# Exploratory Workshop on Urban Agriculture and Adaption to Climate Change

21 January 2020

Wageningen University & Research

## Summary Report

# 1. Introduction

The Exploratory Workshop on Urban Agriculture is one of the actions from the 2018-2020 FACCE-JPI Implementation Plan under Core Theme 4 – Adaption to Climate Change. It was organised by the FACCE-JPI Secretariat (UKRI-BBSRC and Wageningen University & Research) in collaboration with JPI Urban Europe.

The scope of the workshop was determined by a steering group consisting of FACCE-JPI Secretariat members, FACCE-JPI GB, SAB and StAB members, JPI Urban Europe Management Board members and experts in the field.

With urbanisation increasing globally, it was the aim to analyse if and what urban agriculture can contribute to environmental, health, social and economic aspects, and to food and nutrition security. The outcome of this analysis was then to be used to determine if urban agriculture should be included in the Strategic Research Agendas of both JPIs as an emerging topic.

# 2. Workshop

## 2.1. Introduction

The event was held at the Campus of Wageningen University & Research in The Netherlands. Dorri te Boekhorst, FACCE-JPI Secretariat member from WUR, welcomed the participants to the workshop, highlighting the goal to bring people together to explore the potential, limits and challenges for Urban Agriculture in how it could contribute to find solutions for some of the major societal challenges. These include: climate change, food security for a growing population, and ensuring livable and sustainable cities. Additionally, she noted the aim to identify gaps in research, policy, and knowledge on how to engage the public and try to define a message for national policy makers working together in Joint Programming Initiatives.

This was followed by an introduction to FACCE-JPI by Niels Gøtke, FACCE-JPI Governing Board member for Denmark and former chair. He presented why the Joint Programming Initiatives were initiated and highlighted the four Sustainable Development Goals (SDG)

- Zero Hunger
- Responsible Consumptions and Production
- Climate Action
- Life on Land

to which FACCE-JPI can be linked. He continued with the past and ongoing actions of the initiative, which are laid out in Implementation Plans that are based on the Strategic Research Agenda. He also set out how FACCE-JPI will be continuing its work of aligning and co-designing research and policy across Europe to respond to the societal challenges Europe is facing.

Jonas Bylund, Management Board member of JPI Urban Europe, then introduced the Joint Programming Initiative Urban Europe. He highlighted that although JPIs often work with the European Commission and the European Framework Programmes, they are independent and based on country initiative. He explained that JPI Urban Europe works with a dilemma-driven approach to support sustainable urbanisation. For this initiative, the SDG of sustainable cities and communities is the basis for solving a whole variety of other SDGs, such as no poverty, zero hunger, gender equality, and clean water and sanitation. JPI Urban Europe have funded more than 50 Urban Living Labs to address a broad range of issues such as urban governance, water management, and stakeholder involvement. The initiative has also worked with partners outside of Europe for example the US National Science Foundation (NSF), Qatar's QNRF, Japan's JSP and FAPESP in Brazil through the Belmont Forum.

## 2.2. Aims & Objectives

Anja Berndt, FACCE-JPI Secretariat member from UKRI-BBSRC, introduced the aims and objectives of this workshop.

The objectives were to explore and understand the current landscape of urban/peri-urban agriculture and the underlying context driving the urban agriculture discussions, to explore and identify the potential impacts, risks and benefits of urban agriculture and the policy context around it, and to identify and prioritise key areas in urban agriculture which FACCE-JPI and JPI Urban Europe should focus on.

Hence this workshop aimed to bring together European and international experts and stakeholders (scientists, policymakers, funder, industry, investors, retailers, land and urban planners etc.), to identify opportunities for increased collaboration between FACCE-JPI and JPI Urban Europe, and to provide recommendations to the FACCE-JPI Governing Board on areas of relevance for FACCE-JPI contributions. The key questions this workshop tried to answer are:

- What could urban agriculture offer (CO2 reduction as result of short chains, city greening, improvement of urban living conditions, water issues, food & nutrition security etc.)?

- What are major challenges (scientific challenges, policy barriers, yields etc.)?
    - Are there major research gaps?
- What type of instrument could further development of urban agriculture (new research call, living labs etc.)?
    - What could be the role of the JPIs' Urban Europe and FACCE in furthering knowledge and expertise in urban agriculture?

## 2.3. Setting the scene

In order to create a common understanding of the area of urban agriculture, the organiser invited speakers to talk about the various aspects of this area.

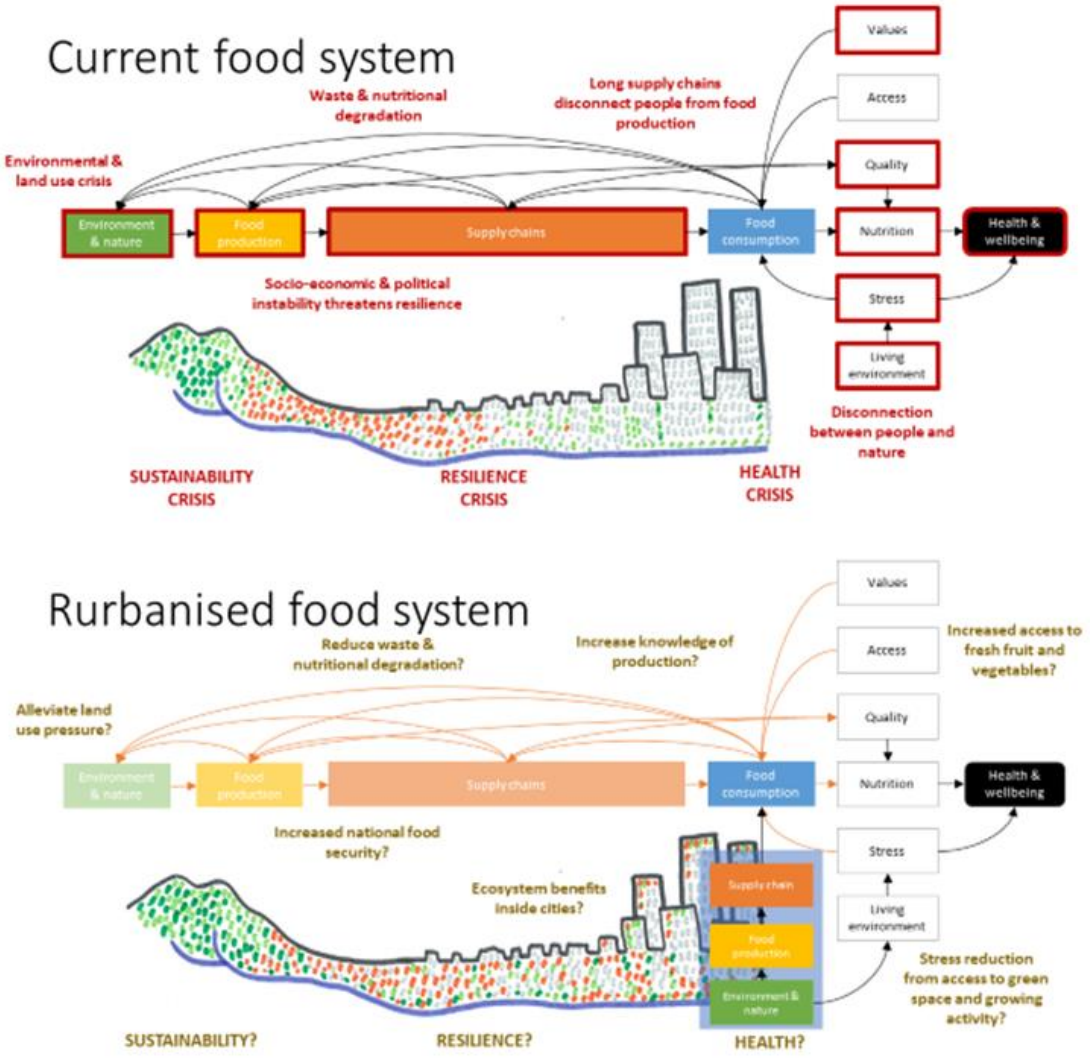


Figure 1: Comparison between the current and envisioned rurbanised food system; from presentation by S. Kourmpetli

As a general overview, Sofia Kourmpetli (Cranfield University, UK) presented "Rurban Revolution: Evaluating the transformative potential of urban growing", a collaborative project with partners from Cranfield University, Lancaster University and the University of

Liverpool, funded by the Global Food Security programme[1]. The project includes researchers from a variety of disciplines: environmental modelling and ecosystem services, social and political sciences and supply chains, psychology and dietary behaviour, and plant sciences, food quality and safety and waste. The project defines "rurbanisation" as the increase in natural green space and agricultural food production in built-up areas. Their aim is to explore, through an interdisciplinary network, the potential that rurbanisation could offer for a more healthy, sustainable and resilient food system. Their proposed rurbanised food system (see figure 1) could lead to alleviating of land use pressure, reduced waste and nutritional degradation, increased access to fresh fruit and vegetables, increased national food security, benefits for urban ecosystems, increased knowledge of food production, and reduction of stress due to better access to green spaces.

The project partners will be analysing different UK cities to try and answer the following questions:

- What would rurbanisation mean for food system resilience & ecosystems?
- How might rurbanisation affect urban ecosystem service delivery?
- What would rurbanisation mean for health and dietary change?
- What would rurbanisation mean for food quality and safety?
- What are the barriers and opportunities for rurbanisation?

The next speaker was Leo Marcelis from Wageningen University & Research, who presented the high-tech indoor approach to urban agriculture. He explained that while indoor farming is not suitable for staple crops, it does provide opportunities for the production of fruit and vegetables. Growing fruit and vegetables indoors in greenhouses has been done for centuries and has now reached the stage where it can be done in large scales or in small scale directly at the consumer level in supermarkets. These modern facilities offer an ever-increasing control over the production process. For example, recent work of PhD students in his group has shown that by manipulating light quality the nutritional content, e.g. vitamin C levels, and shelf-life of lettuce can be altered. This total control over the growing process brings a number of benefits compared to conventional agriculture:

- no pesticides needed
- reduced nutrient use

[1] http://wp.lancs.ac.uk/rurbanrevolution/

- significantly reduced water use
- limited land use
- shorter transport routes
- decreased food waste

However, the costs, energy usage and ensuring sustainable energy sources are currently the bottlenecks of this type of food production. Despite this, he concluded that vertical farming will be part of the modern food systems.

The final presentation focussed on the urban agriculture outdoors and the impacts on circularity, climate change, use and production, and the conflicts arising from different policies. The speakers for this presentation were Jakob Magid (University of Copenhagen), Jørgen E. Olesen (Aarhus University) and Henrik Vejre (University of Copenhagen). Currently, all modelling scenarios indicate a continued contribution to pressures such as land use and soil fertility by conventional agriculture. Therefore, changes in our approaches to agriculture could contribute to alleviating some of the pressures. At the moment, 71% of the global ice-free land surface is managed land, i.e. used as cropland, pastures, and forests. Of the remaining 29%, about 28% are un-used or minimally used due to the nature of the areas (e.g. rocky, high altitude etc.) and the final 1% is classified as “infrastructure”, i.e. mainly urbanised land. This means that pressures such as land use and soil fertility cannot simply be eased by creating more arable land. Given the expected increase in urbanisation over the next decades, the available arable land is even likely to decrease. Hence, we need to find or rediscover radical, new ways of utilising the un-used and urbanised areas. Recycling of water and nutrients within the urban areas and between urban and rural areas could be one of the options that will have to be explored.

In Copenhagen, pre-dating modern sewage systems, this was achieved through the transport of human waste into the surrounding rural areas to be used as fertiliser. However, the introduction of sewage systems, and health and safety regulations have eliminated this system. Today’s liquid waste recycling systems only retain phosphorus and lose most other nutrients and organic matter. Predictions show that with efficient recycling processes in place, 80% of land outside of Copenhagen could be fertilised with waste produced in the urban environment. This shows the urgent need to bring better circularity into the food systems.

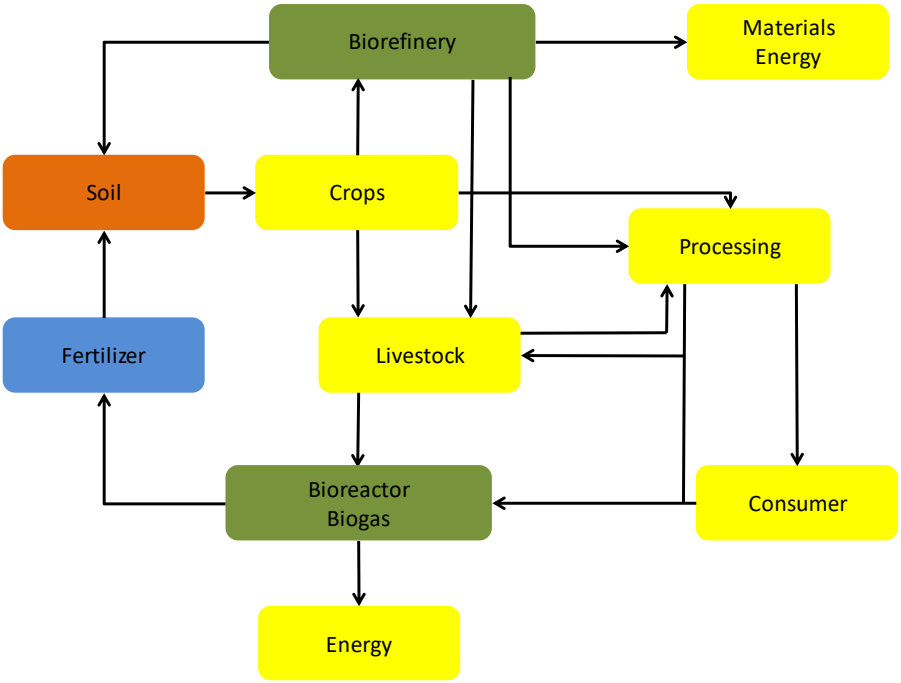


Figure Circularity in agriculture; from presentation by J. Magid, J. Olesen, H. Vejre

Additionally, there is a growing demand and market for sustainable products and solutions supporting a more sustainable lifestyle, which could lead to an increased use of urban agriculture.

However, there are several barriers that hinder this process. In general, there is a lack of suitable space due to the lack of attention on planning of urban and peri-urban areas. As urban agriculture in its current definition is relatively young and trend dependent, the sector is dominated by new and small companies which poses a risk with regards to continuity of actors, market stability and access, and stable supply chains and product quality. Specifically in peri-urban areas, there are issues that are based on the link of rural areas to the CAP and global markets (where does rural start, where does peri-urban end; why is one area marked as rural and another as peri-urban). This often results in difficulties in access to land for start-ups and innovative producers. Therefore, future works has to address how novel agroecological approaches can combine intensive quality food production, urban waste management and recreational landscapes.

After the talks a Q&A session was moderated by Anja Berndt. Questions were raised around the hazards of using human waste for fertilising, how and if urban agriculture can contribute to the calorie needs as it isn't suitable for staple crops, current restrictions due to regulations, and the lack of public funding for research in urban agriculture.

## 2.4. Tackling the dilemmas

The scoping process for this workshop defined three dilemmas that are of importance for urban agriculture.

- Dilemma 1 – To be circular or not?
- Dilemma 2 – Land use vs Soil use
- Dilemma 3 – Conflicting policies

To discuss each dilemma, the participants were divided into three groups, which represented a mixed group of stakeholders. In three breakout sessions they were invited to analyse the dilemmas under the following aspects.

- Environmental & Health aspects
    - Technology approaches such as vertical agriculture, aquaponics etc
    - Climate change impacts on urban environment
    - Resource use efficiency – interdependence of food and energy systems
    - The social implications and/ or ramifications of the above-mentioned aspects
    - Climate change impacts on food supply
    - Recycling risks
- Food & Nutrition Security
    - Accessibility of food
    - Awareness about food source and diets
- Economic & Social aspects
    - Income generation
    - Commerciality of urban farming operations and its implications
    - Public involvement, liveable cities etc.

The outcomes of these breakout sessions are detailed below.

### 2.4.1. Dilemma 1 – To be circular or not?

All three groups agreed that efforts should be made to achieve circularity within the urban and between the urban and rural system. However, the discussions also made clear that circularity needs to go hand in hand with sustainability with the latter having to be achieved before circularity. Efforts to become circular and sustainable should include not only professional growers, but also hobby urban agriculturalists.

A very practical, big issue, for example is the challenge of finding alternatives for unsustainable (like peat-based) growing media. Furthermore, recycling, be it existing

facilities or the potential, needs to be used more efficiently. This will require a detailed risk analysis to determine the potential food safety threats posed e.g. by the use of urban waste as fertiliser or the use of former industrial sites as dedicated growing areas.

For this work to impact policies social scientists should be better integrated into this area. Also, a number of stakeholders have to be included: consumers, growers, investors, and waste collectors to ensure a better translation of results. The inclusion of more stakeholders will also enable the use of existing infrastructure on a local and national level (e.g. waste management). The use of such existing structures, as long they are sustainable, is encouraged as this will also lead to a better collaboration of all actors from a local to national and transnational level.

### 2.4.2. Dilemma 2 – Land use vs Soil use

The participants agreed that there is potential in urban agriculture to contribute to supporting and transforming our food systems, and that it will likely increasingly feature in the topic of food and nutrition security. However, there are several issues that need to be addressed.

Firstly, there are a number of known knowledge gaps. These include addressing the very language and definitions used in and around urban agriculture. Questions such as ‘Does urban agriculture include peri-urban spaces?’, or ‘Is urban agriculture only about high-tech approaches?’ will need to be clarified before a serious discussion can be initiated. Understanding the legal status of different peri-urban and urban spaces, such as, which regulations allow or limit the use of land for agriculture within a particular area, needs to be improved. In addition, there is also insufficient knowledge about which areas are suitable for growing produce. To solve this issue, a soil register similar to a land register was suggested.

Secondly, potential synergies will have to be addressed. While existing green spaces cannot suddenly be used to feed the urban population, they might still be suitable as a source of a certain amount of fresh produce, e.g. trough community vegetable or herb beds. This approach also has the potential to contribute to biodiversity in urban and peri-urban areas. Similarly, multifunctionality of other buildings or land should be investigated or made possible. In an overlap with Dilemma 1, this multifunctionality would require an updated food safety risk analysis of usage of products and/or waste coming from these multifunctional spaces. This would then have to feed into the improved regulations for urban and peri-urban areas, for which the collaboration of

different policy makers at all levels of government (e.g. from the supra-national to the national to the local levels) has to be ensured.

Finally, there are a number of social aspects that have to be addressed. Awareness for urban agriculture needs to increase and efforts have to be made to transform the area towards an area more suitable for all levels of society. This includes both, low-tech outdoor farming, such as community gardens, and high-tech indoor farming, such as vertical framing warehouses. Currently both have supporters that often have a one-sided view on urban agriculture. The social acceptance could be achieved by highlighting the benefits of actively taking part in city life and being part of the food system.

### 2.4.3. Dilemma 3 – Conflicting policies

The points highlighted for Dilemma 3 largely overlap with Dilemma 1 and Dilemma 2 as policies are underpinning the sector.

In order to improve these policies, a better narrative on urban agriculture has to be created, making it not only a local, but a transnational movement. For this, public administration has to consider urban agriculture and capacity building to achieve this.

Reaching the potential of Urban Agriculture requires both horizontal and vertical cooperation in public government. For example, it requires policymakers from different sectors and different layers of public administration to tackle conflicting policies, especially in peri-urban areas, where one part of the area might rely heavily on the Common Agricultural Policy (CAP) whereas the neighbouring plot does not. This can create imbalances in how two areas of peri-urban land, which are at first glance completely similar, can be used, the monetary support that can be claimed, and who has the responsibility with regards to administration.

It will also be necessary to determine how urban agriculture sits within other agricultural systems, an exercise in which the Joint Programming Initiatives could be involved.

## 2.5. Conclusion and recommendations

While a difficult task, the workshop participants agreed that communication between different layers of government, and government and stakeholders has to be significantly improved to achieve changes and impact. In order to achieve this, the new upcoming Horizon Europe partnership instrument has been mentioned as some of the planned partnerships (e.g. Sustainable, Smart and Inclusive Cities and Communities) may provide

opportunities to explore and co-create the topic. The partnerships aim to bring together a varied number of stakeholders (researchers, local governance, civil society and commercial actors) and may provide more opportunities of experimenting in 'live' settings, such as Living Labs, which enable stakeholders to address an overarching topic on a local scale while being connected on a national and transnational level. Additionally, activities such as policy labs were suggested to help with capacity building in the area of inter-stakeholder communications.
The participants also defined research needs in the areas of biorefinery processes and waste cycles/recycling. The outcomes from this research are needed to update current regulations in order to support the creation of a level playing field between urban and traditional agriculture.

Considering the developments in indoor and outdoor farming over the last few years (vertical farming, public engagement etc.), urban agriculture has become a part of the modern food systems and therefore has to be properly integrated into the food chain. This will need to include smart planning to provide for food production in urban areas, concept testing and providing dedicated spaces. This integration will also mean that sustainability aspects of urban agriculture will be addressed.

From these conclusions, the organiser formulated the following recommendations for the Governing Boards of the JPIs:

**Recommendation 1:** Support research, in collaboration with other partners in the bioeconomy space, into biorefinery processes, recycling, waste management and related areas to provide evidence for up to date policies on food production and food safety.

**Recommendation 2:** Utilise suitable upcoming Horizon Europe partnerships and their instruments such as Living Labs to address transnational issues on a local but connected level.

**Recommendation 3:** Treat urban agriculture as part of the food system and address all resulting issues (planning, sustainability, policy etc.) under this aspect.

## 3. Additional activities

In addition to the talks and breakout sessions, additional activities were scheduled for the participants.

During lunch, the participants were able to present posters, models and other material related to their work. This created opportunity to talk to familiarise each oneself with other approaches and areas of urban agriculture.

Also during lunch, Wageningen University students that had passed the first round of the current edition of the Wageningen Urban Greenhouse Challenge presented their ideas. The Urban Greenhouse Challenge is a competition in which multidisciplinary student teams are challenged to bring professional food production (back) into urban neighbourhoods integrating social, economic, environmental and technical aspects in one coherent concept. Their design is based on an existing location in one of the world's major metropoles, different in every edition of the Challenge Ideas ranged from cafes with on-site food production to greenhouses blending into the surroundings.

Figure 3: Participants enjoying a tour of the vertical farming labs at WUR

After the breakout session all participants were invited to join Leo Marcelis on a tour through growing facilities of Plant Research. In two groups, the participants were guided around by plant science postdoctoral fellow Sharath Malleshaiah, and group leader Leo Marcelis. This included visits to the vertical farming pilot facilities, greenhouses, and laboratories testing conditions such as light.

END

*FACCE-JPI Secretariat / AB & DtB*

## Annex 1: Workshop participants

| Name | Organisation/Affiliation | Country |
|---|---|---|
| Anja Berndt | UKRI-BBSRC/FACCE-JPI | UK |
| Dorri te Boekhorst | WUR/FACCE-JPI | NL |
| Christine Bunthof | WUR/FACCE-JPI | NL |
| Jonas Bylund | JPI Urban Europe | DK |
| Anne Colonval | Urbileaf | BE |
| Isabelle Duvernoy | INRAE TERRA division | FR |
| David Farquhar | Intelligent Growth Solutions | UK |
| Falko Feldmann | Julius Kuehn-Institut | DE |
| Francesca Giarè | CREA-PB, Council for Agricultural Research and Economics - Centre for Policy and Bioeconomy | IT |
| Niels Gøtke | Ministry of Science Technology and Innovation | DK |
| Aniek Hebinck | DRIFT for transitions, Erasmus University Rotterdam | NL |
| Uli Hirschmueller | Urban Lab Nürnberg | DE |
| Trine Hvoslef-Eide | Norwegian University of Life Sciences | NO |
| Andrew Jenkins | Queen's University Belfast | UK |
| Juuso Kalliokoski | Ministry of Agriculture and Forestry | FI |
| Joke Kort | Viable Cities | NL |
| Titta Kotilainen | Natural Resources Institute Finland | FI |
| Sofia Kourmpetli | Cranfield University | UK |
| Brenda Kuzniar-van der Zee | Wageningen University and Research | NL |
| Nele Lauwers | Boerenbond | BE |
| Jakob Magid | University of Copenhagen | DK |
| Leo Marcelis | Wageningen University and Research | NL |
| Jørgen E Olesen | University of Copenhagen | DK |
| Carl-Otto Ottosen | Aarhus University | DK |
| Rio Pals | Urban Greenhouse Challenge / WUR | NL |
| Ine Petry | Inagro | BE |
| James Phillips | UKRI-BBSRC | UK |
| Leon Rozanov | UKRI-BBSRC/FACCE-JPI | UK |
| Véronique Saint Gès | INRAE TERRA division | FR |
| Jan-Willem van der Schans | Wageningen University and Research | NL |
| Hanna Tuomisto | University of Helsinki | FI |
| Guri Tveito | Ministry of Agriculture and Food | NO |
| Henrik Vejre | University of Copenhagen | DK |
| Martine Vernooij | Wageningen University and Research | NL |
| Risto Vilkko | Academy of Finland | FI |
| Liselotte de Vos | Department of Economy, Science & innovation | BE |

## Annex 2: Agenda

Wageningen University and Research. Building 104 (Atlas), room Atlas 1+2

| | |
|---|---|
| *09:00 – 09:30* | *Registration, Tea & Coffee* |
| 09:30 – 09:35 | Welcome |
| 09:35 – 09:50 | Introduction to FACCE-JPI<br>*Niels Gøtke (FACCE-JPI)*<br><br>Introduction to JPI Urban Europe<br>*Jonas Bylund (JPI Urban Europe)*<br><br>Aims of the workshop<br>*Anja Berndt / Dorri te Boekhorst (FACCE-JPI)* |
| 09:50 – 10:05 | Rurban Revolution: Evaluating the transformative potential of urban growing<br>*Sofia Kourmpetli (Cranfield University)* |
| 10:05 – 10:25 | Setting the scene for indoor farming - circularity, land use and production, and conflicting policies dilemmas<br>*Leo Marcelis (Wageningen University & Research)* |
| 10:25 – 10:45 | Setting the scene for outdoor farming - circularity, land use and production, and conflicting policies dilemmas<br>*Jakob Magid, Henrik Vejre, Jørgen E Olesen (University of Copenhagen)* |
| 10:45 – 11:15 | Questions and Plenary discussion |
| *11:15 – 11:30* | *Tea & Coffee* |
| 11:30 – 11:40 | Introduction to break-out sessions<br>*Anja Berndt / Dorri te Boekhorst (FACCE-JPI)* |
| 11:40 – 12:25 | Break-out sessions each tackling one dilemma:<br><br>Dilemma 1: Circularity<br>Dilemma 2: Land use and production<br>Dilemma 3: Conflicting policies<br><br>Addressing the following questions:<br><br>• What kind of issues are important?<br>• What is needed to speed development up?<br>• What could be priorities for JPI Urban Europe and/or FACCE?<br>• What instruments to consider? |
| *12:25 – 13:40* | *Lunch & Exhibition* |
| 13:40 – 15:10 | Break-out sessions (continued)<br>*Tea & Coffee break included* |
| 15:10 – 16:10 | Urban Agriculture in practice - *Visit to WUR labs* |
| 16:10 – 16:50 | Reporting back from break-out groups & plenary discussion |
| 16:50 – 17:00 | Wrap up & conclusions |

## Background

### 1) Introduction to FACCE-JPI and JPI Urban Europe

FACCE-JPI and JPI Urban Europe's exploratory workshop on Urban Agriculture and Adaptation to Climate Change is being organised in the frame of the FACCE-JPI Implementation Plan 2018-2020 with an aim to understand the current landscape of urban agriculture, its impact, policy context, and potential for adaptation to climate change, in order to identify key priority areas that FACCE-JPI and JPI Urban Europe can contribute to. This paper sets the scene and identifies key themes and key questions for the workshop.

The Joint Programming Initiative on Agriculture, Food Security and Climate Change (FACCE-JPI) was launched in 2010. It brings together 24 member countries[2], as well as European Commission and SCAR (The Standing Committee on Agricultural Research) as observers, with an aim to build the European Research Area tackling the challenges at the intersection of agriculture, food security and climate change. This is being realised through the alignment and integration of national and European research programmes, the funding of new research programmes, and through exploring innovative approaches for the member countries to work together to address the challenge of ensuring a secure food supply to an ever increasing global population in the context of climate change.

JPI Urban Europe was created in 2010 to address the global urban challenges of today with the ambition to develop a European research and innovation hub on urban matters and create European solutions by means of coordinated research. Currently, JPI Urban Europe has 14 members[3] and 7 observers[4] including European Commission. JPI Urban Europe includes a much broader range of partners in many of its activities. It connects public authorities, civil society, scientists, innovators, business and industry to provide a new environment for research and innovation. The JPI offers experimental zones and long-term research infrastructures in a broad sense with a mission to develop knowledge, tools and platforms for dialogue on urban transitions.

### 2) Scope of the workshop

Context: Urban agriculture is generally defined as 'an industry that produces, processes and markets food and fuel, largely in response to the daily demand of consumers within a town, city or metropolis, on land and water dispersed throughout the diverse types of urban areas along the urban-rural continuum including peri-urban areas, applying intensive production methods, using and reusing natural resources and urban wastes, to yield a diversity of crops and livestock' (adapted from UNDP 1996).

The world population is projected to reach almost 10 billion by 2050[5]. The share of the world's population living in cities and urban areas is already very large and continues to grow. Urban agriculture can offer possibilities to ensure food and nutrition security in the face

[2] FACCE-JPI member countries: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, The Netherlands, New Zealand, Norway, Poland, Romania, Spain, Sweden, Switzerland, Turkey, the United Kingdom

[3] JPI Urban Europe member countries: Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Italy, Latvia, the Netherlands, Norway, Slovenia, Sweden, and the United Kingdom

[4] JPI Urban Europe observers: Estonia, Poland, Portugal, Romania, Spain, Turkey

[5] United Nations, Department of Economic and Social Affairs, Population Division (2017). *World Population Prospects: The 2017 Revision, Key findings and Advance Tables.*

of climate change. The need to develop **less resource intensive forms of food production**, the need to address **dilemmas in urban transitions and influences on food and farming**, and the need to **enhance urban development and build climate robust and resilient urban systems** are some of the factors that are driving the current urban agriculture discussions. The two main approaches to urban agriculture, **indoor farming** (e.g. high-tech based farming such as vertical agriculture) and **outdoor farming** (e.g. low-tech agroecological practices such as food forests and permaculture[6]), are increasingly being discussed for its potential importance to food and nutrition security, climate change and urban sustainability issues.

Themes/Dilemma's: The proposed themes for the workshop are outlined below, in the form of dilemma's, with an overarching theme of quantifying impacts of urban agriculture from environmental, social and economic perspective, circularity, adaptation to climate change, and the policy context. The focus is on urban and peri-urban areas in Europe, however simultaneously considering wider resource support networks, direct and indirect interdependencies, push and pull factors and other types of connections to e.g. rural systems as well as people and nature globally. In other words, the diverse types of urban areas along the urban-rural continuum, including particular attention to peri-urban agriculture, considered from a broad and inter-disciplinary systems perspective.

There are potential benefits and risks of both indoor and outdoor farming approaches, and their transformative potential. How this is assessed, varies widely.

- Environmental & Health aspects
    - Technology approaches such as vertical agriculture, aquaponics etc
    - Climate change impacts on urban environment
    - Resource use efficiency – interdependence of food and energy systems
    - The social implications and/ or ramifications of the above-mentioned aspects
    - Climate change impacts on food supply
    - Recycling risks
- Food & Nutrition Security – crop selection and technologies to maximise nutritional yields and minimise environmental impacts; demographic change resulting in more urban food consumers and less rural food producers;
    - Accessibility of food
    - Awareness about food source and diets
- Economic & Social aspects
    - Income generation
    - Commerciality of urban farming operations and its implications
    - Citizen involvement, liveable cities etc.

These aspects are not mutually exclusive and the impacts – benefits and risks, of urban agriculture should be considered from a holistic perspective.

**Dilemma 1: To be circular or not?**

Circularity in terms of agriculture refers to the cycling of nutrients in a closed system. There are opportunities and challenges in an urban circularity approach. However, food is explicitly

[6] 'Permaculture' is often related in context of ecosystem functioning and linked with practices like no tillage farming and annual planting cycles that result in continuous harvesting times instead of seasonal ones.

omitted from several policies and agreements such as the European Circularity Pact. Knowledge about the opportunities and challenges are limited e.g. on availability of different forms of nutrient, urban waste streams and health risks, urban waste flows such as heat and nutrients and making use of them etc.

**Dilemma 2: Land use versus soil use**

- Is there enough land in urban and peri-urban areas that can be adapted to farming land? What should be the quality of this land? Why should expensive urban land be converted to food production? Isn't that what farmland is for?
- In addition to land use, there is a continuous questionability of the production potential of urban agriculture. What is the potential of urban agriculture in relation with land use, and what choices can be made?
- In what way could urban agriculture contribute to adaptation to climate change? More clarity is required in different ways in which climate goals can be met and their impact on environment (biodiversity, soil health etc.) and urban food systems.

**Dilemma 3: Conflicting policies**

In broad terms, there is a lack of coherence in policies that support agri-food systems and urban sustainability, which may not be surprising as they cover policy areas from different ministries often organised strictly by sector. However, current challenges demand a holistic approach that includes coherent and inclusive policy-making. European agricultural policies might need some critical assessment to propose more facilitative alternatives. Also, the link between climate change policies and urban agriculture is not always obvious e.g. the framing of climate policies in terms of reduction of GHG emissions tends to disregard ecological dimension of sustainable food production. There are potential synergies and conflicts with different forms of land uses and economic activities and policies need to be harmonised accordingly. In addition to the lack of coherence in overarching policies, there are conflicting interests at the local level, for example the real estate policies versus liveable cities (urban development agendas).