption issues and urban agriculture. (See the Glossary for an understanding of the terms definitions). This knowledge acquisition has been useful for creating the online survey for the students in line with the concepts of the Master's programme in 'Food and Landscape'. Some of the questions in the online survey have covered these concepts like the following one: "What doctoral topic(s) would you like to explore in greater depth?". The student had to choose one or several options among the following: "food security and food sovereignty", "food justice", "production and consumption issues", "gender issues" and "sustainability issues".

## 2.2 Online survey

The main method chosen for the study was the use of an online survey on the internet using Google Forms website. This platform was chosen to create the survey because it has no limit in terms of the maximum number of questions, it allows to create conditional questions, customize the design, and obtain the responses automatically into a spreadsheet which has the twin benefits of speed and accuracy in terms of data collection. This survey was sent in the form of a web link by email to Master's students on blind copy. The email consisted of a text explaining the purpose of the study, the duration of the survey, the anonymity and confidentiality of responses, and that answers will only be returned in aggregated form to my supervisors and my university jury. Before being sent by email, the survey content was reviewed and discussed at two meetings with Anna Peterson and Caroline Hägerhäll.

The purpose of the online survey was to gather information on the evaluation of the Master's programme in 'Food and Landscape'. Moreover, the online survey was used to collect factual information about students' identities (age, gender, continent of origin, etc.) that ended the programme or are still enrolled (they are following the Master's programme courses, writing their thesis or taking a break) or have stopped following it. The second aim of the online survey was to study the way in which sustainability questions are approached within the Master's programme as well as the students' opinions and attitudes about it. Indeed, I was interested in knowing how familiar students are with the Sustainable Development Goals of the United Nations, what they consider to be the most important elements in ensuring sustainable food systems, and how they would involve/are they involving sustainability questions in their Master's thesis during the second year of the Master's programme. (For a comprehensive overview of the questions of the

online survey and the aggregated results extracted from Google Forms, please refer to Appendix 1).

The use of the survey was appropriate because the research question involved a fairly large number of students (34 in total) and relatively simple information. The survey consisted of open and closed questions. For instance, "Overall, you are satisfied with the Master's programme in 'Food and Landscape'." was a close statement and the respondent had to select an answer within the range of 1 (strongly disagree) and 7 (totally agree). On the other hand, "In your opinion, what are the most important concepts/elements that you learned from the courses of the Master's programme in 'Food and Landscape' for setting up sustainable food systems? Eg: urban agriculture, agroecology, water management..." was an example of an open question in the survey. The choice of open questions was intended to reflect the full richness and complexity of the views held by the respondents and to let them express themselves in their own words. For certain subjects related to student identity and the evaluation of the Master's programme, closed questions were chosen to provide information in a form that can be quantified and compared.

# 2.3 "Urban agriculture and social interaction" course attendance

Attending lectures and field visits as part of the "Urban Agriculture and Social Interaction" course of the Master's programme in 'Food and Landscape' gave me a useful insight into what the Master's courses are like, and enabled me to gain knowledge on some social, environmental and economic aspects of urban agriculture. This helped me to construct the semi-structured interviews questions with the students and answer part of my research question.

## 2.4 Semi-structured interviews

The results of the online survey showed that a third of the participants replied that urban agriculture is one of the most important concepts or elements they learned in the Master's programme in 'Food and Landscape' for implementing sustainable food systems.

In addition, following the "Urban agriculture and social interaction" course, I wanted to get the Master's students' opinions and views on ways urban agriculture can be developed and what its potential for the social, environmental and economic challenges currently facing cities. I was also interested in the potential of urban agriculture to achieve the Sustainable Development Goal 2 of the Agenda 2030 of the United Nations that aims to eradicate hunger, ensure food security, improve nutrition and promote sustainable agriculture. Moreover, I wanted to know more about the reasons why urban agriculture is a topic of research at the Swedish University of Agricultural

Sciences and the ways in which students could contribute to the development of urban agriculture in their careers.

Finally, I wanted to gain more in-depth students' opinions and ideas to supplement the results obtained in the online survey about the evaluation of the Master's programme in 'Food and Landscape'.

Therefore, interviews were chosen as the second method for the study in order to obtain in-depth information on the evaluation of the Master's programme in 'Food and Landscape' and students' opinions and experiences about urban agriculture.

More specifically, the semi-structured interview format was chosen to be flexible in terms of the order in which the topics were approached and to let the interviewees develop ideas and speak more widely on certain issues. Moreover, the semi-structured interviews were one-to-one interviews and not group interviews to locate specific ideas and transcribe more easily the interview tape.

In order to get in touch with students for the interviews, Anna Peterson, Director of the Master's programme in 'Food and Landscape', sent an e-mail to the students and asked them to contact me if they were interested in doing an interview on the theme of urban agriculture and on the evaluation of the Master's programme. Students who were interested finally contacted her directly and I was able to get in touch with them. Five students were interviewed. These students were all in the second year of the Master's programme in 'Food and Landscape', either in the process of writing their Master's thesis or having finished it. The interviews lasted one hour and were recorded with the permission of the interviewees to back up the written field notes. (For a comprehensive overview of the semi-structured interview guide, please refer to Appendix 2).

# 3 Results

# 3.1 Evaluation of the Master's programme in 'Food and Landscape'

### 3.1.1 Online survey

### 3.1.1.1 Profile of the students

The survey was sent to 34 students and a sample of 18 students has responded to it. The respondents all ended the Master's programme in 'Food and Landscape' or are still enrolled (they are following the Master's programme courses, writing their thesis or taking a break). No students

who have stopped following the Master's programme courses have responded to the survey. The Master's students age is very diverse, ranging from 26 to over 36 years old. The majority of the respondents are women and come from Asia, only 27.8% of the students come from the European continent. Half of the students had a bachelor's degree before entering the Master's programme in 'Food and Landscape' and the other half had a Master's degree. Half of the students come from urban areas. The majority of students is omnivore (72,2%) followed by flexitarians (16,7%). Vegetarian and plant based/vegan dietary choices are in equal amounts (11%). Health reason is the most important reason for dietary choice (44%).

The studies prior to entering the Master's programme are diverse: natural sciences (33.3%), food and meal sciences (22.2%), technology (22.2%), social sciences (11.1%), and others: business and architecture (11.1%).

Half of the students chose to enroll in the Master's programme in 'Food and Landscape' because they didn't get their first choice of Master's programme and the Master's programme in 'Food and Landscape' was part of their second choice.

The reasons why the students chose to study in Sweden are varied: students chose to study in Sweden because it is an interesting place to live and because there is a high-quality education in the country in equal amounts (22.2%). Additionally, 16.6% of students chose to study in Sweden because of the high employability rate after graduation and the welcoming environment for international students.

# 3.1.1.2 Interests and career perspectives of the 'Food and Landscape' Master's students

#### Studies

- A majority of the students chose their Master's thesis topic for personal interest.
- The recurring themes of students' Masters theses are food in cities, plant proteins, sustainable diet, and tourism.
- A large majority of the students enrolled in the Master's programme in 'Food and Landscape' would like to pursue doctoral studies after the Master.
- "Production and consumption issues", "Food security and food sovereignty" and "Sustainability issues" are the doctoral topics that students would prefer to explore in greater depth.

#### Career

• Half of the students enrolled in the Master's programme in 'Food and Landscape' would like to work in a private company or private institution after their studies.

- Almost half of the students enrolled in the Master's programme in 'Food and Landscape' would like to work on national issues in Sweden.
- An equal proportion (33.3%) of students would like to pursue their studies as "food and sustainability strategist" and as researcher (in the fields of "food studies", "landscape planning"...).

#### 3.1.1.3 Relational aspects found in the data

One student is not at all satisfied with the Master's programme in 'Food and Landscape'. This student may not have chosen the right study path. The student chose the answer "1: strongly disagree" to the statement "Overall, you are satisfied with the Master's programme in 'Food and Landscape'" under a scale from 1 to 7. The student also disagreed to the questions "Sustainability questions are sufficiently addressed within the Master's programme in 'Food and Landscape'" and "Do you think that water issues in agriculture are sufficiently addressed within the Master's programme in 'Food and Landscape'?". Finally, the student agreed to the question "In your opinion, the Master's programme in 'Food and Landscape'?". Finally, the student agreed to the question "In your opinion, the Master's programme in 'Food and Landscape'?" On the other hand, another student chose the answer "3: slightly disagree" to the statement "Overall, you are satisfied with the Master's programme in 'Food and Landscape'" under a scale from 1 to 7 and disagreed to the question "Do you think that water issues in agriculture are sufficiently addressed within the Master's programme in 'Food and Landscape'" under a scale from 1 to 7 and disagreed to the question "Do you think that water issues in agriculture are sufficiently addressed within the Master's programme in 'Food and Landscape'?".

## 3.1.1.4 <u>Strengths and challenges of the Master's programme in 'Food and Landscape'</u> and possible ways to improve it

#### <u>Strength</u>

The majority of students are satisfied with the Master's programme in 'Food and Landscape': 33.3% of students are fairly satisfied and 27.8% are very satisfied with it.

A majority of students think that the Master's Programme in 'Food and Landscape' sufficiently addresses the sustainability questions.

#### **Challenges**

Although 72.8% of students think they are not missing any courses in the Master's programme, 27.8% believe that the Master's programme in 'Food and Landscape' lacks courses or activities that connect the field of Foodscape to sustainability issues.

On the other hand, 77.8% of the students think that water issues in agriculture are not sufficiently addressed within the Master's programme in 'Food and Landscape'.

Summary table of the Master's programme in 'Food and Landscape' issues and my suggestions of ways to improve the programme:

lssues	My suggestions
Almost one third of the students think that the Master's programme in 'Food and Landscape' lacks courses or activities that connect the field of Foodscape to sustainability issues.	More fieldwork and practicum, and lectures on "Sustainable tourism and culinary heritage", "Food waste management and circular economy" and "Food policy and governance" could be included in the Master's programme to better connect the field of Foodscape to sustainability issues.
An absolute majority of the students think that water issues in agriculture are not sufficiently addressed within the Master's programme in 'Food and Landscape'.	Lectures on sustainable and efficient use of water in agriculture and food systems could be set up. These lectures could deal with drip irrigation and use of low-water consumption crop species in agriculture for instance.

To conclude, the Master's programme in 'Food and Landscape' so far attracts mainly female students from Asia who have studied in the fields of natural sciences, food and meal sciences, and technology. However, students' studies prior to entering the Master's programme remain highly diverse with students also having a background in social sciences and other fields such as business and architecture.

Half of the students chose to enroll in the Master's programme in 'Food and Landscape' because they didn't get their first choice of Master's programme and the Master's programme in 'Food and Landscape' was part of their second choice.

The Master's programme is fairly research-oriented, with the majority of students willing to continue their studies with a doctorate, 33.3% wanting to become researchers and 22.2% wishing to work in a public institution. Most students seem interested in the issues addressed in the Master's programme, since the recurring themes of students' Masters theses are food in cities, plant proteins, sustainable diet, and tourism, and "Production and consumption issues", "Food security and food sovereignty" and "Sustainability issues" are the most preferred doctoral topics. The Master's programme also directs students towards the private sector for their professional careers as half of the students would like to work in private institutions or companies after their Master's degree.

The majority of students are satisfied with the Master's programme and think that sustainability issues are sufficiently addressed. Nevertheless, two students are not satisfied with the Master's programme: one student is not satisfied at all, and one is slightly dissatisfied.

The Master's programme in 'Food and Landscape' could be improved by adding courses to better connect the field of Foodscape to sustainability issues such as "Sustainable tourism and culinary heritage", "Food waste management and circular economy" and "Food policy and governance", and other lectures related to water supply issues in Foodscape and agriculture.

### 3.1.2 Semi-structured interviews

3.1.2.1 Key highlights of the Master's programme in 'Food and Landscape' embraced by the students interviewed

Practical activities and excursions are among the most popular elements of the Master's programme in 'Food and Landscape' which enabled students to acquire practical knowledge and gain insights into the reality of the food chain. Students particularly enjoyed the fields trips as part of the "Agroecology and Sustainability of food production systems" course to a professor's farm in the Skåne region of Sweden and to a recycling plant. The students also liked the excursions as part of the "Food planning" course, especially the visit to a restaurant in Malmö aimed to create employment opportunities and greater economic independence for foreign-born women with little or no work experience, and to a food factory as part of the "Foodscape 1" course. In addition, the students enjoyed field visits mixing the students 'classes of years 1 and 2 of the Master's programme in 'Food and Landscape'.

The "Food planning" course, which combined political concepts and legislation with agricultural issues, and enabled students to apply their knowledge in group work consisting of evaluating a food plan and a food strategy in cities was the most appreciated courses of the Master's programme in 'Food and Landscape'. Moreover, the "Foodscape 2" course which contains excursions was the second most appreciated course.

Group activities were also appreciated by the interviewees, as it is very useful to be able to share knowledge and work in a group for their careers.

Finally, the interviewees appreciated the international environment of the master's programme in 'Food and Landscape', thanks to the presence of students from all over the world in the class that brought different points of view and perspectives on food studies and agriculture. The majority of the interviewees stated that there is a positive atmosphere in their class, with students helping each other, which creates an ideal working environment.

## 3.1.2.2 <u>Divided students' opinions on the Master's programme in 'Food and Landscape'</u> organization

Although the reading of scientific articles participated to give students a better understanding of the important concepts in food studies and Foodscape research areas, some students did not feel comfortable having to give their critical opinion in class on articles they had read at home, as they had never practiced this exercise in their pre-master education.

In addition, although the students appreciated the good relations and communication with the Master's professors, the latter did not always have solutions to students' requests to improve the programme, given that the Master's programme in 'Food and Landscape' is very recent.

# 3.1.2.3 <u>Student-identified issues within the Master's programme in 'Food and</u>

#### Landscape'

The recurring problem encountered in the Master's programme by the students was that the "Agroecology and Sustainability of food production systems" course was not adapted to the students' level. Most of the students in the Master's programme in 'Food and Landscape' did not have the basic knowledge of Agroecology to enable them to follow the "Agroecology and Sustainability of food production systems" course without getting lost. On the other side, the students of the Master's programme in "Agroecology" that took the "Agroecology and Sustainability of food production systems" course in the same class as the 'Food and Landscape' Masters' students were not satisfied as they felt the course was not advanced enough for their level.

On the other hand, some students did not expect the content of the Master's lectures, which are more focused on social sciences, and expected more technical courses on food technologies.

Most of the articles read by students were written by westerns' researchers and the case studies analyzed from a European point of view during the Master's programme in 'Food and Landscape'. This could be linked to the fact that most of the professors are Swedish in the Master's programme and that the research they have studied is often focused on Western Europe and Western countries. The students were missing reading articles written by researchers from non-Western countries. It would be interesting to include more case studies from outside Western Europe in the lectures. The students would like the professors from the Master's programme in 'Food and Landscape' to provide articles written by researchers from non-Western countries and focusing on the geographical areas of Eastern Europe, the Global South, Central Asia and Africa to get other points of views on food studies and Foodscape. For the majority of students enrolled in the Master's programme in 'Food and Landscape', English is not their first language and they didn't complete a degree in social sciences before entering the Master's programme. This presented a challenge for students in the Master's programme in 'Food and Landscape', as they found it difficult to write essays and to participate in group projects, given that they were not accustomed to such tasks in their previous studies. Finally, some students had to work harder than others in group projects to complete the required work, as some students lacked the necessary writing skills. It would therefore be useful to set up an optional workshop focusing on writing methodology for students who have difficulty writing reports and essays.

In addition, students pointed out that professors often gave students open-ended instructions for their work. Some students felt destabilized by these open instructions, as many of them did not come from a Swedish university before entering the Master's programme and were not used to this freedom in the instructions for the required work, which seems common in Sweden. One interviewee had never written a thesis before writing the Master's thesis, and found it very difficult to write one without a starting point and structured instructions from the teachers. The interviewees expressed that more precise and structured instructions should be given to students for homework, particularly for writing the Master's thesis.

On the other hand, some students felt that it was difficult to work in a hybrid manner with both face-to-face and distance learning. Most of the interviewees pointed out that certain lectures of the "Agroecology and Sustainability and Food Production Systems" course were presented face-to-face, and the following lectures right after the first ones were presented by videoconference, leaving students little time to connect in Zoom or go home to follow the remote lectures. Moreover, one interviewee indicated that the fact that group members were divided between online and on-site participation in the "Innovation and Implementation" course made it challenging to complete the assigned projects. The student would prefer that either all the students are on site for these group projects.

Moreover, one interviewee felt that the workload was unevenly distributed throughout the Master's programme: sometimes there was not much work to do and at other times the workload was very heavy. For example, at the beginning of the "Foodscape 1" course, there was very little homework and thereafter at the end of the course students were asked to write a long essay requiring a significant amount of work.

Furthermore, one interviewee pointed out that courses or activities were often cancelled within the Master's programme in 'Food and Landscape', sometimes at the last minute, and were often not rescheduled. Sometimes, online lectures were cancelled by teachers, no classrooms were available for face-to-face lectures, and an excursion was cancelled due to a bus rental problem. Finally, a student interviewed also felt frustrated at being limited in the choice of courses outside the Master's programme. It is indeed difficult for international students to take courses at other universities such as Lund University in partnership with the Swedish University of Agricultural Sciences because the system of paying for courses between different universities is not practical.

Summary table of the Master's programme in 'Food and Landscape' issues and interviewees 'ideas of solutions:

lssues	Interviewees' ideas of solutions
The "Agroecology and Sustainability of food production systems" course is not adapted to students' level.	First, an optional introductory lecture on Agroecology could be set up to teach the basics of this discipline to the Master's students in 'Food and Landscape' before taking the "Agroecology and Sustainability of food production systems" course. Secondly, it could be better to not mix in the same lecture the students from the two Master's programmes in 'Food and Landscape' and in 'Agroecology', and offer another more advanced lecture for students from the Agroecology Master's, as students from this Master's programme have a higher level in the field of Agroecology.
Students are missing out on reading articles written by non-Western researchers and analyzing case studies from a non-Western European perspective.	Articles written by researchers from non-Western countries and case studies focusing on the geographical areas of Eastern Europe, the Global South, Central Asia and Africa could be provided to students to get different points of view on food studies.
Some Master's students don't know how to write the reports and essays that are required during the Master's programme in 'Food and Landscape'.	An optional methodology lecture on how to write essays or argumentative texts could be set up at the beginning of the first year of the Master's programme.
	Or the selection of students entering the Master's programme could be refined by taking into account their writing skills in English.

The hybrid organization, with both face-to-face and online teaching, of the "Agroecology and Sustainability and Food Production Systems" course is not practical for the students.	More time between face-to-face and online lectures to connect to the online lecture should be allowed to the students.
Group work in the "Innovation and implementation" Master's course is made difficult by the hybrid organization with half of the students in class and the other half at home in distance learning.	A suitable videoconferencing room could be set up. Or it could be required for all students to be in class for group projects in the "Innovation and implementation" course. Or the "Innovation and Implementation" course could be set up online for all students.
The open and broad instructions given by some teachers make it difficult for some students to hand in their work.	Teachers could sometimes give slightly more precise instructions on the work required, particularly graded work and thesis, so that some students will be less lost. A workshop could be set up a at the beginning of the Master's programme that provides students with a clear understanding of the expectations placed upon them in terms of their assignments.
The workload is sometimes unevenly distributed throughout the Master's programme.	Instead of asking for all the Master's courses a long assignment that requires an important amount of work at the end of the course, shorter written assignments could also be requested throughout the course to spread the workload at home more evenly for students.
Lectures or activities are sometimes cancelled within the Master's programme, sometimes at the last minute, and are often not rescheduled.	Advance notice of the cancellation of a lecture could be given to the students if possible. In addition, a date for rescheduling the cancelled lecture could be suggested to the students. It should be ensured that there is always a room available for the lectures and that the technical equipment is available for the organization of excursions.

# 3.2 The potential of urban agriculture as a means of addressing the social, environmental and economic challenges currently facing cities

# 3.2.1 Online survey: perceptions of the sustainability questions and urban agriculture by students

94.4% of the students are familiar with the sustainable development goals of the United Nations and first hear about it in the academic world.

An absolute majority of the students think that water consumption by agriculture is worrying.

One third of the students think that urban agriculture and urban foodscape are the most important concepts or elements that they learned in the 'Food and Landscape' Master's programme lectures for setting up sustainable food systems.

All the students who answered that urban foodscape or urban agriculture as one of the most important concepts or elements learned in the lectures of the Master's programme in 'Food and Landscape' for setting up sustainable food systems are Asian, come from urban or peri-urban environments and have mostly completed a bachelor's or master's degree in technology or food and meal sciences.

Almost one third of the student would like to link or are linking their second-year master's thesis with urban agriculture or urban landscape topics.

# 3.2.2 Semi-structured interviews: exploring students' perspectives on urban agriculture

#### 3.2.2.1 Role of urban agriculture in achieving Sustainable Development Goal 2

The Sustainable Development Goal 2 aims to eradicate hunger, improve food nutrition, ensure food security and promote sustainable agriculture. The students interviewed believe that the main role of urban agriculture in achieving Sustainable Development Goal 2 is to help ensure food security and resilience in cities in the event of a crisis such as a climate disaster (floods, droughts...).

However, some interviewees pointed that urban agriculture cannot be a long-term solution to food security, as there is not enough space in cities to produce all the food needed by the urban population. According to the interviewees, urban agriculture can improve food security during one-off crises but is not a solution for securing the local population's food supply in the long term.

One interviewee believes that the primary role of urban agriculture is to reduce the gap between consumers and food production by educating consumers about the effort required to produce food and raising awareness of the need to avoid wasting food.

### 3.2.2.2 Interviewees' ranking of the benefits of urban agriculture

During semi-structed interviews, I asked students the following question: "What are the greatest benefits of urban agriculture in your opinion among the following ones? Please rank the following options in order of importance according to you: "food security", "organic food production", "local food production", "social interaction", "climate change mitigation", other(s)"

After food security, the second benefit of urban agriculture highlighted by the majority of interviewees is the promotion of social interaction. Indeed, the promotion of social interaction through urban agriculture is very important for curing mental illness and enabling city dwellers to get to know each other and create social links between them. For example, interviewees explained that in the town of Malmö in Sweden, gardening activities that enable residents to get to know each other can be very useful, as there are many people coming from different countries in the town. In addition, social isolation for the elderly, particularly in developed countries, is a major problem, and participating in urban agriculture can solve this issue.

The third benefit highlighted by students is the local food production intrinsic to urban agriculture. Climate change mitigation and organic food production are benefits of urban agriculture that students ranked last because urban agriculture is not necessarily organic and in developing countries these aspects are less of a priority than food security.

## 3.2.2.3 <u>The difference between the main objective of urban agriculture in developed</u> and developing countries and its limits.

Students interviewed explained that the main objective and success of urban agriculture projects depends on the urban area in developed and developing countries, and the will of political institutions, the government or municipality.

In developed countries, some students expressed the fact that it can be complicated to develop urban agriculture in megacities because of the very high price of urban land. On the other hand, some students highlighted the fact that urban agriculture is a solution to fight against social isolation in developed countries and to promote social interaction between residents and neighbors. Urban agriculture can be developed in the form of community gardens, for example, as in Malmö, to strengthen social ties between residents and serve as a place of well-being for sick people. Furthermore, some students highlighted the fact that urban agriculture can give residents a sense of security. Studies have shown that if more people are doing beneficial activities in the street, the crime rate could be reduced. In Detroit, for example, some urban agriculture gardens have been implemented to help reducing crimes.

In developing countries, urban agriculture can be developed in cities to reduce their dependence on food supplies, increase food security and improve living conditions for their inhabitants. Urban agriculture can be implemented in "food deserts" and in urban areas that could be particularly affected by climatic disasters (storms, droughts...). Urban agriculture can be a way to improve the food nutritional quality and supplement the lack of protein intake for local populations. For example, urban agriculture is practiced in Accra in Ghana where residents grow vegetables and raise chickens to make up for the lack of protein in fish stocks, which are in decline. However, the government of Ghana does not allow the practice of urban agriculture in the city. Therefore, the population does urban agriculture by itself in a bottom to up design called "guerilla farming" (See the Glossary for an understanding of the terms definitions). This example from Accra illustrates the fact that the development of urban agriculture in cities depends heavily on the political will of decision-makers.

Another barrier to the development of urban agriculture in developing countries can be hygiene and sanitation issues. Wastewater treatment infrastructures are inefficient in some developing countries, and urban agriculture crops can run the risk of being contaminated by the bacteria contained in human excrement.

Nevertheless, in some developing countries, municipalities or governments support urban agriculture projects. For instance, the municipality of Colombo, the capital of Sri Lanka, supported urban agriculture in gardens linked to a community kitchen during the COVID-19 by providing seeds and gardening equipment. In addition, in Bandung in Bangladesh, the city government supported urban agriculture projects and launched the "Buruan SAE" initiative program aimed to address food security issues in the city by encouraging residents to use their available land for gardening. This initiative not only promoted self-sufficiency in food production but also helped reduce household spending on groceries.

In conclusion, in developing countries, urban agriculture can be one of the solutions to help securing food supplies in the event of climatic or geopolitical crises that could impact punctually food production and the transport of food to cities. Urban agriculture has potential in terms of supplying nutrients and proteins to the local population. Urban agriculture is also key to promote social interactions particularly in developed countries, and can improve the residents' sense of security. Nevertheless, the development of urban agriculture in very dense cities can be limited due to the lack of available space and the high cost of land. Moreover, urban agriculture can be

limited in developing countries because of a lack of political and financial supports from the government and municipalities, and hygiene and sanitation barriers. Finally, urban agriculture is hardly a long-term solution for the city's food security.

#### 3.2.2.4 Techniques of urban agriculture

Not all the students interviewed had in-depth knowledge of the methods and techniques used in urban agriculture because they did not all choose to take the "Urban Agriculture and Social Interaction" course in the second semester of the first year of the Master's programme in 'Food and Landscape', and some of the interviewees did not choose to do their Master's thesis on the theme of urban agriculture.

Nevertheless, some of the interviewees were able to answer the questions during the interview about techniques that can be used in urban agriculture. To provide energy for urban agriculture greenhouses, one interviewee mentioned the use of building heating, a technique read in a study published by researchers of the Swedish University of Agricultural Sciences on the campus of Umeå. Moreover, interviewees argued that solar panels can be used to power rooftop gardens and greenhouses, and compost can be used as an organic fertilizer for crops. A student also argued that methane produced from human feces could be used as source of energy for urban agriculture.

Furthermore, certain interviewees pointed out that high-tech methods of urban agriculture like aquaponics or molecular farming can be employed more easily in affluent urban areas, such as Malmö. The choice of technologies depends on the city, the aim of the urban agriculture project, the local government objectives, the financial support as well as the preferences of the local population. However, in cities of developing countries such as Accra in Ghana or Colombo in Sri Lanka, the population is constrained in their ability to use some of urban agriculture technologies (solar panels powered greenhouses, aquaponics...) due to a lack of governmental support or less economical resources than in developed countries.

Finally, the establishment of efficient irrigation systems for the water supply for urban agriculture in developing countries is often challenging. In most cases, local populations rely on tap water or rainwater harvesting in cities to supply the plants. Some water supply techniques to optimize the use of water for irrigation could be used such as drip irrigation and sprinkler irrigation systems regulated by monitoring systems. Sensors could be also used to identify the different water plant requirement.

#### 3.2.2.5 Economic and social questions of urban agriculture projects development

• Economic questions: "How to finance urban agriculture projects in developed and developing countries in your opinion? How can we ensure the economic viability of urban agriculture projects and amortized costs (i.e. land costs, energy costs, fertilizer costs...) in your opinion?"

Interviewees recognized that financing urban agriculture is an important issue as urban land is often expensive, particularly in developed countries, and urban agriculture needs financial support for fertilizers, water supply, etc.

Students believe that governments or municipalities should monitor and financially support urban agriculture projects by distributing the necessary resources, such as seeds and other gardening equipment. Financing and developing urban agriculture projects require public policies, subsidies, and laws to be put in place that are the responsibility of the government. Several stakeholders also need to be involved in the process: experts from the municipality, from research institutes, universities, etc.

One interviewee believes that it is important to highlight the economic and social benefits of urban agriculture so that governments or municipalities will be more willing to fund urban agriculture projects. Urban agriculture can indeed be beneficial in terms of improving soil health and avoiding the cost to the municipality of decontaminating the soil. Urban agriculture could also be incorporated easily in municipal garden by interplanting esthetic edible plants such as sweet peas or rosemary with flowers.

Another student interviewed pointed out also that funding from European or international organizations could support urban agriculture projects in cities such as the European Social Fund.

Nonetheless, students highlighted the fact that even if local populations could benefit from financial support when starting their urban agriculture project, they should be independent and autonomous in carrying out the project and not be completely dependent on outside support.

- Social questions
- "Which people will be working on the urban agriculture project in your opinion? i.e.
   Residents, specialized council employees, disabled or sick people."

Anyone can take part in urban agriculture projects. Residents, people with mental or physical illnesses, children and prisoners can take part in urban agriculture, promoting collective work and a sense of usefulness and community for participants. In addition, people looking for employment can take part in urban agriculture projects and be paid for their work.

"How should food production through urban agriculture be coupled with a system for sharing knowledge about recipes and methods for cooking local produce?"

Sharing knowledge about the production of local crops and how to cook local produce could start at a very young age in schools, nursery schools and kindergarten. Urban agriculture could enable children to pick local vegetables in the garden, enjoy them in their school refectory and share their knowledge with their parents at home. This idea could be a good way of instilling virtuous eating habits from an early age.

Workshops could be set up in towns to enable people to use local products and make specialties from their own country. In Malmö, for example, these workshops could be useful for making cultural recipes such as falafels from Swedish local vegetables as many inhabitants come from different countries.

## 3.2.2.6 Exploring urban agriculture as a research area at the Swedish University of Agricultural Sciences

Questions:

"What do you think is the main reason why urban agriculture is a research area at the Swedish in the Swedish University of Agricultural Sciences (SLU) in your opinion?"

Some students believe that urban agriculture is a research area at the Swedish University of Agricultural Sciences because it represents an opportunity for Sweden. Indeed, most urban areas in Sweden are flat and do not have high buildings, Sweden's urban planning policies often prioritize sustainability and green spaces which can affect land prices and their availability, and the Swedish population is quite small.

Other students think that urban agriculture is a research area at SLU University to find solutions to climate change issues and to think about alternatives to conventional agriculture.

Some students believe that urban agriculture is a topic of research at SLU University, to inform and educate the public about this field, which is often little known to the general public, and to raise people's awareness about the origin of the food they consume. One interviewee believes that urban agriculture is a research area at SLU University to demonstrate that gardening allows to strengthen social interactions between people for their well-being and their mental and physical health.

On the other hand, one interviewee stated that urban agriculture is a research area at SLU University because it is currently a "hot topic" in the media and among the Western Europe researchers. Moreover, there is a real trend towards gardening in Western countries. In addition, it is easier for researchers to visit urban farming gardens rather than rural places as there are often less far away from the university site and more accessible. Furthermore, the interviewee believes that urban agriculture is a research area because urban agriculture in a middle-class context often involves money since participants in urban agriculture pay money to cultivate their plots. Conversely, there is very little research on urban agriculture in poor contexts. For example, the interviewee pointed out that some immigrants working in building construction grow their own crops in the city illegally in China, which is a form of urban agriculture that is rarely mentioned in scientific research articles.

"Do you think Sweden is a pioneer in the field of urban agriculture?"

Most of the students interviewed think that Sweden is not a pioneer in the development of urban agriculture and that it has potential that could be developed further. On the other side, Germany, the Netherlands, and Canada have made significant strides in urban agriculture, with initiatives ranging from community gardens to vertical farming and aquaponics.

#### 3.2.2.7 Students' contribution to urban agriculture in their careers

➤ How could you contribute to the development of urban agriculture in your career after the Master's degree?

Firstly, some students would like to gain more knowledge and skills in agricultural practices by doing internships in farms before participating to urban agriculture projects. Secondly, some students would like to get involved in municipalities to raise awareness among policymakers of the urban agriculture benefits, implement cooking workshops using locally grown produce, develop urban agriculture in schools and kindergartens and local excursions to farms for children. In addition, some students would like to practice urban agriculture in their neighborhoods for the benefit of the local community and biodiversity. On the other hand, one student would like to get involved in research and indirectly participate in the development of new urban agriculture technologies.

## 3.2.3 "Urban Agriculture and Social Interaction" course

#### 3.2.3.1 The social, environmental, and economic benefits of urban agriculture

The most detailed benefit of urban agriculture in the "Urban Agriculture and Social Interaction" course is the social benefit of gardening. This includes promoting a sense of well-being for participants, strengthening social relationships between city residents and cultural exchanges, helping integrate international people into the Swedish society, educating the general public on the growing of culture and helping people with physical or mental health problems from a nature-based therapeutic perspective. The second benefit approached in the course is the economic benefit of urban agriculture helping people to find an employment. Finally, the third benefit addressed in the course is the improvement of biodiversity in the city and the development of green urban areas. Each of the urban agriculture benefit studied in the "Urban Agriculture and Social interaction" course is discussed in more detail in the following sections.

#### 3.2.3.2 Case studies

Numerous case studies were covered during the lectures and excursions in the "Urban Agriculture and Social Interaction" course, illustrating the various benefits of urban agriculture. Most of the cases studied in the course were from county of Skåne in Sweden, where the Alnarp campus of the Swedish University of Agricultural Sciences is located, and often from the municipality of Malmö. The lecturers were either researchers from the SLU University or employees from Malmö municipality.

#### 3.2.3.2.1 Strengthening social interaction, gardening education and cultural integration

In Sweden, urban agriculture projects are often supported by municipalities. For example, Malmö municipality supports several urban agriculture projects in and around the city.

In Malmö, urban agriculture takes the form of "community gardens" cultivated by residents' associations, often on public land and financially supported by the municipality of Malmö, for the supply of water, for example. The primary objective of community gardens is social, and it is not to achieve food security in the city. The values of community gardens are social, economic, and ecological. As part of the social values, the improvement of health and the meeting between neighbors from different ages, backgrounds, and cultures are promoted. Increased attractiveness and employment and training are part of the economic values. Finally, a greener city and the development of ecosystem services are part of the ecological values of community gardens.

There are a total of 13 community gardens in Malmö. The strategy for developing community gardens in Malmö was created in 2016. To propose the creation of a new community garden, residents can send an email to the municipality of Malmö setting out the details of their project and the land on which they would like to develop it. The municipality of Malmö provides

guidelines for gardening on public land. The city provides the grant permission of land use, the soil, the water, the storage, and the waste collection. In a contract between the city and the association, the latter agrees to apply organic gardening practices, to refrain from commercial farming, to maintain maintenance and safety, and to implement an evacuation plan.

Some community gardens in Malmö are on private land belonging to housing supply companies. For instance, the community garden in the residential area of the "Seved" neighborhood in Malmö is owned by "MKB Fastighets AB", a housing supply company. In this case, it is the company that supports the community garden project in conjunction with the "Odlingsnätverket Seved" residents' association.





Community gardens in the "Seved" neighborhood and in the Enskifteshagen public park in Malmö organized by the "Odlingsnätverket Seved" residents' association. Pictures were taken by myself during an excursion in the "Urban agriculture and Social interaction" course.

Although community gardens are open to the public, to get a piece of the culture, the interested persons must pay a membership fee (often 300 Swedish crowns, the equivalent of around €25) to the association that tends the community garden. In return for paying a membership fee, residents each receive a wooden pallet container in which to grow their crops. This system encourages residents to take good care of their share and regulates the crops grown in the community garden. The association also offers to its members and the public (students, elderly people, children) gardening activities in the community garden and guided tours. The community garden serves as a venue for interaction and socialization among these groups. By engaging in gardening activities, individuals are encouraged to communicate and aid one another, exchanging knowledge about gardening techniques and other methods.

In the suburban area of Malmö, the "Botildenborg" initiative is also an illustrative example of urban agriculture project that promotes social interaction between participants. The Botildenborg garden and castle are meeting places, where all kinds of participants meet (children, immigrants, etc.) and which serves as vocational training for the long-term unemployed and community farming. The Botildenborg project is funded by the municipality of Malmö, the European Social Fund (ESF), grants from SLU (SLU farm lab) and the University of Malmö. Participants can take part in gardening and cooking with crops grown in the garden. Community building is effective through food by sharing recipes and meals between participants, using all the senses, learning, and tasting together. Botildenborg is also a "place-making" project, as it allows immigrants to leave their mark and integrate into the country of Sweden.

On the Alnarp campus of the SLU University, the Rehabilitation Garden has also served as a meeting and integration place for immigrants from the Middle East. When the migrants were present in the garden, it was important for them to be able to plant trees, a symbol of their rootedness in the Swedish country. Gardening gave the participants a sense of belonging and integration in a new place. In addition, participants from different cultures were able to share recipes using plants in the Rehabilitation Garden's communal kitchen.

#### 3.2.3.2.2 Enhancing mental and physical health

Gardening has many benefits for mental and physical health, as working outdoors allows you to marvel at the beauty of nature, stimulate the body's multi-sensory system, engage in intensive physical activity and strengthen social interaction through cultivation. Gardening stimulates the parasympathetic system and allows the secretion of happiness hormones, endorphins, improving mental health and sleep.

The Rehabilitation Garden in Alnarp was designed for social and therapeutic purposes. The aim of the project was to strengthen the individual's health through nature-based occupations performed in the Alnarp Rehabilitation Garden. It was created in June 2002 and Anna María Pálsdóttir, Senior Lecturer in Nature-Based Interventions (NBI) and Associate professor in environmental psychology of landscape architecture, studied the project from 2007 to 2019. The vocational rehabilitation project was made in collaboration with the Swedish Public Employment Services, the Swedish University of Agricultural Sciences, Lund University and Copenhagen University. The garden welcomed people suffering from stress linked to mental disorders and was run by medical, physiological and gardening staff. The design of the garden enabled patients to feel safe by installing tall wooden containers for stroke patients to lean on, and by creating slightly hidden gardens where patients can rest on a bench in peace and quiet, without having to interact with other people. This last element is known as "refuge space" or "retreat space" in the field of environmental psychology.



The house in the Rehabilitation Garden at the Swedish University of Agricultural Sciences in Alnarp.



"Refuge space" in the Alnarp Rehabilitation Garden.

#### 3.2.3.2.3 Creating work opportunities and contributing to the local economy

Urban agriculture can also help people in difficulty to integrate into the work force and participate in the local economy. The FRAM project launched by the municipality of Malmö is a work-based rehabilitation project created in 2017 using gardening as a tool. The goals of the FRAM project are to break out of participants' passivity and social isolation, create routines, promote a sense of community among the participants, help people integrate into employment, and in the regular labor market. Usually, the length of participation into the FRAM project toward professional insertion last 6 months with possible extension (10 months and occasionally more than 12 months). The project includes a peer support group and information for participants on how the labor market works and job opportunities. The benefits for participants are multiple: being in a positive environment and making new connections, not being socially isolated, finding professional meaning and purpose in their lives, and taking care of themselves and the environment.

The Botildenborg project also generates work opportunities, new knowledge, and a sense of innovation for the participants. Botildenborg offers internships lasting at least two months and one-day training courses for future entrepreneurs who would like to start up professional urban agriculture in the city, and courses in spring and autumn on different types of growing techniques.

Furthermore, the Alnarp's Agroecology farm at the edge of the Alnarp campus participates to the local economy in the Skåne region. Indeed, the products from the Alnarp's Agroecology Farm are sold within the CSA system ("community supported agriculture"). The consumers buy in advance products for 20 weeks between June and October, and there are approximately 8 to 10 products in one of each 20 boxes sold. There is a real connection between the producers and the consumers as the latter can visit the farm, pick-up the local products in selling points not far from the farm in the cities of Lund and Lomma, and participate in events in the farm.

### 3.2.3.2.4 Benefiting the development of biodiversity and the city environment

Promoting biodiversity and enhancing the city environment are major co-benefits of urban agriculture. Community gardens in Malmö are a great example of this. The development of urban green spaces, flowers and various crops encourages the presence of pollinator insects, birds, and certain small mammals. As part of the "Seved" community garden in Malmö, an insect hotel has been installed along the side of a building to encourage the presence of pollinators, other insects and their predators in the city. In the "Enskifteshagen" community garden, bee boxes have also been installed to encourage the presence of bees.

The Botildenborg project also participates to the improvement of urban ecosystems, the increase of biodiversity, and the growing of perennials and annuals plants. By encouraging the cultivation of local plants and using organic gardening methods, urban agriculture helps to control and reduce the spread of invasive species that can harm local biodiversity. Plants grown in urban agricultural areas can also help filter pollutants from the air, improving the quality of the urban environment.

## 3.2.3.3 <u>Techniques of urban agriculture</u>

Some of the "Urban Agriculture and Social Interaction" lectures were given by researchers from the 'Biosystems and Technology' department at the SLU university on the Alnarp campus and were focused on technologies that can be used for urban agriculture. In addition, students who created the Alnarp's Agroecology Farm also gave a lecture on their project and agroecological methods.

In dense and affluent cities, urban agriculture projects combining high technology, horticulture and agriculture could be developed. An innovative system of urban agriculture on roofs using flows from buildings could be used. For example, the CO2 and nutrients contained in the buildings' residents' feces could be used to fertilize the plants. Greenhouses could be heated using solar energy and could be linked to an aquaponics system. Finally, the wastewater and food produced by the greenhouses could be reused in a circular way as it is shown in the figure below.

In addition, as part of a circular approach to urban agriculture, biodegradable waste could be decomposed by the black soldier fly larvae. The insects' excrement could then be used as fertilizer for plants.

Furthermore, the farm project developed by the Pittsburg company "In City Farms" shows that the urban agriculture farm of the future could be made up of an aquaponics system supplying nutrients to the plantations, and different growing techniques such as raised beds and greenhouses. Moreover, an area dedicated to vermiculture could be used to fertilize crops, while a fungiculture area could serve as a bio stimulant for the plants, thanks to their symbiotic relationship that stimulates photosynthesis and the growth of the plants' root systems, and as a CO2 source for the plants.

Agroecological methods can also be used in extensive urban agriculture gardens. The Alnarp's Agroecology Farm uses agroecological methods to grow crops. There is no dig on the land cultivated, and compost mulching, cover crops, crop rotation and species diversification are the methods used in the farm. Organic fertilizers made from chicken and magnolia plants or from a tomato leaf 'soup are also employed in the farm.

The farm is composed of greenhouses, an aromatic herbs area, a compost area, beds, a peri annual section, flower beds, a pumpkin patch, a poly tunnel and a pond that creates a point of biodiversity development. Fennel and sweet peas are examples of crops grown in the beds. Each bed is covered with 15 centimeters of compost. Carrots, tomatoes, salads, and melon are some of the products grown in the greenhouses. The "three sisters" technique with squash, maize and climbing beans in which the plants are mutually beneficial is also used in the farm. The maize pumps water and the squash provides the necessary nutrients, while the beans fix the nitrogen in the soil. The farm also reuses wastewater for hand washing, using large basins.

Agroecology has the advantages of being fossil fuel free, avoiding soil erosion, developing the soil organic matter, strengthening the nutrient content, the biodiversity, and the microbial diversity. It participates to climate change mitigation, safeguards soil health, preserves ecosystem services and participates to local food security.



The Alnarp's Agroecology Farm.

# 4 Discussion

## 4.1 Conclusion

The online survey highlighted an important result: an absolute majority of the students that ended or are still enrolled (they are following the Master's programme courses, writing their thesis or taking a break) in the Master's programme in 'Food and Landscape', are satisfied with the programme. Most of the students interviewed particularly liked the excursions and field visits in the Master's programme, and their favorite courses were "Food Planning" and "Foodscapes 2". Moreover, the classroom atmosphere is good, providing students with an ideal working environment.

As student profiles are international and various particularly in terms of their study background and career prospects, these students' profiles particularities could be more taken into account in the Master's programme in 'Food and Landscape'. Optional lectures teaching the basics of Agroecology and essay writing methodology could be introduced to address the lack of knowledge in these areas for some students. In addition, a workshop or meeting between teachers and students could be organized at the beginning of the first year of the Master's programme to explain teachers' expectations and the instructions for the assignments required of students, as well as an explanation of the organization of the Master's courses, such as the reading of articles and their discussion in class. Therefore, students will be probably less lost in their work, especially at the beginning of the Master's programme. More articles and case studies dealing with non-Western issues could be studied in the Master's programme in 'Food and Landscape', especially as the majority of students come from Asia and are directly concerned by these subjects. The workload could be better distributed in the Master's programme and it could be avoided to ask students to do most of the work in a short period of time at the end of the courses. Lastly, solving some technical problems related to the hybrid organization of lectures, half face-to-face/half online, and the cancellation of lectures or excursions could be solved by making sure that the necessary equipment (classrooms, bus, etc.) is available.

The interviewees highlighted the fact that urban agriculture can help to solve food supply issues facing cities during short-term crises, and thus strengthen the food security of urban areas during these events. This is particularly important for cities in developing countries such as Ghana and Sri Lanka, whose population is growing fast and which are more vulnerable to climatic and geopolitical crises, and for urban areas such as Singapore that are heavily dependent on external food imports.

Urban agriculture has also a great potential in cities of developed countries such as Malmö in Sweden to restore social links between residents and all types of people (adults, elderly people, children, sick persons...) thanks to the development of community gardens in the city. Moreover, urban agriculture has the potential to restore the link between consumption and production in the city, by raising consumer awareness of the effort involved in the crop production process and reducing food waste. Education in crop production, the consumption, and the cooking of local and environmentally friendly produce through urban agriculture can ideally be provided in schools from an early age.

Urban agriculture also represents a key therapeutic alternative for people suffering from mental and physical illness for developed countries such as Sweden. The Alnarp Rehabilitation Garden is a good example highlighting the benefits of gardening and participating in nature-based occupations in improving mental and physical health.

Urban agriculture can also be a tool for helping people to start their own businesses and enter the world of work, as shown by the FRAM and the Botildenborg projects set up by the municipality of Malmö.

Finally, organically managed urban agriculture has the advantage of being highly beneficial to the urban environment, allowing the development of biodiversity in the city and green spaces. The development of community gardens in the city of Malmö that encourages the presence of pollinators and other insects, and increases the presence of greeneries in the city is an illustrative example.

Various urban agriculture techniques can be used: these range from low-tech methods such as agroecology to high-tech methods using solar panels powered greenhouses, aquaponics systems, etc. The choice of method depends on the main objective of the project (to feed the inhabitants, to strengthen social interaction...), as well as the available urban land, the political will, and the economic resources available.

In the case of an urban agriculture project with sufficient economic resources and limited space, where the primary objective is to feed the population, high-tech methods could be put in place. Urban agriculture projects could consist of a highly productive aquaponics system supplying nutrients to the plantations, and different growing techniques (raised beds, greenhouses on rooftops powered by solar panels...). Vermiculture and fungiculture could be also used in urban agriculture systems.

In the case of urban agriculture projects benefiting from a medium-sized area, low-tech agroecological methods could be implemented. This involves encouraging interactions between mutually beneficial species and promoting the development of biodiversity as in the Alnarp's Agroecology Farm. The manual and physical effort participants put into growing the plantations have the advantage of strengthening the social boundaries between them.

## 4.2. Limits of urban agriculture

The implementation of urban agriculture projects remains limited by the lack of space, political will and funding in some urban areas. Moreover, urban agriculture alone cannot guarantee long-term food security for residents. On the other hand, little academic research is currently focusing on urban agriculture in poor areas of developing countries, which makes it difficult to draw conclusions about the setting of urban agriculture in these areas.

## 4.3. Limits of the study

One limit to the evaluation of the Master's programme in 'Food and Landscape' carried out in this study is that students who stopped taking the Master's courses did not reply to the survey. In addition, the sample of the survey is small because few students ended or are still enrolled (they are following the Master's programme courses, writing their thesis or taking a break) in the Master's programme. Moreover, the recurring examples of urban agriculture studied during my internship, particularly in the "Urban Agriculture and Social Interaction" course, often focus on Sweden and the municipality of Malmö, and less on other urban areas and developing countries, which limits the study. In addition, not all the students interviewed had taken the "Urban agriculture and social interaction" course, thus some students had slightly less in-depth knowledge of economic and technical aspects of urban agriculture than others interviewed. Finally, I have chosen to compare two simplified groups of "developed" and "developing" countries to have a schematic trend of the potential of urban agriculture in solving the economic, environmental and social challenges in different urban areas. However, I am aware that the characteristics of urban agriculture projects cannot only be understood and generalized in two categories: "developed" and "developing" countries.

# **5** Acknowledgments

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# 6 Appendix 1: Google form aggregated results

You ended the Master's programme in "Food and Landscape" or you are still enrolled (you're following the Master's programme courses, you're writing your thesis, you're taking a break) 18 responses



What level of education did you have when you enrolled in the Master's programme in "Food and Landscape"?

18 responses



What were you studying before joining the Master's programme in "Food and Landscape"? 18 responses



**Case answer"other"** : Please enter the field you were studying before joining the Master's programme in 'Food and Landscape'.

2 responses

- 1) Business
- 2) Architecture

Where have you spent the most time in your life? 18 responses



Before starting the Master's programme, which continent did you live on? 18 responses



#### What is your dietary choice? 18 responses



What is the main reason why you chose this dietary choice? 18 responses



**Case answer "other"**: Please enter the main reason why you chose this dietary choice. 2 responses

- 1) I grew up vegetarian, everyone in my family is, and started eating plant-based as an adult
- 2) Because I think a good diet is a varied diet.

What is the main reason why you decided to study in Sweden? 18 responses



**Case answer "other"**: Please enter the main reason why you decided to study in Sweden. 2 responses

- 1) Obtaining a degree to find a job in Sweden
- 2) It's interesting to know another culture, low financial cost, educational quality

What is the main reason why you decided to do the Master's programme in "Food and Landscape"? 18 responses



Overall, you are satisfied with the Master's programme in "Food and Landscape". 18 responses



How would you involve/are you involving sustainability questions in your Master's thesis project during the second year of the Master's programme in 'Food and Landscape'? (eg: your project would be/is linked to the themes of hunger, poverty, gender equality, health, water, climate change, sustainable cities...)

18 responses

- 1) Sustainable cities
- 2) My thesis involves sustainable development and sustainable traveling
- 3) Focusing on the next step of sustainability: regeneration
- 4) My thesis topic is related to economically sustainable local food networks/local food systems.
- 5) I am currently studying about a food strategy implemented by one of the South Asian countries. The strategy aims to address issues related to the full utilization of local

agricultural produce, encourage women entrepreneurs, and sustainably ensure food availability in cities.

- 6) My thesis is related to the vegetarian diet and how relevant is this concept in Eastern countries with the example of Azerbaijan. It is mainly linked to social aspects such as ethical concerns, religion, etc. as well as the effects on the landscape due to large meat consumption.
- 7) My project is related to sustainable development goals that contribute to the development of local economies and related to zero hunger goal.
- 8) I'm discussing and involving topics such as food security and local food availability in my thesis
- 9) I like to focus more on health and well-being, especially addressing the role of Food in childhood cancers.
- 10) sustainability of Cheese production and employment on a particular landscape in Sweden
- 11) Yes, It included sustainable foodscape character in cities.
- 12) Health, sustainability
- 13) My theme is related to sustainability
- 14) Haven't considered it yet
- 15) I will definitely do my thesis in sustainability area
- 16) Sustainable city planning
- 17) I took three courses and a individual project for master's thesis. My thesis is kind of about sustainable urban development.
- 18) My project might be linked to sustainable communities.

Please indicate the topic that you are writing about/that you wish to explore in greater depth as part of your Master's thesis project in the second year of the Master's programme in 'Food and Landscape'.

#### 18 responses

- 1) Interdependencies between urban and rural areas in terms of food production, consumption, and land use, and explore opportunities for fostering sustainable urban-rural linkages.
- 2) the role of food in increasing sustainable travel by train
- 3) Regenerating our food systems through the nexus of tourism and agriculture
- 4) Building resilience for local food manufacturers through embeddedness in market culture
- 5) Shaping up the urban foodscape through local food and traditional knowledge: A case study of "Hela Bojun" food outlet in Kandy District, Sri Lanka
- 6) I am almost done with the thesis but I wish I had time to explore more into the general idea of vegetarianism and if it is. relevant to promote it other than countries in Europe.
- 7) Plant proteins from green agriculture biomass (e.g.lucerne, tomato leaves )
- 8) Crisis management and food preparedness on the countryside in Sweden

- 9) I like to study about the health concerns associated with current food consumption trends. I like to focus more towards the role of food in incidence childhood cancer.
- 10) I wish to explore more on enzymes and proteins
- 11) Tourism and Foodscape
- 12) Extracting protein from seaweed
- 13) How could affect the school foods in Malmö to local food culture
- 14) How Chinese food culture survives and develops in Sweden related cross-cultural exchanges on food
- 15) Food behavior and sustainable diet
- 16) Sustainable food system in city planning
- 17) The relationship between urban development and urban agriculture. A case study in Beijing.
- 18) Conviviality and dynamics between cultural cuisines.

What is the main reason you chose this Master's thesis topic? 18 responses



Are you familiar with the Sustainable Development Goals of the United Nations? 18 responses



#### Case answer "Yes"



Please select by what means did you first hear about Sustainable Development Goals. 17 responses

**Case answer "other"**: Please write by what means did you first hear about Sustainable Development Goals.

#### 1 response

 I don't remember. They have been around for a long time. I did not first hear about them in academia, but I can't remember how I did first hear about them. Maybe the news. Maybe a magazine. Maybe through talking to people at a conference.

Sustainability questions are sufficiently addressed within the Master's programme in "Food and Landscape".

18 responses



In your opinion, the Master's programme in "Food and Landscape" lacks courses or activities that link the Foodscape field and sustainability questions. 18 responses



#### Case answer "Yes"

To better link the Foodscape field with sustainability questions in the Master's programme in "Food and Landscape," the following courses or activitie... included (You can choose more than one answer). <sup>5</sup> responses



Add any other courses or activities that you would like to study in greater depth that are not mentioned in the previous question (Answer is not compulsory). 1 response

1) Global perspective in each course. Not only limited to northern part or southern part of the world.

In your opinion, what are the most important concepts/elements that you learned from the courses of the Master's programme in 'Food and Landscape' for setting up sustainable food systems? Eg: urban agriculture, agroecology, water management,...

18 responses

- 1) Urban Agriculture, food planning
- 2) I have gained a greater understanding of the holistic perspective where different parts must be seen in context and understood in relation to each other.
- 3) SDG's and sustainability are not solving our problems, we need to look at regeneration
- 4) Food Planning, Food Sovereignty, Food Security
- 5) Food strategies
- 6) In my opinion, the program gave me a wholesome picture of different concepts in sustainability.
- 7) I took several courses at another university, so I cannot evaluate all courses from this program. Based on what I took, food planning and sustainable agriculture practices seemed the most important to me.
- 8) food planning, urban foodscape, food security
- 9) Food Planning.
- 10) Farm to fork strategy, Nordic food policy, permaculture, tape tools
- 11) Urban Agriculture, Food Planning, Food Strategies, Foodscape
- 12) urban agriculture
- 13) urban agriculture
- 14) Sustainable Agriculture
- 15) Foodscape, food as a base for design
- 16) Food planning, urban agriculture & social interaction
- 17) Sustainable food system, which should includes (at least) stable, adequate, environmental friendly production system; Resilient transportation and storage system; a distribution system that cover all society; A correct cultural and behavioral guide in food aspect for all citizens; and a stable country with independent economy and government.
- 18) Regional consumption of food.

Do you think that current water consumption by agriculture is a cause for concern? 18 responses



#### Why?

#### 18 responses

- 1) Yes. We need more effective practices.
- 2) In an increasingly dry world, water resources must be used more sparingly. This applies globally but especially in areas that suffer from long dry periods and where agriculture uses up the drinking water of the local population to water crops like avocados.
- 3) 70% freshwater use is in agriculture and agriculture is producing 78% polution of our waterways.
- 4) There are massive water crises around the world due to agriculture: avocado farming in Chile, almond farming in California, almost all agriculture in Australia. We are trying to force landscapes that are not suitable for certain types of agriculture to overproduce, and that requires more water than those regions can afford to provide.
- 5) Because agriculture is the largest consumer of freshwater globally which leading to water scarcity, ecological and environmental impact, food security and climate change.
- 6) Many reasons but one that I was interested in the most during my studies is that monoculture, where only one crop is grown over a large area, can worsen water consumption in agriculture. It demands more water, reduces soil's ability to hold water, increases the need for pesticides, and harms biodiversity, all leading to greater pressure on water resources.
- 7) It all depends on the country in question. In Sweden, there are generally no issues with water shortage for agriculture, but they have had a couple of years with droughts when they experienced a lack of groundwater. Therefore, they are already considering possible water resource management methods for agriculture. Overall, with the global climate change and increasing droughts, the issue of water scarcity will become more and more

acute, considering that agriculture requires a large volume of water and the use is not optimal.

- 8) -
- 9) Needs to practice more effective water management practices.
- 10) Increased production is equivalent to increased input (eg. irrigation, fertilizer) and conversion of forested land, climate change and erratic rainfall pattern create concern about overall water supply and conservation
- 11) Water wastage is high, due to lack proper management in most of agricultural activities.
- 12)
- 13) pollution water
- 14) The amount of water used in agriculture worldwide is huge and most of it does not have a sustainable (recycling) system
- 15) the increasing strain on water resources
- 16) Lack of knowledge & awareness in sustainable usage of production system
- 17) It is kind of important for all farmers and or normal people use water resources carefully.
- 18) It is a concern in regions where water resources are scarce.

Do you think that water issues in agriculture are sufficiently addressed within the Master's programme in "Food and Landscape"? 18 responses



If you could select only one commitment, what do you think is the most effective to achieving the sustainable development goals?

18 responses



Would you like to pursue doctoral studies after graduation? 18 responses



Case answer "Yes"

What doctoral topic(s) you would like to explore in greater depth? (You can choose more than one option).

12 responses



Add any other doctoral subjects that you would like to study in greater depth that are not mentioned in the previous question (Answer is not compulsory).

5 responses

- 1) Economic Sociology
- 2) Dairy science
- 3) Marine ecosystems and overfishing, Connection between biodiversity and agriculture
- 4) Food technology, food safety, food nutrition
- 5) Urban agriculture, sustainable city, agricultural landscape.

What career would you like to pursue after your studies? 18 responses



Case answer "other" : Please write what you would like to do after your studies.

2 responses

- 1) Farmer
- 2) Food & Beverage Entrepreneurship/Start-up/Innovation

On what scale would you like to work? 18 responses



What type of institution would you like to work for after your studies? 18 responses



# 7 Appendix 2: Semi-structured interview guide

# 7.1 Questions on the evaluation of the Master's programme in 'Food and Landscape'.

Topics	Questions
Evaluation of the Master's programme in 'Food and Landscape'	What did you like the most about the Master's programme in 'Food and Landscape'? E.g.: lectures, activities,
	What do you think is not working in the Master's programme in 'Food and Landscape'? E.g.: lectures, potential issues related to post-Master's studies

# 7.2 Questions on the potential of urban agriculture as a means of addressing the social, environmental and economic challenges currently facing cities.

Topics	Questions
Introductive question	What are your thoughts on the role of urban agriculture in achieving Sustainable Development Goal 2 to eradicate hunger, ensure food security, and improve nutrition?
Urban agriculture: a relevant solution in developed and developing countries?	Do you think that in developed countries urban agriculture is a solution that should be implemented in cities? Why?
	Do you think that in developing countries urban agriculture is a solution that should be implemented in cities? Why?

	<ul> <li>What are the greatest benefits of urban agriculture in your opinion among the following ones? Please rank the following options in order of importance. <ul> <li>food security</li> <li>organic food production</li> <li>local food production</li> <li>social interaction</li> <li>climate change mitigation</li> <li>other(s)</li> </ul> </li> </ul>
agriculture	to develop urban agriculture, particularly for the supply of energy and fertilizer?
	<ul> <li>What types of urban agriculture should be promoted in developing or in developed countries among the following ones in your opinion? You can choose several options.</li> <li>Extensive urban agriculture (which includes "basic" agriculture)</li> <li>covered urban agriculture (greenhouses, including rooftops)</li> <li>high-tech, vertical and indoor agriculture (including container and warehouse farms)</li> <li>aquaponics (fish farming combined with one of the techniques above for symbiotic effects)</li> <li>insect breeding (culture of insect proteins from biomass such as biowaste)</li> <li>molecular farming (lab-grown meat and microbial production of essential components such as oils, vitamins and proteins).</li> <li>other(s)</li> </ul>
Water management	Which type of irrigation or water supply should we develop for urban agriculture?
Economics and social aspects in urban agriculture	How to finance urban agriculture projects in developed and developing countries in your opinion?
	How can we ensure the economic viability of urban agriculture projects and amortize costs (i.e. land costs, energy costs, fertilizer costs) in your opinion?
	Which type of people will be working on urban agriculture projects in your opinion?

The urban agriculture approach in the research area at the Swedish University of Agricultural Sciences	What do you think is the main reason why urban agriculture is a research area at the Swedish University of Agricultural Sciences in your opinion?
Study cases of urban agriculture	What examples of successful urban agriculture initiatives have you studied or observed, and what lessons can be learned from them in developed and developing countries?
Urban agriculture in the student's careers	How could you contribute to the development of urban agriculture in your career?