

**UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL  
CENTRO DE ESTUDOS E PESQUISAS EM AGRONEGÓCIOS  
PROGRAMA DE PÓS-GRADUAÇÃO EM AGRONEGÓCIOS**

**Jessica Moreira Maia Souto**

**URBAN AGRICULTURE: A NEW DIMENSION OF AGRIBUSINESS**

**Porto Alegre**

**2017**

**Jessica Moreira Maia Souto**

**URBAN AGRICULTURE: A NEW DIMENSION OF AGRIBUSINESS  
(AGRICULTURA URBANA: UMA NOVA DIMENSÃO DO AGRONEGÓCIO)**

Dissertação de mestrado apresentada ao Programa de Pós-Graduação em Agronegócios da Universidade Federal do Rio Grande do Sul, como requisito parcial para obtenção do título de Mestre em Agronegócios.

Orientador: Prof. Dr. Homero Dewes

Co-orientadora: Profa. Dra. Daniela Callegaro de Menezes

**Porto Alegre**

**2017**

## CIP - Catalogação na Publicação

Souto, Jessica Moreira Maia  
Urban Agriculture: A New Dimension of  
Agribusiness (Agricultura Urbana: uma nova dimensão  
do agronegócio) / Jessica Moreira Maia Souto. --  
2017.  
66 f.

Orientador: Homero Dewes.  
Coorientadora: Daniela Callegaro de Menezes.

Dissertação (Mestrado) -- Universidade Federal do  
Rio Grande do Sul, Centro de Estudos e Pesquisas em  
Agronegócios, Programa de Pós-Graduação em Agronegócios,  
Porto Alegre, BR-RS, 2017.

1. Jardins Urbanos. 2. Sistemas Alimentares. 3.  
Cadeias de Suprimento Alimentar. 4.  
Sustentabilidade. 5. Inovação. I. Dewes, Homero,  
orient. II. Callegaro de Menezes, Daniela, coorient.  
III. Título.

Elaborada pelo Sistema de Geração Automática de Ficha Catalográfica da UFRGS com os  
dados fornecidos pelo(a) autor(a).

**Jessica Moreira Maia Souto**

**URBAN AGRICULTURE: A NEW DIMENSION OF AGRIBUSINESS  
(AGRICULTURA URBANA: UMA NOVA DIMENSÃO DO AGRONEGÓCIO)**

Dissertação de mestrado apresentada ao Programa de Pós-Graduação em Agronegócios da Universidade Federal do Rio Grande do Sul, como requisito parcial para obtenção do título de Mestre em Agronegócios.

**Banca Examinadora**

---

Orientador Prof. Dr. Homero Dewes – CEPAN/UFRGS

---

Co-orientadora Profa. Dra. Daniela Callegaro de Menezes – CEPAN/UFRGS

---

Prof<sup>a</sup>. Dra. Kelly Lissandra Bruch – CEPAN/UFRGS

---

Prof. Dr. Paulo Vitor Dutra de Souza – Agronomia/UFRGS

---

Prof. Dr. Leandro Pessoa de Lucena – Economia/UFMT

Porto Alegre, 03 de abril de 2017.

I dedicate this dissertation to my Mother  
who has always encouraged me to  
pursue my dreams. To Arthur, the  
greatest support system I could ever  
know. To the memory of my  
Grandmother.

## ACKNOWLEDGEMENTS

I would first like to thank my thesis advisors of the Interdisciplinary Center for Studies and Research in Agribusiness (CEPAN) at Federal University of Rio Grande do Sul (UFRGS), for consistently allowing this research to be my own work, but steering me in the right direction whenever they thought I needed it. Thank you very much for your support and understanding, for bearing with me in my time of need and showing me what it means to be in a master's program - the responsibility, the hard work, and the fun!

I am grateful to my advisor; professor Ph.D Homero Dewes for always having his door open whenever I ran into trouble. Thank you for all the academic and life lessons, for being an inspiration to us all as a professor, a scientist and, a person. Your teaching and (AMAZING) enthusiasm made a strong impression on me, and I will always carry positive memories of your classes with me.

I would also like to thank co-advisor Ph.D Daniela Callegaro de Menezes who was involved in the entire process of this research project. Without her passionate participation and input, her endless patience and belief, this study could not have been successfully conducted. Thank you for all the learning and joyful moments and the constant opportunity to grow as well as giving me peace in times of desperation.

I would also like to acknowledge the Agribusiness Program (PPG Agronegócios) for giving me this incredible opportunity to thrive and ameliorate my researching strengths and skills. To the professors who have been there along the way sharing their knowledge and contributing to my development. Distinctively, Debora, for the emails, phone calls and showing up at her door without being asked. For her kindness and attentiveness, to always helping me find solutions to my problems not matter how little they were. I also give thanks to Coordination for the Improvement of Higher Education Personnel (CAPES) for giving me scholarship funding throughout my master's program to be able to accomplish all of my research, publications and event participations.

I have to thank Professor Ph.D Marcia Dutra de Barcellos for her kindness and help in the development of a better version of this project and for being part of a very important and special moment of my academic career.

I must also thank my fellow students at the program and those who came before us for the advice and inspiration through the sharing of experiences, the rich discussions, and continuous challenging. Specially Marcos Araujo and Martiele Borges, who have been more than peers, for the many memorable evenings out and in, who opened both their homes and hearts to me when we first met.

Getting through my dissertation required more than academic support, and I have many people to thank for listening to and, at times, having to tolerate me over the past years. To Rodrigo Azambuja, Gisele Zanetti, Brittany Jones, Alan Pegoli, Athos Ribeiro, Ana Isabel Jaramillo López and Fernanda França who have helped in more ways than I can think of. I cannot begin to express my gratitude and appreciation for your friendship.

I cannot forget to mention the professors who have accepted to participate in my defense's committee. Professor Ph.D Kelly Lissandra Bruch, Professor Ph.D Paulo Vitor Dutra de Souza and Professor Ph.D Leandro Pessoa de Lucena I will be eternally grateful to you for your precious comments on this dissertation.

Finally, I must express my very profound gratitude to my mother and my boyfriend for providing me with unfailing support and continuous encouragement throughout my years of study and through the process of researching and writing this dissertation. To Francisco for all the motivational speeches when I was sure nothing would result from this. This accomplishment would not have been possible without them.

To all of you who have contributed to my development into an improved researcher, I sincerely thank you.

Jess

"There is no such thing on earth as an uninteresting subject;  
the only thing that can exist is an uninterested person."

G. K. Chesterton, *Heretics* (1905).



## **LIST OF ABBREVIATIONS**

**UA** - Urban Agriculture

**UG** - Urban Gardens

**CG** - Community Gardens OR Urban Community Gardens

**UF** - Urban Farming OR Urban Farms OR Commercial Urban Farms

**PUA** - Peri-Urban Agriculture

**UL** - Urban Landscaping

**UP** - Urban Parks

**IG** - Institutional Gardens

**IL** - Idle Land

**HeG** - Health Gardens

**HoG** - Home Gardens

**FAO** - Food and Agriculture Organization

**UN** - United Nations

**PRISMA** - Preferred Reporting Items for Systematic Reviews and Meta-Analyses

**WS** - Web of Science Database

**AU** - Agricultura Urbana

## LIST OF FIGURES

<b>CHAPTER 3 - Urban Agriculture: From a telluric order to a business opportunity:</b>	
Figure 1 - Number of articles on urban agriculture published in the scientific literature in the period of 1956 to 2016.....	23
Figure 2 - Definition of Urban Agriculture .....	27
Figure 3 - Urban agriculture and its interaction levels framework .....	28
<b>CHAPTER 4 - Urban Farming Trends in a Metropolitan Area of Southern Brazil:</b>	
Figure 1 - Porto Alegre and Metropolitan Area Examples .....	52

## **LIST OF TABLES AND CHARTS**

### **CHAPTER 3 - Urban Agriculture: From a telluric order to a business opportunity:**

Table 1: Summary of correspondence terms according to the urban agriculture and its interaction levels framework.....	31
---	----

### **CHAPTER 4 - Urban Farming Trends in a Metropolitan Area of Southern Brazil:**

Chart 1. Listing of scientific articles related to urban farming from 2010 to 2015.....	46
Chart 2: Urban farming and its types and characteristics in the world.....	50
Chart 3. Summary of Characteristics of Urban Farming in the Metropolitan area of Porto Alegre in Southern Brazil for a Viability Analysis.....	54

## CONTENT

<b>CHAPTER 1: General Introduction</b> .....	16
<b>CHAPTER 2: Methodology</b> .....	20
<b>CHAPTER 3: Urban Agriculture: From a telluric order to a business opportunity</b>	21
Abstract .....	21
Introduction .....	22
Procedures .....	23
Historical background .....	24
What is Urban Agriculture? .....	26
Conclusions .....	37
Acknowledgements .....	38
References .....	38
<b>CHAPTER 4: Urban Farming Trends in a Metropolitan Area of Southern Brazil</b>	45
Abstract .....	45
1 Problem statement .....	45
2 Procedures .....	47
3 Results .....	48
3.1 Urban Farms in the World .....	48
3.2 Introduction to the analysis .....	52
4 Pertinence of urban farming facing critical conditions .....	53
4.1 Urban farming in the Metropolitan area of Porto Alegre in Southern Brazil .....	53
5 Conclusions .....	57
6 References .....	57
<b>CHAPTER 5: Final Considerations</b> .....	59
<b>REFERENCES</b> .....	63
<b>ANNEX</b> .....	65

## ABSTRACT

Agribusiness is a multifold interdisciplinary field of study that is concerned with the unfolding status of the food production chains and its developments worldwide. This dissertation proposes to evidence a comprehensive analysis of the evolution of urban agriculture (UA) and its progress in the world. In addition, we introduce a local example describing UA in Southern Brazil. This research also seeks to create an urban agriculture identification framework. This dissertation is composed of mix-method qualitative exploratory interdisciplinary phases, separated into two articles that meet the goals mentioned above. To execute the study, a systematic review that followed the PRISMA protocol was conducted, in order to understand the state of the art in the urban agriculture field and, therefore, establish a categorization of the types of urban agriculture. A practical point of view was pursued, and, for that reason, a multi-case study in the surrounding region of Porto Alegre (RS), in Brazil was carried out. Results suggest that due to an increased interest in the urban food sector it was possible to identify that UA can take on many formats depending on the area it is located, the people and the interests involved in it. Within the municipality of Porto Alegre and its metropolitan area, the implementation of urban farming showed that some categories are better suited than others due to local incentives. A part of the initiatives studied started its projects as community-oriented but, later on, turned into businesses searching for new market opportunities. The urban agriculture terms found in the scientific literature were summarized and grouped in a framework that discusses urban agriculture and its sublevels. This framework can be used as a tool for a better handling of urban agriculture terms, as well as to help stakeholders identify the projects they take part of and to understand them in the bigger picture. Urban agriculture presents many advantages for businesses as well as groups that are after social outcomes, such as education, wellbeing and health benefits for its participants. Another result is that there is an increase in the percentage of the population which demands food products that are environmentally sustainable and are at a close distance to the consumer. This research can be useful for policymakers, scholars and the general public.

**Keywords:** Urban gardening, food systems, food supply chains, sustainability, innovation, dynamics.

## RESUMO

O agronegócio é um campo multidisciplinar de estudo que se preocupa com o status de desenvolvimento das cadeias de produção de alimentos em todo o mundo. Esta dissertação se propõe a evidenciar a evolução da agricultura urbana (AU) e seu progresso no mundo. Esta pesquisa, também, busca criar uma estrutura de identificação da agricultura urbana, além de apresentar um exemplo local no Sul do Brasil. O trabalho é de caráter interdisciplinar, exploratório e qualitativo, separado em dois artigos que atendem aos objetivos mencionados acima. Para a realização do estudo, foi feita uma revisão sistemática seguindo o protocolo PRISMA, a fim de compreender o estado da arte da agricultura urbana e, portanto, estabelecer uma categorização de seus subtipos. Para apresentação de um ponto de vista prático, um multi estudo de caso na região metropolitana de Porto Alegre (RS) foi realizado. Os resultados sugerem que, devido a um amplo interesse no sector alimentar urbano, foi possível identificar que a AU pode assumir muitos formatos, dependendo da área em que se está localizada, das pessoas e dos interesses envolvidos. No município e área metropolitana de Porto Alegre a implantação da agricultura urbana mostrou que algumas categorias são mais utilizadas do que outras, devido a incentivos locais. Uma parte das iniciativas estudadas iniciou seus projetos com foco voltado para a comunidade, mas, com o passar do tempo, transformou-os em negócios, à procura de novas oportunidades de mercado. Os termos da AU encontrados na literatura científica foram resumidos e agrupados em um *framework* que os apresenta, correlacionando-os a seus subníveis. Este *framework* pode ser utilizado como uma ferramenta para uma utilização apropriada dos termos relacionados à agricultura urbana, bem como para ajudar as partes interessadas a identificar os projetos de que fazem parte e compreendê-los em face a um panorama geral. A agricultura urbana apresenta muitas vantagens para empresas e grupos que buscam resultados sociais, tais como benefícios educacionais, de bem-estar e saúde para os seus membros. Outro resultado é que um crescimento no percentual da população que se preocupa com produtos que sejam ambientalmente sustentáveis e se encontrem a uma distância próxima do consumidor. Esta pesquisa é útil para gestores públicos, pesquisadores e o público geral.

**Palavras-chave:** Jardins urbanos, sistemas alimentares, cadeias de suprimento alimentar, sustentabilidade, inovação, dinâmicas.

## RESUMEN

El agronegocio es un campo multidisciplinario de estudio que se interesa en el estado del desarrollo de las cadenas de producción de alimentos y sus desarrollos en todo el mundo. Esta tesis propone evidenciar la evolución de la agricultura urbana (AU) y su progreso en el mundo. También, busca crear una estructura de identificación de la agricultura urbana, además de presentar un ejemplo local en el sur de Brasil. Este trabajo es de carácter interdisciplinario exploratorio cualitativo, separado en dos artículos que cumplen los objetivos citados anteriormente. Para llevar a cabo el estudio, se realizó una revisión sistemática que siguió al protocolo PRISMA, para comprender el estado del arte de la agricultura urbana y, por lo tanto, establecer una categorización de sus tipos. Para presentar un punto de vista práctico, se realizó un estudio de múltiples casos en la región metropolitana de Porto Alegre en Río Grande do Sul / Brasil. Los resultados sugieren que, debido a un mayor interés en el sector de alimentos urbanos fue posible identificar que la AU puede adoptar muchos formatos dependiendo del área en la que se encuentre, de las personas e intereses involucrados en la misma. Dentro del municipio de Porto Alegre y su área metropolitana, la implementación de la agricultura urbana mostró que algunas categorías son más utilizadas que otras debido a incentivos locales. Una parte de las iniciativas estudiadas inició sus proyectos enfocados en la comunidad, pero más tarde se convirtieron en negocios en busca de nuevas oportunidades de mercado. Los términos de agricultura urbana encontrados en la literatura científica fueron resumidos y agrupados en un *marco* que discute la agricultura urbana, sus subniveles y cómo están relacionados. Este *marco* puede utilizarse como una herramienta para un mejor manejo de los términos de la agricultura urbana, así como para ayudar a las partes interesadas a identificar los proyectos en los que participan y percibirlos en un panorama más amplio. La agricultura urbana representa un gran potencial para las empresas, así como para los grupos que buscan resultados sociales, como la educación, el bienestar y los beneficios de salud para sus miembros. Otro resultado es que una parte de la población exige productos alimenticios que sean ambientalmente sostenibles y estén a una distancia cercana al consumidor. Esta investigación puede ser útil para directivos públicos, investigadores y el público en general.

**Palabras clave:** Jardines urbanos, sistemas alimentarios, cadenas de suministro de alimentos, sostenibilidad, innovación, dinámica.

## RESUMÉ

L'agrobusiness est un champ d'étude multidisciplinaire qui s'intéresse aux statuts de développement des chaînes de production d'aliments dans le monde entier. Ce mémoire propose de mettre en évidence l'évolution de l'agriculture urbaine (AU) et sa progression dans le monde. Cette recherche cherche également à créer une structure d'identification de l'agriculture urbaine, ainsi que d'en présenter un exemple local dans le Sud du Brésil. Le travail est de caractère interdisciplinaire, exploratoire et qualitatif, séparé en deux articles qui répondent aux objectifs mentionnés ci-dessus. Pour la réalisation de l'étude, on a fait une révision systématique qui suit le protocole PRISMA, afin de comprendre l'état du chantier de l'agriculture urbaine et pour cela, établir une catégorisation de ses sous-types. Pour une présentation d'un point de vue pratique, une multi-étude de cas dans la région métropolitaine de Porto Alegre (RS) a été réalisée. Les résultats suggèrent que, grâce à un large intérêt pour le secteur alimentaire urbain, il a été possible d'identifier que l'AU peut assumer plusieurs formats, en fonction du domaine dans lequel elle se situe, des personnes et des intérêts en jeu. Dans la municipalité de Porto Alegre, l'implantation de l'agriculture urbaine a montré que quelques catégories sont plus utilisées que d'autres, du fait des aides locales. Les projets d'une partie des initiatives étudiées se concentraient, au départ, sur la communauté, mais, au fil du temps, ils se sont transformés en business, à la recherche de nouvelles opportunités de marché. Les termes de l'AU trouvés dans la littérature scientifique ont été résumés et regroupés dans un *framework* qui les présente en corrélation avec leurs sous-niveaux. Ce *framework* peut être utilisé aussi bien comme un outil pour l'utilisation appropriée des termes en lien avec l'agriculture urbaine, que pour aider les parties intéressées à identifier les projets dont ils font partie et les comprendre face au panorama général. L'agriculture urbaine présente de nombreux avantages pour les entreprises et les groupes qui recherchent des résultats sociaux ou encore des bénéfices en matière d'éducation, de bien-être et de santé pour leurs membres. L'autre résultat est qu'une part de la population exige des produits alimentaires qu'ils soient écologiquement durables et qu'ils se trouvent à une proche distance du consommateur. Cette recherche est utile pour les responsables de gestion publique, les chercheurs et le public en général.

**Mots-clé:** jardins urbains, systèmes alimentaires, chaînes d'approvisionnement alimentaire, développement durable, innovation, dynamiques.



## CHAPTER 1: General Introduction

There are many global challenges concerning climate change, population growth, land scarcity, food deserts, shrinking cities as well as quality, quantity and availability of food (Specht et al. 2016; Beniston et al. 2016; Clendenning et al. 2016). It all calls for attention, new ideas and alternatives to how it can be dealt with. For this reason, urban agriculture has been highlighted as one of the solutions to feeding urban populations that have limited access to quality foods in sufficient quantity. Alongside, there is a constant attempt to implement technology for controlled farming methods, in order to meet food needs and diminish environmental impacts.

Urban agriculture (UA) is a recurrent process that has been present in society since the beginning of times. The evolutionary process dates from 5th century AD (DURUSOY & CIHANGER 2016) and had a strong comeback during the great wars. There are many reasons why UA surfaces. It could be in times of desperation as it is in cities under attack that had no other form of growing or having access to food, or yet, in cities such as Detroit or Chicago in the US that have been going through the process of shrinking cities, once the majority of industries closed and forced people out of town. There could be reasons for integrating immigrants or refugees in cities where they did not feel welcome or part of (Dobernig & Stagl 2015). Even though, as time passed and more people were attracted to the urban centers for living, the knowledge of producing food was lost. The resurgence of agriculture in urban spaces is a natural process that comes and goes depending on the needs and demands of the populations (Barthel et al. 2015; Guitart et al. 2015; Pfeiffer et al. 2014; Drake & Lawson 2015).

UA is closely related to the concept of urbanization, which modifies land use through infrastructure projects in the landscape. The growth of populations and their distribution impact the growth of cities, which creates new local and regional markets for livestock, timber, and agricultural products. However, urbanization occurs in a rural-urban spectrum which is difficult to define accurately in technical terms, since territorial demarcation depends on somewhat arbitrary decisions by the public administration. (Lambin et al. 2003).

The goal of UA is not necessarily to maximize agricultural productivity in this rural-urban spectrum, but to optimize it across a far more complex system of productivity, environmental protection and social justice outcomes. In order to achieve

such goal, better utilizing scarce land availabilities, sustainable intensification is needed. As yields can be increased with the use of existing technologies, there are also manifold options to reduce negative externalities (Godfray et al. 2010)

Thinking ahead, regarding the preoccupation with the ongoing population growth and climate change, especially in urban environments, researchers have been looking for alternatives to produce food. Since higher income does not necessarily translate into higher food security, the demand for equal and greater access to food in cities is ever increasing (Clendenning et al. 2016). Urban Agriculture can be considered an elite and niche market in the global north whereas it is a case of necessity and subsistence in the global south (Cohen & Reynolds 2014). The preoccupation of healthy and chemical-free food is an evolutionary process that not all populations can afford, especially in poor conditions in which the major goal is simply to guarantee better nutrition.

Besides the feeding motivation, these are not the only applications of UA, as it can take many shapes and formats depending on the location it is being developed and the influences the people involved in the projects are going under. Urban agriculture authors discuss that people are being motivated by the emergence of successful entrepreneurs in the field of UA and therefore attracting interest as a new social business model (Specht et al. 2016). There could also be social benefits. Community gardens, for instance, foster social cohesion or simply human interaction, and are mostly formed by immigrants or people of color who normally have more difficulties accessing resources, which grants these people a better inclusion in society (Cohen & Reynolds 2014).

Through planning and strategic reforms the use of technology makes it possible to ameliorate infrastructure, bringing challenges and solutions to a closer end. However, in the case of UA the use of technology is highly variable. For instance, there may be high costs or low costs, regarding implementation and maintenance; there may be automatic irrigation or natural rainfall only; the use of particular fertilizers could be either allowed or outright prohibited; the growing process could take place in regular soil or more complex systems, such as hydroponics and aquaponics, etc. (Pfeiffer et al. 2014). Although tech solutions have made wonders so far, they, still have a long way to go. According to some authors new products should be adapted to the UA reality, to produce more food variety, such as cereals and tubers, or yet, products that are from

other regions, climates or seasons, instead of focusing only on fruits and vegetables (Eizenberg & Fenster 2015).

Regarding the agricultural production chain, the awareness of local foods and more sustainable producing processes are making people interested in changing their habits and lifestyles. Urban consumers now more than ever seek information and produce that is social and environmental conscious (Sanyé-Mengual et al. 2015). Defined by Chekima et al. (2016) as the "probability and the willingness of individuals in their purchase consideration to give preference to green products compared to conventional products" - green purchase intentions surround responsible consumption and ignite the wish of having a more structured Alternative Food Networks. Movements such as the Slow Food, the organic lifestyle and the pursue of short supply chains all focus on local identities (Monaco et al. 2016; Ulusoy 2016), which could be propelled by UA. However, One of the current major goals of urban agriculture is to achieve better zoning policies in order to practice their activities without facing challenges of public order (Sanyé-Mengual et al. 2015).

Among the epistemological difficulties, researchers complain about how hard it is to define UA and its subcategories, however it is a dilemma that comes from early in history, since the first clear delineations about the differences between what urban and rural correspond to did not emerge until the 19th and 20th centuries (Barthel et al. 2015). There is not much formal scientific literature that describes the topic, in order to properly categorize the forms of production and their typology in the field of urban agriculture. For this reason, a flexible approach is required when studying UA, keeping in mind that it is still a realm that needs a lot of advancing to conclude all definitions still in the making (Witheridge & Morris 2016; Specht et al. 2016).

This dissertation aims at presenting contributions to answer to the question: *What has been latest developed and said in terms of urban agriculture (UA) to have state of art information about UA?* In order to accomplish this research is divided into the following objectives:

General Objective:

*Understand the evolutionary process and the progress of UA throughout the globe.*

Specific Objectives:

- Learn if it is possible to categorize UA;

- Construct an urban agriculture identification framework;
- See how it unfolds in a specific region, and
- Presents a local example of the unfolding of UA in Southern Brazil.

This dissertation started in 2015 and is composed of two mix-method qualitative exploratory interdisciplinary phases structured in five parts. The first is the current section, introduction, that contemplates issues that concern scholars of multidisciplinary fields such as food security and food quality, land use challenges and innovative solution for food production mitigating side effects to the environment. Then, Chapter 2, methodology explains the development of the researching process. Even though there are specific materials and methods sections for each of the papers introduced here they have very similar methodologies.

Followed by Chapter 3 composed of the first article of this dissertation entitled - *Urban Agriculture: From a telluric order to a business opportunity*, and represents the newest concepts and definitions concerning urban agriculture. It aims at analyzing the evolution and developments of the food production in urban and peri-urban areas as well as its transformation over the years. The paper has followed a systematic review protocol to define the selections of articles that would be used in the research and to guarantee the excellence and relevance of this article.

The second article comprises Chapter 4 - *Urban Farming Trends in a Metropolitan Area of Southern Brazil*. It also brings a documental analysis but now focusing on a more general view of the urban agricultural field. In a second moment, we utilized a multi-case study to show how urban agriculture presents itself in a metropolitan area of the Global South. We intended to illustrate how it is practiced in a scenario where people are concerned about food justice. It aimed to understand how urban farms are displayed in the metropolitan area of Porto Alegre in Southern Brazil. This work was published in the IFAMA-WICaNeM 2016 Conference program on June 19–23, 2016, in Aarhus, Denmark.

Chapter 5 brings the final considerations in which the most important ideas of this work are summarized and bring questions and food for thought for future researchers. In the end, there a reference section and an annex.

## CHAPTER 2: Methodology

This dissertation was divided into two mix method approaches of qualitative exploratory aspect. An exploratory research seeks to develop, clarify and modify ideas about a certain topic (Gil, 2008). This research is characterized as exploratory due to many investigations that are still needed on the matter. The first step was to execute a systematic review that followed the PRISMA protocol with the support of the StArt Software. The analysis conducted in the studies focused on the current status of urban agriculture, prioritizing documental examination. This review was used to understand the state of the art in the urban agriculture field and therefore establish a categorization of the types of UA.

Systematic reviews have the objective of answering a clear research question through a systematic method to identify relevant research and minimize errors and bias (JESSON E LACEY, 2006). It is imperative that the systematic review follow a protocol to ensure the scientific quality of the research (MOHER et al., 2009). For this dissertation we followed the PRISMA protocol which is an internationally known protocol that highlights the importance of having standardized reference for synthesizing evidence, in order to achieve methodological rigor. The PRISMA protocol checklist contains 17 numbered items (26 including sub-items) that are categorized into three main sections: administrative information, introduction, and methods. A step-by-step path is needed for the development of each of the protocol sections, which are: Identification, screening, eligibility and inclusion of the material that were used in the research.

Then, for the second step semi-structured interviews were conducted with the key people of the urban farming projects in the metropolitan area of Porto Alegre, since interviews are an investigative technique which is an efficient manner of gathering information on human behavior (GIL, 2008). A more practical understanding was pursued, and, for that reason, we used a multi-study case method (YIN, 2001) to find developments of urban farming in the surrounding region of Porto Alegre (RS), Brazil. The cases presented in this article fall into the "stakeholder dependent" category of the proposed framework.

## **CHAPTER 3: Urban Agriculture: From a telluric order to a business opportunity<sup>1</sup>**

Jessica Moreira Maia Souto  
*Center for Research in Agribusiness,  
Federal University of Rio Grande do Sul, Porto Alegre, Brazil*

Daniela Callegaro de Menezes  
*School of Management, and Center for Research in Agribusiness,  
Federal University of Rio Grande do Sul, Porto Alegre, Brazil, and*

Homero Dewes  
*Department of Biophysics, Biosciences Institute,  
and Centre for Agribusiness Studies, Federal University of Rio Grande do Sul,  
Porto Alegre, Brazil*

### **Abstract**

#### **List of abbreviations**

UA - Urban Agriculture  
UG - Urban Gardens  
CG - Community Gardens OR Urban Community Gardens  
UF - Urban Farming OR Urban Farms OR Commercial Urban Farms  
PUA - Peri-Urban Agriculture  
UL - Urban Landscaping  
UP - Urban Parks  
IG - Institutional Gardens  
IL - Idle Land  
HeG - Health Gardens  
HoG - Home Gardens

---

<sup>1</sup> This paper follows the Author Guidelines of the British Food Journal available at <  
[http://www.emeraldgrouppublishing.com/products/journals/author\\_guidelines.htm?id=bfj](http://www.emeraldgrouppublishing.com/products/journals/author_guidelines.htm?id=bfj)> as it is  
intended for future submission.

## Introduction

*Urban Agriculture* (UA) has been a social community driven solution since the domestication of plants (Green & Duhn 2015), and it has undergone marked changes over the years. It is not possible to pinpoint in time the exact moment when UA has started, since there are many different views on the matter. Some target the beginning of it with the first settlements of small populations, while others believe it was a more recent process that created a necessity for growing food in urban areas (Barthel et al. 2015; Garrett & Leeds 2014; Classens 2015). Barthel et al. (2015) tell us that a clear separation from what urban and rural means did not come forward until the 19th and 20th centuries in which food shortages began to be more frequent. UA popularized with the Industrial Revolution, as well as with wars and conflicts that have played a significant role in creating the need for producing food close to where the population lived, in order to avoid starvation (Garrett & Leeds 2014).

As time passed by, urban growth displaced agricultural producing land pushing them away from metropolitan areas. Driving forces associated to repurposing agricultural areas for residential construction; properties transformed the uses of land, and green spaces died out (Sanyé-Mengual, Cerón-Palma, et al. 2015; Barthel et al. 2015). This separating movement created a gap in knowledge so much so that the urban population collectively forgot how to grow food (Barthel et al. 2015; Green & Duhn 2015).

Sanyé-Mengual et al. (2015) express the concern with urban issues that have arisen with the design and transformation of cities, such as the dependence of resources that come from outside the city limits, food production for self-sufficiency, and food production in a sustainable manner. All of these reasons result on the more prominent resurgence of UA, enabling the growth of agricultural products with the use of different technologies.

There is an increased demand for products that are at a closer reach to consumers, providing a food supply that is dynamic and adequate for a sustainable system (Monaco et al. 2016) and that does not use synthetic chemicals (Guitart et al. 2015). Moreover, the lack of knowledge related to food precedence and quality shapes how consumers' view food products at supermarkets and stores (Opitz, Berges, et al. 2016). For many scholars, the varied forms of urban agriculture should be seen as a social movement that sought to defy the current food system. Some authors bring the concern about the complexity of social and political implications that are at times not included in the discussion, mentioning that *Urban Gardens* (UG) projects are a form of reproducing contemporary neoliberal politics and are therefore losing their activist roots (Classens 2015; Drake & Lawson 2015).

Alternative food movements are usually related to UA activities (Sanyé-Mengual et al. 2016), such as farmer's markets that oppose conventional farming and the current industrial food production system (Opitz, Specht, et al. 2016; Weissman 2014). This preoccupation with new and more sustainable food chains, as well as food security and climate change has gotten the attention of many scholars towards *urban agriculture* as a response to the challenge of a growing population that needs to be fed. However, an emergence of entrepreneurs attracted an interest to emulate other forms of business models that are market-oriented and enable both financial and social gains (Specht et al. 2016; Dimitri et al. 2016).

From a global perspective, *urban agriculture* is responsible for 15 to 20% of total agricultural production (Lorenz 2015; Lin et al. 2015). Furthermore, UA corresponds not only to the process of growing food, but also raising animal husbandry (Lorenz 2015; Mosha 2015; Conard 2014; Carolan & Hale 2016) and other non-food produce such as green walls (Gallo et al. 2016), medicinal or ornamental plants (Lin et al. 2015), or sedum green roofs (Whittinghill et al. 2016; Morgan 2015). UA is more than just a measure of food production, as it can also bring green variety back into the urban centers, providing biodiversity for the ecosystem (Lin et al. 2015). *Urban gardens* have long been interpreted as beneficial for many reasons, and more recently UA has been celebrated for promoting various health, social, educational and mental benefits (Carolan & Hale 2016; Witheridge & Morris 2016). It has also been seen as a means of increasing access and intake of fresh fruits and vegetables (Beniston et al. 2016; Eggert et al. 2015) and as community development (Classens 2015).

There are many different forms of commercialization for urban food products, varying from selling points in farmer's markets, fairs for direct marketing, urban cooperatives of food processors or at the *Community Garden's* (CG) own venue (Ribeiro 2015). However, there are barriers in the marketing process, such as elevated prices due to the size and form of production. On the other hand, some urban producers can sell their produce with a high level of transparency concerning food origin and its process (Opitz, Berges, et al. 2016).

Nevertheless, barriers surround this form of marketing, as local food is usually perceived as more expensive and difficult to obtain in quantity and quality wanted (Pothukuchi & Molnar 2014). Consumers trust certifications which are tough to get due to small scale and high certification costs that large institutions' require for issuing insurance and certifications, posing as threats to small producers (Lorenz 2015; Ribeiro 2015).

Thus, this study highlights three aspects of the evolutionary process of urban agriculture. First as a social movement that focused on preventing urban populations from food starvation. Then, as a reconnection to farming as it is perceived that more and more people want to be connected to the land and environment. And at last as a business model that utilizes high technology devices to produce food in small and closed spaces where it would have been unthinkable before.

Therefore, this paper aims to analyze the evolution of both the urban food production and its transformation over the years into many different forms, as well as to discover what has been developed in the academic field related to the topic of urban agriculture. Due to the recent increase in literature in the years of 2014, 2015, and 2016, our focus is to understand the developments it has taken over the course of these years.

## **Procedures**

This paper followed a systematic review protocol for the gathering of all material used in the context of a qualitative methodology. All the articles used in this research were found in the Web of Science (WS) database. This database was chosen based on a Sao Paulo University study (2013) that says WS has the largest journal database, representing the interdisciplinary field the best. The keywords input were: Basket Gardens, Community Garden, Rooftop Agriculture, School Garden, Urban Farm, Urban Garden, Urban agriculture, and Vertical Farming.

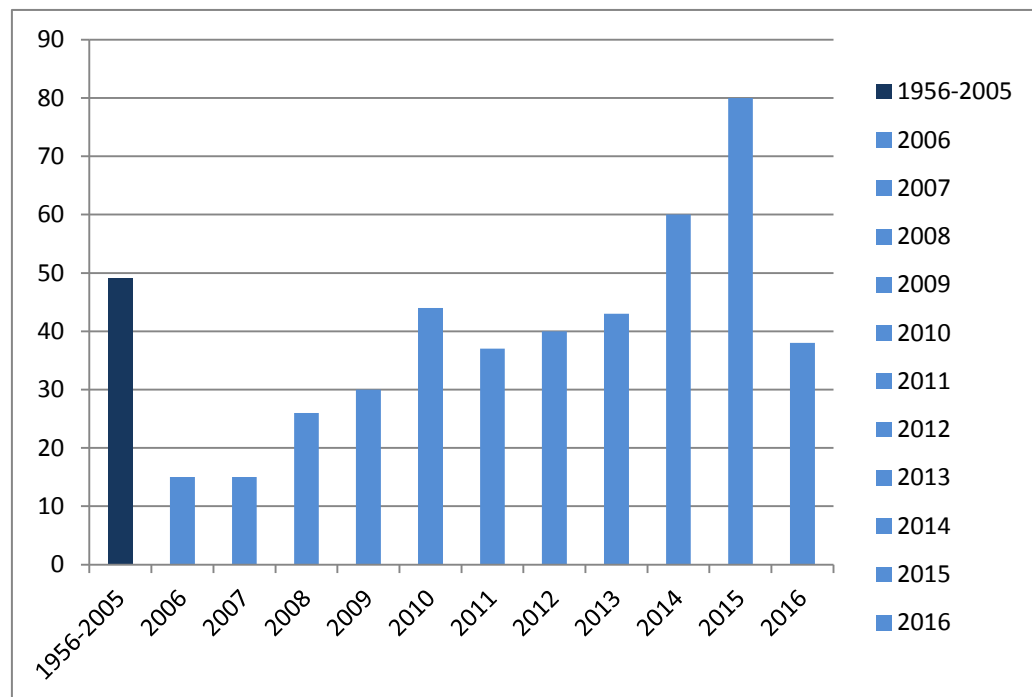


The selection criteria were based on Peer reviewed and Interdisciplinary field journals, with articles published in English only. All years available in the search field, from 1945 to October 2016 were considered. Letters, reviews, and chapters were not considered in the results.

A total of 1605 articles were then analyzed by three scholars to ascertain that the materials fit the scope of this research. Considering only the items which were approved by all three researchers, the search was narrowed down to 447 pieces that range from 1956 to 2016. We chose to analyze the papers published in the years of 2015 and 2016 as they represent the newest discussions of the last years of research.

In figure number 1 we can identify the evolution of papers published in the area of urban agriculture. The last ten years represent a rapid increase in the topic research. *Ad exemplum*, the period of 1956 to 2005 add up to a total of just 49 articles, a number that is surpassed considering the year of 2014 alone.

**Figure 1 - Number of articles on urban agriculture published in the scientific literature in the period of 1956 to 2016**



Source: Elaborated by the authors

### Historical background

It is very hard to establish a starting point for urban agriculture, but it certainly is not a new project (Dimitri et al. 2016). It has been present in the lives of many for generations and for as long as people can remember, since the first attempts at cultivating crops by the first settlers (Green & Duhn 2015). Then, records show mentions of urban cultivation in the old Byzantine period during 5th century AD (Durusoy & Cihanger 2016).

As cities grew and the land started to be repurposed, production was moved away from urban centers and into rural areas (Sanyé-Mengual, Cerón-Palma, et al.

2015; Barthel et al. 2015; Green & Duhn 2015). The reliance on agricultural resources has been discussed since *The Wealth of Nations* (Smith 2007). Examples from Berlin, Istanbul, and many cities throughout the US (Clendenning et al. 2016; Specht et al. 2016; Durusoy & Cihanger 2016) mention significant evidence of urban gardening since the 19th century, in a period that is represented by the fast growing of urbanized areas and a massive industrialization process. *Urban gardens* (UG) were established to improve the health and self-sufficiency of the affected population, especially the working class and the poor (Specht et al. 2016).

In the 20th century, however, food shortages influenced communities affected by the Great Wars to begin producing food in the cities again. Times of great crisis pushed many citizens in North America and in Europe to create their first gardens called *War gardens* during WWI and *Victory Gardens* in WWII (Sanyé-Mengual et al. 2016; Dimitri et al. 2016; Brown et al. 2016; Opitz, Berges, et al. 2016). As a result of the conflicts international commercialization and supply lines to urban areas suffered (Barthel et al. 2015). *Urban gardens* helped once again to sustain the population through conflicts and economic crisis that resulted in limited food access (Specht et al. 2016).

After the collapse of the Soviet Union in 1989, other parts of the world such as Eastern European countries and Cuba also suffered from food shortages that stimulated the creation of urban gardening. These gardens were the response to resource restrictions (Barthel et al. 2015; Leitgeb et al. 2016; Sanyé-Mengual et al. 2016). At the beginning of the movement, novice farmers in Cuba occupied state land that was unproductive and used balconies, roof terraces, and backyards for gardening and livestock maintenance. Local food production also contributed to reducing logistic costs for bringing food from rural areas (Leitgeb et al. 2016).

In the recent past, it is possible to see that the majority of urban gardens concentrated in developing countries, particularly as it is a way for the poor to feed themselves (Dimitri et al. 2016). The reason that permitted urban agriculture to flourish in these regions under such dreadful conditions was that producers had practical knowledge of farming (Specht et al. 2016). Also, Urban gardens were and still are established by the local government and institutions such as churches, schools, hospitals and universities to alleviate poverty in troubled neighborhoods (Warming et al. 2015; Pothukuchi & Molnar 2014; Grier et al. 2015).

*Urban agriculture* faded during the 1950s and 1960s throughout the US, reappearing in the late 1960s and 1970s as a place for community development. In this period many gardeners organized the cleaning and planting of abandoned lots. Administrative operations were created to provide technical support to growers in low-income communities (Reynolds 2015). After that, in the 1960s and 1970s, consumption was a real concern as more and more citizens were turning to supermarkets and stores to purchase food, creating a feeling of "banality" (Zitcer 2015). Moreover, The United States went through a major urban restructuring in the 1970s, led by neoliberal principles which modified what was known as *urban community gardens* (CG). CG started as a socializing, integrating, and assimilating perspective to the poor, immigrants, and children into a more contested space for citizenship and radical social action. A place for highlighting how different neoliberal politics were expressed, perceived and implemented in community gardens as controlled spaces (Eizenberg & Fenster 2015).

In the past decades, UA has broadened an exciting field for academics and professionals who have sustainable urban production and a less extensive land use in mind. This phenomenon has increased especially in the Global North, where researchers show that growth in idle lands is being used by activists, community members, non-profit organizations, and local governments to increase food production and reshape urban spaces, transforming land use. Moreover, UA activities come as a solution to limited access to healthy food during economic crisis (Sanyé-Mengual et al. 2016). A more recent example, in the twenty-first-century, are the food shortages that happened in Athens due to the euro crisis, providing reminders of the prone situation of city populations (Barthel et al. 2015).

In today's world, other aspects of urban agriculture are being put into light based on social demands that have changed, from acquiring necessary material to seeking aesthetics, leisure, tourism, and entertainment businesses (Peng et al. 2015). People have begun to pay more attention to environmental problems such as energy and ecological crisis that may threaten human development. People are focusing, therefore, on food systems that think about the entire chain from production to consumption in a more sustainable way, integrating aspects of nutrition, processing, and packaging, distributing and retailing, and the food consumption itself (Toth et al. 2016; Peng et al. 2015).

### **What is Urban Agriculture?**

It is tough to define what a farm is as it varies in size, scale, performance, produce and means of production (Dimitri et al. 2016) and the same happens to urban agriculture. UA has many other forms of nomenclature, and they all vary and unfold in subtypes (Guitart et al. 2015). Also, definitions may vary according to countries where it is located and how well it is developed. It is widely influenced by governments and policies (Scheromm 2015). However, the most shared and broad definition for UA is the one that comprises any form of food production within the city limits (Carolan & Hale 2016; Specht et al. 2016; Opitz, Berges, et al. 2016; Masvaure 2015; Leitgeb et al. 2016; Opitz, Specht, et al. 2016; Smart et al. 2015; Weissman 2015; Sanyé-Mengual, Cerón-Palma, et al. 2015).

For Pölling (2016), UA is widely practiced in our society, and it is scientifically documented as well. Even though many definitions can be found for UA, he argues that it should be a broadened term and that it separates into two other categories, namely *Urban Farming* (UF), which tends to be profit-oriented, and *Urban Gardening*, that has a more standard and non-profit focus.

Three broad categories address UA in the literature according to Specht et al. (2016). The first is about emerging cities in the Global South, how important UA is for subsistence farming, urban survival, and food source diversification. The second corresponds to an economic decline in the towns of the Global North, the phenomenon of Shrinking Cities and Food deserts. The third is related to the large scale production potential that UA has through the use of technology development and controlled environmental cultivation. Opitz et al. (2016) also present a set of three groups of studies that the literature focuses on, them being, best practices, global potential and technical innovations, and resource needs analysis. There is not such a thing as the right or perfect way of doing urban agriculture as it could be a simple implementation or integrated with livestock keeping. It could use or not technology to help farming.

Therefore there are many different answers to what urban agriculture is (Schlesinger et al. 2015).

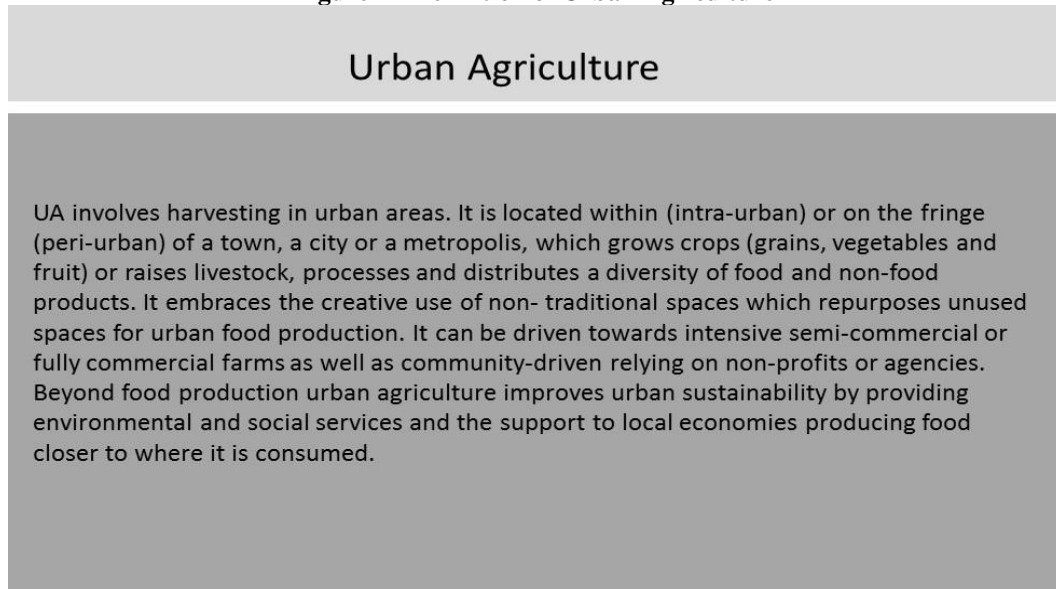
The subcategories of UA may vary on its *Organizational Structure* having goals that diverge such as being pro-profit or not. It also differs regarding *Land Access*, either for production or on tenure dependency. *Infrastructure* can be one more factor of differentiation as of the equipment that is used or if it is restricted to food growing or raising animals. Or yet, on *Fertility* land is described as closed systems or dependent on the weather and seasonality. The soil must have been tested for nutrients as well as contaminants. Pest and disease control may vary according to the chosen crops and rotations. *Labor* is used in the shape of volunteers or paid staff, or yet temporary employees for harvesting purposes only. Forms of *Production Outputs* and how they are handled, be it by hand or with the use of technology. *Market Access* as the number of people that consume may vary, as well as the distribution channels. Moreover, divergence may happen on how farmers are involved in the process of *Teaching and Learning* (Pfeiffer et al. 2014).

Many scholars worry about the quick changes that the world is going through such as climate change or the non-stop growing population that is expected to surpass nine billion by 2050 (Clendenning et al. 2016; Leitgeb et al. 2016). For this reason, discussions often involve UA as a solution for global challenges. Recently a shift towards the emergence of entrepreneurs and their business models (Specht et al. 2016) has taken over a significant amount of the literature. Urban agriculture is occurring in many different forms because of various expanding practices as in how food is grown and processed prioritizing financial capital and profit maximization (Carolan & Hale 2016). According to Pölling (2016), the strategies shared by conventional agriculture and urban agriculture are directly differentiated as mainstream-agriculture focus on what he calls "grow and give way." Urban farms are either focused on part-time growing with main incomes that come from activities other than agriculture or farms adjust to the urban influences and shape their models for profitability reasons. The adaptations can have many formats ranging from high-value crop production with the use of technology, niche markets or yet the provision of various services. van der Schans (2010) apud Polling (2016) describes three business models defined as standard urban farming operation patterns in developed countries: low-cost specialization, differentiation, and diversification.

For this reason, UA and its many unfolding forms are taken as an innovative model of agricultural development (Yang et al. 2016). There are many examples of models around the world such as the "Rent a lot" for urban gardening in Germany (Pölling 2016). However, how can we know if it will be possible to reproduce such models in other regions (Pribadi & Pauleit 2016)? For many, on the other hand, UA cannot be perceived as the solution to global challenges once it is not able to meet all food needs of cities, but enhance its resilience (McClintock et al. 2016; Martin et al. 2016). For this, Opitz et al. (2016) set *peri-urban agriculture* (PUA) as a dilemma uncertain if PUA should be included as urban agriculture. This paper regards all forms of *urban agriculture* independently of their nomenclature. Therefore, we introduce the major concepts that we have taken into consideration. Even though many different definitions can be applied to these terms, we intend to make it easier and more accessible to readers to identify the types of UA.

We have also grouped many of the recurrent terms based on their ultimate common denominator and on the definitions we used, which is to produce plants or animals within the city limits, whether they are situated downtown or on the outskirts. Another critical discussion is to understand the usage of the different terms to designate the varied forms of UA.

**Figure 2 - Definition of Urban Agriculture**



**Source:** Elaborated by the authors based on the work of Carolan & Hale 2016; Specht et al. 2016; Pölling 2016; Opitz, Berges, et al. 2016; Masvaure 2015; Leitgeb et al. 2016; Opitz, Specht, et al. 2016; Walker 2015; Reynolds 2015; Smart et al. 2015; Weissman 2015; Surls et al. 2014; Pfeiffer et al. 2014; Potter & Lebuhn 2015; Cook et al. 2015; Cohen & Reynolds 2014.

Regarding semantics and geography, the words periphery, urban and rural have very clear and diverse meanings. However, terms as fringe, peri-urban and intra-urban are used as synonyms when UA is concerned because it is the duty of the municipalities' governments to define their zoning agreements, making it much harder to have an accurate definition. To have a full understanding of the urban agriculture spectrum, it is of the utmost importance to comprehend all levels of interaction among the categories of urban agriculture. In the framework, we illustrate the relationship of the terms and its categories as they were mentioned in the scientific literature.

The frame corresponds to a classification of levels of UA. Urban agriculture is the broadest term we can use to describe the action of planting, harvesting and raising livestock within the urban limits. It is then separated into two major product-related categories, which are non-food and food. Non-food products focus raising plants that have its purpose different from feeding. On the other hand, food products (vegetable or animal source) concentrate on feeding urban populations. The last focus can either be of the market or community orientation, based on the stakeholders and the location of the urban food producing centers. However, there is a third category of food products that is named situational, which stands for a mix of market and community goals, in other words, that has social and economic gains. Under each category of orientation, we have groups of urban agriculture types that are mentioned in the scientific literature.

Figure 3 - Urban agriculture and its interaction levels framework.



Source - Elaborated by the authors.

*Urban landscaping* (UL) is a type that comprises non-food green produce that is used to help mitigate climate and environmental problems as well as beautify the city and its surroundings. It is market-oriented. In this category we introduce green rooftops that can vary from *sedum green roofs*, (Whittinghill et al. 2016) which are large mats of

sedum plants on top of buildings or *green roofs* that can have a wider range of plant blankets (Tong et al. 2016; Aloisio et al. 2016; Gallo et al. 2016). Other forms of UL can appear as *green spaces* in the forms of small gardens or terraces, or yet on *green walls or covers* (Gallo et al. 2016; Lee et al. 2015; Dennis & James 2016; Dimitri et al. 2016).

*Commercial Urban Farming* (UF) can be either from entrepreneurial or non-profit initiatives. However, there is a paid staff that operates on private land. It is market-oriented, and scale of production may vary. The most common models are rooftops (Pölling 2016; Brown et al. 2016; Weissman 2014; Lorenz 2015). In this study we introduce *Rooftop Farms* (Tong et al. 2016; Opitz, Berges, et al. 2016; Sanyé-Mengual et al. 2016; Whittinghill et al. 2016; Sanyé-Mengual, Oliver-Solà, et al. 2015; Thomaier et al. 2014; Cohen & Reynolds 2014), *Zero-Acreage Farms* (Thomaier et al. 2014; Sanyé-Mengual, Oliver-Solà, et al. 2015; Sanyé-Mengual et al. 2016), *Skyfarming* (Sanyé-Mengual et al. 2016; Sanyé-Mengual, Oliver-Solà, et al. 2015) and *Commercial Rooftop Greenhouse* (Specht et al. 2016; Sanyé-Mengual et al. 2016; Sanyé-mengual et al. 2015).

*Commercial UA* also focuses on profit and is market oriented. It is diverse from commercial UF from the way it is produced. It can vary from rooftops with or without greenhouses, fully integrated buildings or yet ground greenhouse production (Cretella & Buenger 2016; McClintock et al. 2016). We consider commercial urban agriculture the models of *Rooftop Greenhouses* (Sanyé-Mengual, Oliver-Solà, et al. 2015; Thomaier et al. 2014), *Vegetable Green roofs* (Whittinghill et al. 2016), *Agricultural Holdings* (Opitz, Berges, et al. 2016), *Commercial Market Gardens* (McClintock et al. 2016), and *Full Scale Green roofs* (Whittinghill et al. 2016).

*Stakeholder dependent* is a category that can be either market or community oriented depending on the stakeholders' decisions. It can also be a shared group in which case a market-oriented garden can have goals that benefit social programs of the community. This group is perhaps the most difficult to categorize due to its many forms and shapes. We can cite *City Farms* (Opitz, Berges, et al. 2016), *Vertical Farms* (Tong et al. 2016; Specht et al. 2016; Gallo et al. 2016; Sanyé-Mengual, Oliver-Solà, et al. 2015; Cohen & Reynolds 2014), *Containers* (Warming et al. 2015; Cohen & Reynolds 2014), *Indoor Farms* (Specht et al. 2016; Opitz, Specht, et al. 2016; Sanyé-Mengual, Oliver-Solà, et al. 2015; Sanyé-mengual et al. 2015; Thomaier et al. 2014), *Metropolitan Agriculture* (Pölling 2016; Opitz, Berges, et al. 2016), *Greenhouses* (Carolan & Hale 2016; Specht et al. 2016; Gallo et al. 2016; Sanyé-Mengual, Oliver-Solà, et al. 2015; Cohen & Reynolds 2014), *Inner-City Gardens* (Specht et al. 2016), *Rooftop Gardens* (Specht et al. 2016; Opitz, Berges, et al. 2016; Leitgeb et al. 2016; Toth et al. 2016; Warming et al. 2015; Guitart et al. 2015), *Agroecological Urban Agriculture* (Huang et al. 2015), *Intra-Urban Agriculture* (Cretella & Buenger 2016), *Peri-Urban Agriculture* (Pölling 2016; Opitz, Berges, et al. 2016; Cretella & Buenger 2016; Yang et al. 2016; Pribadi & Pauleit 2016; James & Neill 2016; Recasens et al. 2016; Rogus & Dimitri 2014; Huang et al. 2015; Warming et al. 2015; Schlesinger et al. 2015; Diti et al. 2015), *Peri-Urban Fringe* (James & Neill 2016), *Urban And Peri-Urban Agriculture* (Cadzow & Binns 2016; Monaco et al. 2016; Toth et al. 2016; Ribeiro 2015), *Urban Fringe Agriculture* (Pölling 2016; Opitz, Berges, et al. 2016), *Urban Farms* (Tong et al. 2016; Pölling 2016; Opitz, Berges, et al. 2016; Leitgeb et al. 2016; McClintock et al. 2016; Opitz, Specht, et al. 2016; Dimitri et al. 2016; Rogus &

Dimitri 2014; Weissman 2014; Reynolds 2015; Thomaier et al. 2014; Pfeiffer et al. 2014; Schmidt et al. 2015), *Allotment Gardens* (Witheridge & Morris 2016; Specht et al. 2016; Opitz, Berges, et al. 2016; Durusoy & Cihanger 2016; Toth et al. 2016; Dennis & James 2016; McClintock et al. 2016; Martin et al. 2016; Warming et al. 2015; Barthel et al. 2015; Guitart et al. 2015; Lorenz 2015), *Building-Based Agriculture* (Sanyé-Mengual, Oliver-Solà, et al. 2015), *Building Integrated Agriculture* (Sanyé-Mengual et al. 2016; Sanyé-Mengual, Oliver-Solà, et al. 2015; Thomaier et al. 2014), and *Urban-Rural Fringe* (Recasens et al. 2016).

*Urban Parks* (UP) are of intensive and large agricultural production. It can be of either market or community oriented. Types of UP are *Agricultural Parks* (Martin et al. 2016; Gallo et al. 2016), *Agroparks* (Specht et al. 2016) and *Community Orchards* (Dennis & James 2016; Barthel et al. 2015; Monaco et al. 2016).

*Urban Gardens* (UG) are micro or small-scale gardens focused on community programs, but could also have profit through the selling of produce. It can be a combination of social and environmental engagement (Specht et al. 2016; Pölling 2016; Camps-calvet et al. 2016; Durusoy & Cihanger 2016; Leitgeb et al. 2016; Sanyé-Mengual et al. 2016; Reynolds 2015; Warming et al. 2015; Barthel et al. 2015; Codyre et al. 2015). Examples of *urban gardens* are *Urban Horticulture* (Specht et al. 2016; Pölling 2016; Sanyé-Mengual et al. 2016; Martin et al. 2016; Barthel et al. 2015; Perrin et al. 2015; Lorenz 2015), *Food Gardens* (Pothukuchi & Molnar 2014; Green & Duhn 2015) and *Z-Farming For Urban Living Quality* (Thomaier et al. 2014).

*Institutional Gardens* (IG) are present at institutions/organizations, such as *church gardens*, *hospital gardens* or *university gardens* (McClintock et al. 2016; Warming et al. 2015; Pothukuchi & Molnar 2014). Other examples include as *school farms*, *school gardens*, and *school programs* (Carolan & Hale 2016; Sanyé-Mengual et al. 2016; Warming et al. 2015; Grier et al. 2015; Surls et al. 2014; Green & Duhn 2015; Dimitri et al. 2016). It could also be in the form of *Social And Educational Z-Farming* or *Z-Farming As Innovation Incubator* (Thomaier et al. 2014).

*Idle Land* (IL) corresponds to plots or territories that have been unused or abandoned due to the need of relocating. It is well cited in the scientific literature in cities like Detroit and Chicago in the United States, which have undergone a process of industrial decline. In this article we refer to idle land as in *Vacant Lots* (Witheridge & Morris 2016; Beniston et al. 2016; Opitz, Berges, et al. 2016; Sanyé-Mengual et al. 2016; Opitz, Specht, et al. 2016) and *Derelict Land* (Rogus & Dimitri 2014; Ribeiro 2015; Morckel 2015; Sharma et al. 2015; Garrett & Leeds 2014).

*Health Gardens* (HeG) are small-scale productions in which the primary focus is to guarantee mental and physical health to the participants through the dealing with nature. It is related to gardening as a hobby activity. Examples of HeG are *Therapeutic Gardens* (Witheridge & Morris 2016), *Green Care* and *Care Farming* (Pölling 2016).

*Home Gardens* (HoG) are of small-scale productions as well, which focus on feeding the people of said residence (Carolan & Hale 2016; Algert et al. 2016; Spliethoff et al. 2016; Leitgeb et al. 2016; McClintock et al. 2016). It can appear in the forms of *Residential Gardens* (McClintock et al. 2016), *Pocket Gardens* (Gallo et al. 2016; Dennis & James 2016), *Backyard Gardens* (Opitz, Berges, et al. 2016; Toth et al. 2016; Sanyé-Mengual et al. 2016; Martin et al. 2016; Ribeiro 2015; Morgan 2015) or *Back Greens* (Witheridge & Morris 2016) as they are named in Scotland, *Family*



*Gardens* (Specht et al. 2016), *Livestock Keeping* (Morgan 2015; Cohen & Reynolds 2014; Surls et al. 2014), and *Balconies* (Toth et al. 2016).

The last of our categorization is *Community Gardens* (CG) which are shared urban agricultural lands managed by many residents who garden to provide local scale food, physical and social benefits to participants, in spaces that provide a direct link between growers and consumers. Often community-driven projects rely on non-profits or agencies in order to function collectively or cooperatively (Carolan & Hale 2016; Sama 2016; Witheridge & Morris 2016; Algert et al. 2016; Crossan et al. 2016; Opitz, Berges, et al. 2016; Spliethoff et al. 2016; Durusoy & Cihanger 2016; Gallo et al. 2016; Toth et al. 2016; Sanyé-Mengual et al. 2016; Dennis & James 2016; McClintock et al. 2016; Opitz, Specht, et al. 2016; Dimitri et al. 2016; Martin et al. 2016; Weller & Darrel 2015; Eggert et al. 2015; Morckel 2015; Grier et al. 2015; Pothukuchi 2015; Surls et al. 2014; Guitart et al. 2015; Pfeiffer et al. 2014; Morgan 2015; Lorenz 2015; Eizenberg & Fenster 2015; Drake & Lawson 2015; Pothukuchi & Molnar 2014; Garrett & Leeds 2014; Classens 2015). Examples of CG models are *Community-Based Farming* (Specht et al. 2016; Sanyé-Mengual et al. 2016), *Social Farming* (Pölling 2016), *Community-Led Urban Agriculture* (Opitz, Specht, et al. 2016), *Neighborhood Gardens* (Cretella & Buenger 2016), *Self-Managed Community Gardens* (Sama 2016), *Collective Gardening* (Pourias et al. 2016), *Community Supported Agriculture* (Carolan & Hale 2016; Specht et al. 2016; Toth et al. 2016; Sanyé-Mengual et al. 2016; Opitz, Specht, et al. 2016; Weissman 2014; Surls et al. 2014), *Guerilla Gardens* (Barthel et al. 2015; Guitart et al. 2015; Morgan 2015), and *Public Access Community Garden* (Durusoy & Cihanger 2016).

**Table 2: Summary of correspondence terms according to the urban agriculture and its interaction levels framework**

TERMS	CORRESPONDENCE
<b>Sedum Green Roofs</b> (Whittinghill et al. 2016)	<b>URBAN LANDSCAPING (UL)</b> (Toth et al. 2016)
<b>Green Walls</b> (Gallo et al. 2016)	
<b>Green Spaces</b> (Dennis & James 2016; McClintock et al. 2016; Dimitri et al. 2016; Morckel 2015)	
<b>Green Roofs</b> (Tong et al. 2016; Aloisio et al. 2016; Gallo et al. 2016; Whittinghill et al. 2016)	
<b>Green Covers</b> (Lee et al. 2015)	
<b>Rooftop Farms</b> (Tong et al. 2016; Opitz, Berges, et al. 2016; Sanyé-Mengual et al. 2016; Whittinghill et al. 2016; Sanyé-Mengual, Oliver-Solà, et al. 2015; Thomaier et al. 2014; Cohen & Reynolds 2014)	<b>COMMERCIAL URBAN FARMS</b> (PÖLLING 2016; Brown et al. 2016; Weissman 2014; Lorenz 2015)
<b>Zero-Acreage Farms</b> (Thomaier et al. 2014; Sanyé-Mengual, Oliver-Solà, et al. 2015; Sanyé-Mengual et al. 2016)	
<b>Skyfarming</b> (Sanyé-Mengual et al. 2016; Sanyé-Mengual, Oliver-Solà, et al. 2015)	
<b>Commercial Rooftop Greenhouse</b> (Specht et al. 2016; Sanyé-Mengual et al. 2016; Sanyé-mengual et al. 2015)	

<b>Rooftop Greenhouses</b> (Sanyé-Mengual, Oliver-Solà, et al. 2015; Thomaier et al. 2014)	<b>COMMERCIAL URBAN AGRICULTURE</b> (Cretella & Buenger 2016; Mcclintock et al. 2016)
<b>Vegetable Green roofs</b> (Whittinghill et al. 2016)	
<b>Agricultural Holdings</b> (Opitz, Berges, et al. 2016)	
<b>Commercial Market Gardens</b> (Mcclintock et al. 2016)	
<b>Full Scale Green roofs</b> (Whittinghill et al. 2016)	
<b>City Farms</b> (Opitz, Berges, et al. 2016)	<b>STAKEHOLDER DEPENDENT</b>
<b>Vertical Farms</b> (Tong et al. 2016; Specht et al. 2016; Gallo et al. 2016; Sanyé-Mengual, Oliver-Solà, et al. 2015; Cohen & Reynolds 2014)	
<b>Containers</b> (Warming et al. 2015; Cohen & Reynolds 2014)	
<b>Indoor Farms</b> (Specht et al. 2016; Opitz, Specht, et al. 2016; Sanyé-Mengual, Oliver-Solà, et al. 2015; Sanyé-mengual et al. 2015; Thomaier et al. 2014)	
<b>Metropolitan Agriculture</b> (PÖLLING 2016; Opitz, Berges, et al. 2016)	
<b>Greenhouses</b> (Carolan & Hale 2016; Specht et al. 2016; Gallo et al. 2016; Sanyé-Mengual, Oliver-Solà, et al. 2015; Cohen & Reynolds 2014)	
<b>Inner-City Gardens</b> (Specht et al. 2016)	
<b>Rooftop Gardens</b> (Specht et al. 2016; Opitz, Berges, et al. 2016; Leitgeb et al. 2016; Toth et al. 2016; Warming et al. 2015; Guitart et al. 2015)	
<b>Agroecological Urban Agriculture</b> (Huang et al. 2015)	
<b>Intra-Urban Agriculture</b> (Cretella & Buenger 2016)	
<b>Peri-Urban Agriculture</b> (PÖLLING 2016; Opitz, Berges, et al. 2016; Cretella & Buenger 2016; Yang et al. 2016; Pribadi & Pauleit 2016; James & Neill 2016; Recasens et al. 2016; Rogus & Dimitri 2014; Huang et al. 2015; Warming et al. 2015; Schlesinger et al. 2015; Diti et al. 2015)	
<b>Peri-Urban Fringe</b> (James & Neill 2016)	
<b>Urban And Peri-Urban Agriculture</b> (Cadzow & Binns 2016; Monaco et al. 2016; Toth et al. 2016; Ribeiro 2015)	
<b>Urban Fringe Agriculture</b> (PÖLLING 2016; Opitz, Berges, et al. 2016)	
<b>Urban Farms</b> (Tong et al. 2016; PÖLLING 2016; Opitz, Berges, et al. 2016; Leitgeb et al. 2016; Mcclintock et al. 2016; Opitz, Specht, et al. 2016; Dimitri et al. 2016; Rogus & Dimitri 2014; Weissman 2014; Reynolds 2015; Thomaier et al. 2014; Pfeiffer et al. 2014; Schmidt et al. 2015)	
<b>Allotment Gardens</b> (Witheridge & Morris 2016; Specht et al. 2016; Opitz, Berges, et al. 2016; DURUSOY & CIHANGER 2016; Toth et al. 2016; Dennis & James 2016; Mcclintock et al. 2016; Martin et al. 2016; Warming et al. 2015; Barthel et al. 2015; Guitart et al. 2015; Lorenz 2015)	

<b>Building-Based Agriculture</b> (Sanyé-Mengual, Oliver-Solà, et al. 2015)	
<b>Building Integrated Agriculture</b> (Sanyé-Mengual et al. 2016; Sanyé-Mengual, Oliver-Solà, et al. 2015; Thomaier et al. 2014)	
<b>Urban-Rural Fringe</b> (Recasens et al. 2016)	
<b>Agricultural Parks</b> (Martin et al. 2016; Gallo et al. 2016)	<b>URBAN PARKS</b>
<b>Agroparks</b> (Specht et al. 2016)	
<b>Community Orchards</b> (Dennis & James 2016; Barthel et al. 2015; Monaco et al. 2016)	
<b>Urban Horticulture</b> (Specht et al. 2016; PÖLLING 2016; Sanyé-Mengual et al. 2016; Martin et al. 2016; Barthel et al. 2015; Perrin et al. 2015; Lorenz 2015)	<b>URBAN GARDENS</b> (Specht et al. 2016; PÖLLING 2016; Camps-calvet et al. 2016; DURUSOY & CIHANGER 2016; Leitgeb et al. 2016; Sanyé-Mengual et al. 2016; Reynolds 2015; Warming et al. 2015; Barthel et al. 2015; Codyre et al. 2015)
<b>Food Gardens</b> (Pothukuchi & Molnar 2014; GREEN & DUHN 2015)	
<b>Z-Farming For Urban Living Quality</b> (Thomaier et al. 2014)	
<b>School Farms</b> (Carolan & Hale 2016)	<b>INTITUTIONAL GARDENING</b> (Mcclintock et al. 2016)
<b>School Gardens</b> (Sanyé-Mengual et al. 2016; Warming et al. 2015; Grier et al. 2015; Surls et al. 2014; GREEN & DUHN 2015)	
<b>School Programs</b> (Dimitri et al. 2016)	
<b>University/Churches/Hospital Gardens</b> (Warming et al. 2015; Pothukuchi & Molnar 2014)	
<b>Social And Educational Z-Farming</b> (Thomaier et al. 2014)	
<b>Z-Farming As Innovation Incubator</b> (Thomaier et al. 2014)	
<b>Vacant Lots</b> (Witheridge & Morris 2016; Beniston et al. 2016; Opitz, Berges, et al. 2016; Sanyé-Mengual et al. 2016; Opitz, Specht, et al. 2016)	<b>IDLE LAND</b>
<b>Derelict Land</b> (Rogus & Dimitri 2014; Ribeiro 2015; Morckel 2015; Sharma et al. 2015; Garrett & Leeds 2014)	
<b>Therapeutic Gardens</b> (Witheridge & Morris 2016)	<b>HEALTH GARDENS</b>
<b>Care Farming</b> (PÖLLING 2016)	
<b>Green Care</b> (PÖLLING 2016)	
<b>Residential Gardens</b> (Mcclintock et al. 2016)	<b>HOME GARDENS</b> (Carolan & Hale 2016; Algert et al. 2016; Spliethoff et al. 2016; Leitgeb et al. 2016; Mcclintock et al. 2016)
<b>Pocket Gardens</b> (Gallo et al. 2016; Dennis & James 2016)	
<b>Backyard Gardens</b> (Opitz, Berges, et al. 2016; Toth et al. 2016; Sanyé-Mengual et al. 2016; Martin et al. 2016; Ribeiro 2015; Morgan 2015)	
<b>Family Gardens</b> (Specht et al. 2016)	
<b>Back Greens</b> (Witheridge & Morris 2016)	
<b>Livestock Keeping</b> (Morgan 2015; Cohen & Reynolds 2014; Surls et al. 2014)	
<b>Balconies</b> (Toth et al. 2016)	

<b>Community-Based Farming</b> (Specht et al. 2016; Sanyé-Mengual et al. 2016)	<b>COMMUNITY GARDENS</b> (Carolan & Hale 2016; Sama 2016; Witheridge & Morris 2016; Algert et al. 2016; Crossan et al. 2016; Opitz, Berges, et al. 2016; Spliethoff et al. 2016; DURUSOY & CIHANGER 2016; Gallo et al. 2016; Toth et al. 2016; Sanyé-Mengual et al. 2016; Dennis & James 2016; Mcclintock et al. 2016; Opitz, Specht, et al. 2016; Dimitri et al. 2016; Martin et al. 2016; Weller & Darrel 2015; Eggert et al. 2015; Morckel 2015; Grier et al. 2015; Pothukuchi 2015; Surls et al. 2014; Guitart et al. 2015; Pfeiffer et al. 2014; Morgan 2015; Lorenz 2015; Eizenberg & Fenster 2015; Drake & Lawson 2015; Pothukuchi & Molnar 2014; Garrett & Leeds 2014; Classens 2015)
<b>Social Farming</b> (PÖLLING 2016)	
<b>Community-Led Urban Agriculture</b> (Opitz, Specht, et al. 2016)	
<b>Neighborhood Gardens</b> (Cretella & Buenger 2016)	
<b>Self-Managed Community Gardens</b> (Sama 2016)	
<b>Collective Gardening</b> (Pourias et al. 2016)	
<b>Community Supported Agriculture</b> (Carolan & Hale 2016; Specht et al. 2016; Toth et al. 2016; Sanyé-Mengual et al. 2016; Opitz, Specht, et al. 2016; Weissman 2014; Surls et al. 2014)	
<b>Guerilla Gardens</b> (Barthel et al. 2015; Guitart et al. 2015; Morgan 2015)	
<b>Public Access Community Garden</b> (DURUSOY & CIHANGER 2016)	

**Source: Elaborated by the authors.**

Another foremost discussion regards the different approaches that the Global North and the Global South give to urban agriculture. Many times UA is a matter of guaranteeing a means of living and survival, rather than an option or a pleasure (Opitz, Berges, et al. 2016). On the other hand, some countries in the Global North still endure the effects of the 2008 financial crisis and their low-income population also has to cope with increasing food prices, so much so as to create food deserts in wealthy urban areas. The social aspects of UA movements often demand larger access to food in cities once income and food security are most of times correlated (Clendenning et al. 2016).

Diverse goals motivate UA, being much related to a food production focus in the forms of nutrition, community engagement, education, and job training. Moreover, food production can also mean goals for social benefits (Pfeiffer et al. 2014). But also, diverse people are motivated by different reasons to take part in UA. The exact reasons may change depending on the individual who is involved, his or her goals and expectations (Cohen & Reynolds 2014).

The production systems involved in urban agriculture vary wildly, from familiar and traditional approaches to high technology techniques. Even though UA production forms are close to conventional farming, they can also be well distinguished. Conventional and urban farming differentiate regarding land use as UF uses lots that are limited or seem non-traditional, as well as a unique legal and political environment. Urban farmers sometimes have little or no experience (Cohen & Reynolds 2014) in previous agricultural involvement what results in innovations in the development of operations, seeking to maximize space and intensive food production (Pfeiffer et al. 2014). Production can be implemented using aquaponics (Carolan & Hale 2016; Opitz, Specht, et al. 2016; Dimitri et al. 2016; Surls et al. 2014), raised-beds (Beniston et al. 2016; Algert et al. 2016), movable-beds (Opitz, Specht, et al. 2016), aeroponics (Yang et al. 2016), hydroponics (Opitz, Specht, et al. 2016; Dimitri et al. 2016), vermiculture (Opitz, Specht, et al. 2016), air-dyponics (Lin et al. 2015), and others. There are however structural barriers once the technology has a high cost of implementation, maintenance, and cultivation. The higher the production, the higher the price (Sanyé-mengual et al. 2015).

There are a large number of benefits that are cited in the scientific literature, mainly benefits that involve health and well-being, social and community cohesion, as well as environmental. UA presents itself as a promoter of physical activity, and a means of accessing a place for growing affordable fresh fruit and vegetables. It is also a place that develops social and community cohesion through the many experiences that it involves. As an environmental tool, it is an alternative to save water resources, and the application of large quantities of compost has consistently improved soil physical characteristics (Witheridge & Morris 2016; Specht et al. 2016; Cadzow & Binns 2016). By being located in urban areas, locally grown, healthy foods are another form of opportunities for reducing environmental impacts of food transport and large-scale production (Spliethoff et al. 2016). Other possibilities that are promoted by UA and its variations is that it can increase communication and sharing of value, helping to foster resilient communities and build social capital (Witheridge & Morris 2016). Educational opportunities are about teaching and learning about food growing, harvesting, cooking and healthy eating (Specht et al. 2016).

One more aspect that should be considered is the perspective of the consumers. Sanyé-Mengual et al. (2016), in research with stakeholders in Barcelona, concluded that for many "UA is not seen as real agriculture." Moreover, there are authors that disregard any form of UA production that is cultivated in closed environments such as indoor farming and greenhouses or underground (Martin et al. 2016; Sanyé-Mengual et al. 2015). The vast majority of German consumers (92%) prefer to purchase local products, corroborating to the idea that close fresh produce is appealing to urban consumers (Specht et al. 2016). Many cities in the USA and Canada have already demonstrated in the scientific literature and its policies that there are successful commercial UA models which are viable. These food business models can incorporate local food with little transport miles, which can reduce carbon emissions as a key factor in a sustainable food supply chain (Witheridge & Morris 2016; Specht et al. 2016).

There is, however, a lot of bureaucratic resistance in many governments and city halls due to many challenges that must be faced in order to introduce UA in their city plans. Some of these difficulties can be summarized in the lack of available space for producing within the city limits, once the competition with housing and other capital purposes is fierce. Some people who are uninvolved with UA could be interested in growing their own food, but access to land is scarce and waiting lists for plots are long. Examples of this situation go from the city of Edinburgh to places scattered in Tanzania (Schlesinger et al. 2015; Witheridge & Morris 2016). Although there is a sense of preoccupation about global challenges, very few program initiatives actually support and feed low-income populations.

There is also the insecurity that hovers over land tenure and access due to the fluctuation of prices and the need to use urban spaces for other reasons that generate more revenue for the landowners. Secure land tenure, difficulties to access safe water, purchasing tools, fertilizers, and pesticides, plus all the physical demands of intensive manual farming work create another challenge to people who are interested in becoming urban farmers (Cadzow & Binns 2016). The problems also impact the way in which we see and experience nature in the city (Carolan & Hale 2016).

Some of the criticism found in the literature revolves around the low levels of professionalism of city farmers and the partly short-term involvement of stakeholders in gardening activities (Opitz, Berges, et al. 2016). Additionally, only a small fraction of

cities directly benefits from the UA since the quantity that is produced today within its limits is not enough to supply the growing urban population (Camps-calvet et al. 2016).

Furthermore, health risks can be pointed out as possible threats related to the use of compost, since it is necessary to have specialized equipment ready to preserve the produce, avoiding air and soil contamination by heavy metals (Opitz, Berges, et al. 2016). UA could also be a venue of contamination due to previous land use. Heavy metals can be present in urban produce because they can be deposited on the growing plant as well as on its surface. The roots can also absorb metals from the soil and leaves can accumulate residue from air dust. The most common metals are Cd, Cr, Cu, Ni, Pb, and Zn (Kim et al. 2015).

## **Conclusions**

Urban agriculture is a topic that has attracted many in the academic field as well as in the business world, as there are various forms of representation and motivation for its existence. Due to this increasing interest in the urban food sector this paper aimed at analyzing the evolution of both the urban food production and its transformation over the years into many different forms. It was possible to identify that UA has many shapes and formats and its development depends on the location and the group of stakeholders involved. It can range from small spaces in the urban and peri-urban area to skyscrapers, using high technology to produce short supply chain crops close to consumers. It was also identifiable that some of the unfoldings of UA turned into business models using various approaches that focused on profitability.

Another goal of this research was to discover the developments in the academic field related to urban agriculture thanks to an increase of available scientific literature in the years of 2014, 2015, and 2016. Even though this paper found scientific literature from 1956 to 2016, it concentrated on a more limited number of years due to its high increase in publishing. It is a relatively recent topic discussed in the academic field, and for this reason, there still is a bit of conflict regarding whether or not UA will be the solution for global challenges as climate change impacts deepen and the world population grows continuously.

This paper followed a systematic review protocol using the Web of Science database and the input of keywords. Out of a total of 1605 articles, 447 pieces were narrowed down following the protocol. Being this section contemplated with a stratum of 118 analyzed papers to compose the findings. Because not all articles of the research were analyzed, one of the limitations of this review can be associated with the ability to fully understand the evolution of UA and identify its many types of subcategories as well as have the most accurate definition for it.

In this paper, we tried to summarize and bring out the many different terms that are associated with UA in the scientific literature, along with our framework discussing the concept of urban agriculture and its sublevels. Social struggles will continue in the global south as well as in the global north making it even more important to focus on technology and new techniques to produce more food in ever small spaces.

In a globalized world where a significant portion of the population demands and believes in labels and certifications, should urban farmers let consumers know about the avoidance of contamination through their labels? Will we be shortly looking at something like "Pb-free certifications", for instance? Another essential prospective

study is to analyze UA in small cities and suburbs since the majority of studies focus on large or capital cities.

### Acknowledgements

Our gratitude goes to the much-motivated researchers Alan Pegoli, Arthur Villela, Athos Ribeiro, Brittany Jones, Gisele Zanetti and Rodrigo Azambuja who participated in the tailoring of this paper as reviewers, contributors, and critics. I also thank the Centre for Agribusiness Studies of the Federal University of Rio Grande do Sul for the support and the Coordination for the Improvement of Higher Education Personnel (Capes, Brazil) for funding this research.

### References

- Algert, S. et al., 2016. Community and home gardens increase vegetable intake and food security of residents in San Jose , California. *California Agriculture*, 70(2), pp.77–82.
- Aloisio, J.M., Tuininga, A.R. & Lewis, J.D., 2016. Crop species selection effects on stormwater runoff and edible biomass in an agricultural green roof microcosm. *Ecological Engineering*, 88, pp.20–27. Available at: <http://dx.doi.org/10.1016/j.ecoleng.2015.12.022>.
- Barthel, S., Parker, J. & Ernstson, H., 2015. Food and Green Space in Cities : A Resilience Lens on Gardens and Urban Environmental Movements. , 52(May), pp.1321–1338.
- Beniston, J.W., Lal, R. & Mercer, K.L., 2016. ASSESSING AND MANAGING SOIL QUALITY FOR URBAN AGRICULTURE IN A DEGRADED VACANT LOT SOIL. *Land Degradation & Development*, 27, pp.996–1006.
- Brown, S.L., Chaney, R.L. & Hettiarachchi, G.M., 2016. Lead in Urban Soils: A Real or Perceived Concern for Urban Agriculture? *Journal of Environmental Quality*, (16), pp.26–36.
- Cadzow, H. & Binns, T., 2016. Are groups a good thing ? Evaluating group associations among vegetable farmers in Freetown , Sierra Leone. *Development in Practice*, 26(4), pp.406–119.
- Camps-calvet, M. et al., 2016. Environmental Science & Policy Ecosystem services provided by urban gardens in Barcelona , Spain : Insights for policy and planning. *Environmental Science and Policy*, 62, pp.14–23. Available at: <http://dx.doi.org/10.1016/j.envsci.2016.01.007>.
- Carolan, M. & Hale, J., 2016. “ Growing ” communities with urban agriculture : Generating value above and below ground value above and below ground. *Community Development*.
- Classens, M., 2015. The nature of urban gardens : toward a political ecology of urban agriculture. , pp.229–239.
- Clendenning, J., Dressler, W.H. & Richards, C., 2016. Food justice or food sovereignty? Understanding the rise of urban food movements in the USA United States Department of Agriculture. *Agriculture and Human Values*, 33(1), pp.165–177.
- Codyre, M., Fraser, E.D.G. & Landman, K., 2015. Urban Forestry & Urban Greening How does your garden grow ? An empirical evaluation of the costs and potential of

- urban gardening. *Urban Forestry & Urban Greening*, 14(1), pp.72–79. Available at: <http://dx.doi.org/10.1016/j.ufug.2014.11.001>.
- Cohen, N. & Reynolds, K., 2014. Resource needs for a socially just and sustainable urban agriculture system : Lessons from New York City. , 30(1).
- Conard, M., 2014. Sustainable Food Systems for Future Cities: The Potential of Urban Agriculture\*. , 45(2), pp.189–206.
- Cook, J. et al., 2015. Re-conceptualizing urban agriculture : an exploration of farming along the banks of the Yamuna River in Delhi , India. , pp.265–279.
- Cretella, A. & Buenger, M.S., 2016. Food as creative city politics in the city of Rotterdam. *Cities*, 51, pp.1–10. Available at: <http://dx.doi.org/10.1016/j.cities.2015.12.001>.
- Dennis, M. & James, P., 2016. Site-specific factors in the production of local urban ecosystem services : A case study of community-managed green space. *Ecosystem Services*, 17, pp.208–216. Available at: <http://dx.doi.org/10.1016/j.ecoser.2016.01.003>.
- Dimitri, C. et al., 2016. Urban agriculture : connecting producers with consumers.
- Diti, I., Tassinari, P. & Torreggiani, D., 2015. The agri-environmental footprint : A method for the identification and classification of peri-urban areas. , 162, pp.250–262.
- Drake, L. & Lawson, L.J., 2015. Results of a US and Canada community garden survey : shared challenges in garden management amid diverse geographical and organizational contexts. *Agriculture and Human Values*, 32, pp.241–254.
- DURUSOY, E. & CIHANGER, D., 2016. Historic Landscape vs . Urban Commodity?: The Case of Yedikule Urban Gardens , İstanbul. *Megaron*, 11(1), pp.125–136.
- Eggert, L.K. et al., 2015. Coalition Building for Health : A Community Garden Pilot Project with Apartment Dwelling Refugees. *Journal of Community Health Nursing*, 32, pp.141–150.
- Eizenberg, E. & Fenster, T., 2015. Reframing urban controlled spaces : Community gardens in Jerusalem and Tel Aviv-Jaffa. *ACME: An International E-Journal for Critical Geographies*, 14(4), pp.1132–1160.
- Gallo, P. et al., 2016. PERFORMANCES AND POTENCIAL OF A PRODUCTIVE URBAN GREEN INFRASTRUCTURE. *TECHNE*, 11, pp.104–112.
- Garrett, A. & Leeds, M.A., 2014. The Economics of Community Gardening. , 41(2), pp.200–213. Available at: <http://dx.doi.org/10.1057/eej.2014.8>.
- GREEN, M. & DUHN, I., 2015. The Force of Gardening: Investigating Children's Learning in a Food Garden. *Australian Journal of Environmental Education*, 31(1), pp.60–73.
- Grier, K. et al., 2015. Feasibility of an experiential community garden and nutrition programme for youth living in public housing. *Public Health Nutrition*, 18(15), pp.2759–2769.
- Guitart, D.A., Byrne, J.A. & Pickering, C.M., 2015. Greener growing : assessing the influence of gardening practices on the ecological viability of community gardens in South East Queensland , Australia. *Journal of Environmental Planning and Management*, 58(2), pp.198–212.
- Huang, Y. et al., 2015. An integrated approach to assess heavy metal source apportionment in peri-urban agricultural soils. *Journal of Hazardous Materials*, 299, pp.540–549. Available at: <http://dx.doi.org/10.1016/j.jhazmat.2015.07.041>.



- James, S.W. & Neill, P.M.O., 2016. Planning for Peri-urban Agriculture: a geographically-specific, evidence-based approach from Sydney. *Australian Geographer*, 9182(February), pp.1–16.
- Kim, H. et al., 2015. Soil Science and Plant Nutrition Influence of airborne dust on the metal concentrations in crop plants cultivated in a rooftop garden in Seoul. *Soil Science and Plant Nutrition*, 61(1), pp.88–97.
- Lee, Y., Ahern, J. & Yeh, C., 2015. Landscape and Urban Planning Ecosystem services in peri-urban landscapes: The effects of agricultural landscape change on ecosystem services in Taiwan's western coastal plain. *Landscape and Urban Planning*, 139, pp.137–148. Available at: <http://dx.doi.org/10.1016/j.landurbplan.2015.02.023>.
- Leitgeb, F., Schneider, S. & Vogl, C.R., 2016. Increasing food sovereignty with urban agriculture in Cuba. *Agriculture and Human Values*, 33(2), pp.415–426.
- Lin, B.B., Philpott, S.M. & Jha, S., 2015. The future of urban agriculture and biodiversity-ecosystem services: Challenges and next steps. *Basic and Applied Ecology*, 16(3), pp.189–201. Available at: <http://dx.doi.org/10.1016/j.baae.2015.01.005>.
- Lorenz, K., 2015. Organic Urban Agriculture. *Soil Science*, 180(4/5), pp.146–153.
- Martin, G., Clift, R. & Christie, I., 2016. Urban Cultivation and Its Contributions to Sustainability: Nibbles of Food but Oodles of Social Capital. *Sustainability*, 409(8), pp.1–18.
- Masvaure, S., 2015. Coping with food poverty in cities: The case of urban agriculture in Glen Norah Township in Harare. *Renewable Agriculture and Food Systems*, 31(3), pp.202–213.
- Mcclintock, N. et al., 2016. Landscape and Urban Planning Socio-spatial differentiation in the Sustainable City: A mixed-methods assessment of residential gardens in metropolitan Portland, Oregon, USA. *Landscape and Urban Planning*, 148, pp.1–16. Available at: <http://dx.doi.org/10.1016/j.landurbplan.2015.12.008>.
- Monaco, F. et al., 2016. Optimizing agricultural land use options for complying with food demand: evidences from linear programming in a metropolitan area. *AESTIMUM*, 68(July), pp.45–59.
- Morckel, V., 2015. Urban Forestry & Urban Greening Community gardens or vacant lots? Rethinking the attractiveness and seasonality of green land uses in distressed neighborhoods. *Urban Forestry & Urban Greening*, 14(3), pp.714–721. Available at: <http://dx.doi.org/10.1016/j.ufug.2015.07.001>.
- Morgan, K., 2015. Nourishing the city: The rise of the urban food question in the Global North. , 52(8), pp.1379–1394.
- Mosha, A.C., 2015. Urban agriculture in Botswana. , 2030(18), pp.48–68.
- Opitz, I., Berges, R., et al., 2016. Contributing to food security in urban areas: differences between urban agriculture and peri-urban agriculture in the Global North. *Agriculture and Human Values*, 33(2), pp.341–358.
- Opitz, I., Specht, K., et al., 2016. Toward Sustainability: Novelties, Areas of Learning and Innovation in Urban Agriculture. , pp.1–18.
- Peng, J. et al., 2015. Science of the Total Environment Multifunctionality assessment of urban agriculture in Beijing City, China. *Science of the Total Environment*, The, 537, pp.343–351. Available at: <http://dx.doi.org/10.1016/j.scitotenv.2015.07.136>.

- Perrin, A., Basset-mens, C. & Huat, J., 2015. High environmental risk and low yield of urban tomato gardens in Benin. , pp.305–315.
- Pfeiffer, A., Silva, E. & Colquhoun, J., 2014. Innovation in urban agricultural practices : Responding to diverse production environments. , 30(1).
- PÖLLING, B., 2016. Comparison of Farm Structures, Success Factors, Obstacles, Clients' Expectations and Policy Wishes of Urban Farming's Main Business Models in North Rhine-Westphalia, Germany. *Sustainability*, 8(1), pp.446–469. Available at: <http://www.mdpi.com/journal/sustainability>.
- Pothukuchi, K. & Molnar, S.A., 2014. SUSTAINABLE FOOD SYSTEMS AT URBAN PUBLIC UNIVERSITIES : A SURVEY OF U-21 UNIVERSITIES. *Journal of Urban Affairs*, 37(3), pp.341–359.
- Potter, A. & Lebuhn, G., 2015. Pollination service to urban agriculture in San Francisco , CA. , pp.885–893.
- Pourias, J., Aubry, C. & Duchemin, E., 2016. Is food a motivation for urban gardeners ? Multifunctionality and the relative importance of the food function in urban collective gardens of Paris and Montreal. *Agriculture and Human Values*, 33, pp.257–273. Available at: <http://dx.doi.org/10.1007/s10460-015-9606-y>.
- Pribadi, D.O. & Pauleit, S., 2016. Land Use Policy Peri-urban agriculture in Jabodetabek Metropolitan Area and its relationship with the urban socioeconomic system. *Land Use Policy*, 55, pp.265–274. Available at: <http://dx.doi.org/10.1016/j.landusepol.2016.04.008>.
- Recasens, X., Alfranca, O. & Maldonado, L., 2016. Land Use Policy The adaptation of urban farms to cities : The case of the Alella wine region within the Barcelona Metropolitan Region. *Land Use Policy*, 56, pp.158–168. Available at: <http://dx.doi.org/10.1016/j.landusepol.2016.04.023>.
- Reynolds, K., 2015. Disparity Despite Diversity : Social Injustice in New York City ' s Urban Agriculture System. , 47(1), pp.240–259.
- Ribeiro, S.M., 2015. Agroecological urban agriculture from the perspective of health promotion 1 Agricultura urbana agroecológica na perspectiva da. , pp.730–743.
- Rogus, S. & Dimitri, C., 2014. Agriculture in urban and peri-urban areas in the United States : Highlights from the Census of Agriculture. , 30(1).
- Sama, S., 2016. “ Take Part in the Community Vegetable Garden ! ” : Community Appropriation and Management of Urban Public Space 1. *Urbanities*, 6(1), pp.39–56.
- Sanyé-mengual, E. et al., 2015. Techniques and crops for efficient rooftop gardens in Bologna , Italy. *Agronomy for Sustainable Development*, 35, pp.1477–1488.
- Sanyé-Mengual, E., Oliver-Solà, J., et al., 2015. An environmental and economic life cycle assessment of rooftop greenhouse ( RTG ) implementation in Barcelona , Spain . Assessing new forms of urban agriculture from the greenhouse structure to the final product level. *International Journal of Life Cycle Assessment*, 20, pp.350–366.
- Sanyé-Mengual, E., Cerón-Palma, I., et al., 2015. Integrating Horticulture into Cities : A Guide for Assessing the Implementation Potential of Rooftop Greenhouses ( RTGs ) in Industrial and Logistics Parks. *Journal of Urban Technology*, 22(1), pp.87–111.
- Sanyé-Mengual, E. et al., 2016. Resolving differing stakeholder perceptions of urban rooftop farming in Mediterranean cities : promoting food production as a driver for

- innovative forms of urban agriculture. *Agriculture and Human Values*, 33, pp.101–120.
- Scheromm, P., 2015. Urban Forestry & Urban Greening Motivations and practices of gardeners in urban collective gardens : The case of Montpellier. *Urban Forestry & Urban Greening*, 14(3), pp.735–742. Available at: <http://dx.doi.org/10.1016/j.ufug.2015.02.007>.
- Schlesinger, J., Munishi, E. & Drescher, A., 2015. Geoforum Ethnicity as a determinant of agriculture in an urban setting – Evidence from Tanzania. *Geoforum*, 64, pp.138–145. Available at: <http://dx.doi.org/10.1016/j.geoforum.2015.06.019>.
- Schmidt, S., Magigi, W. & Godfrey, B., 2015. The organization of urban agriculture : Farmer associations and urbanization in Tanzania. *Cities*, 42, pp.153–159. Available at: <http://dx.doi.org/10.1016/j.cities.2014.05.013>.
- Sharma, K., Cheng, Z. & Grewal, P.S., 2015. Relationship between soil heavy metal contamination and soil food web health in vacant lots slated for urban agriculture in two post-industrial cities. , pp.835–855.
- Smart, J., Nel, E. & Binns, T., 2015. Geoforum Economic crisis and food security in Africa : Exploring the significance of urban agriculture in Zambia ’ s Copperbelt province. *Geoforum*, 65, pp.37–45. Available at: <http://dx.doi.org/10.1016/j.geoforum.2015.07.009>.
- Smith, A., 2007. *An inquiry into the Nature and Causes of the Wealth of Nations*. 4th editio. S. M. Soares., ed., MetaLibri Digital Library. Available at: <http://metalibri.incubadora.fapesp.br>.
- Specht, K. et al., 2016. Socially acceptable urban agriculture businesses. *Agronomy for Sustainable Development*, 36(17), pp.1–14. Available at: <http://dx.doi.org/10.1007/s13593-016-0355-0>.
- Spliethoff, H.M. et al., 2016. Estimated lead ( Pb ) exposures for a population of urban community gardeners. *Environmental Geochemistry and Health*, 38(4), pp.955–971.
- Surls, R. et al., 2014. Gearing up to support urban farming in California : Preliminary results of a needs assessment. , 30(1).
- Thomaier, S. et al., 2014. Farming in and on urban buildings : Present practice and specific novelties of Zero-Acreage Farming ( ZFarming ). , 30(1).
- Tong, Z. et al., 2016. A case study of air quality above an urban roof top vegetable farm. *Environmental Pollution*, (208), pp.256–260. Available at: <http://dx.doi.org/10.1016/j.envpol.2015.07.006>.
- Toth, A., Rendall, S. & Reitsma, F., 2016. Resilient food systems : a qualitative tool for measuring food resilience. *Urban Ecosystem*, 19, pp.19–43.
- Walker, S., 2015. Urban Geography Urban agriculture and the sustainability fix in Vancouver and Detroit. , (July).
- Warming, M. et al., 2015. Does intake of trace elements through urban gardening in Copenhagen pose a risk to human health? *Environmental Pollution*, 202, pp.17–23. Available at: <http://dx.doi.org/10.1016/j.envpol.2015.03.011>.
- Weissman, E., 2014. Brooklyn ’ s agrarian questions. , 30(1), pp.92–102.
- Weissman, E., 2015. Entrepreneurial endeavors : ( re ) producing neoliberalization through urban agriculture youth programming in Brooklyn , New York. , 21(3), pp.351–364.
- Whittinghill, L.J. et al., 2016. Stormwater performance of a full scale rooftop farm :

- Runoff water quality. *Ecological Engineering*, 91, pp.195–206. Available at: <http://dx.doi.org/10.1016/j.ecoleng.2016.01.047>.
- Wetheridge, J. & Morris, N.J., 2016. An analysis of the effect of public policy on community garden organisations in Edinburgh. *Local Environment - The International Journal of Justice and Sustainability*, 2(21), pp.202–218.
- Yang, Z. et al., 2016. Peri-urban agricultural development in Beijing: Varied forms, innovative practices and policy implications. *Habitat International*, 56, pp.222–234. Available at: <http://dx.doi.org/10.1016/j.habitatint.2016.06.004>.
- Zitcer, A., 2015. Food Co-ops and the Paradox of Exclusivity. , 47(3), pp.812–828.

## CHAPTER 4: Urban Farming Trends in a Metropolitan Area of Southern Brazil<sup>2</sup>

**Authors:** Jessica Moreira Maia Souto<sup>3\*</sup>[1], Martiele Cortes Borges [2], Marcos Vinícius Araujo [3], Joana Colussi [4], Daniela Callegaro de Menezes [5] and Homero Dewes [6].

### Abstract:

#### 1 Problem statement

The expansion of food production, safety, and quality of food, is every day more present in global agendas. Alongside with this, there are challenges concerning quality, quantity and availability of food for the population - that is to say, food and nutrition security. The United Nations Food and Agriculture Organization (FAO) defines food security and nutrition as an ideal situation in which all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO, 2015). In Brazil, Law No. 11.346 / 2006, defines food and nutritional security as the right of all people to regular and permanent access to quality food in sufficient quantity, without compromising access to other essential needs. It is based on practices aiming to promote healthy food consumption and respect cultural diversity while being environmental, culturally, economically and socially sustainable.

---

<sup>2</sup> This paper was presented at IFAMA-WICaNeM 2016 Conference, June 19–23, 2016, in Aarhus, Denmark (Annex A). The text follows the author guidelines of the symposium.

<sup>1</sup>[1] Master's student of Agribusiness, Federal University of *Rio Grande do Sul* - jessica.souto@ufrgs.br - +55 51 98325-7926 \*(main contact)

[2] Master's student of Agribusiness, Federal University of *Rio Grande do Sul* - martiele.borges@ufrgs.br - +55 51 98340-4609

[3] Master's student of Agribusiness, Federal University of *Rio Grande do Sul* - marcos.araujo@ufrgs.br - +55 51 98308-5851

[4] Master's student of Agribusiness, Federal University of *Rio Grande do Sul* - joana.colussi@ufrgs.br - +55 51 99727-4772

[5] Ph.D. in Agribusiness, Federal University of *Rio Grande do Sul* - professor at Federal University of *Rio Grande do Sul* - daniela.callegaro@ufrgs.br - +55 51 98151-4956

[6] Ph.D. in Biology, University of California Los Angeles, Professor at Federal University of *Rio Grande do Sul* - hdewes@ufrgs.br - +55 51 98142-3424

In an attempt to find new solutions to these problems inventions and technology have been used to seek alternatives of controlled farming methods in order to meet food needs, and diminish the environmental impact. The use of technology can also create new jobs locally and regionally. Due to climate issues, such as drought and flooding, food quality and production can be harmed, therefore, the use of indoor farming can become not only more popular but also more lucrative (AMIRLATIFI, 2016).

According to Boserup (1965), as the lack of food supply becomes a threat to the population, they seek to improve the techniques used to optimize the work and improve productivity. However, today, beyond the concern of food availability there is a concern about the way it is produced, how resources are used in this production, its availability and consumption.

In the present scenario, consumers are participant and have access to technology and information quickly. Thus, companies realize that the goods and services they offer no longer meet consumer needs as they did before. In addition, companies are under pressure from its competitors and compete for consumer attention, since for the consumer it is difficult to see major differences between them. Hence, companies that keep offering the same products or services, with the same production system and marketing can be overcome by competitors that rethink this system. Food production has undergone major changes over the years. With technological advances it was possible to maximize the amount of food available for consumption (FIESP & IBOPE, 2010), therefore contributing to population growth.

According to The World Population Prospect: the 2012 revision Report by the UN global population nowadays is of 7.2 billion and is projected to reach 9.6 billion by 2050 (UN). With the increased food demand and the growth of urban centers, it becomes necessary to create new productive solutions that ensure the livelihood of the population. The spaces intended for growing food are scarce because areas are being used for housing, commerce, and leisure, among others. Innovation can be understood as the effort that is used to create a targeted change to the economic or social potential of a company (ACS; MORCK; YEUNG, 2000); as in the process of transformation of ideas in opportunities and their consequent practice as widely as possible (TIDD, J.; BESSANT, J.; PAVITT, 2008). The agri-food sector can deal with high competition by rethinking the business model of companies, verifying if the models used nowadays are appropriate to the new scenario in which they operate and by pursuing innovation.

In addition, movements like slow food are gaining worldwide notoriety. Starting in 1986 in Italy it brought the concept of food to a more conventional view, and by conventional it is understood what is widely used in cooking books, despite the fact that it is a very recent concept, which does not precede the industrial revolution (SIMONETTI, 2012).

Furthermore, the lack of space and the pursuit of convenience, among other elements, have affected conventional agriculture paving the way for the emergence of new business models, which is defined by Osterwalder (2004) as a conceptual tool that covers a set of related elements that demonstrate the logic of how a company operates. This set of elements describes the value that the company offers to one or more customer segments. The company's architecture and its relationship with its stakeholders in the marketing and delivery of value in generating a profitable revenue stream and sustainability.

In this sense, the phenomenon known as urban farms poses as an alternative to deal with the problems of today's society (PHILPOTT, 2010) from food safety to the use of natural resources and the consequences of climate change. Over the past 20 years (PHILPOTT, 2010) the concern of improving food quality as well as its availability has helped the idea of urban farming to dissipate in the world.

UA is an industry located within (intra-urban) or on the fringe (peri-urban) of a town, a city or a metropolis, which grows or raises, processes and distributes a diversity of food and non-food products, (re-)using largely human and material resources, products and services found in and around that urban area, and in turn supplying human and material resources, products and services largely to that urban area (MOUGEOT, 2000, p.11)

Over the past 20 years (PHILPOTT, 2010) the concern with improving the quality of food as well as its availability has intensified and helped this idea to dissipate in the world.

Due to large unemployment caused by the dismantling of local manufacturing industry, which migrated to the southern United States, and later to Mexico, urban gardens proved to be a solution to society at that time of need as a means of subsistence (PHILPOTT, 2010). Urban agriculture has even been suggested and encouraged by governments of crumbling economies as the city of Detroit (USA) which encouraged the unemployed people as a reflection of the 1893-1897 crisis to plant fruits and vegetables for subsistence and trade in vacant lots. In addition, more than 40% of the food produced during World War II in the US was produced in urban gardens, which are currently used in many different ways (GEORGE, 2013).

It is believed that the urban "agriculturation" is a phenomenon that benefits society and contributes to the fight against world hunger. This is the most important movement of our time since it contributes positively to the local economy. Urban agriculture tends to have a shorter trade chain (direct sales from producer to consumer), even encouraging some communities to conduct product exchanges that are produced by the residents themselves (KUMAR, 2012). Urban farmers have an environmental commitment to using sustainable techniques that enrich the soil. Along these lines, urban farming also promotes greater local political involvement because discussions related to the local community emerge, promoting community integration besides generating a search for a healthier diet. Another benefit is the increase of green areas in cities, contributing to mitigate the heat island effect, and even creating areas for relaxation and contemplation in urban centers (HOWARD, 2015). There is also the search for greener areas in cities as well as the rise of population asks for a better usage of space for production, food engineering and how it shifts the relationships between food and society.

## **2 Procedures**

This research is characterized as exploratory and qualitative. In order to understand how urban farms are displayed in the metropolitan area of Porto Alegre in Southern Brazil, the research was carried out in two stages. Initially, a search in the database Web of Science was conducted to identify the different approaches used over the past five years about urban farms. The keywords input were "urban farm\*". In addition, filters such as English language, year of publication between 2010 and 2015 and by file type (articles and review) were used. From this, it was possible to identify the most usual urban farms in the world.

In a second moment, a comparison of the conditions found in literature, with the conditions of the city of Porto Alegre and its metropolitan area was held and then seven variables (space, cost, logistics, conflict of interest, consumers/customers, products, and location) were identified demonstrating how these urban farms are presented in the city.

After that, we carried out a study based on secondary data and interviews with an unstructured script with some of the people who are responsible for urban farming in Porto Alegre and the metropolitan area, randomly selected, for convenience. We hoped to find at least one of each type among the eight we were able to find in the literature gathered. For result analysis of the data collection, we used seven variables of viability: space, costs, logistics,

conflicts of interest, consumer/customer, product, and location. An analysis was made of the behavior of the variables in each type of urban farm studied.

### 3 Results

In order to understand how urban farms are distributed in Porto Alegre and its metropolitan area, this research was performed in two stages. The first sought to understand what urban farms are and how they are presented in the world. The second stage sought to find their applications in Porto Alegre and the metropolitan area, from a seven pre-determined criteria.

After analyzing the articles and reviews on urban farms, eight distinct practices were identified: community gardening, rooftop agriculture, vertical agriculture, basket gardening, school gardening, gardening in dangerous places, vacant lots and container gardening. These practices stand out for their differentiation in the way of production and application, making them remarkable for this study.

#### 3.1 Urban Farms in the World

The first stage of this study refers to the selection of Web of Science articles, concerning urban farms, in the eight categories mentioned above. So, after the articles investigation was conducted, it was possible to identify the ones which were relevant to the research. The table below shows the scientific articles selected for this paper.

Chart 1. Listing of scientific articles related to urban farming from 2010 to 2015

Article	Year	Authors	Title
1	2012	Greg Sharzer	A Critique of Localist Political Economy and Urban Agriculture
2	2014	Stephanie Rogus and Carolyn Dimitri	Agriculture in urban and peri-urban areas in the United States: Highlights from the Census of Agriculture
3	2006	Isabelle Vagneron	Economic appraisal of profitability and sustainability of peri-urban agriculture in Bangkok
4	2012	Pierre Walter	Educational alternatives in food production, knowledge and consumption: The public pedagogies of Growing Power and Tsyunhekw
5	2011	Vinsoun Millogo, Lennart Norell, Georges Anicet Ouédraogo, Kerstin Svennersten-Sjaunja and Sigrid Agenäs	Effect of different hand-milking techniques on milk production and teat treatment in Zebu dairy cattle
6	2012	Jennifer Cockrall-King	Food in the city: Urban agriculture and the new Food Revolution
7	2013	Yen Hai Doan, Toyoko Nakagomi, Yair Aboudy, Ilana Silberstein, Esther Behar-Novat, Osamu Nakagomi and Lester M. Shulmanb	Identification by Full-Genome Analysis of a Bovine Rotavirus Transmitted Directly to and Causing Diarrhea in a Human Child
8	2009	Clara Irazabal and Anita Punja	Cultivating just planning and legal institutions: a critical assessment of the south central farm struggle
9	2012	Carol Melody and Olaf Schmidt	Northward range extension of an endemic soil



			decomposer with a distinct trophic position
10	2012	Clayton Pierce	The Promissory Future(s) of Education: Rethinking scientific literacy in the era of biocapitalism
11	2013	Mary M. Gardiner, Scott P. Prajzner, Caitlin E. Burkman, Sandra Albro, Parwinder S. Grewal	Vacant land conversion to community gardens: influences on generalist arthropod predators and biocontrol services in urban green spaces
12	2012	Carl Johan Lagerkvist , Marther Ngigi, Julius J. Okello, Nancy Karanja	Means-End Chain approach to understanding farmers' motivations for pesticide
13	2012	Roy Maconachie, Tony Binns, Paul Tengbe	Urban farming associations, youth and food security in post-war Freetown, Sierra Leone
14	2013	Valerià Patila, Fiona Haslam McKenzieb	Peri-urban farmland conservation and development of alternative food networks: Insights from a case study area in metropolitan Barcelona (Catalonia, Spain)
15	2013	Carl Johan Lagerkvist, Sebastian Hess, Julius Okello, Helena Hansson, Nancy Karanja	Food health risk perceptions among consumers, farmers, and traders of leafy vegetables in Nairobi
16	2012	Enbal Shacham, Michael F. Donovan, Shannon Connolly, Andrea Mayrose, Mary Scheuermann, E. Turner Overton	Urban Farming: A Non-Traditional Intervention for HIV-Related Distress
17	2013	Vincent M. Smith, Robert B. Greene, Janet Silbernagel	The social and spatial dynamics of community food production: a landscape approach to policy and program development
18	2012	Yves Cabannes	Financing urban agriculture
19	2012	Jessica Leah, Willy Pradel, Donald C Cole, Gordon Prain, Hilary Creed-Kanashiro and Miluska V Carrasco	Determinants of household food access among small farmers in the Andes: examining the path
20	2015	Christine Eigenbrod, Nazim Gruda	Urban vegetable for food security in cities. A review
21	2014	Stephanie Rogus and Carolyn Dimitri	Agriculture in urban and peri-urban areas in the United States: Highlights from the Census of Agriculture
22	2014	Susanne Thomaier Ulf B. Freisinger and Magdalena Sawicka, Kathrin Specht, Dietrich Henckel	Farming in and on urban buildings: Present practice and specific novelties of Zero-Acreage Farming (ZFarming)
23	2014	Anne Pfeiffer, Erin Silva and Jed Colquhoun	Innovation in urban agricultural practices: Responding to diverse production environments
24	2015	Emily Warren, Sophie Hawkesworth, Cécile Knai	Investigating the association between urban agriculture and food security, dietary diversity, and nutritional status: A systematic literature review
25	2013	Francesco Orsini, Remi Kahane, Remi Nono-Womdim and Giorgio Gianquinto	Urban agriculture in the developing world: a review

Source: Web of Science

The selected papers presented various aspects related to urban farms, however, not all of them considered all eight categories mentioned, but at least one of them. In the next section, we will describe each of these types.

### 3.1.1 Community Gardening

Community gardening means a collective cultivation of plants by several people in a shared AREA (EIGENBROD, GRUDA, 2014). Community gardens have been introduced in the US as an urban enrichment source and as a way to bring social harmony to neighborhoods, increasing the sense of community in the residents (SHACHAM et al., 2012). Such urban farm allows interaction between neighbors, besides being a healthy form of leisure that provides physical, psychological and restoration activities reducing stress. Moreover, it is being practiced in order to increase the consumption of vegetables and fruits (SHACHAM et al., 2012) by the population. Thus, agricultural activities not only serve to supplement the food supply but also provide a platform for intercultural communication and a strengthened community (LOVELL, 2010). Another important aspect is that they provide access to the poor communities to healthier food. The increasing popularity of this urban farm style has led to increased private and public investment (SMITH et al., 2013). Thus, it becomes necessary to increase the planning and allocation of resources in the municipalities. In recent years, there have been many individuals and communities participating in the local production of food on a small scale (SMITH; GREENE; SILBERNAGEL, 2013). In addition, studies of these authors indicate that this type of production follows political priorities, thus prioritizing programs that place community gardens in lower average family income areas.

### 3.1.2 Rooftop Agriculture

Another practice of urban farming is known as rooftop agriculture or green roofs. To Caplow (2009), schools, hospitals, hotels, prisons, shopping malls and supermarkets rooftops are ideal for building integrated agriculture. Using this space for nontraditional agriculture enables food cultivation in proximity to dense populations and associated markets (PFEIFFER; SILVA; COLQUHOUN, 2014). This practice has become popular due to the environmental benefits brought by them such as cooling the correspondent buildings and a way to bring the food closer to densely populated areas. Although many buildings use this space for ornamental gardens, interest in growing food for restaurants, schools, and retail food in nearby regions has increased (PFEIFFER; SILVA; COLQUHOUN, 2014). Green roofs provide the cultivation of vegetables, flowers and berries, however, there are difficulties in adopting this practice in a wide range because there is the belief that these foods are not safe, even though tests have proven that they contain the same amount or even less heavy metals than many grown in vegetable fields (SAYDEE; UJEREH, 2003). In Brazil, for example, Shopping Eldorado has developed a composting area created from scraps of food from the food court. This food is used to feed their open garden - on the building roof. Starting in 2012, these actions are beginning to take shape in the city of São Paulo, SP, Brazil (SHOPPING ELDORADO, 2015).

### 3.1.3 Vertical Farming

The process of vertical farming is seen as the future of agriculture (DESPOMMIER, 2010), since the lack of space is a constant concern, especially for food supply in major cities. This method is precisely indicated by enabling the use of space and production indoors

(SHARZER, 2012, p.75), thus being able to produce food in confined spaces with the use of high technology and investment (ROGUS; DIMITRI, 2014). This is a method that promotes easy handling and allows the application of an organic production, providing a sustainable urban environment and the search for healthier major centers (DESPOMMIER, 2010). On the other hand, it allows the production in large quantities to consumers in a controlled environment and with high profits (EIGENBROD & GRUDA, 2014), also allowing its use in buildings, optimizing spaces and bringing the production of food closer to consumers (DESPOMMIER, 2010).

#### 3.1.4 Basket Gardens

Similar to a garden, basket gardens are mostly used as decoration and in small spaces, seeking production of small, vegetables, leaves and herbs. The basket is a solo depositary, which must withstand not only the inputs, such as land but also the process of irrigation and plant for some time; it can also be moved (EGGLETON, 1976).

#### 3.1.5 School Gardens

Due to constant concern for sustainability and food security, one of the alternatives is the development of community garden programs by schools so that students can become aware of sustainability (PIERCE, 2012), and take care of and develop gardens (SMITH et al., 2013). Community development is also very tied to this application, as schools develop education programs for fresh and healthy food not only among students but also for good nutrition and food security in the community, (EIGENBROD; GRUDA, 2014).

#### 3.1.6 Dangerous Places

Another possible design is the use of urban farms in places that are considered "dangerous". This means land that suffered some kind of contamination, such as arsenic, lead or others (GOLDSTEIN, 2009, HOWARD, 2015). One of the measures adopted to ensure that this land is used is the use of compost-filled socks and raised beds that do not allow chemicals to affect production. There could be grass growing for land restoration, but also the growing of vegetables and tubers for consumption and marketing (GOLDSTEIN, 2009). A successful case is the Botanical Garden in Cleveland (Ohio), which has researched different types of seeds that can be used to reclaim land contaminated by lead (GOLDSTEIN, 2009).

#### 3.1.7 Empty Lots

Another style of urban farming is developed in empty or vacant lots that are abandoned or expropriated. It seeks the re-establishment of this land and soil recovery having the starving and lower income populations, whose unemployment is the result of the closure of manufacturing industries use them. The government in American cities of Cleveland (Ohio) and Lincoln (Massachusetts) encourage people to make use of this natural resource to promote the livelihood of the neediest population and promote the creation of community organizations. Despite the high concentration of population in urban centers there are still plenty of places available in the "concrete jungle" that can be cultured, and provide more pleasant spaces of the urban scene (GOLDSTEIN, 2009).

#### 3.1.8 Cargo Containers

The last type of urban farm identified is established in cargo containers and is characterized by "hosting" crops that are devoid of soil. The containers can be used in various models of construction or as greenhouses, growing vegetables, legumes, seasonings and other

hydroponics and aquaponics (THOMAIER et al., 2014, p. 1), or even organoponics filled with organic compost derived from various sources (ORSINI et al., 2013, p. 695). There are several ways of farming that can be employed in the containers with the most innovative methods (EIGENBROD & GRUDA, 2014, p. 483). The containers offer a good alternative since they prevent leakage of pesticides and fertilizers and avoid contamination between cultures (EIGENBROD & GRUDA, 2014, p. 483).

### 3.2 Introduction to the analysis

In order to investigate urban farming in the metropolitan area of Porto Alegre in Southern Brazil seven variables were used for a viability analysis: space, cost, logistics, conflicts of interest, consumer or customer, product, and location. Food production alternatives were defined from the literature presented and are considered the most recurrent in urbanized municipalities. Food safety issues, ie., quantity and quality of food available begin to emerge in large Brazilian cities. The high density of cities, globalization and urbanization are factors that hinder the establishment of healthy eating habits (CERVATO-MANCUSO et al., 2012). Accordingly, in large cities, it is necessary to consider alternatives which do not compete for urban spaces, such as non-living areas or ceilings that can be easily accessed to provide food with quality and in sufficient quantity. Therefore, we present a summary of the characteristics per type of urban farming that will lead us to understand their presence in the region studied.

Chart 2: Urban farming and its types and characteristics in the world

Urban farms	Characteristics
Community gardens	<ul style="list-style-type: none"> <li>- Increased sense of community in participants</li> <li>- Provides healthy activities and social interaction</li> <li>- Promotes access to healthy food by low-income communities</li> <li>- Is an intercultural interaction platform</li> </ul>
Rooftop agriculture (roof gardens)	<ul style="list-style-type: none"> <li>- It is ideal for building integrated agriculture</li> <li>-A form to bring food to densely populated areas closer</li> <li>-Food commerce with nearby businesses</li> <li>- Growing vegetables, flowers, and berries</li> <li>- Foods as healthy as those grown in the field</li> </ul>
Vertical farming	<ul style="list-style-type: none"> <li>-Good use of space</li> <li>- Indoors production</li> <li>- Production in confined spaces</li> <li>- No need for a lot of technology</li> <li>- Low capital investment</li> <li>- Easy to handle and organic production</li> <li>- Provides sustainable urban environment and pursuit of good health in large centers</li> <li>- Allows production in large quantities to consumers in a controlled environment and with high profits.</li> <li>- Agriculture of the future, in buildings, space, and proximity optimization.</li> </ul>
Basket gardens	<ul style="list-style-type: none"> <li>-Used for decorating</li> <li>-Greate space utilization</li> <li>- Production of tubers and other vegetables, leaves and herbs.</li> </ul>

School gardens	<ul style="list-style-type: none"> <li>- Education for sustainability Development</li> <li>- Improves concern for garden care</li> <li>- Placed in areas of average and high-income and without concern for food security</li> <li>- It depends on the decision process of institutional and municipal instances so it can promote food security</li> <li>- Education for fresh and healthy food and concern for nutrition and food security</li> </ul>
Gardening in dangerous places	<ul style="list-style-type: none"> <li>-Use of raised beds or compost filled socks</li> <li>- Soil contamination - mainly lead</li> <li>- Mass adoption in the states of the American Midwest.</li> </ul>
Vacant lots	<ul style="list-style-type: none"> <li>- Restoration of areas / soils</li> <li>- Plenty of potential sites</li> <li>- Further development of population after the decline of the industry in the states of the Midwest in the US</li> <li>- Subsistence Solution and government application</li> </ul>
<i>Container</i>	<ul style="list-style-type: none"> <li>- Pesticide and fertilizers spill prevention</li> <li>- Avoid contamination of cultures</li> <li>- "Takes in" cultures devoided of soil.</li> <li>- Vegetables, legumes, spices and other hydroponics, aquaponics and organiponia can be grown</li> </ul>

Source: Written by the authors

#### 4 Pertinence of urban farming facing critical conditions

In the years 2000, the rate of population growth in Brazilian urban areas was of 2.45 percent while the rural population decreased at a rate of -1.37 percent (IBGE, n/d), indicating a rural exodus and a higher concentration of people in the cities. Added to this, Porto Alegre is one of the ten most populous and dense areas of the country (IBGE, 2005). The city and its metropolitan area shelter a population of over 4 million inhabitants in an area larger than 10,000 KM<sup>2</sup>. It is also interesting to note that the region is located in latitude 30° 01' 59" S and longitude: 51° 13' 48" W and, therefore, has specific climate conditions that differentiate the studied region and the other papers researched that are focused on the Northern hemisphere.

To perform the analysis of viability, seven variables were used to verify the eight methods of urban farms. These eight food production alternatives, as well as the variables, were found in the literature presented. These methods can be implemented from the roofs of buildings and houses up inside homes and closed spaces, optimizing the use of space and facilitating consumer access to fresh food trade bringing new business alternatives.

#### 4.1 Urban farming in the Metropolitan area of Porto Alegre in Southern Brazil

##### 4.1.1 Community Garden *Lomba do Pinheiro*

One of the oldest urban agriculture projects in Porto Alegre, being over 15 years old, is the Community Garden of *Lomba do Pinheiro*, on the east side of the city, which was reactivated in 2011. Currently, it receives groups of seniors and students of basic education network that participating in the cultivation of vegetables and organic medicinal plants every week. In an area of 0.7 hectares, the community garden is open to anyone in the community as long as they participate in the production process.

#### 4.1.2 *Utopia e Luta* Rooftop Agriculture

In the center of Porto Alegre, on the terrace of one of the buildings in *Borges de Medeiros* Avenue (one of the landmarks of the city) about a thousand lettuce and arugula heads are produced per month, besides spices like rosemary and basil. Cultivation is done hydroponically, where the seedlings are protected from the weather in greenhouses, as shown in Figure 1. If no coverage was used, plants would be exposed to pests and soot, one of the challenges of urban production. Without the use of agrochemicals, vegetables and medicinal herbs germinate in a small coir block, with the help of salt that is placed in water. Built on a 62-square-meter area on the 9th floor of a building, the garden is maintained since 2010 by members of the “Solidarity Mixed Cooperative of Utopia and *Luta* Movement”. The organic production is sold to residents of the building and also in the “word of mouth”. Recently, the production is being marketed to the restaurant and bar *Ocidente*, one of the most traditional in the neighborhood *Bom Fim* (also located in Porto Alegre).

#### 4.1.3 *Paralelo Vivo*’s Vertical agriculture

Conceived by a group of organic food consumers, *Paralelo Vivo* is a hub of social entrepreneurs that had the idea of using urban discards to produce food in permaculture. Today some of the companies that participate in the action create designs that allow them to have urban gardens installed using water harvesting, irrigation in urban gardens, gardening for installation of gardens, irrigation with automated software to do so. However, in the house where the organization's office has the prototype of this application, in which they produce their own food and serve herbal teas. At a very low cost, the idea is to reuse disposal leftovers from construction sites and renewable materials such as plant fiber pots for vertical gardens. The idea is to expand the network by installing gardens in street flower beds and green roof buildings such as hotels and create projects applicable to spaces that people can collaborate and produce their own food or market, as is the case of an organic fair in *Bom Fim* neighborhood. This fair sells products from this project, which also includes substrate production with worms that are fed food scraps.

Figure 1 - Porto Alegre and Metropolitan Area Examples



Source: Photographer Felix Zucco / Photo courtesy Zero Hora

1. *Lomba do Pinheiro* Community Garden. 2. *Utopia e Luta* Rooftop Agriculture. 3. *Paralelo Vivo* Vertical Farming. 4. *Canoas* Urban Farming in Dangerous Places

#### 4.1.4 Basket gardens

Being mostly used for ornamental plants as decoration this practice is a trend that seems to interest the population of the area even though no cases of basket gardening producing food were found for this study.

#### 4.1.5 School Gardens at *Farroupilha* Elementary School

The Elementary School *Farroupilha*, located in the suburb of *Três Figueiras* in Porto Alegre is one of the institutions founded to assist arrived German immigrants in the State. This institution defends values related to sustainability, thus, it provides their students the possibility of contact with food production. One of those ways is the Planting Project, where students revitalized the garden in their kindergarten, producing spices and vegetables such as parsley, chives, mint, and arugula. In addition, the students use the garden to produce for their sandwiches and other foods prepared in school.

#### 4.1.6 Urban Farming in Dangerous Places

In Canoas (metropolitan region of Porto Alegre), 21 families in *Guajuviras* neighborhood found a way to save on buying food, and also a new source of income, cultivating gardens in dangerous places (under a high-voltage electricity network). Registered in a social program of the city, residents grow vegetables and grains in two community gardens divided into individual lots. Much of the organic production is for their own consumption and the surplus is sold in the neighborhood.

#### 4.1.7 Urban Farming in Vacant lots

The Community Garden *Vila União Operária* was established in the 1980s in a land occupation, people came together and decided to set aside an area for a community gardening since many of those who would live there did not work, and that would be a way to produce cheaper food. However, for the families to participate in the project, a membership was organized. That not only regularized the space of the garden but also the occupation, now associated with the garden in the residence village. The residents take care not only of the garden but also of digital inclusion projects, income making, and cultural aspects linked to Canoas city hall.

The garden is divided into two categories: members who plant and harvest their own products individually by paying a maintenance fee of US\$ 0.50 and members of the income generation project in which the products are sold in fairs and supermarkets. Production is done in its majority by volunteers, but there are also employees for each of the projects. All of their production is free of pesticides and is grown naturally.

#### 4.1.8 Urban Farming in Cargo Containers

The type of urban farm known as container was not found in Porto Alegre, it is believed that the use of this type of agriculture uses higher and expensive technology, besides needing legal clearance and city hall permits for placement and working on the streets and public spaces, becoming more expensive and bureaucratic to the producer, thus being a less viable option in this city today.

Chart 3. Summary of Characteristics of Urban Farming in the Metropolitan area of Porto Alegre in Southern Brazil for a Viability Analysis

Variables	Community gardens	Rooftop agriculture	Vertical farming	School gardens	Gardening in dangerous places	Vacant lots
<b>Space</b>	Needs to be placed in large areas that can be in the open air or in greenhouses.	It usually occupies large areas even though it can be placed in smaller ones. It is necessary to use raised beds or other materials that help cultivation.	Uses small spaces and it can be done indoors. It can be grown in small pots and boxes, serving as decoration (inside houses, apartments, etc.).	Open air school spaces	Areas that can put participants at risk	Open air areas
<b>Cost</b>	Medium Cost	Medium cost	Low cost	Low cost	High Cost	High Cost
<b>Logistics</b>	Needs great logistical effort due to being large growing areas, demanding more supplies, and technical care.	Needs large logistical effort, as they are major growing areas, demanding more supplies, and technical care.	Easy due to quantity grown and little need for supplies (production for own consumption).	Short logistic efforts due to production on a small scale and limited range of products.	Not Identified	Depends on the property: in general needs more logistics effort, as they are major growing areas, demanding more supplies, and technical care, mainly because it is in abandoned or unused land.
<b>Conflict of interest</b>	There is competition with businesses in the region. It can generate conflict among users.	There is competition with businesses in the region. It can generate conflict among residents.	Not identified.	Not identified	Not identified	Many conflicts may occur because of people who may be interested in using the same property considering the owners and the large community.
<b>Consumer/ Client</b>	Community members	Building residents and other people that get the word of mouth.	Their own consumption.	School students	Community members responsible for the cultivation and selling.	Region residents and people who are supporters.
<b>Products</b>	Vegetables and organic medicinal plants	Vegetables and organic medicinal plants	Herbs, fruits and flowers.	Spices and vegetables	Vegetables and grains	Vegetables, spices, grains and tubers.
<b>Location</b>	Open air areas and accessible to any member of the community, as long as participate in the production.	Use of spaces in buildings, ceilings, and homes.	Indoors: in apartments, homes, and other confined spaces.	School gardens and beds	Dangerous places	Vacant or empty lots

Source: The authors



## 5 Conclusions

It was possible to identify types of urban farming that can be implemented in small spaces, using few resources, such as a basket gardening and vertical agriculture. On the other hand, community gardens, rooftops, school gardens, gardens in dangerous places, vacant lots and containers require a larger space, usually outdoors, thus using more resources such as financial and human, among others.

Also, another difference found in the eight methods shown is individual or collective participation in spaces. Depending on the area used for cultivation, it may become part of a social interaction among participants. This collective practice is mainly presented in open spaces.

Within the municipality of Porto Alegre and its metropolitan area it was possible to identify possibilities of implementation for all types of urban farming, even though some are better suited than others due to not having conflicts of interest and the need to rely on few people for their maintenance, as well as the use of few resources and small or reused spaces. Another issue is that even if this study was able to find trends for all the usages of urban farming not all of them are currently being cultivated in the region. Even though some of the initiatives we studied have originated as community service some have changed into businesses over the past few years, showing big intentions of accessing the new opportunities of the market as well as selling it at people's doorsteps. Therefore, there is a great potential for business in the metropolitan area of Porto Alegre in Southern Brazil as new forms of technology are emerging and more forms of employment can be found. Other cities in Brazil such as Sao Paulo and Brasília have already started implementing great efforts to develop urban farming.

## 6 References

- ACS, Z. J.; MORCK, R.; YEUNG, B. Y. *Entrepreneurship, Globalization & Canadian Public Policy*. 10 nov. 2000.
- AMIRLATIFI, A. *The Future of Hydroponics/Aeroponics*. LinkedIn. 6 Feb 2016. Available at <[https://www.linkedin.com/pulse/future-hydroponicsaeroponics-ali-amirlatifi?trk=pulse\\_spock-articles](https://www.linkedin.com/pulse/future-hydroponicsaeroponics-ali-amirlatifi?trk=pulse_spock-articles)>.
- CEVATO-MANCUSO, A.M. et al. *A atuação do nutricionista na Atenção Básica à Saúde em um grande centro urbano*. *Ciência & Saúde Coletiva*, v. 17, n. 12 December 1 2012.
- GEORGE, E. *The Urban Agriculture Movement: History and Current Trends*. [s.d.].
- GOLDSTEIN, N. *Vacant lots sprout urban farms*. *BioCycle*, 2009.
- LOVELL, S. T. *Multifunctional urban agriculture for sustainable land use planning in the United States*. *Sustainability*, 2010.
- MOUGEOT, L. J. A. *Urban Agriculture: Definition, Presence, Potentials and Risks, and Policy Challenges*, 2000.
- PFEIFFER, A.; SILVA, E.; COLQUHOUN, J. *Innovation in urban agricultural practices: Responding to diverse production environments*. *Renewable Agriculture and Food Systems*, v. 30, n. 1, p. 1–13, 2014.
- PIERCE, C. *The Promissory Future(s) of Education: Rethinking scientific literacy in the era of biocapitalism*. *Educational Philosophy and Theory*, v. 44, n. 7, p. 721–745, 2012.
- ROGUS, S.; DIMITRI, C. *Agriculture in urban and peri-urban areas in the United States: Highlights from the Census of Agriculture*. *Renewable Agriculture and Food Systems*, v. 30, n. 1, p. 1–15, 2014.
- SAYDEE, G. D.; UJEREH, S. *Rooftop Gardening in Senegal\_1*. *UA-Magazine*, p. 16–17, 2003.
- SHACHAM, E. et al. *Urban farming: A non-traditional intervention for HIV-related distress*. *AIDS and Behavior*, v. 16, n. 5, p. 1238–1242, 2012.
- SHARZER, G. *A Critique of Localist Political Economy and Urban Agriculture*. *Historical Materialism*, v. 20, n. 4, p. 75–114, 2012.
- SIMONETTI, L. *The ideology of Slow Food*. *Journal of European Studies*, 2012.
- SMITH, V. M.; GREENE, R. B.; SILBERNAGEL, J. *The social and spatial dynamics of community food production: A landscape approach to policy and program development*. *Landscape Ecology*, v. 28, n. 7, p. 1415–1426, 2013.
- TIDD, J.; BESSANT, J.; PAVITT, K. *Gestão da inovação*. 3ª ed. Porto Alegre: Bookman, 2008.
- Bessant, J., Tidd, J. 2009. *Inovação e empreendedorismo*. Porto Alegre, Bookman.

- BOSERUP, E. 1965. *The Conditions of Agricultural Growth: The Economics of Agrarian Change under Population Pressure*. London, G. Allen and Unwin, 1965; Chicago: Aldine.
- CAPLOW, T. 2009. Building integrated agriculture: Philosophy and practice. *Urban Futur. 2030 Urban Dev. Urban Lifestyles Futur*. Heinrich-Böll-Stiftung, pp 48 – 51
- DESPOMMIER, D. 2010. *The vertical farm: feeding the world in the 21st century*. St Martin's Press, New York.
- EGGLETON, C. 1976. Growing Vegetables in Containers. <[http://www.verticalfarm.com/?page\\_id=36](http://www.verticalfarm.com/?page_id=36)>. [accessed September 12, 2015].
- EIGENBROD, C., GRUDA, N. 2014. Urban vegetable for food security in cities. A review. *Agronomy for Sustainable Development*, p. 483-498.
- FAO. 2015. Food security and the right to food., POST-2015 AND THE SUSTAINABLE DEVELOPMENT GOALS, May 2015.
- FIESP-IBOPE. 2010. Pesquisa Nacional Fiesp/IBOPE Sobre o Perfil do Consumo de Alimentos no Brasil. *Brasil Food Trends 2020*, São Paulo.
- HOWARD, B.C. Urban Farming Is Growing a Green Future. [http://environment.nationalgeographic.com/environment/photos/urban-farming/#/earth-day-urban-farming-new-york-rooftop\\_51631\\_600x450.jpg](http://environment.nationalgeographic.com/environment/photos/urban-farming/#/earth-day-urban-farming-new-york-rooftop_51631_600x450.jpg) [accessed September 11, 2015].
- IBGE. 2005. Áreas Urbanizadas do Brasil. <http://www.inde.gov.br/noticias-inde/8290-ibge-disponibiliza-conjunto-de-mapas-das-areas-urbanizadas-do-brasil-2005.html> [accessed September 11, 2015]
- KUMAR, R. Five Reasons Why Urban Farming is the Most Important Movement of our Time. 21 NOV 2016 Available at: <<http://magazine.good.is/articles/five-reasons-why-urban-farming-is-the-most-important-movement-of-our-time>>.
- ORSINI, F., KAHANE, R., NONO-WOMDIM, R., GIANQUINTO, G. 2013. Urban agriculture in the developing world: A review. *Agronomy for Sustainable Development*, v. 33, n. 4, p. 695-720.
- OSTERWALDER, A. *The business model ontology – a proposition in a design science approach*, Tese de doutorado, Ecole des Hautes Etudes commerciales, Université de Lausanne, Lausanne, France, 2004.
- PHILPOTT, T. 2010. The history of urban agriculture should inspire its future. <http://grist.org/article/food-the-history-of-urban-agriculture-should-inspire-its-future/full/> [accessed September 05, 2015]
- PIERCE, C. 2012. The Promissory Future(s) of Education: Rethinking scientific literacy in the era of biocapitalism. *Educational Philosophy and Theory*, v. 44, n. 7.
- Sharzer, G. 2012. A Critique of Localist Political Economy and Urban Agriculture. *Historical Materialism*, v. 20, n. 4, p. 75-114.
- SHOPPING ELDORADO. Projeto De Compostagem Do Shopping Eldorado - Telhado Verde. 2015. Available at: <<http://www.shoppingeldorado.com.br/card/telhado-verde>>.
- THOMAIER, S., SPECHT, K., HENCKEL, D., DIERICH, A., SIEBERT, R., FREISINGER, U. B., SAWICKA, M. 2014. Farming in and on urban buildings: Present practice and specific novelties of Zero-Acreage Farming (ZFarming). *Renewable Agriculture and Food Systems*, v. 30, n. 1, p. 1-12.

## **CHAPTER 5: Final Considerations**

Urban agriculture has become a recurrent topic in the last few years, not only in the academic field but in society as a whole. On newspapers, online blogs and social media there are many contents publicizing new approaches and technologies, but also explaining to the general public what urban agriculture is and how and where one can get started<sup>1</sup>. The fact is that there are a great number of people involved in urban agriculture. Either because they are food enthusiasts and worry about where and how the produce they consume is being produced, or because they want to reconnect with activities that remind them of their childhood and the time they spent with their parents or grandparents tending a garden. People could also be looking for a way to flee the hectic contemporary life, interact with other people in a slower environment and get their hands dirty. UA could be a way to unite passion for alternative foods and having a business, so that one does not have to stay at the office all week. Motivations and outcomes that surface in the spectrum of urban agriculture are immensely varied and therefore make it an interesting topic of analysis.

With that in mind this dissertation had a goal of comprehending the latest developments in the evolution of UA in its many shapes throughout the globe. This way, learn state of the art information of UA. We also wanted to present a local example of its unfolding processes. Finally, it sought to construct an urban agriculture identification framework, in order to help all of the interested parts in UA to better understand each other and where exactly they stand in the entire system.

To answer these objectives the first paper introduced in this research aimed at analyzing the evolution of both the urban food production and its transformation over the course of the last three years. Furthermore, it built a systematic categorization of well used terms related to urban agriculture and its subgroups in the scientific literature. On the second article, however, we sought to apply some of the categories into a local analysis, in order to understand how urban farms are displayed in the metropolitan area of Porto Alegre, in Southern Brazil.

To achieve all of the above mentioned goals the researching process of this dissertation started in 2015 in pursuit of advancing the urban food research and its trends in the world and Brazil. Consequently, an interdisciplinary research composed of mix-method qualitative and exploratory processes was conducted. The first phase was dedicated to the

preparation of the documental examination following the PRISMA protocol of systematic reviews. This review was substantial for the construction of an urban agriculture categorization. Secondly, a multi-case study scenario was analyzed in the surrounding areas of Porto Alegre (RS), Brazil, to explore which categorization types could be found in the region. These stages of research culminated in the development of two research papers that we proposed in this dissertation.

Results suggest that UA can take many forms as it can occupy small spaces in the urban and peri-urban area, inside buildings such as apartments or entire floors in skyscrapers. But it can also occupy larger pieces of land giving new purpose to lots that have been idle. UA can translate a social gathering of people who are concerned with environmental changes and seek to transform the food chain as we know today. It can be a place of rest and healing as it is in areas directed to the elderly or physically impaired such as in hospitals or churches. It can have high use of technology or follow traditional agriculture principles either to be a source of nutrients to the ones who tend their gardens and plots or as a business opportunity. It is imperative to understand that even though there are many different practices of UA it is all focused on the growing and harvesting of plants and the raising of livestock within urban grounds.

Although it is a relatively recent topic of discussion in the academic field, UA has been a part of the evolution of humankind. The drivers which trigger the waves of interest in turning the urban land into agrarian land may vary but it all results in environmental changes. However, there still are conflicts regarding UA. The first is an academic struggle to come to terms regarding of definitions, and determining what should and should not be considered UA. The second is a concern regarding whether UA will be the solution for global challenges, such as containing climate change impacts and producing enough food for the future population of nine billion people by 2050.

In this ever more globalized world, where a significant portion of the population demands and believes in alternative production methods, labels and certifications, the focus on technology and new techniques of food production in small spaces are more and more of an essence. It is not possible to forget that safety measures must be taken to avoid contamination in the produce of urban spaces, and, therefore, knowledge and technical consulting are indispensable for the future of UA.

In the context of Porto Alegre, which is a capital city of 1,5 million inhabitants located in the Global South, it was possible to identify that the types of urban farming that can be implemented in small spaces and that required the use of few resources, such as a basket

gardening and vertical agriculture were the most viable. In the eight sublevels shown in the research, participation was divided between the projects that were mainly conducted by individuals or by collective participation. In the latter, social interaction among participants was a major benefit, and the most important characteristic regarded was that these initiatives all took place in open-air lots. Conflicts of interest and the need to rely on few people for the maintenance of the gardens make it hard for the implementation of urban food spaces in the city. However, movements frequently rise looking for new opportunities and trials. Another fundamental finding was that the orientation of some of the urban agriculture plots change over time from community to market oriented practices. Therefore, there is a great potential for UA businesses in the metropolitan area of Porto Alegre as long as their business plans focus on short supply chains and alternative means of food production. These opportunities can result on employment rates and the use of new technologies, following the examples of other cities in Brazil such as Sao Paulo and Brasília, which have already started implementing efforts to develop urban farming in Brazil.

It is important to keep in mind that even if UA is not the feeding solution the world is looking for, it is and will continue to be, a major part of social interactions and efforts to mitigate climate change. However, it is imperative that we notice the changes we are forcing the agrarian world into as we make it more robotic and expensive, both in terms of currency and resources. In order to bring food production to desert areas or unproductive lands the use of technology will be needed even more, such as smart buildings, closed systems and led lights for example. Are we ready to be part of that world?

Given the importance of safety for urban produce, other studies should focus on protective measures urban growers should take in order to avoid metal or air pollutants contamination. Another essential study is to analyze UA in the perspective of small cities and suburbs since the majority of the studies focus on large or capital cities. Yet, an effort should be made into creating more defined lines of what urban agriculture stands for, with a more detailed technical description of its sublevels.

Because of the restriction of years of articles analyzed it was not possible to create definitions that correspond to the entire spectrum of UA worldwide, since it is possible that other UA practices were not described in the papers taken into consideration. The same happens to sample populations of urban farms represented in the study involving the city of Porto Alegre.

This dissertation is important for the academic field because it brings an overview of urban agriculture and its sublevels in a pragmatic way, focusing on a grouping of

correspondent terms in order to make the understanding of the UA realm easier. It also brings important findings to the general public once it highlights the evolutionary process of urban agriculture, helping the public comprehend its development and how they can contribute to its future.

-----  
<sup>i</sup> Examples of websites, newspapers, social media and other movements engaged in UA are:

- <http://torontourbangrowers.org/img/upload/indicators.pdf>
- [connectivitycheck.gstatic.com](http://connectivitycheck.gstatic.com); [http://www.fao.org/soils-2015/news/news-detail/en/c/329009/?utm\\_source=facebook&utm\\_medium=social+media&utm\\_campaign=fao+facebook](http://www.fao.org/soils-2015/news/news-detail/en/c/329009/?utm_source=facebook&utm_medium=social+media&utm_campaign=fao+facebook); <http://engenhariae.com.br/meio-ambiente/fazenda-vertical-usara-95-menos-agua/>
- <http://inhabitat.com/massive-food-hub-in-denmark-is-agricultures-answer-to-silicon-valley/>
- <https://www.youtube.com/watch?v=Ei9i7DisX8c>
- <https://www.youtube.com/watch?v=xudTNNnGiNg&feature=share>
- <https://www.linkedin.com/company-beta/631262/>
- <http://www.bbc.com/news/science-environment-36506160>
- <http://edition.cnn.com/videos/living/2016/06/21/urban-farmers.cnn>

## REFERENCES

- BARTHEL, S.; PARKER, J.; ERNSTSON, H. Food and green space in cities : a resilience lens on gardens and urban environmental movements. **Urban Studies**, Abingdon, v.52, May, n.7, p.1321–1338, 2015.
- BENISTON, J.W.; LAL, R.; MERCER, K.L. assessing and managing soil quality for urban agriculture in a degraded vacant lot soil. **Land Degradation & Development**, New York, v.27, p.996–1006, 2016.
- CHEKIMA, B. et al. Examining green consumerism motivational drivers : does premium price and demographics matter to green purchasing? **Journal of Cleaner Production**, Amsterdam, v.112, p.3436–3450, 2016. Available at: <http://dx.doi.org/10.1016/j.jclepro.2015.09.102>.
- CLENDENNING, J.; DRESSLER, W.H.; RICHARDS, C. Food justice or food sovereignty ? Understanding the rise of urban food movements in the USA United States Department of Agriculture. **Agriculture and Human Values**, Dordrecht, v.33, n.1, p.165–177, 2016.
- COHEN, N.; REYNOLDS, K. Resource needs for a socially just and sustainable urban agriculture system : Lessons from New York City. **Renewable Agriculture and Food Systems**, Wellingford, v.30, n.1, p.103-114, 2014.
- DOBERNIG, K.; STAGL, S. Growing a lifestyle movement ? Exploring identity-work and lifestyle politics in urban food cultivation. **International Journal of Consumer Studies**, Oxford, v.39, p.452–458, 2015.
- DrAKE, L.; LAWSON, L.J. Results of a US and Canada community garden survey : shared challenges in garden management amid diverse geographical and organizational contexts. **Agriculture and Human Values**, Dordrecht, v.32, p.241–254, 2015.
- DURUSOY, E.; CIHANGER, D. Historic Landscape vs . Urban Commodity ?: The Case of Yedikule Urban Gardens , İstanbul. **Megarön**, İstanbul , v.11, n.1, p.125–136, 2016.
- EIZENBERG, E.; FENSTER, T. Reframing urban controlled spaces : Community gardens in Jerusalem and Tel Aviv-Jaffa. **ACME: An International E-Journal for Critical Geographies**, Milano, v.14, n.4, p.1132–1160, 2015.
- GODFRAY, H.C.J. et al. Food security : the challenge of feeding 9 billion people. **Science**, Washington, v.327, p.812–818, 2010.
- GUITART, D.A.; BYRNE, J.A.; PICKERING, C.M. Greener growing : assessing the influence of gardening practices on the ecological viability of community gardens in South East Queensland , Australia. **Journal of Environmental Planning and Management**, Abingdon, v.58, n.2, p.198–212, 2015.
- LAMBIN, E.F.; GEIST, H.J.; LEPERS, E. Dynamics of land-use and land-cover change in tropical regions. **Annual Review of Environment and Resources**, Palo Alto, v.28,

p.205-241, 2003.

MONACO, F. et al. Optimizing agricultural land use options for complying with food demand : evidences from linear programming in a metropolitan area. **Aestimium**, Firenze, v.68, July, p.45–59, 2016.

PFEIFFER, A.; SILVA, E.; COLQUHOUN, J. Innovation in urban agricultural practices : Responding to diverse production environments. **Renewable Agriculture and Food Systems**, Wellingford, v. 30, n.1, 2014.

SANYÉ-MENGUAL, E. et al. Integrating horticulture into cities : a guide for assessing the implementation potential of rooftop greenhouses ( RTGs ) in industrial and logistics parks. **Journal of Urban Technology**, Abingdon, v.22, n.1, p.87–111, 2015.

SPECHT, K. et al. Socially acceptable urban agriculture businesses. **Agronomy for Sustainable Development**, Berlin, v.36, n.17, p.1–14, 2016. Available at: <http://dx.doi.org/10.1007/s13593-016-0355-0>.

ULUSOY, E. Experiential responsible consumption. **Journal of Business Research**, New York, v.69, n.1, p.284–297, 2016. Available at: <http://dx.doi.org/10.1016/j.jbusres.2015.07.041>.

WITHERIDGE, J.; MORRIS, N.J. An analysis of the effect of public policy on community garden organisations in Edinburgh. **Local Environment - The International Journal of Justice and Sustainability**, Abingdon, v.2, n.21, p.202–218, 2016.



**ANNEX** – E-mail confirming acceptance for publication of the paper “**Analysis of Urban Farms in Porto Alegre (Brazil)**” in the IFAMA-WICaNeM 2016 Conference in Aarhus, Denmark.



---

**RE: [IFAMA] Analysis of urban farms in Porto Alegre (Brazil)**

1 mensagem

---

IFAMA <WICaNeM2016@wur.nl>  
Responder para: WICaNeM2016@wur.nl  
Para: Jessica Souto <jemmsouto@gmail.com>

sex, 8 de jan de 2016 às 6:27 PM

Dear Jessica Souto,

Hereby your notification of acceptance for the proposal you have sent in for the IFAMA-WICaNeM 2016 conference in Aarhus!

We look forward to receiving your full paper by March 6th 2016, to which we will provide feedback. We plan on sending you this feedback by April 1st, after which we would like to receive your final paper by May 1st.

For now, we will also send you an invitation to upload your final paper. Please keep in mind that your text needs to be blinded for this round also! We will again be asking you to upload a frontpage with all your information, and then a blinded version of your full text.

With warmest regards,

The IFAMA-WICaNeM 2016 organising team

P.S.: To prevent confusion, this notification regards your proposal titled "Analysis of urban farms in Porto Alegre (Brazil)".

You can go here to view the submission:  
<http://ifama.submittable.com/user/submissions/4951826>

Please notice that the name of the article was changed in the full paper submission to "**Urban farming trends in a metropolitan area in Southern Brazil**" as it is printed in the Conference program available at <http://www.ifama.org/resources/files/2016-Conference/Symposium-2016.pdf>

Parallel Sessions IV: Sunday 10th, 16.00-17.45					
Location: VIA University, Building E, Floor 2, Room 09 (E2.09)	VIA University, Building E, Floor 2, Room 13-14 (E2.13+14)	VIA University, Building E, Floor 2, Room 15 (E2.15)	VIA University, Building E, Floor 3, Room 10 (E3.10)	VIA University, Building E, Floor 3, Room 13 (E3.13)	VIA University, Building E, Floor 4, Room 9 (E4.09)
Food security and sustainability  Chair: B. Schulze-Ehlers	INSECTS 2.0: food radical innovation between barriers and new opportunities  Chair: L. Cembalo	Innovation and sustainability in developing and emerging economies  Chair: M. Dutra de Barcellos	BPA - Consumer trust and value chain models: the effects of food crime and scandals  Chair: T. del Giudice and T. Panico	Governance and contracts issues in chains and networks  Chair: V. Bitsch	Teaching Cases Workshop (ICW)  Chair: Brent Ross, F. Braga
Farm Entry and Exit from U.S. Agriculture - A. Katchova and M. Abearm	Consumers' perspective on circular economy strategy for reducing food waste - M. Borrello, F. Casaciale, A. Lombardi, S. Pascucci, and L. Cembalo	Eco-innovation for a circular supply chain: evidences from Brazil - L. Vieira, M. Bonzomini Bostle, N. Rabenhöhl do Couto, and M. Dutra de Barcellos	Consumption behaviour for wood certified products in Italy - T. Panico, G. Cicci, T. del Giudice and F. Casaciale	Introduction of a Nationwide Minimum Wage: Challenges to Agribusinesses in Germany - V. Bitsch S. Mair, M.M. Borwinska, and C. A. Schettler	ICW: Teaching Cases Methods Workshop: How to Write and Use Cases
Rural Household Food Preferences, Dietary Diversity and Supply Chain Development - M. Steele, D. Westerspoon, J. Oebmke and L. Westerspoon	Consumer acceptance of edible insects. A value proposition development for the case of an entomology-based venture - L. Capponi, V.C. Matera and A. Linneman	Motivations for agri-food producers and processors to adopt eco-innovation - M. Dutra de Barcellos, N. Rabenhöhl do Couto, M. Bonzomini Bostle and L. Marques Vieira	An exploratory study about consumers' perception of Made in Italy foodstuff: The case of Italian egg pasta in the Swedish market - P. Passarini, A. Cavicchi, and T. Andersson	Mainstreaming Farm Animal Welfare: Consumer preferences for alternative meat supply chain standards in Germany - B. Gassler and A. Spiller	
Supermarket Development Potential in Urban Food Deserts - M. Steele and D. Westerspoon	Insects as food: a multi-approach analysis to identify barriers and drivers for Italian consumers' acceptance - C. Cavallo and V.C. Matera	Expected Benefits in The Purchase of Equipment by Grain Producers in Brazil - R. Farinha, L. Silva Antolini, and R. Fava Scaré	Can a multi-level label do better than a binary label for animal welfare? A PLS-analysis of consumer satisfaction - R. Weinrich and A. Spiller (Best Paper Finalist)	Organizational Costs in Agricultural Cooperatives: From Symptoms to Diagnosis to Solutions - C. N. Iliopoulos and M. L. Cook	
Locally produced food: Institutional vs. intermediated buyers - A. Rimal, J. Moldovan, and B. Onyango		The Influence of Signal Attribute on Willingness-To-Pay for Pasture-Raised Beef - J. Chini, E. Spers, H. Moretti Ribeiro da Silva, M. Cais Jajic de Oliveira, M. Fava Neves and P. Burnier	Institutional entrepreneurs dealing with violent organizations in the agri-food value chains - S. Pascucci, T. Panico, and T. del Giudice	Systems perspective on partnership governance in smallholder agricultural value chains - H. Lie, C. Brown, and K. M. Rich	
Climate change interactions with agriculture, forestry sequestration, and food security - L. Pena-Levano		Urban farming trends in a metropolitan area in Southern Brazil - J. Moreira Maia Sousa, M. Cortes Borges, M. Vinícius Araújo, Joana Caluzzi, D. Collegno de Menezes and H. Dewez (Presented by M. de Barcellos)			