



Public versus private: Juxtaposing urban allotment gardens as multifunctional Nature-based Solutions. Insights from Seville

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ABSTRACT

Many European countries witness growing interest in allotment gardening. Thus, private allotment gardens (AGs) have been created in some countries, including Spain. As a result, there are places where non-consumptive and commodified allotment gardens coexist. The paper presents an in-depth comparison of public and private AGs through the lens of the nature-based solutions (NBS) concept. First, we assess the importance that gardeners attribute to the spectrum of environmental and socio-economic impacts provided by both types of AGs; we identify differences and similarities in their development and management, and assess the demographic and socioeconomic profile of gardeners. Subsequently, we discuss gardeners' and other stakeholders' opinions on both types of AGs and explore the roles that they can play as solutions for urban policy challenges. Our results show that both types of AGs are nature-based solutions with particularly positive impacts on the health and well-being of their users. These gardens do not compete but complement each other, fostered by their role as multifunctional nature-based solutions. Moreover, the option of cultivating a private or a public AG seems to be more linked to the freedom of cultivation and the freedom of access rather than economic reasons. We conclude that in the current complex scenario, public and private AGs must have territorial, legal and institutional frameworks within all urban policies that explore NBS.

1. Introduction

The city is one of the most complex and heterogeneous human creations. Over the centuries, it has shown to possess a powerful capacity for evolution, mutation and adaptation, which makes it difficult for researchers to understand and analyse its current and future behaviour.

In southern European countries such as Spain, the traditional models of a compact, complex, efficient city, socially cohesive and closely linked to the rural environment have made it possible to maintain high levels of environmental and territorial quality. This compact city model generated spaces for sociability, which fostered the meeting of economic activities and urban and peri-urban natural environments of recognized value. However, this model is being replaced by multiple urban forms that break the compact, multifunctional and even pragmatic character of the city. In the last two centuries, excessive processes of city growth have taken place all over the world, which in most cases have resulted in an uncontrolled territorial expansion. The latter, in turn, has led to an unprecedented urban explosion (Puente, 2012a).

Today's world cities are facing a triple crisis: climate, caused by

decades of negative impacts of air pollution and increased ecological footprint; socioeconomic (especially in southern Europe) due to the economic crunch of 2008 and its consequences during the last decade; and health, caused by Covid-19, which is a new and as yet unfinished challenge. In this context, Nature-based Solutions (NBS) are a fairly new concept encompassing all approaches, actions or processes that rely on the principles of nature to respond to various challenges such as climate change, urban management or food security (see e.g. Seddon et al., 2021). The term NBS emerged at the end of the first decade of the 21st century. The first publication focusing on NBS was the 2008 report by the World Bank, which described the climate change mitigation and adaptation benefits offered by the Bank's investments in biodiversity conservation (Mackinnon et al., 2008). NBS were then adopted by conservation organizations, which were actively involved in shaping the concept (Seddon et al., 2021; Wynberg et al., 2021). As a result, the term was defined by the International Union for the Conservation of Conservation of Nature and Natural Resources (IUCN) as actions to protect, sustainably manage and restore natural and modified ecosystems in ways that address societal challenges effectively and adaptively, to

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provide both human well-being and biodiversity benefits (IUCN, 2012; Cohen-Shacham et al., 2016). Since then, the concept has been adopted by the European Commission (EC), which defines NBS as actions inspired by, supported by or copied from nature; both using and enhancing existing solutions to challenges, as well as exploring more novel solutions (European Commission, 2015a, 2015b). Both the IUCN and EC definitions of NBS highlight the multiple benefits that can be derived by working with nature. The IUCN frames these in terms of biodiversity and human well-being, while the EC emphasizes innovation and economic cost-effectiveness (Seddon et al., 2021). However, there is still no common conceptualisation of NBS (Almenar et al., 2021; Castellar et al., 2021). The fact that NBS are defined very differently by various actors results in confusion and polemic e.g. some NBS function simultaneously under several names, while others should not be called that way at all (Castellar et al., 2021). Moreover, NBS are highly contested, with many advocates defining NBS to suite their own activities, which they would like to see implemented (Wynberg et al., 2021). The misuse of the concept of NBS as a quick 'ecological fix' for the crisis generated by unsustainable patterns of production and consumption exacerbates the controversy over the term (Seddon et al., 2021). One of the allegations against the concept of NBS is that, as currently framed, it perpetuates a commodified worldview that separates people from nature, and where nature continues to be commodified (Wynberg et al., 2021). However, to deliver effective, resilient, legitimate and equitable outcomes, all relevant stakeholders (especially Indigenous Peoples and local communities, IPLCs) should be engaged in the design, implementation, management, monitoring and evaluation of NBS, and interventions should foster ownership, empowerment, and well-being of the local stewards, shaping the landscapes in which they take place (Mercer et al., 2012). In other words, the NBS should be based not only on nature but also on local people. In this article, we adopt the perception of NBS proposed by Seddon et al. (2021), i.e. "solutions that involve the protection, restoration or management of natural and semi-natural ecosystems; [...] or the creation of novel ecosystems in and around cities or across the wider landscape. They are actions that are underpinned by biodiversity and are designed and implemented with the full engagement and consent of Indigenous Peoples and local communities. People and nature, together, co-produce a variety of outcomes which benefit society. These benefits can, in turn, support ecosystem health. While the ultimate goal of NBS is to support sustainable development, including human health and well-being, the ecosystems that provide NBS must be healthy, functional and biodiverse if such benefits are to be provided in the long term. Hence, to qualify as an NBS, an action must sustainably provide one or more benefits for people while causing no loss of biodiversity or ecological integrity compared to the pre-intervention state. Although actions with only one societal benefit could be classified as NBS, an intervention in nature usually has multiple interlinked effects on the climate and the social-ecological system. By identifying all of these effects, interventions can be designed to build synergies and to be resilient to future climate and socio-economic change." Through systemic, efficient and locally adapted interventions (Faivre et al., 2017), NBS are a challenge and an opportunity that, when applied effectively, provide multiple environmental, economic and social benefits (Frantzeskaki et al., 2020).

However, the governance of NBS is a complex phenomenon, involving multiple social and political actors, premises and visions. The forms, or schemes, of governance according to the main actors promoting them are public authorities, private/for profit entities, civil society/non-for-profit organizations, academia or grassroots movements (Sekulova and Anguelovski, 2017). Engaging all actors in the process of implementing NBS is a potential solution in which all parties benefit, and where innovation, economic gains, biodiversity protection, and climate change could go hand in hand (Haase, 2021; Frantzeskaki et al., 2018). The partnering of different actors in the governance of NBS is perceived as a way to reduce barriers to adopting NBS on a wider scale, which is especially important in terms of implementing NBS projects in

cities (Dushkova and Haase, 2020). In light of e.g. shrinking public funds and long-term management of urban greening initiatives, NBS projects should involve businesses and the private sector (Perkins, 2010). Moreover, green business models of NBS create green job opportunities (Dushkova and Haase, 2020; WWF and International Labour Organization, 2020; Kopsieker et al., 2021).

No single, universally accepted classification of NBS has been implemented to date. However, in the typologies available, urban agriculture (UA), including allotment gardens (AGs), is considered an NBS (Almenar et al., 2021; Castellar et al., 2021) or fits into the characteristics of the proposed NBS types (Eggermont et al., 2015). At the most detailed level of the hierarchical NBS classification scheme proposed by Castellar et al. (2021), AGs are Spatial Mixed Vegetation Units, i.e. NBS spatial units in which a different form of vegetation (apart from trees) can be employed. As claimed in the NBS performance assessment provided by the same authors, AGs address almost all urban challenges (8 out of 10) mentioned by Raymond et al. (2017) in the ECLIPSE report, with the greatest degree of green space management, urban regeneration and social justice and only to a slightly lesser extent public health and water management. Moreover, AGs provide all categories of ecosystem services, i.e. cultural, provision, regulation, support, with cultural ecosystem services (CES) playing a dominant role¹. Due to its multifaceted and multifunctional nature, UA is one of NBS that offers a great variety of positive ecosystem services to address ecological, social, economic and health challenges in cities (Artmann and Sartison, 2018; Kingsley et al., 2021). However, urban design planners have still few chances to incorporate agriculture into the city (Gómez-Villarino and Ruiz-García, 2020) because of difficulties like the need to have knowledge and experience from numerous disciplines, e.g. architecture, ecology or engineering (Kabisch et al., 2016; Frantzeskaki, 2019; Frantzeskaki et al., 2020). Without the urban policymakers' will and support UA cannot develop its full social, ecological and economic potential (Azunre et al., 2019).

In the context of multi-layered crisis faced by cities, we explore how UA in general and AGs (public and private) in particular can be a mechanism based on nature that, apart from providing quality food, enhancing health and well-being, developing neighbourhood initiatives and launching business projects, increases urban resilience and orients the future towards sustainability.

Based on data from Seville, Spain, this study attempts to conduct an in-depth comparison of public and private AGs, determining whether they are competing or rather complementary solutions.

Our specific objectives are to:

- (1) assess the importance that gardeners attribute to the spectrum of environmental and socio-economic impacts provided by both types of AGs;
- (2) identify differences and similarities in the development and management of these AGs;
- (3) assess the demographic and socioeconomic profile of gardeners from public and private AGs;
- (4) discuss gardeners' and other stakeholders' opinions on AGs;
- (5) explore the roles that these types of AGs can play as solutions for urban policy challenges.

To the best of our knowledge, the issue of private AGs as NBS has not yet been addressed. The few studies that have so far been dedicated to urban gardens as NBS have focused on non-commodified forms of AGs and community gardens (e.g. Cabral et al., 2017a, 2017b; van der Jagt et al., 2017). Our study aims to contribute to closing this research gap. In a broader context, this article enriches the NBS discourse dominated by the tree planting narrative and scarce in case studies evaluating the full

¹ Nature-based solutions performance assessment is available at <https://icra.shinyapps.io/nbs-list/>

range of their potential benefits (Seddon et al., 2021). Our paper also responds to a call by Calvet-Mir and March (2019) to expand the scope of the empirical research on various urban gardening initiatives to include less-studied geographies, such as southern Europe.

1.1. Land ownership and governance of allotment gardens

The advent of AGs in the world is closely linked to philanthropic activity helping impoverished families who suffered very bad living conditions in rapidly industrializing cities. The land used for such initiatives was offered to the needy either by rich manufacturers, local authorities or parishes (Keshavarz and Bell, 2016). While over time plots were rented by people from different social strata, their availability did not reflect their market economy value and the rental fees were low. As the foundation of the allotment movement was its egalitarian, non-consumptive nature, all users paid the same low rent for their plot (Alter, 2010). The desire to have a plot remains important in the dynamics of the contemporary urban life (Crouch, 2003). In many European countries, there is growing interest in allotment gardening (Artmann and Breuste, 2020). In some countries, the surge in demand for AGs that has appeared in the past few years has led to the creation of private AGs (Hope and Ellis, 2009; Simon-Rojo et al., 2015). For instance, a company in the UK started renting out allotments to people at a much higher price than the municipality and received a mixed response (The Ecologist, 2010). At that time, there was a decrease in the supply of communal plots concomitant with an increase in demand (Mok et al., 2014).

Spain does not have a long tradition of allotment gardening, but its gardens have also had philanthropic character since the very beginning, e.g. Rio Tinto Mines. In some cases, plots were taken over illegally and thus were free of charge (Domene and Saurí, 2007; Morán, 2011). Two factors have influenced the rapid increase in the number of AGs in Spain: the economic crisis and pro-environmental initiatives of various green movements (see Conill et al., 2012; Puente-Asuero, 2014; Fernández Casadevante and Morán, 2015; Calvet-Mir and March, 2019). However, irrespective of the motivation behind establishing such gardens, the payment for using them, if any, was symbolic (Maćkiewicz et al., 2019). Nevertheless, the recent success of AGs in Spain, particularly in big cities, has encouraged private entities to lease and manage such areas. Therefore, there are currently three types of AGs in Spain, i.e. public, associative, and private (see Puente-Asuero, 2012a; Calvet-Mir and March, 2019; Palau-Salvador et al., 2019). Public AGs are located on public land and managed by municipalities or regional governments, while associative AGs are a combination of different partnerships, including public-private. Apart from these three categories, there are also illegal gardens i.e. squatted gardens (Calvet-Mir and March, 2019). For AGs to be considered private, the land must be private property. In these gardens, two agents are directly involved: owners and plot-holders. This means that these private AGs differ from non-commodified gardens, as their existence depends primarily on the will of private land owners.

During the years of the real estate boom (1998–2008), many land-owners wanted to sell or rent the agricultural land to construction companies to build houses (Espinosa-Seguí et al., 2017). Since the beginning of the economic crunch in 2008, the same owners have been thinking of renting their land to city dwellers looking for an agricultural experience. Secondly, for citizens holding a lease, a private AG is an opportunity to enter the rural world. Therefore, they need someone to provide them with a suitable plot, the equipment, and accompanying services. Interestingly, in the 19th and particularly from the mid-20th century onwards, Spaniards fled from the countryside to cities (*éxodo rural*), the consequences of which Gallar and Vara (2010) call a productive and also a cultural deagrarianization, i.e., the loss of interest in agriculture and rural life. Nowadays, however, Spanish city dwellers pay to have a plot.

2. The study area

2.1. Background

With 688,592 inhabitants (2019) in the city proper and over 1.52 million people in the larger metropolitan area, Seville is the fourth largest city in Spain and capital of Andalusia. With a population density of 4896.55 inhabitants/km², it is the fifth Spanish city in relation to access to green areas (11.27 m² per capita), well below the levels recommended by the United Nations (30 m² PC), and the European Union (26 m² PC) but slightly above the data recommended by the World Health Organization (9 m² PC) (Khalil, 2014). Seville City Council recognizes that the city faces important ecological challenges. In Seville, the consequences of climate change will manifest in the increase in the frequency and duration of dry spells, in addition to an average increase in temperatures between 2 and 5 °C (Regional Government of Andalusia (Junta de Andalucía), 2020). Other associated effects will also include the loss of biodiversity, health conditions due to an increase in pollutants and atmospheric particles, impacts on agriculture and water supply, and sudden periods of intense rainfall. Therefore, the commitment to multifunctional NBS such as urban gardens is considered one of the most effective ways to solve these problems (Seville City Council (Ayuntamiento de Sevilla), 2017 and 2020).

Agriculture in Seville has been present throughout its history, as evidenced by the remains left by different cultures (Romans,

Visigoths, Arabs). During the 16th and 17th centuries, Seville also became the gateway to America, and it was in its gardens that the first horticultural products of the New World were experimented on (Fernández, 1998). However, these gardens had little to do with the urban gardens that emerged in Europe from the first half of the 19th century. While the cities and societies of central and northern Europe were industrializing rapidly, changing into a landscape where factories replaced farmland and workers replaced peasants, Spanish cities in general and Seville in particular experienced a weak and late Industrial Revolution (Puente-Asuero, 2012b). In the 1950s and 1960s, the significant exodus from rural areas caused the expansion and development of cities. The high levels of job insecurity and poverty in peripheral neighbourhoods pushed many citizens to occupy vacant plots to create their own urban gardens. But very few or none have survived to this day, as they have been gradually eaten up by the real estate growth of the cities (Fernández and Moran, 2016).

It was only in 1991 that Seville saw the creation of its first public urban allotment in the Miraflores Park. Between this date and 2008, two public AGs and one community garden (CG) were established due to the pressure from the city's environmental associations. The socio-economic crisis produced by the bursting of the real estate bubble affected Seville in a powerful way and both citizens and the City Council looked to urban gardens as a means of food production and for combating job insecurity and social exclusion. Thus, nine new public urban gardens promoted by the municipal government or the regional government were created between 2008 and 2015 (Puente-Asuero, 2015; Seville City Council (Ayuntamiento de Sevilla), 2017). At present, there are 11 public AGs in total in Seville, occupying an area of 272,800 m² (Fig. 1). Their area per capita is 0.39 m², which means one 70 m² plot for 200 inhabitants. A demand study commissioned by the City showed that 30 % of Sevillians would be interested in cultivating an allotment, meaning the current supply is clearly insufficient (Seville City Council (Ayuntamiento de Sevilla), 2017). Not only citizens and public administrations see the potential of AGs in the city. There are also private initiatives interested in exploring the possibility of renting agricultural land to citizens who want to experiment with contact with the land. As a result, two private AGs appeared in 2011 and 2013 in the north of the city, one located within the city limits, the other next to the boundary but in a different municipal area.

Urban gardens in southern European countries have long been known to be highly vulnerable and lacking appreciation among policy-

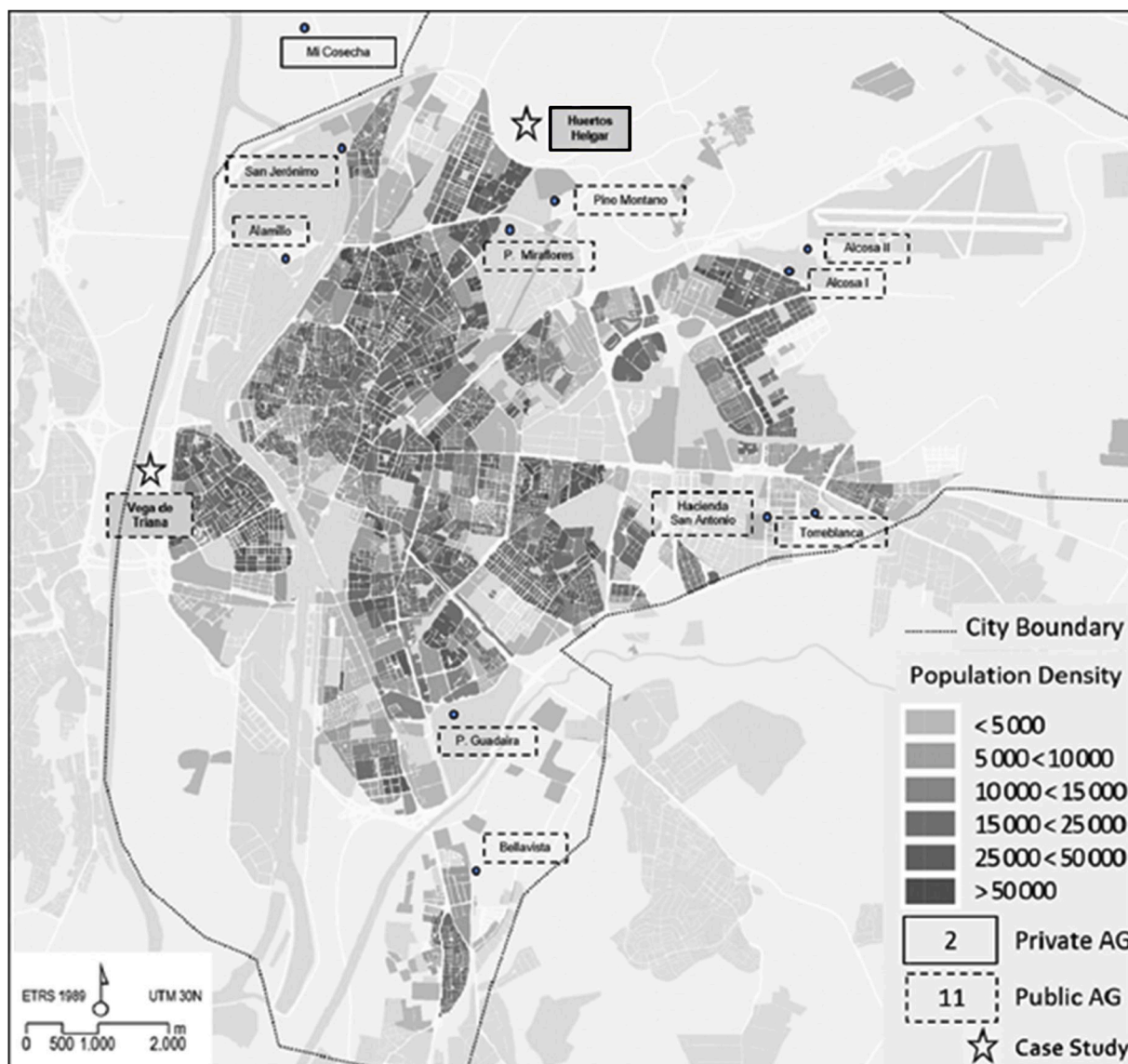


Fig. 1. Urban allotment gardens in Seville in 2020.

Source: own work

makers and large parts of the society (Domene and Saurí, 2007). However, this situation has improved in recent years (see e.g. Camps-Calvet et al., 2016; Calvet-Mir and March, 2019). In 2017, Seville City Council, through its Urban Planning Department, produced an ambitious plan "RUHS Network of allotment gardens in the city of Seville. Bases and strategies for the creation of the network of allotment gardens in Seville" for developing more public AGs and, as a result, give rise to 31 such gardens distributed in a balanced way throughout the city (Seville City Council (Ayuntamiento de Sevilla), 2017). However, this project is still to be implemented.

2.2. Case study

The selection of the Vega de Triana and Helgar AGs as a case study was motivated by their differing ownership status. Moreover, both are located within the city of Seville and were created at a similar time (2013–2015). Besides, none of them has been researched so far.

The Vega de Triana allotment garden (PUAG²) is located in the eastern part of the city, on the bank of the Guadalquivir river, within the newly established Metropolitan Park of the Vega de Triana, in the Triana District, which has an area of 9.38 km², 48,948 inhabitants and a population density of 5,218.34 people/km² (Seville City Council (Ayuntamiento de Sevilla), 2019). The area allocated to the AG constitutes 0.32 % of the park. In the spatial development plan, this area is intended for green areas. The land on which it is located is in the public domain, managed by the Junta de Andalucía.

The Helgar allotment garden (PRAG) is located in the northern part of the city, within a traditionally agricultural area, in the Northern District, which has an area of 38.10 km², 73,968 inhabitants and a population density of 1,941.42 people/km² (Seville City Council, 2019). Approximately half of the surface of the Northern District is rural land, hence the population density is lower than in Triana and the city average. The land on which this AG is located is private and managed by the owners. It is also the only private AG within the city of Seville. In the

² In the remaining text, the public allotment garden will be designated as PUAG and private PRAG.

spatial development plan, its area is intended for agriculture.

While both of these gardens were promoted in Seville as prior-NBS interventions, we argue that they can be incorporated and viewed as NBS. Although introduced only recently, the specific term "NBS" has a much longer history. These interventions were labelled using older green concept names or were simply described as protection, restoration or management of ecosystems, nature or biodiversity (see: Dushkova and Haase, 2020; Chausson et al., 2020; Seddon et al., 2021). As stated by Cabral et al. (2017a, 2017b) AGs can be viewed as one of the earliest deliberately implemented nature-based solutions to achieve multiple environmental and societal goals by promoting urban green spaces to provide benefits to human well-being.

3. Material and methods

An original methodological approach was used in the study, following the mixed-methods research concept (see e.g. Creswell and Clark, 2017). It involved desk research, supported by qualitative content analysis. First, to compile up-to-date background information on urban gardens in Seville, we conducted an initial screening of policy documents and grey literature including information from the local authorities in the RHUS, a study on foundations, and the strategies of the urban allotments network in the city of Seville. At this stage, we also analysed documents on the regulatory bases of cultivation and the use of gardens selected as a case study, delivered by the Neighbourhood Association Triana Norte (Seville City Council. Triana District (Ayuntamiento de Sevilla. Distrito Triana), 2015) and the owners of the Helgar allotment garden. Next, we organised 50-minute exploratory walks around the gardens with a group of their users. These walks provided hands-on insight into both types of AGs. Later, we conducted questionnaire interviews among randomly selected plot-holders from the AGs. Participation in the questionnaire was voluntary. The sample included 28 surveys and was not fully representative. However, conducting a fully representative study with such a small population would require questioning almost everyone, which was impossible for many reasons (e.g. some plots were abandoned, some people refused to participate in the study). In the Vega de Triana AG, the number of available plots is 35. Ten surveys were carried out in this AG, which at the confidence level of $\alpha = 0.95$ gives a 26 % maximum error. Helgar AG consists of a larger and variable number of plots - 63 at the time of the study. Eighteen questionnaires were conducted in this AG, which at the confidence level of $\alpha = 0.95$ gives a 20 % maximum error. The questionnaire included an ordered set of 63 questions, both open-ended and closed-ended, pertaining to 4 subject areas divided into 9 sections, i.e.: development of AG; profile of plot-holders; impacts of AGs as multi-functional NBS, different forms of AG ownership (public and private). First, we performed a detailed evaluation of AG development i.e. with regard to the entire garden, its common parts and individual plots. Next, we assessed the profile of the gardeners. To this end, the survey included questions regarding sex, age, citizenship, employment situation, affiliation to NGOs, economic situation, living conditions, time spent on the garden, and previous experience in urban gardens. We used this information to define the gardeners' profile by means of descriptive statistics. As the concept of NBS addresses multiple concerns simultaneously (see e.g. Eggermont et al., 2015; Kabisch et al., 2016), we subsequently assessed the environmental, social, economic, health and well-being impacts of AGs. This approach is our original proposal and is intended to examine environmental and socio-economic benefits at the same time. The environmental impacts of AGs investigated were urban biodiversity, heat island, air quality, water system, quantity of green spaces in the city. The respondents were asked to choose the importance attributed to individual impacts on a 5-point scale, from the lowest to the highest importance. Although, in contrast to the other questions, this set was of a more "expert nature", we consider the opinion of the plot-holders to be valuable, as the perception of the environmental issues by allotmenters translates directly into development of their plots.

Moreover, it is believed that citizen engagement can be a starting point for identifying potential NBS (see: the Special Eurobarometer survey on nature-based solutions No 444) and is recommended by e.g. van Ham and Klimmek (2017). The group of social impacts questions included social integration, family relationships, cultural activities, education and training, and the sense of belonging to a group. The economic impacts included the expenses and savings in the gardeners' budgets. On the expenditure side, the following were included: lease plus water plus management, plants and seeds, fertilizers, and phytosanitary products. The level of expenses was measured on the Likert scale (1–5) where 1 meant no cost and 5 a very high cost. On the savings side, food, tobacco and alcohol and games etc., health maintenance (medications, physical therapy, psychotherapy etc., and entertainment (e.g. going to the shopping mall). The level of savings was measured on the Likert scale (1–5) where 1 meant no savings and 5 a lot of savings. Health and well-being impacts included physical health, psychological health, relaxation and recreation, and general satisfaction with life. The respondents evaluated the importance attributed to individual impacts using a Likert scale (1–5), with 1 denoting the lowest and 5 the highest importance. Finally, both types of AG ownership were assessed. The respondents were asked whether they would prefer to have a plot in a public or private AG or whether the city needs more public or private AGs. Finally, the purposive sampling method was used (Etikan et al., 2016). We carried out 4 individual in-depth interviews to obtain qualitative data related to the results of the questionnaire surveys. The criterion for selecting participants for the sample was their different type of involvement in the AGs studied. Interviews were conducted with four individuals representing various stakeholders, i.e. owners of a private allotment garden (RPPRAG), local authorities (RPLA), public allotment gardeners (RPPUAG) and an external entity hired to carry out activities in the allotment gardens (RPAC). The interview questionnaire consisted of 15 questions focused on three issues: the relationship between public and private gardens, urban policies and planning, and the interdependences of AGs and local authorities. The interviews lasted between 40 min and 1 h

and were noted down. The next step involved analyzing the interviews to determine the opinion on the roles that both types of AG can play as solutions to urban policy challenges. All research was conducted from September to November 2020.

4. Results

4.1. Allotment gardens – rules, development, management

The PUAG covers an area of 2572 m², which constitutes only 0.32 % of the surrounding park. This park is poorly landscaped, as it consists mainly of compacted chalky soil (*albero*) and a few clumps of grass next to scattered small trees that are few and far between. There are also no trees around the garden. The PUAG is divided into 37 plots of approximately 50 m², 9 of which, according to the rules, were assigned to various non-profit NGOs from the district and two are training plots allocated to the district administration. The remaining 26 plots were leased free of charge to private individuals for 4 years, provided that they are adult residents of the district and have no tax arrears obligations with the city, no real estate of a rustic nature with irrigation in the province of Seville, and do not live with a person who already has a plot in any public AG in the city. After the allocation of plots in 2015, more than 200 interested persons remained on the waiting list.

The PRAG is 4700 m² in area and has an adjoining 2000 m² recreational and storage space. Around there is agricultural land characterized by a monoculture of potatoes or cotton and a great shortage of trees or other plants. In the PRUG, the area of the plots is variable and depends on the will of their users and the fees they pay. The minimum size is 30 m² and the monthly fee is EUR 1.5 per m². The minimum lease term is three months. Among the plot-holders, they were only private individuals. The size of the plots ranged from 30m² to 145 m² and

averaged 62.5 m². At the time of the study, there were 63 plots in the garden, all of which were taken. There were 40 people on the waiting list.

Both AGs are intended exclusively for organic agriculture and only the use of authorized products compliant with the standards for organic farming is allowed. The regulations of both gardens also pay a lot of attention to preventing water wastage and soil contamination. However, only in the PUAG do the goals and general principles of cultivation raise the issue of increasing biodiversity, including the cultivation of endangered, locally valued horticultural products. In the PRAG, the provisions are not as detailed, and the users are only asked to respect the natural environment. In the PUBG, the gardeners cannot sell their produce under pain of losing the plot. There are no such restrictions in the PRUA.

In both AGs, the plots were developed in similar yet slightly different ways. On average 85.5 % of area in the PUAG and 75.5 % in PRAG is occupied by crops. In the PUAG, the plot agro-diversity was greater, with 29 types of crops, 6 types of shrubs, 5 types of trees, types 6 of herbs and 11 types of flowers. In the PRAG, it was accordingly: 10, 2, 7, 8 and 3. Although planting trees and shrubs exceeding 1 m in height is prohibited in the PUAG, they were planted illegally on some plots. The area of the paths was 13.5 % and 14 %, respectively, and the compost area was 0.4 % and 0.5 %. However, in the PRAG, more land was allocated to the leisure area (5%) and shed (5%) than in the PUAG, where it was 0.6 % and 0%, respectively. This stems from differences in regulations. As regulations in the PUAG allow covered spaces only in communal areas and prohibits any type of construction and additional equipment on the plot, in the PRAG this type of constructions are permitted, provided that they are not permanently attached to the ground, and are approved by the owners and neighbours. There were some neglected and abandoned plots in the PUAG, some of which were taken over by gardeners who already had plots or even by people from the outside. Moreover, the training plots and those belonging to school associations were in a deplorable condition. There was no such negligence in the PRUA.

There were profound differences in the available infrastructure and development of the communal areas of the gardens. There is no toilet or access to drinking water in the PUAG nor in the entire park where it is located. Moreover, there is no lighting in the garden and the park is not sufficiently illuminated. Consequently, there are frequent break-ins and acts of vandalism, as evidenced by numerous holes in the fence, which are patched up by the gardeners. The only place where plot-holders can store their tools is a small office lock-up that has also been broken into repeatedly. Due to the impermeable concrete foundation of the fence, the garden is often flooded. There is no common composter in the garden, nor are there any covered, shaded areas accessible to gardeners. Planting trees in the garden is prohibited, there are no trees in common areas and there are very few trees on the outside of the fence. Thus, with typical summer temperatures of up to 50 °C, the comfort of being in the garden decreases significantly.

"They should plant trees in common areas. I have them although they are prohibited. Deciduous fruit trees are not allowed in this garden. But I don't get it. There are a lot of absurd rules. Those of trees, provision of taps, shrubs of more than one meter."

PUAG 03

By contrast, there is no theft nor break-ins in the PRAG. A high level of security is guaranteed by the proximity of an inhabited farm. In addition, gardeners have a recreational and storage space adjacent to the garden at their disposal. There are also some shade trees in this part. The spacious building located there has electricity, a toilet, a shower, a fridge, a place to rest and store tools. Although there is no drinking water, there is enough space to store it. The garden itself, however, lacks a communal rest area shaded and planted with trees, as the entire space is divided into plots for rent.

Management of the PUAG was assessed as poor by all the gardeners. They pointed out gross negligence, abandonment and lack of interest

from the administration.

"Allotment garden management is practically non-existent. They established the garden even though they didn't want to and that's why they abandoned it later on."

PUAG 03

"Lack of communication with the city administration.

Lack of meetings."

PUAG 07

"The district has totally abandoned its responsibilities. The technical commission, e.g. which is required to meet every 4 months, has not met for at least 3 years. There's no direct management body and no coordination between the various municipal authorities."

PUAG 03

In turn, management of the PRAG was assessed as good by 2/3 of users. However, there were also some critical opinions.

"When something breaks down and there is no water, they're in no hurry to repair it."

PRAG 17

"Actually, the management is done by the gardeners themselves (one or two responsible gardeners) and the owners do little."

PRAG 09

However, despite these individual complaints, the overall assessment of the management of the PRAG was positive.

4.2. Impacts of allotment gardens

Two main results can be highlighted as regards an evaluation of the impacts of public and private urban AGs. Firstly, the highest overall importance assigned to health and well-being by plot-holders from both types of gardens is 4.0 for the PUAG and 4.2 for PRAG (Table 1). Secondly, the assessment of overall environmental and social impacts is quite similar. Although gardeners from the PUAG rated both categories slightly higher, the differences were not large - 0.1 and 0.3, respectively. In both gardens, however, the overall environmental impact was rated slightly higher than the social one. Thus, on a general level, only the economic impacts were more differentiated. The PRUA gardeners rated the impact on their expenses higher, but also on the revenue side, their assessment was higher than that of PUAG gardeners. Among the expense-related economic impacts, the PRAG gardeners valued the lowest rent + water + management (2.7) i.e. significantly lower than plants and seeds (3.5) or organic fertilizers (3.5). In the PUAG, the most valued in each category were: quantity of green spaces in the city (4.4) followed by urban biodiversity (4.2), social integration (4.1) plants and seeds (2.7) health maintenance (2.8) and physical health (4.5), followed by mental health (4.4). In the PRAG, the most valued in each category were quantity of green spaces in the city (4.4), education and learning (3.5), plants and seeds (3.5) and organic fertilizers (3.5), health maintenance (4.1) and physical health (4.8), as well as mental health (4.8).

Among the partial impacts, the biggest difference was in the assessment of the garden's impact on urban biodiversity. The PUGA users rated it much higher (4.2) than gardeners from the PRAG (2.5).

4.3. Allotment gardeners – profile and previous experience

Regarding the profile of the plot-holders from the AGs, both significant differences and similarities were observed. The gender structure of PUAG users was clearly male-dominated (90 %). In the PRAG, men also made up the majority of users, but their share of the total was smaller (78 %). The gardeners from the PUAG were much older than those from the PRAG. Their age ranged from 56 to 75 (average 67), while for the

Table 1
Valuation of impacts concerning public and private urban AGs as multifunctional NBS.

IMPACTS	PUBLIC UAG value (1–5)	PRIVATE UAG value (1–5)	PUBLIC UAG average value	PRIVATE UAG average value
ENVIRONMENTAL				
urban biodiversity	4.2	2.5		
heat island	2.1	2.4		
air quality	2.8	2.9		
water system	1.5	2.2	3.0	2.9
quantity of green spaces in the city	4.4	4.4		
SOCIAL				
social integration	4.1	2.8		
family relationships	2.3	2.3		
cultural activities	2.5	1.9	2.9	2.6
education and learning	3.0	3.5		
sense of belonging to a group	2.7	2.5		
ECONOMIC				
Expenses in ...				
lease + water + management	1.0	2.7		
plants and seeds	2.7	3.5	1.9	3.1
organic fertilizers	2.4	3.5		
phytosanitary products*	1.6	2.8		
Savings on ...				
food	2.4	2.3		
tobacco, alcohol, games, etc.	1.3	2.4		
health maintenance	2.8	4.1	2.5	3.0
popular entertainment	3.6	3.4		
HEALTH & WELL-BEING				
physical health	4.5	4.8		
mental health	4.4	4.8		
relaxation and recreation	3.5	4.0	4.0	4.2
general satisfaction with life	3.6	3.2		

*Phytosanitary products authorized in organic agriculture.

Source: own work.

PRAG users, it was from 35 to 74 years (average 54.3). Moreover, the group of the youngest users included both men and women, and the mean age of women in the PRAG was 45. The vast majority (80 %) of PUAG gardeners were already retired, the rest unemployed (10 %) or employed (10 %). On the other hand, in the PRAG, the majority (55.6 %) of plot-holders were professionally active and the rest (44.4 %) were retired. 60 % of PUAG gardeners described their economic situation as good, and 30 % as sufficient, while only 10 % declared financial shortages. All gardeners from the PRAG described their economic situation as good. Plot-holders from both gardens had good housing conditions. For the PUAG gardeners, the average number of individuals per household was 1.9 and the living area 97 m², while in the case of PRAG allotment gardeners, it was 2.3 and 91.6 m², respectively. The PUAG plot-holders lived on average 2.3 km from the garden and rated this distance as very close (50 %) or reasonable (50 %). For gardeners from PRUA, the distance to the garden was greater - 3.9 km on average which they mainly perceived as reasonable (40 %) or distant (40 %). In the PUAG, a slightly larger percentage of gardeners (30 %) declared belonging to NGOs, while in PRAG it was 22 %. There were no foreigners

among the gardeners of the PUAG, while in the PRAG one allotment gardener was German. The gardeners from PUAG spent more time in the garden on average (15.5 h) than their PRAG counterparts (12.2 h). The vast majority (80 %) of gardeners from PUAG enjoyed having a plot for the first time. Only a few had prior experience in a school or family garden. In the PRAG, half of the plot-holders were already experienced, and more than 1/5 of the gardeners had previously had a plot in a public AG. In the PRAG, one of the gardeners had a vegetable stand in the city, and the products from the allotment garden were also available there and complemented other vegetables offered. Such a situation did not take place in the PUAG, where the sale of produce is prohibited.

4.4. Public or Private – compilation of opinions

When asked if they would prefer to have a plot in a private or public AG, half of the PUAG gardeners opted for a public garden, while the other half claimed that it did not matter to them. In turn, 2/3 of PRAG gardeners chose a private garden, 27.8 % a public garden, and 5.5 % had no preferences. The representative of the PRAG owners pointed out that the choice of private garden results from the shortage of public gardens. However, this is not always the case. Some people consciously give up the public garden.

"Private gardens are more expensive but here I have more independence and freedom to do whatever I want."

PRAG 03

"There are too many rules in public gardens."

PRAG 05

"In public gardens you also have to pay for shared things and they are more "watched" by the managing association."

PRAG 03

All the gardeners and representatives interviewed agreed that there should be more AGs in the city. The representative of PUAG's plot-holders advocated increasing the number of such gardens.

"PUBLIC, more public gardens. We are really lagging behind compared to other places in Europe, so as the first step we would have to ensure that each neighbourhood has at least one public AG."

RPPUAG

A representative of the local authorities spoke out in a similar vein, though in a slightly milder form. This person also honestly admitted that he/she did not know private AGs.

"The neighbourhoods built by the City Council (Official Protection Housing) could each have an AG. (...) I do not know any private AGs."

RPLA

Other representatives argued similarly, paying attention to the type of urban space.

"There should be an AG in each neighbourhood, as there is a lot of demand. They should be public if it is an open neighbourhood and the management is performed by the City Council. If it is a gated community and the management is carried out by the homeowners, it could be private."

RPAC

"There should be more AGs in the neighbourhoods and it would be a good idea if new developments were built with AGs. If the urban development is private, the logical thing is that the AGs are private, that is, for the residents of the urbanization. If the urbanization is public, they can be public, managed by the City Council."

RPPRAG

Both gardeners from PUAG (90 %) and PRAG (100 %) were of the opinion that public gardens and private gardens do not compete with each other, but complement each other. The representatives selected for the interview were of the same opinion as well.

"They are complementary. They are alternative."

PRAG 08

"I think there is no room for rivalry. I don't see that there is competition between them."

PUAG 03

Three out of four representatives were of the opinion that the AGs, both public and private are not properly acknowledged by the city. At the same time, they claimed that the gardens are highly appreciated by local inhabitants.

"No, they are not recognized by the City Council at all.

By citizens, yes, they are."

RPAC

"The AGs are recognized and valued by citizens but very little by politicians and the City Council. Public AGs are a little more valued by the City Council but private AGs receive very little or no recognition; they don't even know we exist."

RPPRAG

Only the representative of the local authorities was of a different opinion and he/she said that AGs are recognized by the city, which is making efforts to improve their management.

5. Discussion

5.1. Different gardens similar impacts

Coincidentally, both PUAG and PRAG gardeners highlighted repercussions on health and well-being above other beneficial impacts. This is in line with other publications recognizing that there is strong evidence for positive health effects of urban nature, and supports the academic arguments for NBS's contribution to improving health and well-being (Panno et al., 2017; van den Bosch and Sang, 2017; Kolokotsa et al., 2020). This is also in line with the studies that highlight the spatial importance of AGs not only for physical but also mental health (Van den Berg et al., 2010; Hawkins et al., 2013; Genter et al., 2015; Soga et al., 2017). The gardeners particularly emphasized that physical exercise like walking, bending over, being in constant movement during the time spent in the garden, has an impact on people's physical and mental improvement. Some stressed that the possibility of disconnecting with technology and connecting with nature is the best form of relaxation from the 21st-century life. Moreover, in this study, gardeners from both AGs saw greater benefit in the quality and taste of the products than in the amount of food obtained from the garden. Faced with a diet based on meat, sugars and fats, gardeners recognize the importance of AGs as a tool for maintaining a healthy diet, which once again proves that AGs are NBS with a particularly large impact on the health and well-being of their users (Kingsley et al., 2021). This also corroborates previous research that shows that AGs have become more recreation and health than quantitative food productivity-oriented (Genter et al., 2015; Artmann and Breuste, 2020). Understanding the significance of the contribution of AGs as a nature based-solution toward well-being is essential in the context, where there is an increasing political interest in public health, in well-being agendas and in the impacts of the environment on mental and physical health (Cabral et al., 2017a, 2017b). This understanding is all the more important in the current pandemic situation, which has spectacularly increased demand for allotment plots (Maćkiewicz et al., 2021)

Apart from these benefits of AGs, plot-holders from both gardens

gave the highest rating to AGs' positive impact on the amount of green space in the city. At the same time, it was also the most important environmental impact. This means that gardeners appreciate the importance of these extra green spaces in the city. The PUAG is an example of the revitalization of free space without landscaping value, while the PRUA is an example of the revival of former agricultural land that was not used by the owners and was at risk of environmental degradation. In both cases, AGs are NBS that enrich the quality of city's landscape and bring floral and animal biodiversity to their immediate surroundings. However, the assessment of the garden's impact on urban biodiversity has varied considerably. The PUGA gardeners rated it significantly higher than their PRAG counterparts. This difference is confirmed by the greater agro-diversity of PUAG plots. Moreover, the need to increase biodiversity was emphasized only by the goals and principles of PUAG cultivation. On the other hand, however, the area of the PUAG is small, which limits its importance for urban biodiversity (see Borysiak et al., 2017). The ban on planting trees is also not conducive to enhancing biodiversity. In the case of both gardens, their influence on mitigating the heat island effect was considered relatively low. The reasons for this can be found in the insufficient number of trees in the gardens, as well as in their immediate surroundings (see e.g. Hiemstra et al., 2017). Normally, in AGs trees are not planted in the space reserved for growing vegetables as they prevent the arrival of solar rays to these small plants. Similarly, tree roots can compete for water and nutrients with horticultural plants in the garden. Therefore, it is recommended to designate adjoining spaces for trees, preferably fruit trees, that enrich and improve the biodiversity and can help to cool the air through evaporation, while simultaneously providing shade helping to mitigate the urban heat island effect (Kopsieker et al., 2021). AGs are not the largest contributors to climate mitigation at the city level, as parks' contribution is greater due to the larger amount of biomass in large trees. Their role in microclimate regulation is highlighted when gardens are interlinked with other green spaces, thus enhancing their performance (Cabral et al., 2017a, 2017b). However, in the case of Seville, where the climate challenges are particularly demanding, the importance of the AGs themselves in this regard should be reinforced. Planting trees in common parts of the AGs, as well as in their immediate surroundings is recommended in the strategy document for the creation of the network of AGs in Seville. However, this document is still to be implemented and applies only to public AGs. Importantly, the overall environmental impact was rated slightly higher than the social one. On a general level, PUGA gardeners rated the social impact slightly higher than their PRAG counterparts. The biggest difference concerned the importance of social integration, which was much more important for PUAG plot-holders than for PRAG gardeners. The PUAG gardeners are mostly retired and their households are less numerous than PRAG gardeners. They spend more time in the garden. This is probably why they value social integration more. While in the AGs regarded by Xie and Bulkely (2020) as NBS social integration and creating a sense of belonging were considered very important, our research did not confirm this role especially in the case of PRUG. In both gardens, plot-holders believed that the AG did not significantly affect their sense of belonging to a group, and they rated the importance of the AG for education and learning higher. This corroborates the results of previous research (Camps-Calvet et al., 2016) and highlights the potential of AG in environmental education and understanding of natural processes and building socio-ecological resilience (Cabral et al., 2017a, 2017b). Among the economic impacts, the biggest differences were in the estimation of the AG's general impact on gardeners' expenses. PRAG gardeners rated them higher than their PUAG counterparts, although the cost of lease, water and management was not prohibitive for them. They believed, however, that they spend quite a lot on plants, seeds and organic fertilizers. These expenses, though estimated lower, were also the most significant for PUAG gardeners. In both AGs, the garden was not considered a tool allowing for significant savings on food, but rather seen as a way to obtain variety of high-quality healthy local produce.

However, this did come at some cost. While the gardeners in both gardens felt that the AG allowed them to spend less on low-quality entertainment (e.g. going to the mall), PRAG gardeners appreciated the savings in health expenses even more. These findings again indicate that having an AG is primarily health-driven.

5.2. Different gardens, different gardeners

It might be thought that urban AGs are a proposal for lower income classes. As people with higher incomes often have more access to recreational uses of nature, for example, through tourism or privately owned gardens (e.g. Breuste, 2010; Camps-Calvet et al., 2016). However, the analysis showed that this was not the case here. The financial and housing situation of the gardeners in both AGs was good, and the differences in this respect were minimal, although in both gardens only a few gardeners had houses with a patio or garden. There were differences in age, employment status and gender, with significantly older and retired male dominated gardeners predominant in the public garden compared to younger and employed people, with a greater proportion of women in the private garden. This indicates that the economic aspect was not the main criterion for entering one or the other AG. This choice is more linked to the freedom of cultivation and access that private gardens offer compared to public ones. The supply of public gardens is too small to meet the needs. Furthermore, the existence of norms and rules that regulate public gardens is a positive aspect to organize coexistence in AGs, but at the same time, it can involve added pressure and stress. Therefore young working people who only want to have meaningful free time in the city shared with nature and friends or family end up opting for the private garden. Moreover, the fact that access to a private garden does not require registration in a given district and paying taxes in a given city means that people who do not meet the above conditions are also interested in such gardens, e.g. those who are only temporarily present in a given place. This is different in the PUAG, e.g. if the PUAG gardener moves to another city district, they have to give up the plot. A more flexible time of commitment also seems to be important. In the PUAG, the plot is allocated for several years, while in the PRAG, it may be three months and the maximum usage time is not limited. Although both gardens are NBS addressed to the local community, the difference in the way they are governed makes their user profiles complementary.

5.3. Challenges for urban policies

We can consider urban AGs as a microcosm in which citizens interrelate with each other and the city through nature. In this sense, we consider AGs as a NBS that should be open and available to all citizens. However, in Seville this is currently not possible as the demand for public gardens is greater than the existing supply. This is one of the reasons why private gardens are successful. They offer equipment and a service based on nature that complements the public offer, which is beneficial both for the citizens who choose this option and for the city as a whole, as it expands the green infrastructure. But could the emergence of private AGs automatically mean the commodification of AGs in Seville, exacerbating environmental injustice and environmental exclusion? We believe this is not the case. There are still insufficient private AGs and their impact is so relatively small in the city as a whole that this cannot be affirmed. Undoubtedly, however, private AGs might seem something not necessarily positive, especially to some activists, i.e. commodified, capitalist, neoliberal etc. They have nothing to do with the radical process of reclaiming the right to the city, and the right to produce in urban gardens, which have proliferated in Spain since the economic crisis of 2007–2008 (see e.g. Espinosa-Seguí et al., 2017; Calvet-Mir and March, 2019). However, it cannot be denied that such gardens also contribute to appreciation of the agricultural land and agriculture within the city limits. Moreover, as in our case, they restore the productivity of the previously fallow agricultural land and provide

jobs to a small, local family business. At the same time, the PRUG allows its users to earn extra money by selling their produce, although this is happening only on a marginal scale as of now. In addition, private AGs liberate plot-holders from institutional norms and interventions in the garden. They free gardeners from quarrels or conflicts with the City Council, which can sometimes be politicized. Last but not least, they free users from the compulsion of any political or ideological involvement. In this sense, private AGs are one more formula of urban gardening that diversifies its offer.

In the light of the respondents' answers, public and private AGs are not competitors, but complement each other. Both gardens offer solutions to different people in Seville. We believe, however, that the emergence of private gardens should become an impulse for in-depth revision of spatial policies, physical planning and multilevel governance frameworks. Because of their multi-functionality AGs have the potential to effectively engage multiple actors, including private sector, which is often excluded from policy making and the planning process (Xie and Bulkeley, 2020). Despite the increase in urban gardens in Andalusia, there is still a huge administrative and governance gap regarding these spaces. There are no national or regional laws that regulate AGs' management and operations. In Seville, neither the Local Agenda 21 (Seville City Council Department of Environment (Ayuntamiento de Sevilla Delegación de Medio Ambiente), 2007) nor the General Plan for Urban Planning (Seville City Council (Ayuntamiento de Sevilla), 2007), the city's highest urban planning instrument, ever mentions or addresses the issue of urban gardens. These gardens, both public and private, exist in Seville but are not legally defined. Like our interlocutors, we believe that the city should significantly expand the network of public AGs, but without forgetting about the existence and potential of private AGs. As NBS, public gardens are predestined to take greater account of socio-ecological justice and social cohesion. However, our study shows that no matter how developed institutional norms might be, they are not enough for this to happen. Among other things, effective management is needed, as well as the allocation of a sufficient budget for the implementation and maintenance of AGs (see e.g. Hansen et al., 2015; Kabisch, 2015). In the case of public AGs in Seville, qualified garden management personnel should be provided instead of part-time staff with unstable contracts. We also believe that the model of AG that has so far prevailed in municipal gardens throughout Spain, i.e. individual leisure and food production for retirees, should definitely not be the only one available in the public offering, the reason being that it is not a one-size-fits-all solution. Formulas of public urban gardens should be more varied, for example, Barcelona's urban gardens from the Empty Plots Plan that foster social entrepreneurship on municipal vacant plots seems to set a good direction in this regard (Torrás, 2015; Calvet-Mir and March, 2019).

To avoid the great legal uncertainty that AGs witness today, planned and specific regulatory instruments are urgently needed to protect and organize diverse types of urban gardens that emerged in the urban fabric of Seville and integrate them into the city's green space system. These instruments should also serve to strengthen the importance of both types of AGs for the mitigation of unfavourable climatic conditions. Obviously, private AGs can be less subject to municipal policy. In such a case, imposing the obligation to introduce standards that increase the environmental impact, in particular, the obligation to allocate part of the land to areas covered with trees, is much more difficult than in the case of public ones. It seems that it would be more likely if the private gardens were noticed by the local authorities and their pro-ecological activities were enhanced in some way e.g. subsidies, lower taxes, etc.

5.4. Limitations of the study

Our study has certain limitations. First of all, it is not fully representative. Furthermore, our proposal of a simultaneous assessment of the environmental, social, economic, health and well-being impacts of AGs is certainly open to criticism and discussion. Finally, this study

refers to the local context of a given city. At the same time, however, this is also an advantage of our research because as stated by e.g. Dushkova and Hasse (2020), the same NBS may have a different impact in different local contexts. That is why it is so important to be able to tailor the NBS to specific local conditions (Seddon et al., 2021). Our paper serves as an initial attempt to assess public and private urban AGs as multifunctional NBS. With this preliminary comparative study we intended to initiate a broader debate, but there is no doubt that more extensive and in-depth research is required in the future.

6. Conclusions

The accelerated changes that we are experiencing (socioeconomic crisis and COVID-19) and their increasing complexity create scenarios of great uncertainty that must be faced with flexible, adaptable and effective solutions. In this respect, AGs have an vital role as they can offer nature-based solutions to address important policy challenges in urban areas (Camps-Calvet et al., 2016; Dushkova and Hasse 2020; Frantzeskaki et al., 2020).

Our study reveals that both types of urban AGs, public and private, proved to be NBS with particularly positive impacts on the health and well-being of their users. In both gardens, the overall environmental impact was rated slightly higher than the social one. However, the assessment of the garden’s impact on urban biodiversity was rated significantly higher in the PUAG. In the case of Seville, the city that faces demanding challenges related to climate change, the role of both types of AGs in mitigating unfavourable climatic conditions, e.g. urban heat island, can and should be increased and further developed.

The desire to create a wide network of public AGs in Seville shows that urban policies are beginning to consider urban gardens as NBS of a flexible, adaptable and effective nature. However, this network and these policies are born of a partial vision since, inter alia, they exclude private gardens and do not consider them towards the future. The invisibility of public gardens is being corrected little by little, although

the approach to their potential and various possibilities of functioning still remains too limited. Private gardens still remain hidden from the majority of citizens and politicians of Seville. In the current complex scenario, public and private AGs must have territorial, legal and institutional frameworks within all urban policies that explore NBS.

We hope that our research will offer inspiring insights contributing to both the revision of city policies and efficient implementation of diverse types of urban gardens.

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Dedication

To this light of Seville

Declaration of Competing Interest

The authors report no declarations of interest.

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Appendix A

Interview questionnaire with allotment gardeners

ALLOTMENT GARDEN	Interview N°			
1 ALLOTMENT GARDEN AND SURROUNDINGS				
How do you go to the garden: on foot, by car, by bicycle, by motorcycle, by public transport?				
Approx. distance in km				
How long does it take to arrive there?				
How do you rate the location of the garden?				
1 (very close)	2 (close)	3 (reasonable distance)	4 (far)	5 (very far)
Why is that?				
Plot size				
How do you rate the size of the plot?				
1 (too small)	2 (small)	3 (sufficient)	4 (a little too big)	5 (too big)
Would you like to have a bigger/smaller plot? Why?				
How is the plot divided?				
Area under cultivation %	Paths, entrance %	Leisure area %	Lawn %	Other uses (compost, storage, etc.) %
Do you take biodiversity (local plants, plants for pollinators, etc.) into account when developing the plot?				
Yes/No. Why?				
2 PREVIOUS EXPERIENCE, MOTIVATION AND TRAINING				
Is this your first garden? If NO, where did you previously garden?				
What was your main motivation for having a garden?				
Did you have previous knowledge of horticulture before having a garden?				
Has the garden helped you to learn about agricultural and environmental issues? If YES, where and how did you learn about them?				
Would you be interested in receiving training on agricultural topics (pests, organic seeds, compost...)?				
If the answer is YES, point out the most interesting topics.				
How much time do you spend in the garden per week?			hours	
How do you spend your time in the garden?				

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ALLOTMENT GARDEN		Interview N°			
Cultivate %	Socialise with other gardeners %	Spend time with Family %	Spend time with friends %	Other (workshops, school visits...) %	
3 CULTIVATION METHOD AND CROPS					
Do you have any kind of organic farming certification?					
Origin of seeds (several options can be ticked).					
Supermarket %	Specialised store (Nursery) %	Exchange %	Seed bank %	Self-production %	
Fertilisers	Organic fertilisers: %				
Chemical fertilisers: %	Manure: %				
	Guano: %				
	Compost: %				
Phytosanitary Products (pests and plant diseases)?		Organic products, methods: %			
Chemical products: %					
Water use (Irrigation)					
Traditional / flooding %	Water-optimised irrigation systems (drip, sprinklers, drip irrigation, sprinklers)%				
		1.			
		2.			
		3.			
		4.			
		5.			
		6.			
		7.			
		8.			
		9.			
		10.			
		...			
		trees			
		bushes			
		aromatic plants/			
		herbs			
		flowers			
List the main agricultural products you grow (from the most to the least important?)					
		6.			
		7.			
		8.			
		9.			
		10.			
		...			
		trees			
		bushes			
		aromatic plants/			
		herbs			
		flowers			
List other plants you have in the garden (trees, aromatic plants, flowers, etc).					
Do you know if you have exotic or invasive plants on your plot? Which ones?					
4 ECOLOGICAL IMPACTS (1–5) – from the lowest to the highest					
How do you assess the economic impacts of the garden?					
	1	2	3	4	5
The garden improves urban biodiversity (flora and fauna).					
Reduces the heat island effect (lowers temperature and increases humidity)					
Improves air quality					
Improves the city's water system					
Increases the area of green spaces in the city					
What is the most important contribution you make to the environment?					
5 SOCIAL IMPACTS					
How do you assess the social impacts of the garden?					
	1 (none)	2 (a little)	3 (some)	4 (quite a lot)	5 (a lot)
Social integration (relationships with neighbors / friends)					
Family relationships					
Recreational use					
Cultural activities					
Education/ Training					
Physical health					
Mental health					
Sense of belonging to a group					
6 ECONOMIC IMPACTS					
How do you assess the economic impacts of the garden?					
EXPENSES IN...	1 (none)	2 (a little)	3 (some)	4 (quite a lot)	5 (a lot)
Lease + water + management					
Plants & seeds					
Organic fertilisers					
Phytosanitary products					
Do you consider having a garden cheap or expensive? Why?					
SAVINGS ON...	1 (none)	2 (a little)	3 (some)	4 (quite a lot)	5 (a lot)
Food					
Tabacco, alcohol, games, etc.					
Health maintenance (medication, physiotherapy, psychotherapy, etc.)					
Popular entertainment (going to the shopping centre, gym, etc.)					
Which economic benefit do you value most? Why?					

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ALLOTMENT GARDEN	Interview N°				
7 OWNERSHIP AND MANAGEMENT					
Do you belong to an association?					
What do you think about the management of the garden?					
Observed needs and shortcomings					
Management recommendations					
Would you prefer to have your plot in a private or public garden, or it doesn't matter?					
Are private and public gardens rivaling or complementary? Why?					
Should there be more private or more public gardens?					
8 GENERAL SATISFACTION					
Has the garden increased your overall satisfaction with life? Yes/No.					
If yes, how?					
1 (very little)	2 (a little)	3 (significantly)	4 (a lot)	5 (very much so)	
Why? Please justify your opinion.					
What is the greatest benefit of having a garden?					
Please rate your satisfaction with the allotment garden from 1 to 10, with 10 being the highest.					
Why? Please justify your opinion.					
9 GENERAL INFORMATION					
Gender	Male	Female	Age		
Employment status	Student	Employee	Retired / Early retirement	Unemployed	
Civil Status	Married	Single	Divorced	Widow/er	
Family members	Children	Adults	Dependent persons (elderly, disabled, etc.)		
Family economic situation	Good (we have no problems)	Enough (we made ends meet)	Insufficient (we have problems)		
Housing type	Flat	House			
	Surface (m ²)	Surface (m ²)	With patio / garden		

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