

## Article

# Allotment Garden Products as Contribution to Sustainable and Resilient Cities: An Analysis in Leipzig, Germany

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**Abstract:** The food supply and the consumption of resources are already central challenges for the growing world population and increasing demands. Urban areas in particular face problems of resilience and sustainability. The development of alternative food systems by, e.g., urban gardening, can contribute to meet targets of sustainable consumption, inclusive economy, and resilient food systems of cities. Our research presents insights into the available harvest of products from allotments. In addition, the interest and motivation of gardeners to distribute products from their allotments was investigated. The analysis was based on a structured and standardized questionnaire with more than 90 allotment gardeners in Leipzig. Data were analyzed by means of descriptive statistics. Our results showed that especially zucchinis, tomatoes, berries, and apples could be distributed to consumers; however, the greatest obstacle involves the legal framework to economically distribute products from these allotments. On the other hand, some respondents showed that income generation from allotment products is less important than the enjoyment of the garden and the charitable goal of action. They suggested an organized distribution system of surplus from allotments to particularly disadvantaged people. This paper encourages re-examination of the conventional urban–rural relations, the production–consumption relationships, and the norms of economic activity.

**Keywords:** citizen; diverse economy; food sharing; food systems; garden plot; resilience; sustainability; urban gardening; vegetables



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## 1. Introduction

According to the United Nations (UN) projections of 2022, the world population will grow to between 9.4 billion and 10 billion people by 2050 [1]. Food insecurity, the overexploitation of resources, and climate change are already central problems of the world's population today and will remain so in the future. Food systems are centrally linked to climate change in several respects. They are particularly part of the problem, affected by the impacts of climate change, and at the same time part of the solution. For food production, there are many possible solutions for sustainable management. The target of the European Union (EU) to tackle climate change and related risks has launched programs like the “New European Bauhaus” [2] or “Agriculture & Innovation” [3], both supporting and funding the research for and testing of new innovative concepts. While the New European Bauhaus is dealing with all forms of societal subsections, “Agriculture & Innovation” particularly addresses food and farming related innovations. “Short Food Supply Chains” are considered as a possible solution for more sustainable food systems. In this context, small-scale farmers are the focus of research [3]. In general, debates about de-growth and the issue of sustainability are becoming increasingly relevant in research in economic geography, especially in Environmental Economic Geography (EEG, [4]). Food systems, in turn, are seen as a relevant research field, as the funding and research agenda by the EU shows [4]. The concept of “Alternative Food Networks”, “Short Food Supply Chains”,

or “Geographies of Alternative Food” could serve as a solution [4–8]. All three concepts are closely related to the idea of the “diverse economy”, which is a critical counterpoint to the “neoliberal order and entrepreneurial food production” [9] (p. 201), and looks at concrete actions in practice that are an alternative to the capitalist economy. According to Winter [10] and Whatmore et al. [11], Alternative Food Networks are characterized by three important features: First, such networks would strive to redistribute value creation, contrary to the logic of mass production. Second, they would re-establish trust between consumers and producers. Third, they would express new forms of political connections and market governance ([11], p. 389 cited in [10] p. 666). The creation of alternative food systems is also closely related to the economic and social inclusion capacity of societies. Braun et al. [4] see Alternative Food Networks as a “means to build a socially inclusive economic system” [4] (p. 125) that creates cohesion through participation while bringing together social and environmental issues. Alternative Food Networks are also seen as closely related to the “right to the city”. The negotiation of the “right to the city” would, among other things, take place in connection with semi-legal practices of urban gardening, such as guerrilla gardening [4] (p. 125).

Allotment gardens contribute to sustainable urban life as green infrastructure (e.g., [12–14]). They can also be seen and valued as space for a different and more sustainable idea of economy and a potential contribution to alternative trade structures. Increasingly, they are seen as a possible alternative to the formal market and for empowerment of disadvantaged groups [15] (p. 195). Environmental education—of high value and relevance, especially for an urban population—can also take place in allotment gardens [16] (p. 5). According to Buckingham [15], urban gardening promotes sharing (the “gift culture”) of products, seeds, or labor. Urban gardening has an integrative power, can strengthen local communities, and ensures that marginalized groups are included more [15] (p. 203). According to Garside et al. [17], the right approach for inclusion of such groups is to “link [...] supply and demand with local economies without capital accumulation” [17] (p. 132). Alternative trade patterns, communal subsidies, or production for a market with alternative forms of currency need to be explored [15,18]. The quite radical approach of a “Diverse Economy” by Gibson-Graham et al. [18] calls for us to rethink the perceived economic system and to rethink our role as part of the economic system, because true prosperity in the sense of well-being cannot be sufficiently elaborated in theory nor produced in practice in the present economic system. This rethinking includes seeing diverse forms of economic action as essential for a functioning society and for a functioning economy. According to them, the way in which the economy is understood must be reframed so that the already existing “against reality” [18] (p. 3) is taken into account. By “against reality”, the authors Gibson-Graham et al. [18] and Buckingham [15] mean not only that various alternative forms of economic activity are relevant to the economy as a whole, but it also means that alternative “outputs” of economic activity should be considered. According to them, “well-being” in particular is a relevant measure of the output of economic activity.

Due to the multiple global socio-economic crises, especially of capitalism [6] (p. 54), and the growing urgency for societies to organize themselves in an ecologically, socially, and economically sustainable way in order to establish long-term stability, both the concept of a “Diverse Economy” and the concept of Alternative Food Networks, which point out alternatives, have become even more relevant. Regional, seasonal, organic, unpackaged, and directly sold food is desirable considering its low carbon footprint [19] (p. 4). At the same time, these concepts represent an opportunity to avoid overproduction and waste [20] (p. 439), [21]. Against this background, our research explores the possibility of making products from private gardens accessible to a local market by means of both donations and sales.

The rethinking of the role of the city as part of the food economy has been widely discussed internationally, mainly in the context of sustainable consumption, social and environmental justice, access to healthy food, urban–rural relations, peri-urbanization, and resilience (e.g., [4,12,22–27]). In this context, many authors address the general issue of

repositioning local, urban food and planning implementation (e.g., [27–29]). There are calls for integration and greater recognition of irregular sales of privately grown fruits and vegetables, and the view that such street sales enrich a city [30]. Furthermore, there is a lot of literature dealing with community gardens and their potential in a social sense but also as a counter design to globalized food production [23,27,31]. Community gardens are usually associated with foodsharing (e.g., [23]).

Foodsharing is still a very new field of research and not yet clearly defined as a research subject [32] (p. 146). In principle, something is considered foodsharing when food is given away by a private person or a company to the general public, whereby this can happen both non-commercially and commercially ([24], p. 513, [33]). The difference between commercial foodsharing and an “ordinary” commercial sale lies in the underlying idea and the aim of the sharing. Foodsharing focuses on the idea of avoiding wasting food as much as possible and strengthening the participation of everyone in a society in healthy eating. Foodsharing, in its distinction from the market, therefore always includes a normative component as the ideal core of sharing. Davies [34] also repeatedly refers to foodsharing as “food democracy” [34] (p. 34). Foodsharing is therefore directly related to sustainability but also to the concept of diverse economy (e.g., [24,32,34,35]).

A few papers examine, in the context of sustainability and food justice, the potential of allotments in terms of quantity of produced food and ethical aspects of such a production [14,31,36,37]. For example, Cook [31] deals with the possible marketing and cultivation of quantity in allotment gardens. This work focuses on the question of harvest and sales success in terms of quantity and income. By giving away surplus produce from allotments, a contribution could be made on a local level and on a small scale to a sustainable urban food economy and a more socially fair distribution of fruits and vegetables. Furthermore, small-scale and diverse food production in cities could make them resilient to climate-related risks. It would contribute to the securing of food in cities despite possible crop failures in production regions. The initiative by the Food and Agriculture Organization of the United Nations (FAO) “Food for the Cities”, founded in 2001, calls for strategies for more resilient cities in order to secure both food as well as an intact environment [38] (p. 41). They see the management of food systems in a multi-government approach with the involvement of civil society as an important component for sustainable and secured food [38] (p. 42).

In our study, we refer both to sustainability and resilience of cities. Both concepts share some similarities; for example, avoiding negative consequences of societal, economic, or ecological problems [39]. Generally speaking, in our study we refer to urban resilience as a city’s system ability to react on various external disturbances [40]. Moreover, urban resilience is closely related to food security because dependencies often exist over long-distances [12]. Green spaces and people’s knowledge about growing fruits and vegetables can be relevant factors for local urban food security, even in times of crisis, and a response to external risks as a form of autonomy, and thus also a solution in the sense of a resilient city [12] (p. 1321). The implementation of planning and management strategies adapted to changes that pose an external risk depend in turn on how quickly a change takes place [41,42]. Climate change is a slow process of change and therefore carries the risk of a lack of response from governance actors [41,42]. It is easier to test new management strategies in a resilient city and experimental learning can create sustainable systems [42] (p. 456). The Intergovernmental Panel on Climate Change (IPCC) has already foreseen in 2007 a high probability that ecosystems will lose their resilient status before the end of this century, caused by a multitude and accumulation of negative external influences; for example, by “flooding, drought, wildfire, insects, ocean acidification [...], land use change, pollution, [and] over-exploitation of resources” [43] (p. 5). In the latest IPCC report, published in 2022, the extent of the risks is once again highlighted and it is pointed out that negative effects on society and nature could occur more strongly and earlier than expected [44] (p. 13). The scenarios suggest that in the near future, i.e., today until 2040, the extent of climate-related risks for humans and the environment will mainly depend on adaptation measures and

not on reducing emissions [44]. The IPCC Special Report identifies indigenous and local knowledge as a key to responding to these increasing risks, i.e., to resilience [35] (p. 439). Local, self-organized and highly connected food production also makes cities more resilient in social terms. Self-initiatives, local networks, and bottom-up processes are seen as very relevant for urban resilience [45,46]. For this reason, there is literature available handling the meaning and importance of community gardens in connection with urban resilience, sustainability, and food security [47–49] and for a large variety of geographical contexts also including a post-socialist perspective [50]. The preliminary aim of this research was to explore the potential of selling fruits and vegetables grown exclusively in allotments as a contribution to resilient cities and as a new perspective in addition to the existing discussions about community gardens.

However, preparatory work revealed that the most serious regulation and thus obstacle to the sale of allotment garden produce lies in the legal circumstances. According to the German Federal Allotment Law ([51] BKleinG §1), allotment gardens: “1. serve the user (allotment gardener) for non-commercial horticultural use, in particular for the production of horticultural products for personal use and for recreation (allotment garden use)”, (BKleinG §1, translated from German). The prohibition on making money from garden products is a relevant obstacle for allotment gardeners (BKleinG §1). This prohibition is related to the non-profit character of allotment garden associations (BKleinG §2). However, as we wanted to investigate a general willingness of gardeners to distribute the surplus of their garden products in our study, the main questions were formulated independently from this legal context and were defined as follows:

1. What is the potential (relative quantity and type/variety) of garden products that could be distributed in relation to the existing harvest?
2. Is there a willingness among gardeners to give away the surplus of the harvest from their allotments?

This unique research plays a pioneering role in investigating the potential and motives of the sale or gift of allotment garden products. Specific case studies are mainly found in Great Britain [37,52] which could be related to the fact that there exist shops in allotment associations that sell the products, since they do not have the same legal restrictions as in Germany. We could not find any peer-reviewed literature for German case studies that considered the sale of garden products from allotments even though discussions are taking place [36]. Leipzig was selected as a case study because it has a long tradition and a historical connection to allotment gardens. Already 150 years ago, Daniel Gottlob Schreber came up with the idea of allotment gardens (“Schrebergärten”, [53]). In order to answer the questions, garden holders from various allotment garden associations in Leipzig were contacted in person on their allotment and asked to fill out a questionnaire.

In this paper, after the presentation of the case study and method, we will answer whether there is overproduction in garden products, using selected allotments in Leipzig as a case study, and whether and under what circumstances allotment gardeners are willing to sell or give away this overproduction/surplus. In subordinate questions, we also ask to what extent the legal framework is an obstacle in the distribution of garden products from allotment gardens. By garden products, we mean in this study fruits and vegetables (and possibly also other products such as honey, seeds, or flowers) produced by private allotment gardeners. Furthermore, in the larger context, based on the theory of the diverse economy and the Alternative Food Networks, this paper examines which alternative forms of economic action contribute to a sustainable, inclusive economy, more food democracy, and a more resilient city.

## 2. Methodology

### 2.1. Description and Selection of the Case Study Area

Leipzig was chosen as a case study because of its particular history in the creation of urban allotment gardens, originally intended as a place of recreation for workers. Leipzig is still a city where relatively many urban green spaces are provided for allotment gardens [53].

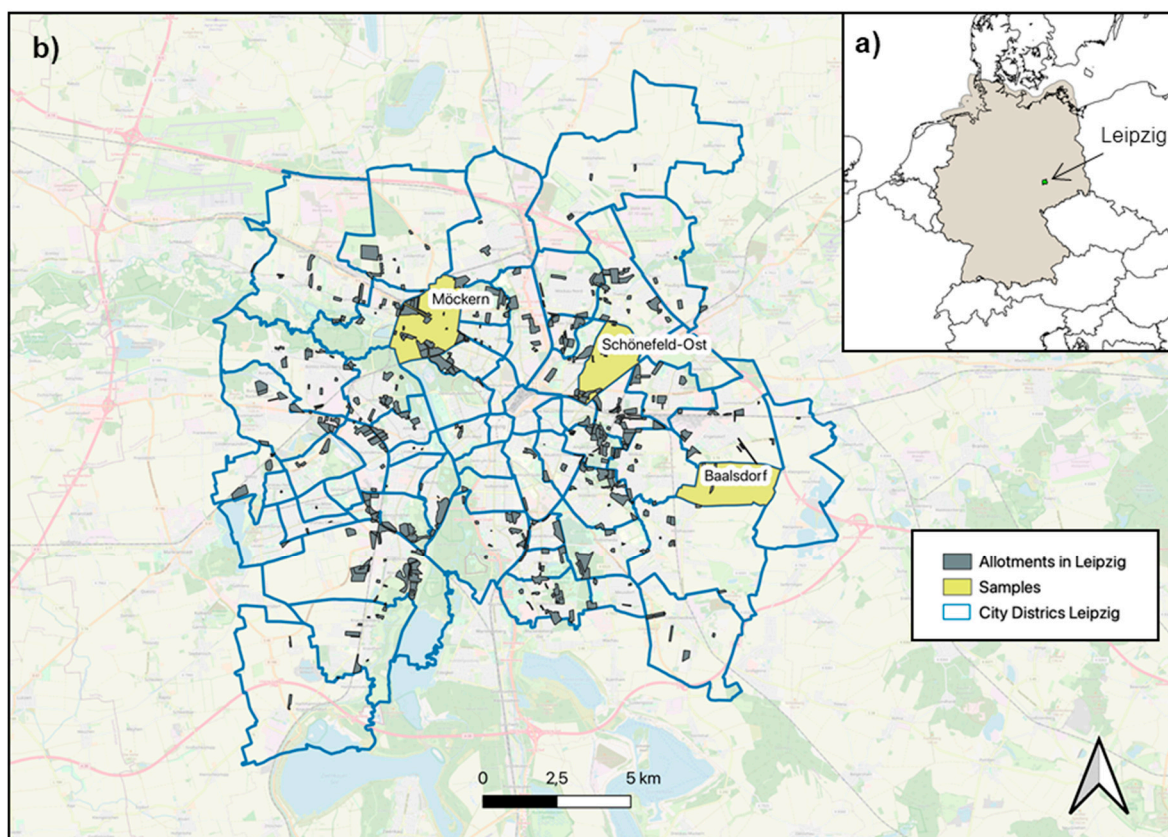
There are currently “278 allotment garden sites with over 39,000 plots on an area of approximately 1240 hectares” ([54], translated from German). These would represent 30% of Leipzig’s urban green areas [54]. Due to the shrinking process that Leipzig underwent after German reunification, many areas were available that could be used for such horticultural purposes. According to Cabral [53], the rate of urban gardening per inhabitant in Leipzig is 23 square meters, one of the highest rates in Europe. Overall, allotment gardens are very popular in Leipzig, and young city dwellers are increasingly interested in having their own garden [55] (p. 87). At the same time, we assume that many gardens harvest more fruits, vegetables, herbs, etc. than the owners or tenants consume themselves. In rural areas, there are sometimes places with cash boxes in front of the houses for such surplus. With regard to allotment gardens in Leipzig, but also throughout Germany, we could not find many existing professional food exchange systems. For the city of Leipzig, there exists a website where gardeners (mostly garden owners, not allotment holders) and consumers can make private arrangements (see [56]). The main aim of this online exchange is to ensure that no food will be wasted. Furthermore, the Leipzig food bank garden project “Tafelgärten” has been providing food to disadvantaged groups since 2007. In this context, some formerly vacant garden sites in Leipzig’s garden plot associations are used and cultivated by long-term unemployed people. The resulting harvest of fruits, vegetables, and herbs is given to the Leipziger Tafel e.V. which is an association that gives overproduced produce (food) to people with no or low-income who cannot afford a balanced diet [57] (p. 3). The quantity of such food bank garden project’s production should not be underestimated. In 2016, for example, 38.5 tons of fruits and vegetables were delivered [57] (p. 4). This project has since become a model for many similar projects in Germany [58].

Since a survey of the complete population in Leipzig was beyond feasibility, a partial survey consisting of nine allotment garden sites (Figure 1, three districts and three allotment garden sites per district) in different parts of Leipzig was chosen as a representative sample size and composition, designed and supposed to create reliable data and avoid bias [59]. The procedure combined a systematic selection of three socio-demographic disparate city districts; gardeners were contacted randomly as potential participants in each of these districts. Since some of the garden associations are relatively small and not all gardeners were present during data gathering, we carried out data collection in several garden associations in each district. The determination of exactly three of such addressed garden association ensured comparability between the three districts. The stratified sampling of the three city districts was developed through a partially manual clustering process which helped to cluster all of Leipzig’s city districts in socially differing types. Three indicators were identified to be relevant for the clustering process and associated development of a stratified sampling. The following data were provided by the Office for Statistics and Elections of the City of Leipzig for all districts [60]:

- Average population age (most recent data; from 2020);
- Share of unemployed in the labor force per 100 persons (most recent data; from 2020);
- Average net income per household (most recent data; from 2019).

Within the clustered city districts, three among their socio-demographic character differing districts were chosen: Baalsdorf, Schönefeld-Ost, and Möckern. This selection of districts with different social structures was based on the following assumptions: (a) That users of an allotment garden in a specific district of Leipzig are also residents of this district, and (b) that social factors could have an influence on the answers provided by allotment holders. In the later analysis, however, it was found that social factors had no significant effect on the answers [61]. For this reason, the analysis of any correlations between social factors and responses is not further outlined in the results. The geographical data on the location of the allotment gardens comes from Open Street Maps. In QGIS 3.28, data of all allotments in Leipzig were downloaded with the plugin “QuickOSM” via an overpass query. The key “land use” and the value “allotments” were chosen as map features. The boundaries of the districts were downloaded from the geodata service of the city of Leipzig [62]. In QGIS, the geoprocessing tool “intersection” was used to select all allotments that were located within

the boundaries of the three sample districts. Areas without associated information were not addressed further.



**Figure 1.** (a) The location of Leipzig in Germany, and (b) the location of allotments in Leipzig and the selected city districts Möckern, Schönefeld-Ost, and Baalsdorf (own representation in QGIS 3.28. Data source: Open Street Maps, 2023).

## 2.2. Structured Questionnaire with the Gardeners

In the nine allotment garden sites, gardeners were contacted in person by means of a paper-based standardized questionnaire. Quantitative, standardized questionnaires are a suitable method to collect data from a larger number of participants. Choosing PASI (Paper and Pencil Self-Administered Interviewing, [63], p. 22f) gave us the chance to reach many participants. At the same time, the influence on the answers is lower in PASI than in face-to-face interviews [63]. For our research questions which were supposed to investigate the initial potential of a levy of allotment products in terms of product availability and willingness of the gardeners, either closed-ended questions or 1–10 Numeric Rating Scales were considered suitable. For the questions regarding which products are mostly harvested and that have a surplus, open-ended questions were created so that the range of possible answers would not be limited a priori. In addition to the close-ended question regarding the willingness to give away products, reasons for and against a potential levy were queried in an open-ended question in order to also investigate the participant's reasons to agree with the idea of a levy or not.

The cross-connection between the research questions and the questionnaire is represented in Appendix A, Table A1. In general, we prepared 8 questions to answer the first research question and 20 questions to answer the second research question. Demographic questions such as age, household income, and employment status were also included in the questionnaire. In addition, the questionnaire asked whether the participant lived in the neighborhood of his/her allotment garden. The complete questionnaire is included in the Supplementary Material.

The paper-based questionnaire was distributed after an initial test phase at the end of April until June 2022 on weekends with good weather in order to reach as many gardeners as possible in the selected allotments. Three different allotment garden associations were visited in each district. People were directly contacted on site. The topic of the research and the contents of the questionnaire were presented to the respondents and they were informed about the data protection regulations. In order to give time for filling in the questionnaire, the participant was informed that the questionnaire would be collected from their garden after about 15 minutes. Out of 100 distributed questionnaires, 94 were returned sufficiently completed. A total of 6 were found to be filled in incorrectly or incompletely. “Incorrect” or “incomplete” means when (a) either at least 25% of the questions were not answered, (b) the three central questions 14 to 16 were not answered, or (c) the answering of several questions was contradictory. The sample sizes are composed as follows:

Möckern: 32 valid, 3 not valid

Schönefeld-Ost: 33 valid, 2 not valid

Baalsdorf: 29 valid, 1 not valid

### 2.3. Statistical Analysis of Survey's Responses

Data were analyzed using descriptive statistics in SPSS (Statistical Package for Social Sciences). Frequency distributions and position parameters like the arithmetical mean and the median, as well as quantiles, were applied. Several frequency distributions were evaluated as a multiple-answer set. For open questions and the associated differing responses, a categorization of these answers was carried out preceding the analysis of an answer distribution [59,63]. In order to investigate the potential in terms of the participant's agreement to a levy, the close-ended Question 15.1: “If selling were allowed, would you generally find it useful to have a system that organizes the distribution of surplus harvest to potential customers [...]?” combined with the following open-ended Question 15.2: “Why?” were analyzed. We developed a categorization of the open-ended answers as having an either positive or negative connotation, depending on how Question 15.1 was answered. In the case that Question 15.1 was answered with “maybe”, the positive or negative connotation of the answer's content was retrieved.

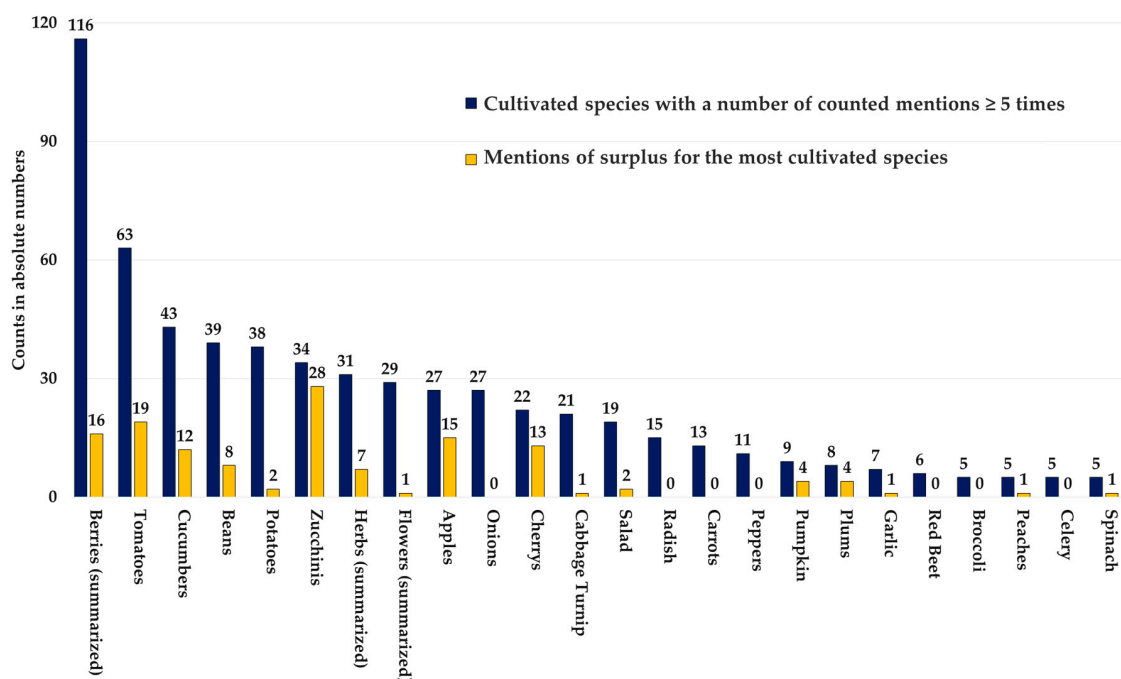
## 3. Results

The survey was conducted with 94 allotment gardeners. The number of respondents per answer/result varied due to partially missing entries. More women participated in the survey than men, with a gender distribution of approximately 60% to 40%. No one indicated gender as “diverse.” Age was approximately normally distributed, with some outlier values (see Appendix A, Figures A1 and A2); there were particularly high numbers of respondents who are in their late 30s or, in contrast, approximately 80 years old. Therefore, a Shapiro–Wilk test in SPSS rejected a normal distribution. None of the respondents were younger than 20 years or older than 80, with a mean of an age of 48.7. As described in Section 2, the selection of the samples was based on socio-demographic characteristics of the districts of Leipzig, and thus it was also based on the assumption that the gardeners in a district are also residents of that district. The analysis shows that only 58.1% of the respondents live in the district in which their allotment garden is located and in which the survey was conducted.

### 3.1. The Potential (Amount and Type/Variety) of Garden Products That Could Be Distributed

The survey started with the question regarding the usage of the garden. Approx. 98% of all respondents stated that they would use the garden either primarily for growing fruits and vegetables (11%) or for growing fruits and vegetables but also for recreation (87%). For 39% of the respondents, the cultivation of flowers is their focus. Although the question was not offered in the questionnaire as multiple choice, many of the respondents chose several answers. Therefore, the question was evaluated as a multiple answer, but must be interpreted with caution and only serves to give an impression about the use of the gardens.

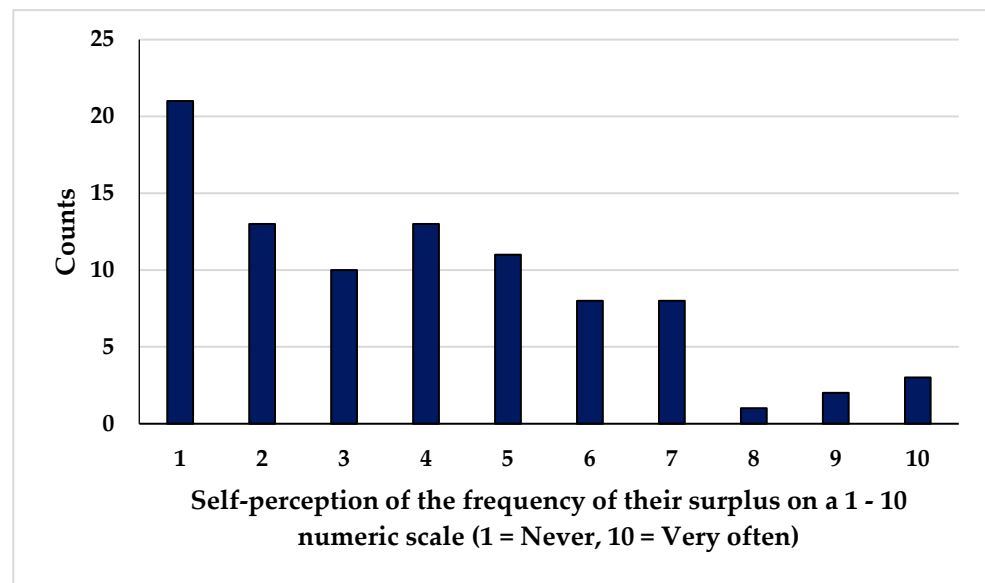
The cultivated varieties/species are shown in Figure 2, according to the frequency of the mentions. The figure shows all cultivated varieties/species with a number of five counts or more and the related counts of their surplus. Cultivated species that were mentioned less than five times were: Pears, Cabbage, Swiss chard, Rhubarb, Grapes, Cauliflower, Mirabelle, Plums, Brussels sprouts, Apricots, Leek, Melon, Sugar Snap Peas, Hazelnuts, Honey, Ginger, Kiwi, Turmeric, Spring Onion, Corn, Nectarine, Mushrooms, Saffron, Sea Buckthorn, and Savoy Cabbage.



**Figure 2.** The most commonly grown fruits and vegetable varieties/species and their surplus (by counts in absolute numbers; multiple response). The categories “berries”, “herbs”, and “flowers” were created though summarizing different kinds of berries, herbs, and flowers. Own representation. Data source: own survey, 2022.

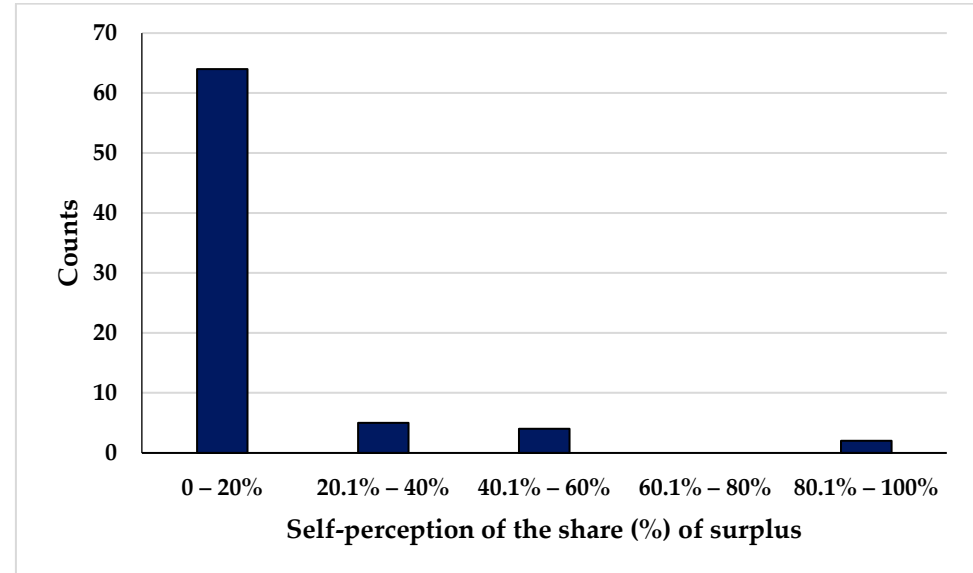
The high number of answers that state “berries” is due to the fact many respondents named several berry types (e.g., blueberries, raspberries, gooseberries, Figure A3), and during the categorization, all mentioned berry types were placed into one category “berries”. This was done by recalculating the respective variables in SPSS. Therefore, some respondents grow “berries” more than once. The same recalculation and categorization apply to different mentions of herbs and flowers. Preceding the analysis, a multiple response set was created based on the categorized variable. Among the most frequently cultivated varieties/species are many fruits and vegetables that have normally high yields (e.g., zucchini, tomatoes, cucumbers, potatoes, or cherries) and that can be harvested also several times a year. Besides the expected species, there were also less expected ones, such as turmeric, ginger, sea buckthorn, kiwi, or saffron, which shows that a wide range of species are grown in Leipzig’s allotment gardens, including special species that are native to tropical or subtropical regions and which are normally imported and transported over long distances. The answer to the question of which varieties/species are in surplus can also be seen in Figure 2. It is noticeable that most of the species of which there is a surplus are also those that are most frequently cultivated. Related to the surplus, respondents were asked to estimate the frequency of surplus (Figure 3), answered on a scale between 1 (never) to 10 (very often). The most frequently given number (21 times) was 1 which means that many respondents never had a surplus. Overall, a surprisingly high number of respondents chose a value between 1 and 7. Half (50%) of the answers are between the values 2 and 5.25.





**Figure 3.** Participant’s estimation of the frequency of their own surplus on a 1–10 numeric scale (1 = Never, 10 = Very often (Question: “How often do you harvest more than you consume?”, translated from the questionnaire in German).

The self-perceived share of the production surplus (Figure 4) shows that the majority of respondents think that they have a surplus of between 0% and 20%. The mean value is 11.2%. The median is even at 5%.



**Figure 4.** Self-perceived share of the surplus of garden products (Open-ended question: “Approximately what percentage of the total harvest is the surplus that you do not consume yourself?”, translated from the questionnaire in German).

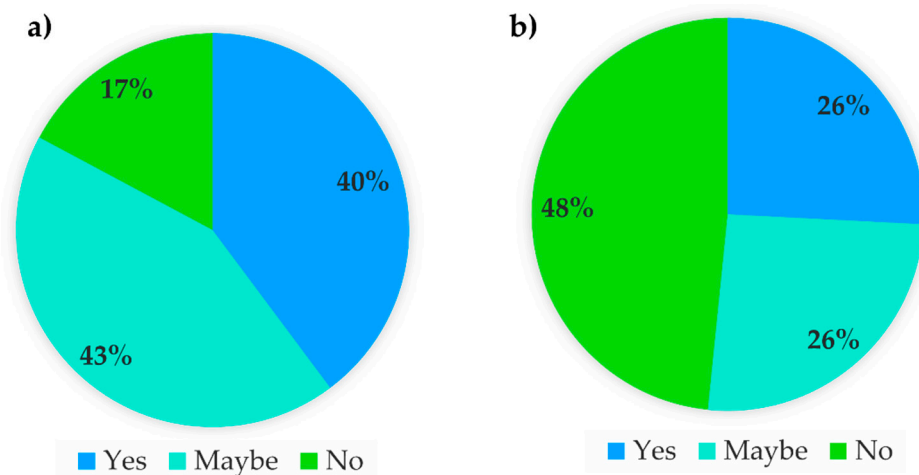
### 3.2. Willingness of Gardeners to Give Away the Surplus of the Harvest from Their Allotments

The majority of respondents have already given away products (including surplus), but the number of such actions per year and on average is relatively low. About 84.8% of respondents stated that they already give away surplus. This accounts for almost half (49.3%) of all responses (multiple responses). Approx. 57% of respondents said they would process the products to preserve them and only 6.3% of gardeners said that they would throw away the surplus (e.g., compost). Regarding the frequency of garden products that

were given away or exchanged with other gardeners per year, answers were separated according to (a) fruits and vegetables and (b) products such as seeds, young plants, and cut flowers. The mean values for (a) and (b), and for both exchanging and giving as gifts to other gardeners, are all between 2 to 6 times of exchange per year, with seeds, young plants, and cut flowers being exchanged most frequently, 6 times/year. The mean value for giving away fruits and vegetables is 4 times/year. For giving away seeds, young plants, and cut flowers, 4 times/year was shown as mean value.

Eight out of 93 respondents have already thought about selling products from their garden, which corresponds to 8.6%. Related to this, two thirds (66.7%) of the respondents are aware of the legal regulation that prohibits commercial activities in allotment gardens. Approximately 40% of the respondents have the opinion that this law is useful in connection with the sale of allotment garden products in general, but that there should be a possibility to give away surplus. About 38% of the respondents have the opinion that this regulation also makes sense in the context of surplus of garden products. In contrast, 22% of the respondents have the opinion that this regulation does not make sense.

The most important question was related to the question of whether respondents would generally find a system useful that organizes the distribution of surplus harvests to potential consumers if selling garden products would be allowed. About 43% of the respondents answered with “maybe”, 40% with “yes”, and 17% with “no”. Taking together those who answered “yes” and “maybe” forms a clear majority of 83% (Figure 5a). About 48% of the respondents answered “no” regarding the question of whether selling the products from their garden would still be attractive if they could only earn a small amount of money, while 26% answered with “maybe” and another 26% with “yes” (Figure 5b). Those who can imagine potentially selling garden products (if it would be allowed) thus form a slight majority of 52%. Four out of ninety-three respondents have even sold products from their own garden, although at least one respondent referred to the time and distribution system of the former German Democratic Republic (as emerged from the personal communication and from a note on the questionnaire).



**Figure 5.** Willingness for giving away or selling garden products. Question (a): If selling garden products would be allowed, would you generally find a system useful that organizes the distribution of surplus to potential consumers? Question (b): Even if you could only earn a small amount of money, would it still be attractive for you personally to sell products from your garden? (Translated from the questionnaire in German, Own representation. Data source: own survey, 2022).

After the gardeners were asked whether they would find a system useful of both, generally sharing and concretely selling allotment garden products, they were asked for their reasons for their “yes”, “maybe”, or “no” statement in an open-ended question. The reasons were then later categorized into those with a positive connotation and those with

a negative connotation. All answers of gardeners who answered “maybe” were also included in these categories, depending on the either positive or negative connotation of the response content. In the evaluation, all positive and all negative reasons (including the respondents that had previously answered with “maybe”) were then evaluated separately. Since some gave several reasons, multiple answers and their frequency were also used here.

The reasons that were given for selling garden produce are shown in Table 1. Most often mentioned was the reason that produce is not thrown away. Regarding the reason that the quality of the produce from allotment gardens is higher, “chemical-free” or “100% organic” were mentioned. The three answers that were categorized as “useful for the environment” were specifically related to the avoidance of transport as well as a general formulation. Overall, there were less openly described reasons from those respondents who were rather against the sale of garden products in comparison to those respondents who were rather advocates. Therefore, there was no particularly frequent category here. Four categories were mentioned two times: 1. The cost–benefit ratio is not right; 2. There is too little yield; 3. Reasons of hygiene; and 4. No sales should be transacted with garden products.

**Table 1.** Categorized reasons for the participants to generally agree on a distribution of produce from the allotment garden (own representation. Data source: Own survey, 2022).

Categorized Reasons	Counts	% of All Answers
So that it is not thrown away	16	25.00%
Utilization of what is available anyway	10	15.60%
The organization of a levy would become easier for the gardeners	8	12.50%
Strengthening local marketing	7	10.90%
So that everybody can afford a healthy diet	5	7.80%
The products have high quality	4	6.30%
Useful for the environment	3	4.70%
Strengthening the local community	3	4.70%
To support disadvantaged groups	2	3.10%
There is nothing against it	2	3.10%
A well-known contact-point for potential customers could evolve	1	1.60%
The income could be used to enable reinvestment for the garden association	1	1.60%
Sensitization of consumers to foodstuffs	1	1.60%
Strengthening interest in allotment gardens	1	1.60%
Total	64	100.00%

Of those respondents who stated that they would generally assess a distribution of surplus of garden produce positively and gave their own reasons in the following question, two people explained that they would find it even better if the levy was made as a donation to disadvantaged people. This answer is remarkable because this question was not asked here. This attitude becomes even clearer in the question of whether, specifically, a sale would be interesting for the participants personally and reasons for their answer (open-ended question). These open answers were also first categorized and evaluated as multiple answers. The proportion of those who stated that they would prefer to give away products amounts to 83% of all respondents and 69% of all answers. In turn, 14% of all respondents explicitly stated that they would prefer to give the products to disadvantaged people (which accounts for 11.8% of all answers, see Table 2). Others say that they would rather give garden products to family or neighbors, for example, or that they already have done so. One respondent, for example, would rather distribute allotment products in schools or kindergartens than sell them. The categorization and its frequency analysis can be seen in Table 2. In Table 3, all the categorized answers are shown again separately, regarding who mentioned giving away the garden products to different groups as a preferred alternative to selling.

**Table 2.** Categorized reasons for the participants not to sell their own allotment products (own representation. Data source: Own survey, 2022).

Categorized Reasons Not to Sell	Counts	% of All Answers
I prefer a giveaway in terms of a gift in general	19	37.30%
I prefer a giveaway in terms of a gift to my family, friends, and acquaintances in general	9	17.60%
There is not enough surplus	7	13.70%
I would prefer a levy to disadvantaged groups	6	11.80%
I could imagine selling if the levy was organized very professionally	3	5.90%
I prefer to swap in general	3	5.90%
I do not have enough time	2	3.90%
I prefer a giveaway in terms of a gift to schools or kindergartens in general	1	2.00%
I do not want to give away any of my harvest	1	2.00%
Total	51	100.00%

**Table 3.** Answer subset with all answers that contain the dimension of a gift within all categorized reasons for the participants and not to sell their own allotment products (own representation. Data source: Own survey, 2022).

Mentions of Different Dimensions of "Give-Aways" within All Categorized Reasons (Not to Sell)	Counts	% of All Answers
I prefer a giveaway in terms of a gift in general	19	37.30%
I prefer a giveaway in terms of a gift to family, friends, and acquaintances in general	9	17.60%
I would prefer a levy to disadvantaged groups	6	11.80%
I prefer a giveaway in terms of a gift to schools or kindergartens in general	1	2.00%
Subtotal	35	68.70%
Total	51	100.00%

#### 4. Discussion: Alternative forms of Economic Activities as a Contribution to More Sustainable and Resilient Cities

With regard to the potential of giving away the existing harvest (first research question), we found a limited, but from our point of view relevant, share of existing surplus produce. Although there is only little surplus in terms of quantity, the fact that most respondents gave a value in the medium-low range shows that many gardeners have some surplus. The products that are in surplus are also diverse, mainly those cultivated varieties/species that produce high quantity; e.g., zucchini, tomatoes, and apples. Therefore, it is worthwhile to consider the option to give away the surplus.

With regard to the gardeners' willingness to give away the surplus of a harvest from allotment gardens (second research question), it was shown that there is agreement, especially in general, with a system of distribution of surplus without an explicit need to sell the garden products. The interest in a sale on an individual scale was lower than in a (non-specific) distribution of the surplus. In particular, the self-formulated reasons that the gardeners gave either for general surplus distribution or against sales thereof on an individual scale provided interesting conclusions about the implementation of the initial idea to give away the surplus of garden products. The findings have also revealed that the answers might have been biased because of the relatively young as well as old response group (the statistical distribution was not normal for the respondent's age range). In addition, only 58% of the respondents also lived in the district of the location of their allotment. However, the collected socio-demographic characteristics (average population age, share of unemployed in the labor force, and average net income per household in the

respective district) did not significantly influence the answers (after testing for bivariate correlation with Spearman's Rho Correlation Coefficient, Contingency Coefficient C, and Cramer's V statistical test, depending on the variable's scaling [61]).

The results of this study were considered in a wider context based on the theory of the diverse economy and the Alternative Food Networks. During the research, seven major fields of action emerged as a contribution to alternative forms of economic action for a sustainable, inclusive economy, more food democracy, and a more resilient city:

- Giving away the garden products (Section 4.1);
- Using local knowledge and resources (Section 4.2);
- Testing new approaches in the stable state of resilient cities (Section 4.3);
- Strengthening the local community (Section 4.4);
- Considering production and consumption together locally (Section 4.5);
- Considering alternative economic practices to be central to the development of sustainable food systems (Section 4.6).

The fields of action are discussed in the following sections.

#### 4.1. Giving Away the Garden Products

Even under the current legal framework, it is possible to give away products from allotment gardens. The survey showed that most allotment gardeners would prefer to make a gift rather than selling the garden product. Consensus is especially high if the garden products are given away to disadvantaged groups. The high approval of a donation without a commercial interest, from which the general public and especially disadvantaged groups could benefit, could be relevant for associations such as "Tafelgärten" and the "Tafel e.V.". In connection with the answers that supported a distribution of production surplus from the point of view of a simplified organization, a possible expansion of the existing system "Tafelgärten" could be considered. The willingness of the gardeners to give away their surplus is high and in combination with a logistically well-organized delivery system, for example, in the form of an organized collection of garden products, possibly even more products from the allotment gardens could be made available for the "Tafel". The need for a professional organization of surplus distribution was also mentioned by a few gardeners in connection with the question of why a sale is not personally attractive to them.

In the context of rising food prices, the demand for the help offered by the "Tafel" throughout Germany has increased substantially in the last year [64,65], so that the demand might not be covered by the supply. More food, along with more helpers and volunteers, is a central factor in securing supplies through food organizations such as the "Tafel e.V." [65]. The fact that these associations are already interconnected with allotment gardens suggests an expansion of organized cooperation in the form of logistical collection systems of surplus produce.

#### 4.2. Using Local Knowledge and Resources

Access to and strengthening of resources that are locally available is also the approach of resilience (e.g., [66]). Based on the results of the questionnaire, it can be said that most allotment gardeners have huge knowledge and interest in the production of fruits and vegetables. Therefore, in the sense of a resilient city, this knowledge and this existing potential of the allotment gardeners could contribute to supplying the immediate neighborhood with a probably limited but significant share of seasonal and local fruits and vegetables. The focus on decentralization and concentration on local resources could strengthen food security in times of increasing risks, e.g., climate change.

For the implementation of concrete actions that can strengthen resilience in cities, research suggests that governance structures should improve the involvement of civil society in finding solutions [38]. The resources that are, in any case, locally available should be used wisely. In this case, these are the garden areas, the knowledge of the gardeners, and the surplus. Particularly in Leipzig, as described in Section 2.1, there is a large amount of green space for urban gardening in comparison to other cities and, in connection with this,

we expect that there is also a relevant resource of knowledge provided by the gardeners. The gardeners described with a particularly high number of mentions (as the second most frequent reason for selling surplus) the meaningfulness of using what is already there: the surplus of garden products. As described, this approach corresponds to the idea of resilience. The frequent mention of higher product quality as a reason for selling also indicates that the gardeners are aware that they create with their knowledge and their work a value that goes beyond mere food production; that their products exceed the usual quality in conventional sales and that can also have a high value for other people.

#### *4.3. Testing New Approaches in the Stable State of Resilient Cities*

As described by Carpenter and Gunderson [42], it is far easier to explore strategies for more resilience through trial and error while the surrounding system is still in a stable state and before there could be a risk for reaching a tipping point or change into an unstable state. The idea of selling products from allotments can be seen as such an experiment in a stable, resilient phase in contrast to slow-moving, elusive changes [41] (p. 243) that could threaten urban food security in the long run. Today, most consumers in Leipzig and in Germany can almost always access any product relatively cheap and easy. Therefore, the testing of the implementation of such a distribution system does not seem necessary at the moment. Nevertheless, it is relevant in the sense of a resilient city to discuss new approaches to solutions today and, in the best case, to test them before the risks increase and the system reaches a tipping point and changes into an unstable and irreversible state [41,42].

#### *4.4. Strengthening the Local Community*

Strengthening the local community plays a role in the considerations of pro or contra, at least for some of the respondents, and their evaluation of a distribution system (the question addressed a sale of surplus). As already shown and discussed in Table 1, about 6% of those respondents who confirmed the idea of a sale of surplus stated that this approach would strengthen the local community. An even larger proportion (about 9% of the respondents) gave an answer categorized as: “So that everyone can afford a high-quality product”. About 3% of the respondents mentioned that the sale of surplus would support disadvantaged people. The evaluation of the question why or why not a sale was personally interesting for the respondents also showed that community values played a central role for them.

These results are strongly related to the concepts of Alternative Food Networks and the diverse economy, and to the normative component of the foodsharing concept [4–6,18,24,32]. This normative component distinguishes the sale of products through foodsharing platforms from a commercial form of sale and justifies a classification of a levy of produce as a “food democracy” approach. A “reframing” [18] of the economy could reinterpret such informal forms of distributing fruits and vegetables to the neighborhood as a recognized economic act. Such an exchange of garden products for money could be at the same time recognized as economic action and action that serves the common good. The separation between “profit-oriented” and “common good-oriented” and the assignment of the formal market only to the “profit-oriented” market should generally be questioned in the sense of a sustainable economy [18]. Both forms can be understood as currently existing. An understanding of the relevance of the “common good-oriented” market as part of the formal market should be established [18].

#### *4.5. Considering Production and Consumption Together Locally*

Following the Agri-Food-Studies, especially the concepts of Alternative Food Networks and the idea of sustainable consumption introduced by Garside et al. [17], production and consumption should be seen as closely interlinked. This is also true when it comes to finding alternative solutions for sustainable consumption. The research idea presented here brings production and consumption as close together as possible. Cultivated products would be made available for consumption in the immediate neighborhood. This geograph-

ical proximity and immediacy could have the side effect of increasing interest and possibly indirect knowledge about food production, which in turn could strengthen resources for urban resilience. The evaluation of the survey with gardeners also shows that strengthening the local marketing of products played a role in their evaluations for pro or contra of a sale. Approximately 15% of those respondents, who confirmed the idea of selling the surplus, stated that this would strengthen local marketing. In addition to linking local production and local consumption, the studied idea of giving away allotment products also challenges the culture of shopping—consumption expectations and habits—at the same time. In order to promote sustainable consumption, possible restrictions/changes in our shopping behavior must be addressed as well [17] (p. 118f). Changes also must take place in the culture of consumption; it is not only changes on the production side that can transform economic systems, especially food economic systems, towards sustainability [17]. The possibility of giving away garden products supports the search for plausible alternatives to existing consumption patterns, without creating a connotation with prohibition at the same time. The design of marketing products in front of the allotment gardens that represents a rural character could open up a possibility that many people are likely to associate the products with something positive; for example, authenticity, transparency, “healthy” food, or rural idyll.

#### *4.6. Considering Alternative Economic Practices to Be Central to the Development of Sustainable Food Systems*

By making the economic practice itself the alterity, rather than the product, a real alternative can be created within the existing food economy system, which enables sustainable food networks. For “real” alternative food networks, this aspect in particular is crucial [6]. For our alternative economic approach studied here, it is important how a product is transferred from the producer to the consumer. There is less focus on how the product itself was produced. Regional products are generally becoming more and more relevant, for consumers and for producers [67]. However, this development is taking place to a large extent (e.g., through sales in large supermarket chains) in connection with commercialization [6]. Thus, an alterity of products in the sense of economic practice is again denied [6]. In this context, the marketing of allotment garden products would offer regional and entirely local products. At the same time, it could make commercialization impossible, since economic practices are carried out by many individual actors who can contribute only a small number of products. An interest in profit maximization cannot manipulate the actual idea here because resources in the allotment garden will always be limited.

#### *4.7. Discussion of the Methodological Approach*

We conducted research where literature and data about the specific topic (selling or gifting of products from allotment gardens in Germany) are still missing in the wider scientific community. Therefore, we considered a structured and standardized questionnaire of gardeners in selected allotment gardens in Leipzig as a justified starting point. Our sampling method aimed at designing a survey group representing different socio-demographic parts (in average age and household income) of the city of Leipzig, which should create a reliable data set and reduce bias. The in-person survey potentially reached more representatives that are not familiar with digital media, such as the elderly population who also belong to our target group. However, we acknowledge that a combined paper- and internet-based survey would have collated more data [68]. Furthermore, the questionnaire was distributed and collected later. By this approach, the respondent had enough time to reflect about their responses without the observation of the researcher. During the collection process, the researcher was available for direct feedback.

The transparent selection process of the three different districts and the random selection of potential participants enable repeated research under similar circumstances [59]. A survey based on a structured and standardized questionnaire with clear and mainly

closed questions allows for a descriptive data analysis and would facilitate a comparative survey across different cities as a next research step. Even though we had a high response rate, we are aware that the sample is not fully representative. The analysis of participant age distribution showed an overrepresentation of a younger age group (late 30s) and very old age group (approx. 80 years old, Figure A1).

## 5. Conclusions

Global challenges, e.g., food insecurity and climate change, call for finding alternatives and new concepts in the urban food economy. There is urgency to explore and test such alternatives in today's stable state of urban-social systems in order to maintain the resilience of cities. This work has discussed the possibility of a distribution system of allotment garden products, despite the legal obstacle caused by the German federal allotment garden law. It was shown that Leipzig's gardeners indeed have a surplus of garden products and that a distribution system would be an attractive idea for many respondents. The range of fruits and vegetables grown is very wide and spread over different harvest seasons. The varieties/species that are grown most often are also those with high yields, such as zucchini, cucumbers, or tomatoes. At the same time, those varieties/species often produce a surplus. For many respondents, for whom it would not be personally interesting to sell products, it would be more desirable instead to give their products away, especially to socially disadvantaged people. This knowledge could be used to practically and immediately expand existing collaborations between Leipzig's allotment garden associations and the "Tafel e.V.". A well-organized collection and picking up the products with a low organizational effort could be a useful and helpful contribution to existing shortages of such "Tafel" associations and provide access to a diverse and fresh diet for such disadvantaged groups. The gardeners expressed a general approval of such a give-away system with reasonings of using available resources, waste reduction, strengthening local community and local marketing, social justice, higher product quality, and environmental protection.

This research has shown that a distribution of products grown in Leipzig allotment gardens—even for a monetary value—can meet an integrative economic action due to the moral attitude of the gardeners, which would benefit the general public. As a theoretical contribution and impact of this work, it can therefore be questioned in this case whether it is correct to compare "sale" and "public utility" in a mutually exclusive way. Based on the attitude of the gardeners and on the theory of diverse economy and Alternative Food Networks, it was argued that both are possible at the same time. In this context, the Leipzig gardeners themselves also have the opinion that the Federal Allotment Garden Law should at least create a possibility to sell surplus. Nevertheless, most of the interviewees considered the existing regulation of the prohibition of sales to be correct. It was also concluded that the available systems of gifting and exchange and its approval by society are an example of an already existing diverse economy. In addition, it shows that economic actions have long been practiced in this context and are important for social well-being. They could and should also be reinterpreted as relevant "real" economic markets. At the same time, they contribute to socially fair and environmentally friendly food systems. We have also shown that there is a clear limitation in terms of quantity of production surplus and food that would be available per head. Therefore, the contribution of the production surplus on city resilience and therefore also on sustainable cities can be only one small component of a larger (inter-)national agenda. As a next scientific step, the structured and standardized questionnaire could be used in a comparative study of allotment gardens located in different cities and different international contexts. This approach will allow a better generalization and better assessment of the contribution of allotment gardens to sustainable and resilient futures of cities.



**Supplementary Materials:** The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/su15065598/s1>, Questionnaire.

**Author Contributions:** Conceptualization: L.S., J.K., and M.S.; methodology: L.S., J.K., and M.S.; software: L.S.; validation: L.S.; formal analysis: L.S.; investigation: L.S.; resources: L.S. and J.K.; data curation: L.S.; writing—original draft preparation: L.S.; writing—review and editing: L.S., J.K., and M.S.; visualization: L.S. and J.K.; supervision: J.K. and M.S. All authors have read and agreed to the published version of the manuscript.

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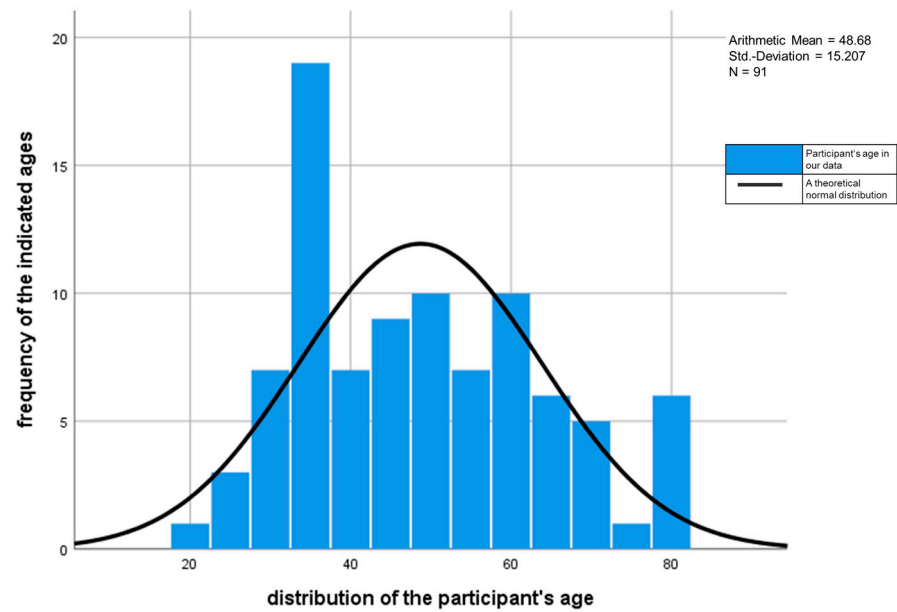
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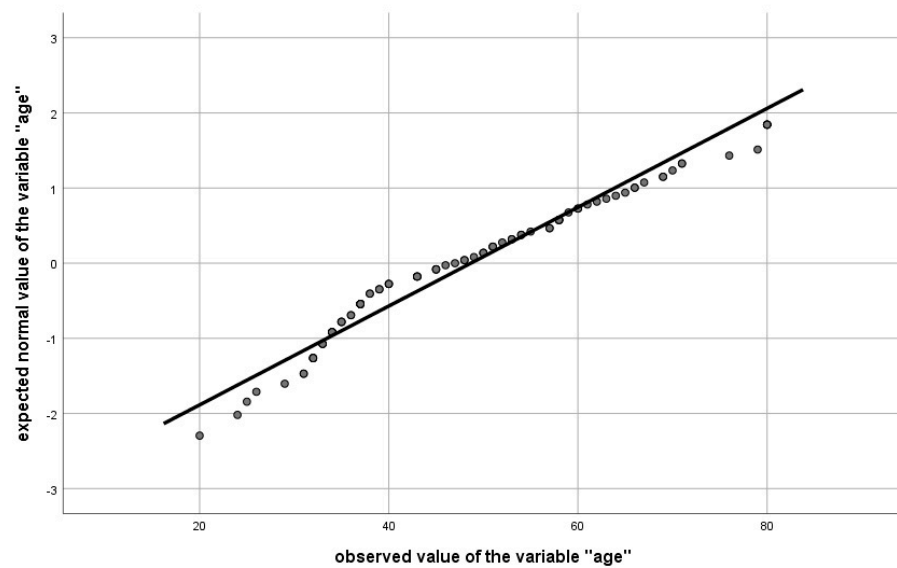
## Appendix A

**Table A1.** Cross-connection between the research questions and the questionnaire (aggregated questions; data source: own survey, 2022).

Research Questions	Questionnaire Questions
RQ 1: What is the potential (relative quantity and type/variety) of garden products that could be distributed in relation to the existing harvest?	Questions 1–5 ask how much the allotment gardens in Leipzig are used to produce food and which varieties the gardeners harvest most. Questions 6 and 7 ask whether there is an “overproduction” of fruits and vegetables in the selected allotment gardens, and Question 8 is intended to answer which varieties are in surplus.
RQ 2: Is there a willingness among gardeners to give away the surplus of the harvest from their allotments?	Questions 9–11 ask how Leipzig gardeners have dealt with a possible surplus so far. Questions 12 and 18 ask whether the gardeners have ever sold garden products or have ever thought about this possibility. Questions 13 and 14 are intended to answer how the Leipzig gardeners assess the prohibition of commercial activities in allotment gardens with regard to the potential sale of their cultivated products. Questions 15 to 17 and 19 ask whether the Leipzig gardeners would sell their products and under what conditions.



**Figure A1.** The distribution of the participant's age in comparison with normal distribution. Data source: own survey, 2022.



**Figure A2.** QQ-Diagram to test the variable "age" for normal distribution (own representation. Data source: own survey, 2022.

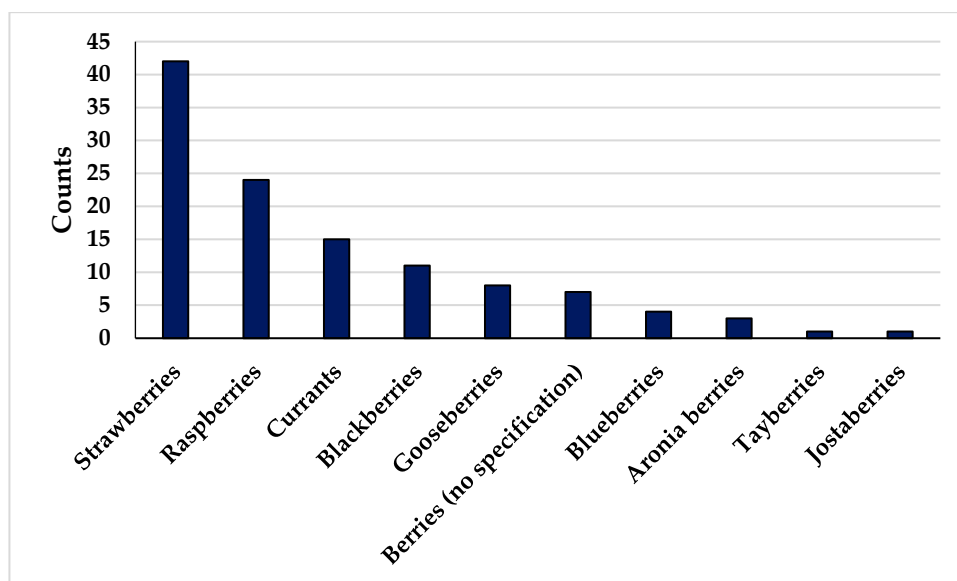


Figure A3. Mentioned counts for the different berry types. Data source: own survey, 2022.

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