sustainability

MDPI

Article

The Location Matters: Determinants for "Deepening" and "Broadening" Diversification Strategies in Ruhr Metropolis' Urban Farming

Bernd Pölling * and Marcus Mergenthaler

Department of Agriculture, South Westphalia University of Applied Sciences, 59494 Soest, Germany; mergenthaler.marcus@fh-swf.de

* Correspondence: poelling.bernd@fh-swf.de; Tel.: +49-2921-378-3225

Received: 10 April 2017; Accepted: 28 June 2017; Published: 4 July 2017

Abstract: Consumer-oriented diversification activities, such as direct sale ("deepening") as well as tourism services and care farming ("broadening"), are common business strategies of farms within urban areas. This empirical study investigates determinants of urban farming's diversification decisions by analyzing a dataset of 123 farmers in German Ruhr Metropolis. Binary logit models are used here as econometric method to determine characteristics influencing the decision to diversify. Farm characteristics, which encourage the implementation of "deepening" strategies, are: larger farm sizes, high-value production, organic farming, and livestock production. By contrast, the consumer-oriented "broadening" strategies tourism services and care farming prevail on smaller farms and on farms with horses and higher grassland shares. Agricultural extension services increase the odds to diversify. The results of the conducted binary logistic regressions show increasing odds and predicted probabilities for "deepening" and "broadening" activities when approaching the city. Farms' location advantages close to cities can be used best when applying consumer-oriented "deepening" or "broadening" strategies; namely, direct sale or other short supply chains, tourism services, and care farming. Viable business strategies of urban farming support a forward-looking integration into urban economy, society, and decision-making.

Keywords: urban agriculture; city proximity; binary logistic regression; city-adjustments; urban rural nexus; agricultural extension service

1. Introduction

Agronomists and agricultural geographers progressively rediscover the nearly 200 years old theory of location ("Standorttheorie") from von Thünen (1826) explaining agricultural land use patterns, production and market decisions around a central market [1]. Despite critical views of the model along with changing framework conditions, such as decreasing importance of transportation costs, globalization, and progress in agricultural engineering, recent studies show a renaissance of von Thünen's theory, especially in the field of urban farming and regional food systems [2]. Thus, Wästfelt and Zhang state that "proximity to the city is [...] a key determinant of the current production and land use decisions" [3] (p. 180). Ilbery (1991) detected that location is a key factor influencing diversification decision [4]—following the main motivation of income generation highlighted by him and several other scholars [5–10]. Additionally, models of spatial clustering of industries are gaining increasing recognition again [11]. However, "the impact of the proximity to urban centers on the decision to diversify remains unclear" [12] (p. 28). Lange et al. (2013) and Meraner et al. (2015) highlight the need for further research investigating farm location's influence on business decisions and more precisely on the implementation of diversification strategies [9,10].

The present study addresses their call for further research on farm diversifications' spatial influences by placing an emphasis on city proximity when analyzing key determinants for urban farming's diversification strategies. In addition to the spatial context, several influences of farms' and farm managers' characteristics on the decision to diversify are investigated. Following a literature review on farm diversification and city proximity, this empirical study's material and method are introduced. The applied econometric method binary logit model determines the characteristics, which influence the decision to diversify, based on a dataset of 123 farmers. Afterwards, the results of the logit regressions are presented, discussed, and concluded.

1.1. Consumer-Oriented Diversification

Diversification strategies date back to the 1960s, are being under wider scientific discourse since the late 1980s, and are promoted by European cash flows since then [4,9,10,13–15]. Public money is introduced into the farming sector with the aim to develop alternatives to solely productivity-oriented models of agriculture. Responding to overproduction with additional intensifications leads into constantly reducing market prices when following economies of scale. This raises difficulties to leverage farm business profitability concurrently. Farm diversification exploits economies of scope via various horizontal and vertical business strategies, diffuses revenue streams, minimizes income volatility as well as reliance on single price fluctuations, and contributes to agriculture's multifunctionality [14,16–21]. European agriculture's multifunctionality is a response to societal demands, overproduction, and the growing economic squeeze on agriculture due to decreasing margins [4,16,22]. Jongeneel et al. (2008) conclude that diversification is a strategy, which combines comparative advantages of new activities on their markets building a cornerstone of Europe's model of multifunctional agriculture [23]. Parallel to food needs, multifunctionality includes additional—often non-marketable—goods, such as ecosystem services and cultural values [3,24,25]. Nowadays, about one third of European farms conduct some diversification measures. The main motivation to apply diversification activities is additional income by minimizing agricultural market dependency [4,6–10].

Griffiths (1987) distinguishes farm diversification strategies into the two pillars: agricultural and structural diversification [26]. While agricultural diversification is directly connected to crop and livestock production, structural diversification summarizes tourism (accommodation, recreation), processing, and direct sale arrangements as well as land and building lease (passive diversification) [4]. Additionally, some scholars include off-farm business and employment—named by Ilbery et al. (1997) as other gainful activities [27]—as a diversification strategy. They are especially profound close to job-rich cities suitable for daily commute [5]. Following former studies, van der Ploeg and Roep (2003) introduce "deepening", "broadening", and "re-grouping" to structure farm diversification activities operationally [28]. "Deepening" summarizes vertical integration of processing and marketing via short supply chains with no or just few intermediaries. "Broadening" covers diversification activities not directly connected to physical agricultural production but connected to agricultural resources, such as tourism services, equestrian services, care farming, nature conservation, and landscape management. Economic activities and employment, which take place outside the farm and are not connected to farming, are summarized under "re-grouping". Within this paper and hereafter, we focus solely on "deepening" and "broadening" diversification strategies addressing individual consumers, but no public entities such as municipalities (road clearance, landscape management, etc.). These explicit consumer-oriented diversification strategies cover most of Griffiths' structural diversification; namely direct sale arrangements ("deepening") as well as the "broadening" activities care farming and tourism services [27,29–31]. They are of special interest when analyzing urbanized areas with large consumer potentials.

Farm activities near cities have been greatly diversified over the previous decades, because several consumer-oriented diversifications offer promising economic pathways to generate employment and income, and it also attracts newcomers from outside the agricultural sector. Consumer-oriented "deepening" and "broadening" represent changes from traditional rural income fields towards

urban-oriented businesses to take advantage of closeness to cities in the global North [29,32]. Proximity to cities "opens different possibilities to the future agriculture in light of the current multifunctional discourse" [3] (p. 175). Generally, farm diversification is of increasing importance in European agriculture in transition from sole productivity orientation towards socially desired multifunctional patterns [15,33]. Lange et al. (2013) and Meraner et al. (2015) underpin the increasing academic focus on farm diversification, although highlighting a knowledge gap regarding farm determinants that influence farm diversification. Within this paper, the determinant of special interest is city proximity [9,10].

1.2. City-Proximity

Urban farming is not new, but interest in agriculture within and near cities is of upscaling interest nowadays [5,34,35]. It "has been re-appreciated with the recognition of its economic, social and environmental contributions" [3] (p. 172). Various farm structure specific chances and hurdles occur in urbanized areas spatially explicit [5,30,34,36–38]: consumer potentials, societal demands and trends, innovative milieus, land-related constraints, off-farm employment, etc. Thus, urban environments promote the application of farm strategies outside mainstream farming parallel to declining economic importance [25,38,39]. Traditional rural farming practices are inappropriate for most urban settings, so that Beauchesne and Bryant categorize "the urban fringe as an area where alternative forms of agriculture [...] are favored" [32] (p. 320) by looking for business niches stimulating innovative city-adjustment strategies [5,30]. "The survival of farms requires innovative adaptation and investment to take advantage of the characteristics of the peri-urban environment" [12] (p. 24).

Urban demands for goods and services originating from the agricultural sector are highlighted as an intensifying driving factor to adapt farming activities to the cities by capitalizing the close proximity [4,30,39]. Good accessibility of potential consumers in cities is increasingly acknowledged by farmers as comparative advantage [3,9]. When adjusting adequately to the cities, "commercial farming in urban areas is surviving and even prospering" [34] (p. 100). Profitability based solely on agricultural revenue streams via traditional long value chains—even when conducting high-value crop production—is challenging nowadays, especially in urban areas [4,14,29,31,34]. This paper emphasizes on urban farming's alternative business strategies outside primary production. Munton (1990) and Ilbery (1991) are two of the first highlighting diversification as a farm adjustment strategy [4,40]. Nowadays, it is widely discussed and receives considerable public and academic attention. However, due to its wide range of activities, various classifications and definitions exist, which make comparisons between studies and secondary data challenging [3,4]. Furthermore, competitive disadvantages in comparison to rural farms and contested global agrarian markets lead urban farms into distinct diversification strategies outside primary production [9,19,29,34,41,42]. Due to these framework conditions, proximity to cities is increasingly acknowledged as an important driver for farm diversification to ensure farm viability [7,9,10,39].

Ilbery (1991), who is one of the first linking farm diversification with farms' locations, detects concentration patterns near British cities [4]. He was able to. Several other scholars confirm his findings in other case studies of the global North [5,8–10,19,23,30,43,44]. Conversely, Mishra et al. (2004) and Barbieri and Mahony (2009) address city proximity's negative influence on farm diversification activities [18,45]. A Danish peri-urban case study reveals that only few farms focus solely on primary production [29]. Higher frequencies of "deepening" and "broadening" activities occur here with closeness to urban areas. Another Greater Copenhagen case study confirms these findings in a way, that purely agricultural functions decrease parallel to an increasing importance of diversification [39]. Concluding, they highlight the prevalence of rather extensive agriculture land use patterns towards farm diversification at the expense of rather land-intensive farming activities, such as arable and high-value crop production as well as intensive livestock farming. However, other studies emphasize the "concentration on more intensive production on remaining cropland" [5] (p. 51), for instance near cities in the US [5] and Canada [12]. For profitability reasons, individual

farms adapt heterogeneously to cities, so that the regional farm structure has a greater variety of farm types than in the rural countryside [14]. In contrast to previous times of mainstream farming's modernization, Wästfelt and Zhang (2016) nowadays see a mixture of intensive and extensive farming operations in wider metropolitan areas representing a higher heterogeneity of farm structures [3,46]. Food provision-oriented production on the one hand and service-oriented strategies with comparable little primary production components on the other hand co-exist in urban settings. Both are able to result in higher levels of farm business efficiency. Coming back to diversification's geographical aspects, "the impact of the proximity to urban centers on the decision to diversify remains unclear" [12] (p. 28). An explanation for this is the variety of on-farm diversification activities with their very individual spatial characteristics and preferences. Meraner et al. (2015) confirm this in a Dutch analysis by investigating individual diversification strategies and comparing "deepening" and "broadening" activities [10]. Our paper builds on their analysis by focusing on urban farming's consumer-oriented "deepening" and "broadening" activities, namely direct sale, tourism services, and care farming.

1.3. "Deepening" and "Broadening"

Consumer-oriented "deepening" and "broadening" diversification activities require immediate social contacts between producers and consumers, which is especially important in densely populated areas. Short supply chains build the major "deepening" activity. This vertical integration steps out of and differentiates from traditional long food chains [4,28,31,47–51]. Locally embedded value chains reduce, firstly, dependency on global markets and, secondly, contribute to a stronger multifunctionality of agriculture [42]. Global market competitiveness requires permanent farm growth to rationalize parallel to low producer prices [3]. "Deepening" embraces direct sale and also other short supply chains with only one or very few intermediaries, e.g., supermarkets, restaurants, and canteens. Short supply chains can be established via geographical proximity and organizational proximity (e.g., Internet selling). However, local supply chains with direct producer-consumer-relations cover the idea of short supply chains in its full sense [52]. Thus, this paper focuses solely on direct sale arrangements without any middleman.

Historically, farms near cities were wedded with the local population, especially by providing fresh and perishable food [1,53]. Industrialization, globalization, and agricultural modernization largely terminated this relation. Rettig (1976) argues that still in the 1970s farmers did not see the benefits for direct sale when being located close to cities [54]. Nowadays, the modern globalized food sector, intensive farming, and the prevalence of long food chains are under critique, especially within distinct segments of urban societies. Growing interest of consumers, inhabitants, and local stakeholders provide urban market opportunities [20,52]. Direct sale is a common strategy to create added value within densely populated areas [20,55]. Consumers are willing to pay higher prices for locally and transparently grown food [12,56]. Thus, urban farmers progressively apply direct sale due to nearby urban consumer potentials, newly emerging and intensifying urban demands for regional food of high quality, higher turnovers, and reduced vulnerability to macroeconomic fluctuations [3,8–10,52,55,57]. Direct sale arrangements enable higher margins due to better control over prices, but demand also financial resources, knowledge, and additional labor force. Hereby, most important are fresh and perishable high-quality products (vegetables, fruits, etc.) comparable difficult to store and transport [1,5,12]. Due to these perishability and transportation concerns, dairy farming historically concentrated near cities. Farms, which are specialized in high-value crops, are economically fragile when being dependent on global market prices [52]. Therefore, many of these specialized farms exploit local consumer potentials to sell fruits, vegetables, and other high-value food products locally to avoid this fragile dependency.

Farm shops, sale booths, farmers' markets, box schemes, and pick-your-own offers are well-established direct sale arrangements. By offering pick-your-own along with rather high product prices, farmers are able to use consumers as an urban resource resulting in a competitive advantage due to reduced labor costs [3]. Parallel to these already well-established ones, since a few years

Alternative Food Networks (AFN), such as Community Supported Agriculture (CSA) and rented gardening plots, emerge progressively—especially within densely populated areas of the global North [3,41,52,55,56,58,59]. These participatory AFNs contribute to upcoming new and share economy concepts within the food sector addressing food supply re-localization [52,60]. Many empirical studies confirm direct sale's importance in agglomerations: Within the municipality of Rome 60% of the farms sell directly along with a recently increasing number of farmers' markets dispersed throughout the city [61]. More than one quarter of the farms located in Ile-de-France exploit short supply food chains with increasing proportions approaching Paris [52], about 30% of the Polish urban farms market directly [62], and near Montreal more farms market directly compared to farms located further outwards [14]. "Broadening" diversification embraces a wide range of service activities. Within this paper we focus on tourism services and care farming. Recreation in farming-dominated areas is of increasing importance for quality of life and public health, especially within highly urbanized regions [30,63]. Within inner-city settings recreation areas are scarce. Thus, farmland in the urban fringe increasingly gains importance as leisure and recreation arena for urban dwellers [30,64]. Already, Ilbery (1991) highlighted that the urban fringe provides favorable conditions for farm-based recreation services, which are on the one hand satisfying urban dwellers' growing leisure demands and on the other hand constitute a promising city-oriented farm business adjustment [4]. Although Yang et al. (2010) state that leisure activities related to agriculture contribute to urban farming's viability [65], tourism services are geographically biased and not an intrinsic characteristic of farming within densely populated areas [30]. Tourism builds also an important pillar of agricultural service-orientation in rural and touristic areas. Generally, farm-based tourism builds one of the major diversification and farm survival strategies by contributing to the economic development of the urban–rural transition zone. Several studies confirm the importance of tourism services in urban farming: Denmark [19,29,39], The Netherlands [10], Spain [53], Germany [9,57], and North America [5,12,14].

Care farming combines farming activities with social, educational, and health care services [66,67]. Herein, farm-work builds the cornerstone of rehabilitation, therapy, and education for specific client groups, such as mentally and physically disabled and socially disadvantaged people, addicts, long-term unemployed, as well as children, adolescents, and seniors requiring special needs. Already ten years ago, Hassink et al. (2007) stated care farming as one of the fastest growing business cases of Europe's multifunctional agriculture [66]. It "might be a strategy for farms around the city to strengthen their economic position" [67] (p. 1). The large number of possible clients raises interest in care farming in densely populated areas. This is theoretically and empirically discussed [10,60,61,68]. In 1997, the number of Dutch care farms was about 70, but nine years later the number reached more than 600 [67]. Most are located in the densely populated areas of The Netherlands and are dairy farms, while arable farms and intensive husbandry is considered less appropriate for care farming services. "Care farming creates a new business case by meeting urban-metropolitan questions and contributing to the well-being of urban citizens" [67] (p. 5).

1.4. "Deepening" and "Broadening" Determinants: Farms' and Farm Managers' Characteristics

The decision to diversify is influenced by various factors. Besides this paper's special emphasis on location, additional farms' and farm managers' characteristics have to be controlled for a comprehensive approach. The variables used in this paper to determine the diversification decision are briefly introduced here.

Several studies reveal a significant influence of farm size on the implementation of diversification activities, although the direction of influence remains unclear [10,47]. Some suggest that larger farms tend to apply diversification activities more often than smaller farms due to their more efficient allocation and exploitation of available farm resources [3,12,13,47,69–73]. Larger farms are able to shift parts of their farm resources more easily out of primary production with the aim to provide land for other activities and apply capital for required building conversions. A Dutch study shows that diversification is more likely on larger farms [10]. However, more precise insights into this Dutch

study show an ambiguous picture: the larger the farms, the more they apply nature conservation measures, but tourism services and care farming prevail on smaller farms. Thus, aggregated analyses of diversification determinants have to be interpreted carefully, so that more focused studies on individual or groups of diversification measures provide a more accurate picture. In line with the Dutch results for tourism services and care farming, some other scholars see a decreasing willingness to diversify with increasing farm sizes. They conclude that larger farms tend to specialize by exploiting economies of scale, which hampers diversification measures [45,74,75]. Wästfelt and Zhang (2016) reveal that horse service farms are comparable small and Doernberg et al. (2016) emphasize CSA as a business strategy for small-sized farms [3,56]. Additionally, some see diversification prevalence for medium-sized farms [4,29].

In line with the farm size discussion, the influence of farm intensity on diversification decisions is ambiguous. Farm intensity is closely intermingled with the grassland-cropland ratio, livestock and horse keeping, and high-value crop production. Older studies see diversification activities mainly on arable farms [27] and less on dairy and livestock farms [76]. Arable farms have a characteristic seasonal workload offering off-season engagements in diversification measures, while dairy and livestock production require constantly high workloads, which prevents farmers from applying additional business fields [47]. However, Lange et al. (2013) argue that fertile soils and intensive arable production along with high yields and revenues do not constitute the need to apply additional income streams [9]. A Dutch study shows that tourism services, direct sale, and care farming activities are applied more often on livestock farms compared to arable farms [10]. Concerning direct sale this confirms findings from Jongeneel et al. (2008) [23]. Studies from Danish [39] and Swedish [3] peri-urban areas both highlight an extensification trend. There, extensive land uses, grassland, and recreation-oriented livestock replace more intensive crop and commercial livestock production.

These findings from Denmark and Sweden are directly linked to the increase of horse keeping and equestrian services in urbanized areas. Diversification into horse services is named to have economic benefits for farms by taking up public's demand [77]. Compared to rather inelastic demands for agricultural commodities, equestrian services are rather elastic. Horse-related services are an increasing source of income within urbanized areas and constitute a major diversification measure [19]. Elgåker and Wilton (2008) emphasize its particular multifunctional character by jointly providing economic (employment, income) and socio-cultural (recreation) functions [44]. Bailey et al. (2000) link the viability of equine services to high population densities [77]. Several studies prove the "horsification" in wealthy urban areas of Northern Europe (Sweden, Denmark, Scotland, and Germany) and Canada [3,14,19,47,78,79]. Busck et al. (2006) name a growing number of horses, but shrinking numbers for other commercial livestock, such as chicken, pigs, dairy cows, and cattle, except sheep in a Danish case study [39].

The influence of livestock on the decision to diversify is complex. Constantly high workloads in many livestock farms are named to limit the application of diversification activities [47,76,80]. They conclude that grain, crop, and mixed farms diversify more than milk and meat producing livestock farms, while other studies name privileged framework conditions for livestock farms to apply on-farm diversification [10,23]. Ilbery (1991) differentiates between extensive and intensive livestock farming, whereby the first applies diversification activities more often [4]. Historically, dairy farming concentrated near cities mainly due to perishability and transportation concerns [1,5]. Exemplary farming patterns show this still today, e.g., around Montreal in Canada [14]. This pattern was also present in Swedish Gothenburg, but, for few decades, dairy and other livestock farming have been widely abandoned in favor of horses [3].

High-value crops enable farmers to generate more income on limited land resources. Therefore it is applied in urbanized areas with their contested land markets to reach higher economic rents [2,3]. Perishable vegetables and fruits hold comparative advantages in metropolitan areas [34]. High-value crop production is concentrated near many cities, for instance Paris, Bordeaux, Lille, and Lisbon [81], Vienna [82], Copenhagen [19], The Hague [83], Montreal and Toronto [12,14,32]. Bryant et al. (1999)

show that, close to Montreal, most of the fruit, vegetable and other horticultural production are directly linked to nearby urban markets [14]. High-value crop's vertical integration is crucial due to its fragility within long value chains and low prices on the global market [52]. Within their study they highlight the importance of short supply food chains for fruits and vegetables around Paris. Additionally, Meraner et al. (2015) emphasize that in The Netherlands high-value croppers diversify significantly more often into direct sale arrangements, while other diversification activities (tourism, care farming) are underrepresented [10].

A Germany-wide study shows that organic farms market more often directly than their conventional competitors [84]. With regard to city proximity, findings remain equivocal: In case studies conducted in the UK [85], Denmark [19], and Canada [32] the share of organic farming increases with proximity to the city. By contrast, studies from Switzerland [86] and Germany [57] cannot confirm this urban–rural pattern. Tobias et al. (2005) see a more powerful influence of nature-based determinants, such as soil fertility and topography [86].

Extension services contribute to successful farming when providing suitable information, guiding farm business decisions, and encouraging business innovation [45,87,88]. However, Knickel et al. (2009) detect a gap between farmers' willingness to adjust—for instance via farm diversification—and insufficient support of advisory services [87]. This gap can even hamper innovation, when advisory services ignore changing needs of farmers, but also of society. With regard to farm diversification, Clark (2009) points out that British extension services are rather disengaged compared to their enthusiasm in mainstream farm business support [88]. Linked to the urban area, Akimowicz et al. (2016) state that due to urban encroachments and farming fragmentations governmental extension offices disappeared within the wider metropolitan area of Toronto [12]. This has left a service provision gap, which challenges farmers to gain valuable information to judge their farm business decisions. In contrast, Aubry and Kebir (2013) mention that in their French case study region Ile-de-France the regional Chamber of Agriculture hired specialists for diversification activities in general and more precisely for short supply food chains, which proves the demand for extension services targeting diversification measures explicitly [52].

The influence of farm managers' age and education on the decision to diversify is vague. While Præstholm and Kristensen (2007) do not see an influence of age [29], Ilbery (1991) argues that farmers with considerable farming experience apply diversification activities more frequently than their younger colleagues [4]. By contrast, other scholars conclude that preferably younger farmers launch on-farm diversification activities due to longer lasting commitments [18,73]. A Dutch study shows shrinking probabilities to apply tourism services, direct sale, and care farming with aging farm mangers, while nature conservation schemes prevail with older farm managers [10]. Higher education supports the application of farm diversification [89]. The authors of this study do not specify the kind of diversification, while McNamara and Weiss (2005) narrow this down to off-farm diversification due to increasing income streams from non-agricultural sources parallel to an increasing level of education [73].

2. Materials and Methods

The study comprises primary web survey data of 123 farm managers situated in German polycentric Ruhr Metropolis. The data of farm managers were collected via a self-administered web survey in spring 2016. The regional Chamber of Agriculture announced the survey by sending emails to the farms in the region added by an email reminder about two weeks later. About 70% of the case study's total population could be reached by this email approach, while the regional Chamber of Agriculture does not contain email addresses of the remaining 30%. The sampling procedure's limitations are acknowledged when discussing and concluding the results. Several pre-tests (17) had been conducted with farmers and agricultural students located outside Ruhr Metropolis. The overall response rate is above ten per cent, but, due to incomplete and inaccurate responses, 123 farms are analyzed. The survey asks for specific data on: (1) farm; (2) farm manager, family, and household;

(3) production and marketing; (4) diversification; (5) spatial components; (6) extension service; and (7) socio-demographic data. The questionnaire consists mainly of preset answers (to tick) and few open questions aiming to ease the questionnaire's completion on the screen. The questions are purposefully selected to address determinants of diversification highlighted in the literature review. The farms that participated in the survey are heterogeneously distributed in the metropolitan area and represent the spatial farm pattern quite suitably (see Figure 1). However, farms in the case study's northwestern urban–rural fringe are underrepresented.

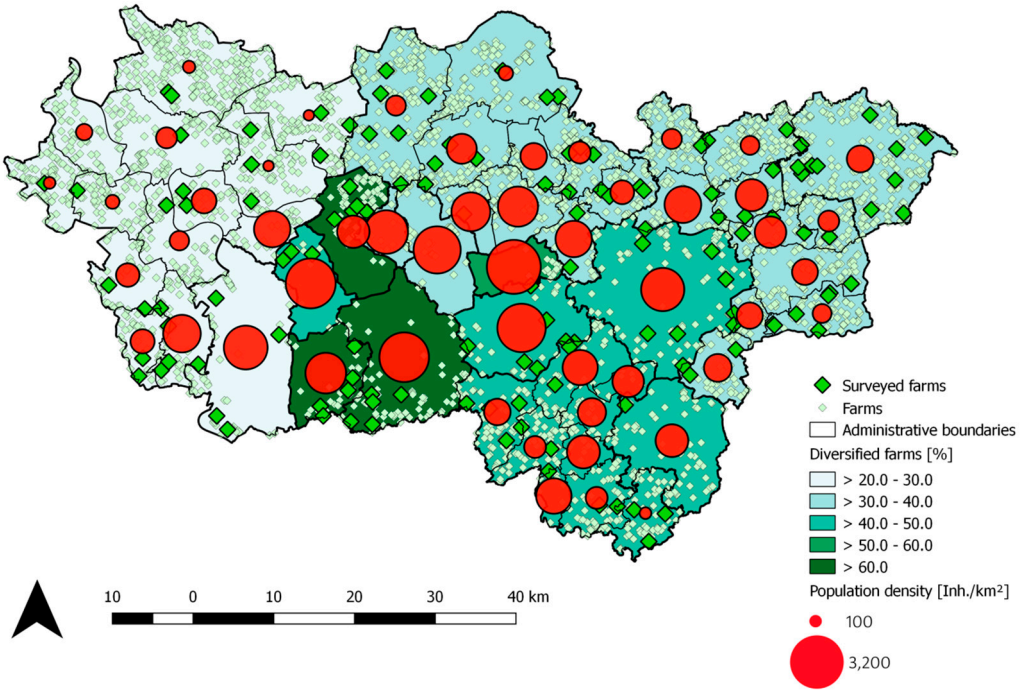

Figure 1. Spatial pattern of on- and off-farm diversification shares based on Agricultural Census 2010 data [90], population density in Ruhr Metropolis, and location of surveyed farms.

2.1. Case Study Region Ruhr Metropolis

Polycentric Ruhr Metropolis is the largest German agglomeration comprising 53 communities and about five million inhabitants, which results in an average population density of above 1100 inhabitants per square kilometer [57,90]. The most densely populated central zone reaches even a population density of more than 2000 inhabitants per square kilometer (see Figure 1). Despite a rapid industrialization and urbanization in the 19th and 20th century, agriculture is with a share of 33% still one of the most important land uses. The spatial relevance tends to increase towards the fringe, where it reaches more than 50%. More than two thirds are cropland.

About 50% of the in total more than 3000 farms situated in Ruhr Metropolis are full-time farms and nearly two thirds keep livestock [90]. The Agricultural Census 2010 reveals that more than one third of Ruhr farms are diversified. This proportion covering on- as well as off-farm diversification reaches more than 50% within the most densely populated central zone (see Figure 1). Farms situated at the northwestern fringe apply diversification measures less often. The two most important diversification activities are direct sale and equestrian services [57,90]. Concerning "deepening", seven per cent of Ruhr Metropolis' farms conduct direct sale, but ten per cent of the farms located in the more densely populated central zone. Equestrian services, which constitute the most important "broadening" farm strategy, are offered by 15% of Ruhr Metropolis' farms and 21% of the farms located in the metropolitan's central zone.

Ruhr Metropolis is an old-industrialized agglomeration facing economic, social, and environmental problems due to the transformation from an industry to information society [57]. The purchasing power differs spatially with higher levels in the southern parts and also at the fringe, but considerably lower purchasing powers in the central north, which has faced strongest problems in societal transformation processes. Urgent problems are for example industrial brownfields, comparable high unemployment rates, and losses of population. Since a few decades, several higher education and research institutes and service-oriented companies have been established to support the transformation into an information society.

Food consciousness differs between social strata. However, no well-established networks linking farmers and consumers exist in the case study region. Ruhr Metropolis is characterized by single linkages between individual farms and consumers, but so far no proper networks exist. Thus far, no food councils exist in Ruhr Metropolis; neither for the whole metropolitan area nor for metropolitan's individual cities. In recent years, some CSAs and other forms of coproduction and prosuming have started to emerge [56,57].

2.2. Binary Logistic Regression

The investigated consumer-oriented diversification strategies "deepening" and "broadening" are common city-adjustments of farms. Binary logistic regressions are run to explain the application of these diversification strategies and predict their odds of occurrence based on a set of ten determinants (see Table 1), which are previously introduced in the theoretical background. These determinants cover several farms' and farm managers' characteristics and city proximity. We decided to conduct binary logit regressions due to several reasons: (1) the dependent variables "deepening" and "broadening" are binary values (yes/no); (2) the independent variables are heterogeneous in terms of their scales of measure; (3) based on the literature review on the ten determinants we argue association relationships rooted in the theoretical derivation (see before); and (4) it is in line with Meraner et al. (2015) who analyzed determinants of farm diversification in The Netherlands with binary logit models [10]. The scales of measure of the ten determinants (independent variables) include categorical and continuous scales. Farm size, grassland share, spatial self-assessment, and farm manager's age are continuous variables, while the remaining six determinants are categorical (binary) variables. The categorical variables are all dichotomous (yes = 1/no = 0). The study calculates two binary logistic regressions: "deepening" (direct sale) and "broadening" (tourism services, care farming). Care farming and tourism services (gastronomy, accommodation, room hire, equestrian services, sport and other recreational services) are combined due to the sample's limited number of care farms. About one third of the web survey sample conducts consumer-oriented "deepening" (39 farms; 32%) and "broadening" (38 farms; 31%) diversification activities. These sample's shares are higher than the total population's shares. The total population's share of on- and off-farm diversification reaches about one third in the Agriculture Census 2010 [90]. Thus, the sample's shares for the "deepening" and "broadening" diversification activities are higher compared to the total population. This overrepresentation of "deepening" and "broadening" farms are taken into account when discussing and concluding the analysis. Meraner et al. (2015) investigated the determinants of Dutch farm diversification including individual calculations for "deepening" and "broadening" strategies based on binary logit regressions [10]. Our paper applies their approach by focusing on these two pillars of farm diversification.

The binary logistic regressions, which are based on Maximum Likelihood Estimations, allow finding relevant determinants for the applications of "deepening" and "broadening" diversification strategies. Firstly, the calculated odds ratios Exp(B) show the association between the determinants and the diversification measures "deepening" and "broadening" [91] (see Section 3.1).

Table 1. Means and frequencies for the ten determinants used in the binary logistic regressions.

Determinants (Units)	Sample (123 Farms)		"Deepening" (39 Farms)		"Broadening" (38 Farms)	
	Mean/Frequency	Standard Deviation	Mean/Frequency	Standard Deviation	Mean/Frequency	Standard Deviation
Farm characteristics						
Farm size (ha)	60	56.54	85	53.15	34	28.97
Grassland share (%)	37	33.53	30	25.36	59	33.15
Organic farms including in conversion (%)	5		10		5	
Farms with high-value crop production (%)	16		38		11	
Farms with livestock except horses (%)	59		77		45	
Farms with horses (%)	39		28		79	
Farms using extension services (%)	63		82		63	
Farmer characteristics						
Farm manager's age (years)	50	10.65	49	11.26	50	10.89
Farm manager with university degree (%)	40		36		29	
Location						
Spatial self-assessment (0–100) [1]	62	29.15	72	24.27	67	26.82

[1] Spatial assessment from 0 (very rural) to 100 (very urban).

Secondly, the predicted probabilities to diversify (P) are based on the regression coefficients (β) of the independent variables (x) estimated in the binary logistic regressions:

$$\mathbf{P}\left(\mathbf{diversification\ strategy}\right) = \frac{1}{1 + e^{-(constant + \beta 1 * x1 + \beta 2 * x2 + \ldots + \beta n * xn)}}$$

The probabilities to diversify into "deepening" and "broadening" activities are predicted from the logistic regressions' results with a special focus on the spatial self-assessment and usage of advisory services (see Section 3.2). As highlighted in the literature section, farms' locations can play a key role in determining farm strategies. Farm manager's spatial self-assessment, which ranges from zero (very rural) to 100 (very urban) in steps of one, is analyzed for location-dependent probability predictions. We use the farmers' self-assessment of city-proximity purposefully. We argue that the perceived or felt distance to cities and potential customers, which might also cover relational and temporal proximity apart from spatial proximity, is a comprehensive indicator of the proximity concept. In the location-dependent predictions we also include the usage or non-usage of extension services, while the remaining eight determinants maintain with the sample's mean values and frequencies representing average sample conditions.

3. Results and Discussion

3.1. Binary Logistic Regression

The two conducted binary logistic regression models seem satisfactory and explain to considerable shares the decision to diversify into "deepening" (direct sale) and "broadening" (tourism services, care farming) within the metropolitan case study region Ruhr Metropolis. The significant Qui^2 tests (omnibus tests) show that the models run with the set of ten determinants are improvements over the baseline models (null models with the constant term only) (see Table 2). The pseudo-R^2 values compare the logistic regressions including the set of ten determinants with the baseline models. Nagelkerke's R^2 values of 0.455 ("deepening") and 0.627 ("broadening") respectively Cox and Snell's R^2 values of 0.324 ("deepening") and 0.445 ("broadening") show the regression models' improvements over the baseline models. The non-significant Hosmer–Lemeshow tests validate the models' goodness of fit. The applied models improve the degree of correct classifications over the baseline model (see Table 3) [92]. In comparison to the baseline model the two regression models including the ten explanatory variables increase the correct classification from 68.3% to 82.1% for the "deepening" model and from 69.1% to 85.4% for the "broadening" model. Nonetheless, the models' accuracies and goodness of fit values show also that other determinants, such as farmers' personal traits, farmers'

family characteristics, and local population's needs and characteristics, might influence the decision to diversify. However, this cannot be covered with this analysis, but has to be considered in the discussion section.

Table 2. Model summary and accuracy for the two binary calculations consumer-oriented "deepening" and "broadening".

Consumer-Oriented Diversifications	Omnibus Test (Qui² Test, *p*)		−2 Log-Likelihood	Nagelkerke's R^2	Cox and Snell's R^2	Hosmer–Lemeshow-Test (Qui² Test, *p*)	
"Deepening" (direct sale)	48.201	0.000	105.462	0.455	0.324	7.426	0.491
"Broadening" [1]	72.467	0.000	79.623	0.627	0.445	4.580	0.801

[1] "Broadening" includes tourism services (gastronomy, room hire, accommodation, equestrian services, sport and other recreation services) and care farming.

Table 3. Classification table of the logistic regressions. The baseline models, which predict always "no (0)", result in correct percentage values of 68.3% ("deepening") and 69.1% ("broadening").

		Predicted ("Deepening")			Predicted ("Broadening")		
		No (0)	Yes (1)	Percentage Correct	No (0)	Yes (1)	Percentage Correct
Observed	No (0)	79	5	94.0	78	7	91.8
	Yes (1)	17	22	56.4	11	27	71.1
	Overall percentage			82.1			85.4

All investigated determinants—except farm manager's age—show significant results at the level of 0.1 (Wald test) with at least one of the two logit regressions (see Tables 4 and 5). Larger farms tend to implement direct sale arrangements, while smaller farms incline to make use of tourism services or care farming business activities.The odds ratio (Exp(B)) of 1.008 shows that each additional hectare farm size increases the odds to diversify into "deepening", while the Exp(B) of .986 shows that each additional hectare farm size decreases the odds to diversify into "broadening" with all other variables constant. Concerning farm size this ambivalent picture of on-farm diversification strategies is in line with former studies' different statements and highlights the need for precise definitions of diversification activities under evaluation to allow valuable comparisons. This study confirms several other studies' results [3,10,45,74,75]: smaller farms apply tourism services and care farming more often than larger farms.

Table 4. Binary logistic regression of "deepening" diversifications. The significance levels are calculated with Wald tests.

Determinants	"Deepening"					
	Regression Coefficient B	Standard Error	*p* [2]	Exp(B)	90% Confidence Interval (Exp(B))	
					Lower	Upper
Constant	−4.882	1.739	0.005 ***	0.008		
Farm characteristics						
Farm size	0.008	0.005	0.093 *	1.008	1.000	1.017
Grassland share	0.010	0.10	0.338	1.010	0.993	1.027
Organic farms including in conversion	2.032	1.210	0.093 *	7.630	1.043	55.814
Farms with high-value crop production	2.021	0.712	0.005 ***	7.544	2.339	24.334
Farms with livestock except horses	1.224	0.566	0.031 **	3.399	1.339	8.630
Farms with horses	−0.455	0.559	0.416	0.635	0.253	1.592
Farms using extension services	1.520	0.666	0.022 **	4.574	1.529	13.685
Farmer characteristics						
Farm manager's age	−0.002	0.025	0.938	0.998	0.957	1.040
Farm manager with university degree	−1.253	0.597	0.036 **	0.286	0.107	0.763
Location						
Spatial self-assessment [1]	0.026	0.011	0.015 **	1.026	1.008	1.044

[1] Spatial assessment from 0 (very rural) to 100 (very urban). [2] Levels of significance (Wald tests): * ≤ 0.1, ** ≤ 0.05, *** ≤ 0.01.

Table 5. Binary logistic regression of "broadening" diversifications. The significance levels are calculated with Wald tests.

Determinants	"Broadening"					
	Regression Coefficient B	Standard Error	p [2]	Exp(B)	90% Confidence Interval (Exp(B))	
					Lower	Upper
Constant	−5.095	2.014	0.011 **	0.006		
Farm characteristics						
Farm size	−0.014	0.008	0.060 *	0.986	0.973	0.998
Grassland share	0.037	0.012	0.002 ***	1.038	1.018	1.058
Organic farms including in conversion	−0.063	1.534	0.967	0.939	0.075	11.706
Farms with high-value crop production	−0.521	0.857	0.543	0.594	0.145	2.432
Farms with livestock except horses	−0.179	0.618	0.772	0.836	0.302	2.312
Farms with horses	2.651	0.653	0.000 ***	14.166	4.837	41.490
Farms using extension services	2.536	0.825	0.002 ***	12.635	3.252	49.090
Farmer characteristics						
Farm manager's age	0.004	0.027	0.891	1.004	0.960	1.049
Farm manager with university degree	−2.208	0.770	0.004 ***	0.110	0.031	0.390
Location						
Spatial self-assessment [1]	0.021	0.012	0.065 *	1.022	1.002	1.041

[1] Spatial assessment from 0 (very rural) to 100 (very urban). [2] Levels of significance (Wald tests): * $\leq$ 0.1, ** $\leq$ 0.05, *** $\leq$ 0.01.

The grassland-cropland-ratio does not have a statistically assured influence on the "deepening" measure direct sale. "Broadening" farms have higher grassland shares compared to their counterpart without tourism services or care farming. The grassland share's odds ratio of 1.038 demonstrates that every additional grassland share unit increases the odds to diversify into "broadening". Concerning consumer-oriented "broadening", these findings follow Lange et al. (2013) who argue that crop production on fertile soils hampers diversification [9]. This fits also to Danish [39] and Swedish [3] case studies, which see an extensification trend with rising proportions of grassland for recreation-oriented livestock (horses). However, older studies from Ilbery et al. (1997) and McInerney et al. (1989), which see diversification mainly on arable farms, cannot be supported with this study's results [27,76]. Farms with horses have a strong tendency to exploit consumer-oriented "broadening" activities. When keeping horses the odds to diversify into "broadening" increase several times. Partly, this is self-explanatory, because equestrian services build a tourism service. Additionally, this is in line with higher grassland shares mentioned before. Equestrian services build one of the most often applied city-oriented diversification strategies—mainly due to large numbers of possible customers living nearby and also due to its rather elastic demands [19,77].

The determinants related directly to primary production (organic farming, high-value crop production, and livestock keeping except horses) have positive coefficients for "deepening" activities, while these determinants have negative coefficients for "broadening" acitivities, although not statistically significant in case of the "broadening" regression model. Farms, which are conducting organic farming, high-value crop production or keep livestock, have few times greater odds to market directly compared to their counterparts. For the results of this study's three production determinants, literature provides confirming but also disconfirming reports: Regarding organic farming, the findings are in line with Goy and Maack (2008), who detected a positive correlation between organic farming and direct sale in Germany [84]. Several studies link high-value production with short value chains (e.g., [10,14]) and Aubry and Kebir (2013) highlight the necessity of direct sale arrangements due to its fragility within contested long value chains [52]. Jongeneel et al. (2008) and Meraner et al. (2015) conclude in their studies, that direct sale, tourism services, and care farming are applied more often by farms keeping livestock [10,23]. Concerning direct sale and livestock husbandry (no horses), these results match with our findings, while other studies see a negative influence of livestock keeping on the decision to diversify due to constantly high workloads in many livestock keeping farm types [47,76,80]. Short supply chains in livestock farming with direct producer-consumer interactions seem to be a promising, socially accepted, and viable strategy for farms to maintain commercial livestock keeping

close to cities. A stronger research emphasis on these issues and also on the influences of livestock farming intensities seems to be of additional value for clearer statements in future studies.

Farm manager's age does not show an interpretable tendency regarding the application of diversification activities. This fits to the indifferent statement of Præstholm and Kristensen (2007) [29], but not to other studies which see diversified farms mainly with older [4] or younger farm managers [10,18,73]. Farm managers with a university degree have odds ratios considerably below one for both models. Higher educated farmers have lower odds to diversify into "deepening" and "broadening" diversification measures compared to farmers without a university degree. Thus, the conclusions of Chaplin et al. (2004) cannot be supported extensively [89]. Their study does not differentiate between on-farm ("deepening" and "broadening") and off-farm ("re-grouping") diversification, which is crucial to be used here for fitting comparisons. McNamara and Weiss (2005) [73] concretise statements of Chaplin et al. (2004) [89] in a way that the level of education correlates positively with off-farm diversification due to the quantity of rewarding jobs outside the farming sector located in the city. Concerning the farm managers, other possible influences on the decision to diversify, such as personality traits and family backgrounds, cannot be covered with this study. Farmers' personality traits might be important especially for alternative and innovative city adjustments including strategies subsumed under "deepening" and "broadening" diversification. Besides the determinants on farms' and farmers' characteristics, location, and usage of extension services, a future study should also include farmers' personality traits as well as farmers' family characteristics, such as background, children, family succession, and off-farm employments.

The spatial self-assessment and usage of extension services have statistically assured positive coefficients for both paths of diversification (see Tables 4 and 5). The odds to apply "deepening" (direct sale) and "broadening" (tourism services/care farming) both rise significantly when being located closer to the city with odds ratios of 1.026 for "deepening" and 1.022 for "broadening". The usage of agricultural extension services strongly promotes the implementation of consumer-oriented "deepening" and "broadening" diversification strategies. The usage of extension services increases the odds to diversify a few times for both regression models. With regard to advisory services, Clark (2009) and Knickel et al. (2009) name disinterest in diversification and insufficient support under changing societal demands [87,88]. Our findings reject their statements when focusing on urban farming's consumer-oriented diversification activities.

3.2. The Location Matters: Predicted Probabilities

The two determinants spatial self-assessment and usage of advisory services are highlighted to predict probabilities based on the logistic regressions. As revealed in the logistic regressions (see Section 3.1) and also highlighted in the literature section, farm managers' spatial self-assessment is of special interest. Thus, location-dependent probability predictions are added to the logistic regressions' results (see Figure 2). The influence of extension services' usage is integrated within these predictions as well. These two determinants' coefficients are the only once being significantly positive for both regression models (see Tables 4 and 5). Therefore, the probabilities to diversify into "deepening" and "broadening" diversification measures are predicted with varying spatial self-assessments ranging from very rural (0) to very urban (100). Regarding extension services, farm managers' usage and non-usage are both considered. The remaining eight determinants are held constant with sample's mean values for the continuous variables and sample's frequencies for categorical variables. The geographical transect from very rural to very urban allows to draw conclusions spatially by keeping other determinants constant. The predictions reveal that being located in a very urban environment and making use of extension services increase the probabilities both for consumer-oriented "deepening" and "broadening" activities considerably. In very rural settings, both predicted probabilities—for consumer-oriented "deepening" and "broadening"—are below ten per cent, but with considerably higher predicted probabilities when making use of extension services. Along with continuous city rapprochement, the predicted probabilities increase by a few

times. "Deepening" reaches more than 50% and "broadening" nearly 25% in very urban locations and when using extension services.

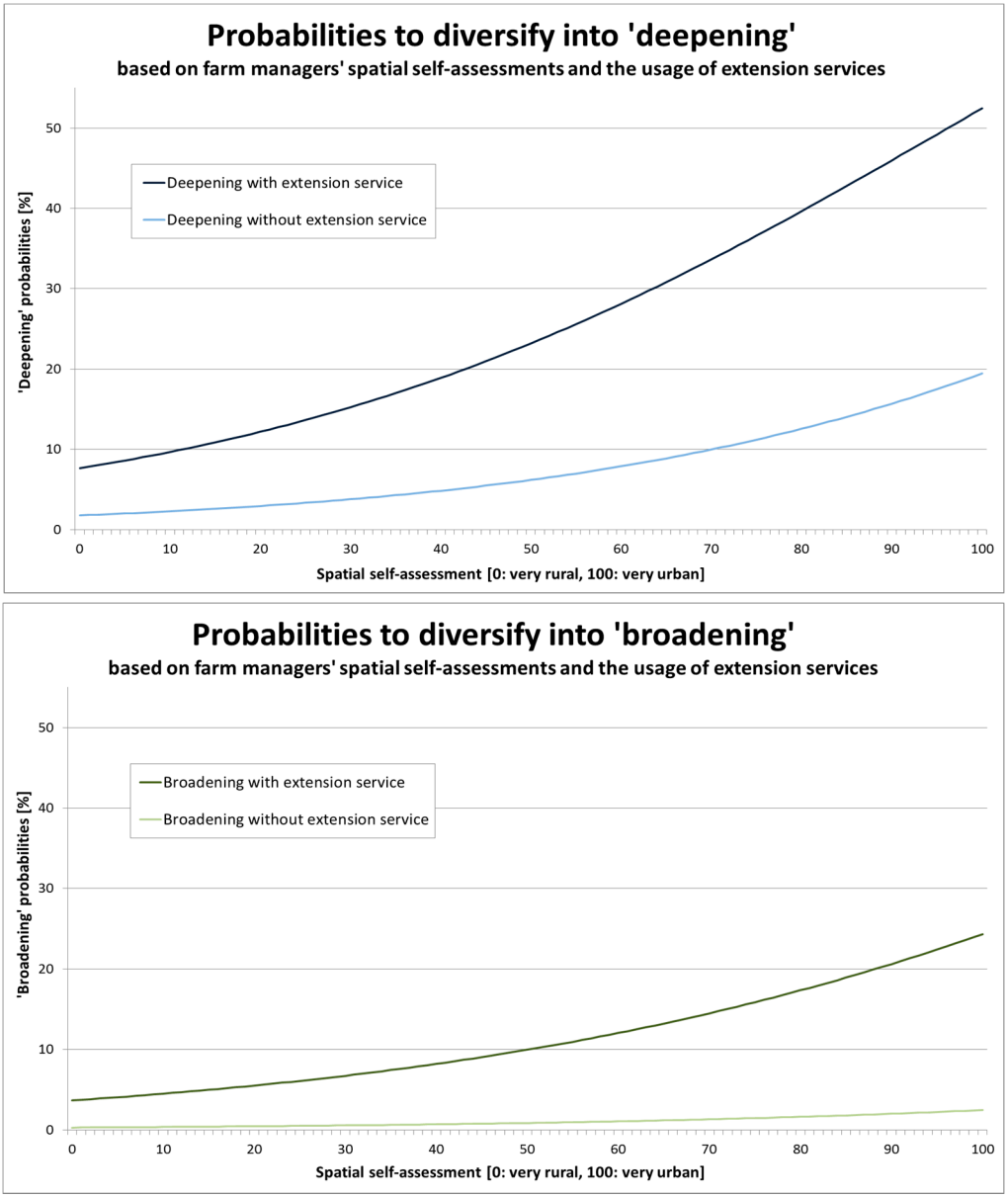

Figure 2. Predicted probabilities to diversify into consumer-oriented: (1) "deepening" (**top**); and (2) "broadening" (**down**) based on spatial self-assessments of farm managers ranging from very rural (0) to very urban (100) and the usage and non-usage of extension services.

The statement, that city proximity is increasingly acknowledged as an important driver for farm diversification to ensure farm viability [7,9,10,39], are in line with this study's logit regression results for consumer-oriented "deepening" and "broadening" strategies. The negative influence of city proximity on the decision to diversify highlighted by [18,45] cannot not be confirmed, while our results are in line with several other case studies of the global North [4,5,8–10,12,19,23,29,30,42–44]. Akimowicz et al. (2016) state that "the impact of the proximity to urban centers on the decision to diversify remains unclear" [12] (p. 28). This can be interpreted with the huge variety of on-farm diversification activities along with their very individual spatial characteristics and preferences. Additionally, it should be considered that the local population's characteristics and needs might

differ within one city or metropolitan area, such as Ruhr Metropolis, but also between different cities or metropolitan areas. Thus, comparisons between urban areas have to be seen also in light of city-specific characteristics and social strata of the local population. These issues go beyond this paper's scope and name future research demands. Meraner et al. (2015) confirm in their Dutch analysis the need for distinct analyses of "deepening" and "broadening" activities [10]. This is in line with our findings: the determinants that influence the decision to diversify into "deepening" or "broadening" differ in many cases.

4. Conclusions

Farms' diversification activities are manifold and contribute to farming's viability under contested urban framework conditions. Due to the heterogeneity of diversification activities, our approach differentiates between consumer-oriented "deepening" and "broadening" strategies, which is in line with Meraner et al. (2015) [10]. The results of the conducted binary logistic regressions reveal increasing odds for "deepening" and "broadening" activities with city proximity and usage of agricultural extension services. The more urban the farm managers perceive their farm location, the higher are the odds to apply direct sale, tourism services or care farming. Farm characteristics, which encourage the implementation of "deepening" strategies, are larger farm sizes, high-value production, organic farming, and livestock production. Conversely, tourism services and care farming prevail on smaller farms and on farms with horses and higher grassland shares. More detailed insights into "broadening" strategies are not possible due to the survey's limited number of care farms. This study puts an emphasis on the spatial aspects of urban farming referring back to von Thünen [1]. Local food production and marketing ("deepening") as well as non-food-oriented services loosely linked to farming ("broadening") are both of increasing importance for urban farming when approaching the city. Renewing von Thünen's theory, this creates a heterogeneous spatial co-existent of rather intensive and extensive city-adjustment strategies around cities. Parallel to important farms' and farm mangers' characteristics the study is able to highlight the relevance of agricultural extension services to develop farms into city-adjusted diversification strategies demanded by urban society. City-adjusted diversifications avoid economies of scale competition in agricultural primary production and well-established and efficient long-value chains. This paper's focus on farms' and farmers' characteristics, location, and usage of extension services is able to explain with high effect sizes decisions to diversify into "deepening" and "broadening" city-adjustment strategies. Despite the limitations of the sample procedure and sample's overrepresentation of "deepening" and "broadening" strategies in this study, the detected determinants provide valuable information for currently non-consumer-oriented farms to make use of present demands and support upscaling. Due to the sample's overrepresentation of "deepening" and "broadening" activities results cannot be transferred one to one to the Ruhr Metropolis' total population. Specific local city conditions, such as land use patterns, as well as socioeconomic and sociocultural environments, e.g., social strata, purchasing power, traditions, and urban milieu, and personal traits go beyond this paper's scope and highlight further research demand. Research in this field allows better understanding farm developments and supporting city-adjusted diversification strategies rooted in the demands of the local population and territorial characteristics.

Author Contributions: Bernd Pölling conducted the literature review on urban farming, "deepening" and "broadening" diversification, and the set of determinants influencing farm diversification. He was also responsible for the collection of data. Both authors decided on the method used. Bernd Pölling carried out the calculations and wrote the article supported by Marcus Mergenthaler.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Von Thünen, J.H. *Der isolirte Staat in Beziehung auf Landwirthschaft und Nationalökonomie oder Untersuchungen über den Einfluβ, den die Getreidepreise, der Reichthum des Bodens und die Abgaben auf den Ackerbau Ausüben*; Perthes: Hamburg, Germany, 1826. (In German)
2. Sinclair, R. Von Thünen and urban sprawl. *Ann. Am. Assoc. Geogr.* **1967**, *57*, 72–87. [CrossRef]
3. Wästfelt, A.; Zhang, Q. Reclaiming localisation for revitalising agriculture: A case study of peri-urban agricultural change in Gothenburg, Sweden. *J. Rural Stud.* **2016**, *47*, 172–185. [CrossRef]
4. Ilbery, B. Farm Diversification as an Adjustment Strategy on the Urban Fringe of the West Midlands. *J. Rural Stud.* **1991**, *7*, 207–218. [CrossRef]
5. Heimlich, R.E.; Barnard, C.H. Agricultural Adaption to Urbanization: Farm Types in Northeast Metropolitan Areas. *Northeast. J. Agric. Res. Econ.* **1992**, *4*, 50–60.
6. Maye, D.; Ilbery, B.; Watts, D. Farm diversification, tenancy and CAP reform: Results from a survey of tenant farmers in England. *J. Rural Stud.* **2009**, *25*, 333–342. [CrossRef]
7. Pfeifer, C.; Jongeneel, R.A.; Sonneveld, M.P.W.; Stoorvogel, J.J. Landscape Properties as drivers for farm diversification: A Dutch case study. *Land Use Policy* **2009**, *26*, 1106–1115. [CrossRef]
8. Meert, H.; van Huylenbroeck, G.; Vernimmen, T.; Bourgeois, M.; van Hecke, E. Farm household survival strategies and diversification on marginal farms. *J. Rural Stud.* **2005**, *21*, 81–97. [CrossRef]
9. Lange, A.; Piorr, A.; Siebert, R.; Zasada, I. Spatial differentiation of farm diversification: How rural attractiveness and vicinity to cities determine farm households' response to the CAP. *Land Use Policy* **2013**, *31*, 136–144. [CrossRef]
10. Meraner, M.; Heijman, W.; Kuhlman, T.; Finger, R. Determinants of farm diversification in The Netherlands. *Land Use Policy* **2015**, *42*, 767–780. [CrossRef]
11. McCann, P.; Sheppard, S. The rise, fall and rise again of industrial location theory. *Reg. Stud.* **2003**, *37*, 649–663. [CrossRef]
12. Akimowicz, M.; Cummings, H.; Landman, K. Green lights in the Greenbelt? A qualitative analysis of farm investment decision-making in peri-urban Southern Ontario. *Land Use Policy* **2016**, *55*, 24–36.
13. Gasson, R. Farm diversification and rural development. *J. Agric. Econ.* **1988**, *39*, 175–182. [CrossRef]
14. Bryant, C.R.; Deslauriers, P.; Marois, C. Diversification strategies in agriculture in the rural-urban fringe. In *Spatial Dimensions of Agriculture*; Mohammad, N., Ed.; Concept Publishing Company: New Delhi, India, 1992; pp. 95–113.
15. European Parliamentary Research Service. *Farm Diversification in the EU*. Available online: http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/581978/EPRS_BRI(2016)581978_EN.pdf (accessed on 10 April 2016).
16. Van der Ploeg, J.D.; Renting, H.; Brunori, G.; Knickel, K.; Mannion, J.; Marsden, T.; de Roest, K.; Sevilla-Guzman, E.; Ventura, F. Rural Development: From Practices and Policies towards Theory. *Sociol. Rural.* **2000**, *40*, 391–408. [CrossRef]
17. Robinson, L.J.; Barry, P.J. *The Competitive Firm's Response to Risk*; Macmillan Publishing: New York, NY, USA, 1987.
18. Barbieri, C.; Mahoney, E. Why is diversification an attractive farm adjustment strategy? Insights from Texas farmers and ranchers. *J. Rural Stud.* **2009**, *25*, 58–66.
19. Zasada, I.; Fertner, C.; Piorr, A.; Nielsen, T.S. Peri-urbanisation and multifunctional adaptation of agriculture around Copenhagen. *Geogr. Tidsskr.* **2011**, *111*, 59–72. [CrossRef]
20. Inwood, S.M.; Sharp, J.S. Farm persistence and adaptation at the rural-urban interface: Succession and farm adjustment. *J. Rural Stud.* **2012**, *28*, 107–117. [CrossRef]
21. Hansson, H.; Ferguson, R.; Olofsson, C.; Rantamäki-Lahtinen, L. Farmers' motives for diversifying their farm business—The influence of family. *J. Rural Stud.* **2013**, *32*, 240–250. [CrossRef]
22. Woods, M. *Rural*; Routledge: London, UK, 2011.
23. Jongeneel, R.A.; Polman, N.B.; Slangen, L.H. Why are Dutch farmers going multifunctional? *Land Use Policy* **2008**, *25*, 81–94. [CrossRef]
24. McClintock, N. Why farm the city? Theorizing urban agriculture through a lens of metabolic rift. *Cambr. J. Reg. Econ. Soc.* **2010**, *3*, 191–207.

25. Mok, H.-F.; Williamson, V.G.; Grove, J.R.; Burry, K.; Barker, S.F.; Hamilton, A.J. Strawberry fields forever? Urban agriculture in developed countries: A review. *Agron. Sustain. Dev.* **2014**, *34*, 21–43.
26. Griffiths, A. *Farmers' Attitudes towards Diversification: A Realist Approach*; University of Exeter: Exeter, UK, 1987; unpublished.
27. Ilbery, B.; Healey, M.; Higginbottom, J. On and off-farm business diversification by farm households in England. In *Agricultural Restructuring and Sustainability: A Geographical Perspective*; Ilbery, B., Chiotti, Q., Rickard, T., Eds.; CAB International: Wallingford, UK, 1997; pp. 135–151.
28. Van der Ploeg, J.D.; Roep, D. Multifunctionality and rural development: The actual situation in Europe. In *Multifunctional Agriculture. A New Paradigm for European Agriculture and Rural Development*; Huylenbroeck, G., Durand, G., Eds.; Ashgate: Hampshire, UK, 2003; pp. 37–54.
29. Præstholm, S.; Kristensen, S.P. Farmers as initiators and farms as attractors for non-agricultural economic activities in peri-urban areas in Denmark. *Geogr. Tidsskr.* **2007**, *107*, 13–27. [CrossRef]
30. Zasada, I. Multifunctional peri-urban agriculture—A review of societal demand and the provision of goods and services by farming. *Land Use Policy* **2011**, *28*, 639–648. [CrossRef]
31. Van der Schans, J.W. Business Models Urban Agriculture. Available online: https://www.wageningenur.nl/upload_mm/f/3/6/fb858e59-2190-46d9-8fe7-f293efd8c0a8_MFL_Business%20models%20urban%20agriculture.%20Juni%202015%20Small.pdf (accessed on 1 January 2016).
32. Beauchesne, A.; Bryant, C. Agriculture and Innovation in the Urban Fringe: The Case of Organic Farming in Quebec, Canada. *Tijdschr. Econ. Soc. Geogr.* **1999**, *90*, 320–328. [CrossRef]
33. Burton, R.J.F.; Wilson, G.A. Injecting social psychology theory into conceptualisations of agricultural agency: Towards a post-productivist farmer self-identity? *J. Rural Stud.* **2006**, *22*, 95–115. [CrossRef]
34. Gardner, B.L. Commercial Agriculture in Metropolitan Areas: Economics and Regulatory Issues. *Agric. Resour. Econ. Rev.* **1994**, *23*, 100–109. [CrossRef]
35. Monaco, F.; Zasada, I.; Wascher, D.; Glavan, M.; Pintar, M.; Schmutz, U.; Mazzocchi, C.; Corsi, S.; Sali, G. Food Production and Consumption: City Regions between Localism, Agricultural Land Displacement, and Economic Competitiveness. *Sustainability* **2017**, *9*, 96. [CrossRef]
36. Mougeot, L.J.A. Urban Agriculture: Definition, Presence, Potentials and Risks, and Policy Challenges. Cities Feeding People Series Report 31, 2000. International Development Research Centre (IDCR). Available online: https://idl-bnc-idrc.dspacedirect.org/bitstream/handle/10625/26429/117785.pdf?sequence=12 (accessed on 2 February 2017).
37. Buciega, A.; Pitarch, M.D.; Esparcia, J. The context of rural-urban relationships in Finland, France, Hungary, The Netherlands and Spain. *J. Environ. Plan. Manag.* **2009**, *11*, 9–27. [CrossRef]
38. Lovell, S.T. Multifunctional Urban Agriculture for Sustainable Land Use Planning in the United States. *Sustainability* **2010**, *2*, 2499–2522. [CrossRef]
39. Busck, A.G.; Kristensen, S.P.; Praestholm, S.; Reenberg, A.; Primdahl, J. Land system changes in the context of urbanisation: Examples from the peri-urban area of Greater Copenhagen. *Geogr. Tidsskr.* **2006**, *106*, 21–34. [CrossRef]
40. Munton, R.J.C. *Farming Families in Upland Britain: Options, Strategies and Futures*; Association of American Geographers: Toronto, ON, Canada, 1990.
41. Jarosz, L. The city in the country: Growing alternative food networks in metropolitan areas. *J. Rural Stud.* **2008**, *24*, 231–244. [CrossRef]
42. Wilson, G.A. From 'weak' to 'strong' multifunctionality: Conceptualising farm-level multifunctional transitional pathways. *J. Rural Stud.* **2008**, *24*, 367–383. [CrossRef]
43. Lobley, M.; Potter, C. Agricultural change and restructuring: Recent evidence from a survey of agricultural households in England. *J. Rural Stud.* **2004**, *20*, 499–510. [CrossRef]
44. Elgåker, H.; Wilton, B. *Horse Farms as a Factor for Development and Innovation in the Urban-Rural Fringe with Examples from Europe and Northern America*; Forest & Landscape Working Papers; University of Copenhagen: Copenhagen, Denmark, 2008.
45. Mishra, A.K.; El-Ostra, H.S.; Sandretto, C.L. Factors affecting farm enterprise diversification. *Agric. Financ. Rev.* **2004**, *64*, 151–166. [CrossRef]
46. Bryant, C.R.; Johnston, T.R.R. *Agriculture in the City's Countryside*; University of Toronto Press: Toronto, ON, Canada, 1992.

47. McNally, S. Farm diversification in England and Wales—What can we learn from the farm business survey? *J. Rural Stud.* **2001**, *17*, 247–257. [CrossRef]
48. Van Huylenbroeck, G.; Vandermeulen, V.; Mettepenningen, E.; Verspecht, A. Multifunctionality of Agriculture: A Review of Definitions, Evidence and Instruments. *Living Rev. Landsc. Res.* **2007**, 1. [CrossRef]
49. Van der Schans, J.W. Urban Agriculture in The Netherlands. *Urban Agric. Mag.* **2010**, *24*, 40–42.
50. Barnes, A.P.; Hansson, H.; Manevska-Tasevska, G.; Shrestha, S.S.; Thomson, S.G. The influence of diversification on long-term viability of the agricultural sector. *Land Use Policy* **2015**, *49*, 404–412. [CrossRef]
51. Weltin, M.; Zasada, I.; Franke, C.; Piorr, A.; Raggi, M.; Viaggi, D. Analysing behavioural differences of farm households: An example of income diversification strategies based on European farm survey data. *Land Use Policy* **2017**, *62*, 172–184. [CrossRef]
52. Aubry, C.; Kebir, L. Shortening food supply chains: A means for maintaining agriculture close to urban areas? The case of the French metropolitan area of Paris. *Food Policy* **2013**, *41*, 85–93.
53. Recasens, X.; Alfranca, O.; Maldonado, L. The adaptation of urban farms to cities: The case of the Alella wine region within the Barcelona Metropolitan Region. *Land Use Policy* **2016**, *56*, 158–168. [CrossRef]
54. Rettig, S. An investigation into the problems of urban fringe agriculture in a greenbelt situation. *J. Environ. Plan. Manag.* **1976**, *19*, 50–74. [CrossRef]
55. Aubry, C.; Ramamonjisoa, J.; Dabat, M.-H.; Rakotoarisoa, J.; Rakotondraibe, J.; Rabeharisoa, L. Urban agriculture and land use in cities: An approach with the multi-functionality and sustainability concepts in the case of Antananarivo (Madagascar). *Land Use Policy* **2012**, *29*, 429–439. [CrossRef]
56. Doernberg, A.; Zasada, I.; Bruszewska, K.; Skoczowski, B.; Piorr, A. Potentials and Limitations of Regional Organic Food Supply: A Qualitative Analysis of Two Food Chain Types in the Berlin Metropolitan Region. *Sustainability* **2016**, *8*, 1125. [CrossRef]
57. Pölling, B.; Mergenthaler, M.; Lorleberg, W. Professional urban agriculture and its characteristic business models in Metropolis Ruhr, Germany. *Land Use Policy* **2016**, *58*, 366–379. [CrossRef]
58. Paül, V.; McKenzie, F.H. Peri-urban farmland conservation and development of alternative food networks: Insights from a case-study area in metropolitan Barcelona (Catalonia, Spain). *Land Use Policy* **2013**, *30*, 94–105. [CrossRef]
59. Pölling, B. Comparison of Farm Structures, Success Factors, Obstacles, Clients' Expectations and Policy Wishes of Urban Farming's Main Business Models in North Rhine-Westphalia, Germany. *Sustainability* **2016**, *8*, 446. [CrossRef]
60. Van der Schans, J.W.; Lorleberg, W.; Alfranca-Burriel, O.; Alves, E.; Andersson, G.; Branduini, P.; Egloff, L.; Giacché, G.; Heller, H.; Herkströter, K.; et al. It Is a Business! Business Models in Urban Agriculture. In *Urban Agriculture Europe*; Lohrberg, F., Licka, L., Scazzosi, L., Timpe, A., Eds.; Jovis: Berlin, Germany, 2016; pp. 82–91.
61. Cavallo, A.; Di Donato, B.; Marino, D. Mapping and assessing urban agriculture in Rome. *Agric. Agric. Sci. Procedia* **2016**, *8*, 774–783. [CrossRef]
62. Sroka, W. Aktywność ekonomiczna i powiązanie z rynkiem gospodarstw rolnych zlokalizowanych w miastach oraz ich obszarach funkcjonalnych. *Roczniki Naukowe SERIA* **2016**, *18*, 231–237. (In Polish)
63. De Vries, S.; Verheij, R.A.; Groenewegen, P.P.; Spreeuwenberg, P. Natural environments—Healthy environments? An exploratory analysis of the relationship between greenspace and health. *Environ. Plan. A* **2003**, *35*, 1717–1731.
64. Antrop, M. Landscape change and the urbanization process in Europe. *Landsc. Urban Plan.* **2004**, *67*, 9–26. [CrossRef]
65. Yang, Z.; Cai, J.; Sliuzas, R. Agro-tourism enterprises as a form of multifunctional urban agriculture for peri-urban development in China. *Habitat Int.* **2010**, *34*, 374–385. [CrossRef]
66. Hassink, J.; Zwartbol, C.; Elings, M.; Thissen, J. Current status and potential of care farms in the Netherlands. *J. Life Sci.* **2007**, *55*, 21–36. [CrossRef]
67. Eweg, H.P.A.; Hassink, J. Business Models of Green Care in The Netherlands. Available online: http://edepot.wur.nl/175712 (accessed on 28 June 2017).
68. Wiskerke, H. On regions lost and regions regained: Reflections on the alternative food geography and sustainable regional development. *Int. Plan. Stud.* **2009**, *14*, 369–387. [CrossRef]
69. Pope, R.D.; Prescott, R. Diversification in relation to farm size and other socio-economic characteristics. *Am. J. Agric. Econ.* **1980**, *62*, 554–559. [CrossRef]

70. McInerney, J.; Turner, M. *Patterns, Performance and Prospects in Farm Diversification*; Report No. 236; Agricultural Economics Unit, University of Exeter: Exeter, UK, 1991.
71. Shucksmith, M.; Smith, R. Farm household strategies in pluriactivity in upland Scotland. *J. Agric. Econ.* **1991**, *42*, 340–353. [CrossRef]
72. Hjalager, A.-M. Agricultural diversification into tourism: Evidence of a European community development programme. *Tour. Manag.* **1996**, *17*, 103–111. [CrossRef]
73. McNamara, K.T.; Weiss, C.R. Farm household income and on- and off-farm diversification. *J. Agric. Appl. Econ.* **2005**, *37*, 37–48. [CrossRef]
74. Krugman, P. Increasing returns and economic geography. *J. Political Econ.* **1991**, *3*, 483–499. [CrossRef]
75. Vik, J.; McElwee, G. Diversification and the entrepreneurial motivations of farmers in Norway. *J. Small Bus. Manag.* **2011**, *49*, 390–410. [CrossRef]
76. McInerney, J.; Turner, M.; Hollingham, M. *Diversification in the Use of Farm Resources*; Report No. 232; Agricultural Economics Unit, University of Exeter: Exeter, UK, 1989.
77. Bailey, A.; Williams, N.; Palmer, M.; Geering, R. The farmer as a service provider: The demand for agricultural commodities and equine services. *Agric. Syst.* **2000**, *66*, 191–204. [CrossRef]
78. Quetier, F.F.; Gordon, I.J. "Horsiculture": How important a land use change in Scotland? *Scott. Geogr. J.* **2003**, *119*, 153–159. [CrossRef]
79. Zasada, I.; Berges, R.; Hilgendorf, J.; Piorr, A. Horsekeeping and the peri-urban development in the Berlin Metropolitan Region. *J. Land Use Sci.* **2013**, *8*, 199–214. [CrossRef]
80. Hansson, H.; Ferguson, R.; Olofsson, C. Understanding the diversification and specialization of farm businesses. *Agric. Food Sci.* **2010**, *19*, 269–283. [CrossRef]
81. Péron, J.-Y.; Geoffriau, E. Characteristics and Sustainable Development of Peri-Urban Vegetable Production in Europe. International Symposium on Horticultural Plants in Urban and Peri-Urban Life. *ISHS Acta Hortic.* **2007**, *762*, 159–170.
82. Vogl, C.R.; Axmann, P.; Vogl-Lukasser, B. Urban organic farming in Austria with the concept of Selbsternte ("self-harvest"): An agronomic and socio-economic analysis. *Renew. Agric. Food Syst.* **2004**, *19*, 67–79. [CrossRef]
83. Korthals Altes, W.K.; van Rij, E. Planning the horticultural sector: Managing greenhouse sprawl in the Netherlands. *Land Use Policy* **2013**, *31*, 486–497. [CrossRef]
84. Goy, I.A.; Maack, K. *Bundesweite Repräsentative Erhebung und Analyse der Verbreiteten Produktions- und Vermarktungssysteme und Aufbau Eines Bundesweiten Praxis-Forschungs-Netzwerkes im Ökologischen Gartenbau—Situation des Ökologischen Gartenbaus in Deutschland*; Leibniz Universität Hannover: Hannover, Germany, 2008. (In German)
85. Ilbery, B.; Holloway, L.; Arber, R. The Geography of Organic Farming in England and Wales in the 1990s. *Tijdschr. Econ. Soc. Geogr.* **1999**, *90*, 285–295. [CrossRef]
86. Tobias, S.; Nuesch, A.; Nebel, R.; Guilmain, A.L. Suburbane Landwirtschaft oder Landschaftsmanagement? *Agrarforschung* **2005**, *12*, 306–311.
87. Knickel, K.; Brunori, G.; Rand, S.; Proost, J. Towards a better conceptual framework for innovation processes in agriculture and rural development: From linear models to systemic approaches. *J. Agric. Educ. Ext.* **2009**, *15*, 131–146. [CrossRef]
88. Clark, J. Entrepreneurship and diversification on English farms: Identifying business enterprise characteristics and change processes. *Entrep. Reg. Dev.* **2009**, *21*, 213–236. [CrossRef]
89. Chaplin, H.; Davidova, S.; Gorton, M. Agricultural adjustment and the diversification of farm households and corporate farms in Central Europe. *J. Rural Stud.* **2004**, *20*, 61–77. [CrossRef]
90. Agricultural Census Data North Rhine-Westphalia. Available online: https://www.landesdatenbank.nrw.de/ldbnrw/online/logon (accessed on 10 March 2017).
91. Osborne, J.W. Bringing Balance and Technical Accuracy to Reporting Odds Ratios and the Results of Logistic Regression Analyses. Available online: http://pareonline.net/getvn.asp?v=11&n=7 (accessed on 28 June 2017).
92. Agresti, A. *Categorical Data Analysis*, 2nd ed.; John Wiley & Sons: Hoboken, NJ, USA, 2002.