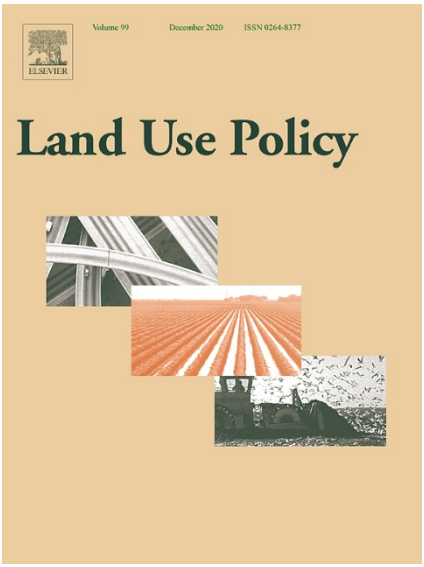
Cite as:
Klusáček, P., Martinat, S., Krejčí, T., Golubchikov, O., Pícha, K., Škrabal, J. and Osman, R. (2021) 'Planning for the future of derelict farm premises: From abandonment to regeneration?', *Land Use Policy*, 102, 105248, doi: 10.1016/j.landusepol.2020.105248



Title: Planning for the future of derelict farm premises:
From abandonment to regeneration

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Journal: *Land Use Policy*

Volume: 102, March 2021

DOI: 10.1016/j.landusepol.2020.105248

Highlights

- Two-thirds of derelict farm premises experience long-term abandonment.
- Planning for derelict farm premises is different from planning for current agricultural use.
- Two-thirds of derelict farm premises are planned to be re-used in agriculture.
- Housing is another important re-use option for such premises.
- Actual regeneration generally follows the requirements of territorial zoning plans.

Abstract

Re-using and regenerating derelict and abandoned areas constitutes an important element in sustainable land use policy and planning. This paper explores the phenomenon of derelict farm premises in South Bohemia, the Czech Republic. It analyses the origin and extent of this phenomenon as well as land use targets applied to such sites by planning documents. A large number of derelict farm premises have emerged on former collectivized lands. According to local territorial zoning plans, agricultural use prevails as the reuse designation for these sites. However, they are still significantly less frequently planned to be used in agriculture than areas currently in active agricultural use and are more frequently planned to be converted into housing, public buildings, or industrial activities. Overall, strategies for the planned utilization of derelict premises are found to be contingent on temporal and spatial factors. While many long-term derelict premises are planned to be converted into non-agricultural use, newly emerged ones are more likely to retain the agricultural designation. In terms of spatial diversity, rural municipalities of the inner peripheries emphasize housing development rather than industrial activity. Further, by analysing successful regeneration projects accomplished for abandoned premises since 2004, it is found that they generally adhere to the requirements of territorial zoning plans.

Keywords

Deagrization
Derelict farm premises
Brownfield
Rural
Central Europe

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1. Introduction

The emergence of human-made wastelands and derelict areas is a concern for sustainability. It detaches land from its socially productive function and yet often has a detrimental effect on natural ecosystems. Sustainability-minded land use policy seeks to find ways of reclamation, restoration, or regeneration of such areas. This concerns not only post-industrial 'brownfields' in urbanised areas (Dixon, 2007; Thornton et al., 2007), but also many manifestations of dereliction in the countryside. Indeed, due to its 'out-of-sight', peripheral and resource-extracting character, the countryside often becomes the host of abandoned anthropogenic 'badlands'. This problem has been well-rehearsed, for example, in the case of large-scale land degradation such as caused by opencast mining that destroys original ecosystems (Sardinha et al., 2013). However, what has received less attention thus far is the phenomenon of abandoned built-up areas located in rural areas, including the troubled practices of their rehabilitation. This aspect is mostly discussed from the point of view of abandoned villages and cultural conservation (Garcia and Ayuga, 2007; Güler and Kâhya, 2019; Jaszczak et al., 2018) and not so much in terms of abandoned farm-related premises and associated land-use policy.

Our paper addresses this lacuna by focusing in particular on one important aspect of this phenomenon – derelict built-up sites located amongst farming/agricultural land. Such sites may emerge as a result of the abandonment of clusters of previously productive assets by farmers (e.g. buildings, houses, depots, warehouses, greenhouses, garages, and other constructions and

infrastructure originally built to support farming activities). Following abandonment, many factors consequently impede their effective reuse. For example, derelict farm premises typically pose a shallow investment potential due to their marginal locations away from economically developed areas (Skala et al., 2013). It is also often difficult to clean them up and convert them into natural habitats due to the high costs involved, lack of incentives, as well as the involvement of the pre-existing structure of land tenure and ownership.

Our empirical grounding lies with the experiences of the Czech Republic. Agriculture used to be a principal employer in the countryside of the countries of the communist Eastern bloc which the Czech Republic also belonged to after WWII (Banski, 2019; Chodkowska-Miszczuk et al., 2019). A specific feature of agriculture in the Central and Eastern European (CEE) countries (except for Poland and Yugoslavia) was its concentration in agricultural cooperatives and state farms, which were established during the period of collectivisation (Bański, 2008; Lindbloom, 2012). As the Iron Curtain fell at the end of the 1980s, many of these farms found themselves uncompetitive under the market conditions, faced with restitution, lack of investment capital, reduced subsidies, and liberalized imports (Doucha and Divila, 2008).

De-collectivization of post-communist agriculture has resulted in four principal types of relationships between land ownership and land use: (i) large landowners involved in large-scale commercial production of agricultural products, (ii) farmers with small or medium-sized farms, (iii) landowners with no farming activities, and (iv) people who are employed elsewhere but still keep their small or medium-sized farms (Zakeviciute, 2016). The distribution between these four types varies across post-communist countries (Banski, 2019; Bezemer et al., 2006; Csatari et al., 2019; Czyzewski et al., 2018; Jancak et al., 2019; Kacz et al., 2019; Zakeviciute, 2016). The main reasons for this are differences in ownership of agricultural land and its utilization (Banski, 2019) and also the changes in ownership during the transformation process. In cases where only a small portion of landowners continue to practice agriculture commercially, like in the Czech Republic, large enterprises dominate, although many family farms continue to grow food for satisfying their owners' food consumption (Bezemer, 2000; Csatari et al., 2019; Doucha and Divila, 2008; Lindbloom, 2012; Spisiak et al., 2008). As these small farmers are unable to fully utilise and reconstruct large-scale premises remained from centralised farms, while old buildings requiring maintenance and regeneration are also not attractive for larger entrepreneurs, a wave of abandonment has appeared during the transformation process (Klusacek et al., 2013; Skala et al., 2013). Even following the accession of the CEE state to the EU in 2004, abandoned sites still materially dominate many rural communities in these countries (Veznik and Konecny, 2011).

Research on rural derelict farm premises is badly needed for a deeper understanding of the conditions underlying the varied development trajectories of such areas, designing appropriate policies for them, and ensuring that their future reuse is in line with sustainability principles, as well as with the needs of local communities (Klusacek et al., 2013).

Planning for the future of large premises from times of collectivized agriculture in CEE countries is part of not only deep transformation processes of agricultural production (Banski, 2018) and rural society (Perlin et al., 2010) in the Central Europe, but it is also part of the transformation of the whole agricultural sector of the EU challenging food security (EU, 2019b), market changes (EU, 2019c), and climate change (EU, 2019a). The development of agricultural entrepreneurship in CEE countries is an integral part of the agricultural development of the EU within the arms of Common Agricultural Policy (Czubak and Pawlowski, 2020). This topic is thus also important in the context of the transformation of the agricultural sector in the EU as a whole.

In this study, we explore the extent of the rural dereliction phenomenon in South Bohemia in the Czech Republic, along with land use planning regimes for these sites and the effectiveness of planning implementation in actual regeneration projects.

2. Contextual background and hypotheses

2.1 Derelict farm premises – definitions of terms

Many farm premises were built in the Czech Republic during the era of collectivized agriculture, i.e. between 1948 and 1989. By premises, we understand a land plot with buildings (Merriam-Webster, 2020). We will use the term 'farm premises' for former collective farms and state farms premises that served the purpose of agricultural production. These often comprise a fenced area with all buildings used for agricultural production or storage, technical support, administrative buildings, as well as close surroundings connected to these buildings (Krejci et al., 2019, 2020). Only premises of collectivized agriculture are of our interest, as these were typical of large-scale farming during the communist era. By the term 'derelict farm premises' (or DFPs) we understand farm premises that were built between 1948 and 1989 for collectivized communist agriculture but lost their function and were abandoned after 1989 (Figure 1).

In planning literature, abandoned, disused, and neglected sites that used to be utilized but are now waiting for re-use, are commonly referred to as brownfields, no matter what was their original use. That is why sites similar to those of our interest here are sometimes referred to in the literature as agricultural brownfields (Klusacek et al., 2013). However, certain confusion emerges along with this definition, because 'brownfield' places the emphasis on possible contamination of these sites and, above all, its industrial character (CEN, 2014). Furthermore, agricultural buildings do not typically count as 'previously developed land' as associated with brownfields (Smith, 2002). Such fallow and vacant tracks of the land of former agricultural production, which are currently available for development, are often seen as 'greenfields' (De Sousa, 2000). If the site is yet heavily contaminated, the terminology of 'blackfields' (Krzysztofik et al., 2012) or 'greyfields' (Newton, 2010) may be used. What is more, 'wastescapes' also adds to this terminology barrage (Amenta and van Timmeren, 2018). To avoid confusion, we use 'derelict farm premises' (DFPs) as the more straightforward term for our purpose.

Figure 1. There are dozens of small-scale derelict farm premises resulting from the abandonment of collectivized communist agricultural premises throughout our study area. This is the case of abandoned piggery adapted for some time for the production of gravestones. Taken by authors.

Among the main reasons for the occurrence of DFPs in CEE, the key ones include the low profitability of farming, coupled with: the inability of agriculture developed under the centrally-planned economy to cope with market principles (Bezemer, 2000; Jancak et al., 2019); a huge inflow of cheap products from other countries (including those where agriculture has been heavily subsidised); and the restitution process that has created new institutional barriers and fragmentation. The extremely rapid restitution of agricultural land that started in 1991 has produced millions of new landowners (Banski, 2018). The majority of original (pre-collectivization) small landowners had already died, while their heirs, who moved to cities, are not interested in practising agriculture (Bezemer, 2000). This was in the context of substantial cuts of subsidies to agriculture in 1993 leading to the collapse of many agricultural enterprises.

This situation consequently resulted in the occurrence of a range of unused or underused post-agricultural buildings and premises (Skala et al., 2013). In the mid-2000s, the first national survey of brownfields by the Czech government identified that the largest share of all abandoned sites in the whole country originally served agriculture (35%) (CzechInvest, 2008), knowing that not all data are precise in this database (Osman et al., 2015).

However, as in the case of the Czech Republic, all land plots, including abandoned ones, have planning regulations stipulating their planned use. Analysing those conditions represents our particular research interest. On the one hand, this can allow the evaluation of the configurations of the very planning regime for such sites and its actual implementation in practice, while, on the other hand (and with the acknowledgment that the planning system in the Czech Republic *does* remain relatively effective), the stipulated planning conditions enable us to assess the future of these sites.

2.2 Land-use planning and territorial zoning plans in the Czech Republic

Spatial/territorial planning has been an integral and traditional part of endeavour for the development of regions, cities, and communities in the Czech Republic (Hoffman, 1994; Maly and Mulicek, 2016). The current institutional arrangement of spatial/territorial planning is primarily based on the Act on Spatial Planning and Building Regulations, or the Building Act No. 183/2006 Coll. According to the Act, the aim of the territorial planning is to "provide conditions for building and sustainable development of the territory consisting in a balance between favourable environment, economic growth and cohesion of the inhabitants of the area as well as satisfying the needs of the present generation without threatening the life conditions of the future generations" (§18, para 1). Another key aim is to achieve a concord between public and private interests.

The objectives of spatial development are implemented by a variety of tools specified in Chapter III of the Building Act (e.g., spatial planning documentation, spatial planning materials, the policy of the spatial development). These tools are implemented at different administrative levels, ranging from the national level (the policy of the spatial development) to a municipal level (spatial plan).

For our purposes, the most important feature of spatial planning is that it sets limits for the utilization of specific localities, mainly by specifying which activities the given area/land plot can or cannot be used for. This is given by territorial zoning plans (as the most detailed part of spatial planning documentation) prepared for the whole municipality. As the land use activities within built-up areas of municipalities are clearly defined for each locality, we can derive from them the potential (allowed) future uses of DFPs.

2.3 Derelict farm premises and the development of the countryside

The spatial planning of rural areas is recognized as a multi-layered process affected by many interconnected internal and external factors (Vaishar and Stastna, 2019). A deeper look at particular types of rural areas is needed. The present-day countryside fulfils predominantly a residential and recreational function, yet all agriculture is located here (Jancak et al., 2019; Perlin et al., 2010). We may speculate that planning is diversified, taking into account the character of the village and that the planning of the future use of the current DFPs reflects the different future functions of the countryside. We may thus also assume that the planned use will not be even within the individual categories of utilization. Based on these facts, we can formulate a set of hypotheses guiding our research.

Hypothesis 1: The planned use of the present-day DPFs will differ according to the location of the site.

As Perlín et al. argue for the Czech Republic (Perlin et al., 2010), at least eight types of the countryside might be identified as per its regional development trends, including: developing rural areas; their neighbouring non-developing rural areas; Moravian peripheries; well-served Moravian rural areas; problematic recreational rural areas; intense recreational areas; structurally affected rural areas; and rural areas without clear development identity. It was also previously found that the likelihood that DFPs are regenerated correlates with the location of the site relative to a city (Green, 2018; Navratil et al., 2018). Kubes and Kraft (Kubes and Kraft, 2011) propose the following types, which we will use in our analysis: (i) borderland peripheral rural areas, (ii) inner peripheral rural areas, and (iii) centrally located rural areas.

Hypothesis 2: Plans on how to use present-day DPFs are different from plans for the use of currently used rural farm premises.

DFPs originate under various combinations of local conditions (Navratil et al., 2019). Apart from entirely abandoned sites, there are sites within which zones of intensive production are combined with abandoned zones (Krejci et al., 2020). For example, areas with the most fertile soils are experiencing pressure to grow the most profitable crops (predominantly cereals and maize) and squeeze out animal husbandry (Martinat et al., 2016; Van der Horst et al., 2018). Assessing further development potential should consider not only the planned use of DFPs but also the planned use of currently used sites and compare these plans.

Hypothesis 3: The planned use of DFPs will differ according to their past use.

The use of former communist rural farm premises has changed over the past three decades (Navratil et al., 2019). The year 2004 may be considered as a significant historical watershed, as it represents fundamental changes in agriculture subsidy policy. In 2004, the Czech Republic became a member of the EU, hence a member of the Common Agricultural Policy (CAP), which has been the most influential factor in Czech agriculture (Veznik and Konecny, 2011). From this perspective, it is interesting to compare the (planned) use of DFPs with their status in 2004.

Hypothesis 4: The regeneration of DFPs which happened between 2004 and 2018 follows the conditions of spatial planning.

Between 2004 and 2018, new DFPs arose; at the same time, many sites were regenerated and started to be used in a new way (Navratil et al., 2019). Based on field studies, there were disproportions between the planned use and the actual use following regeneration of DFPs realised between 2004 and 2018. We can assess to what extent plans for the use have been fulfilled over this period of 15 years.

3. Methods

3.1 Study area

The South Bohemia Region (NUTS III CZ031) is chosen as a study area for our research (Figure 2). This region is located on the southern periphery of Bohemia (the Czech Republic) along the border with Austria and Germany (Popjakova and Blazek, 2015). The peripherality of the region is based on its history and specifics of its economy. South Bohemia has always ranked more among rural and agricultural regions with low population density and dominance of small communities (70% of municipalities in South Bohemia have a population of less than 500), with above-average employment in agriculture and yet a decreasing number of employees and a decrease in the total sowing areas of crops – from 336 thousand hectares in 1993 to 247 thousand hectares in 2017 (i.e., by more than one quarter).

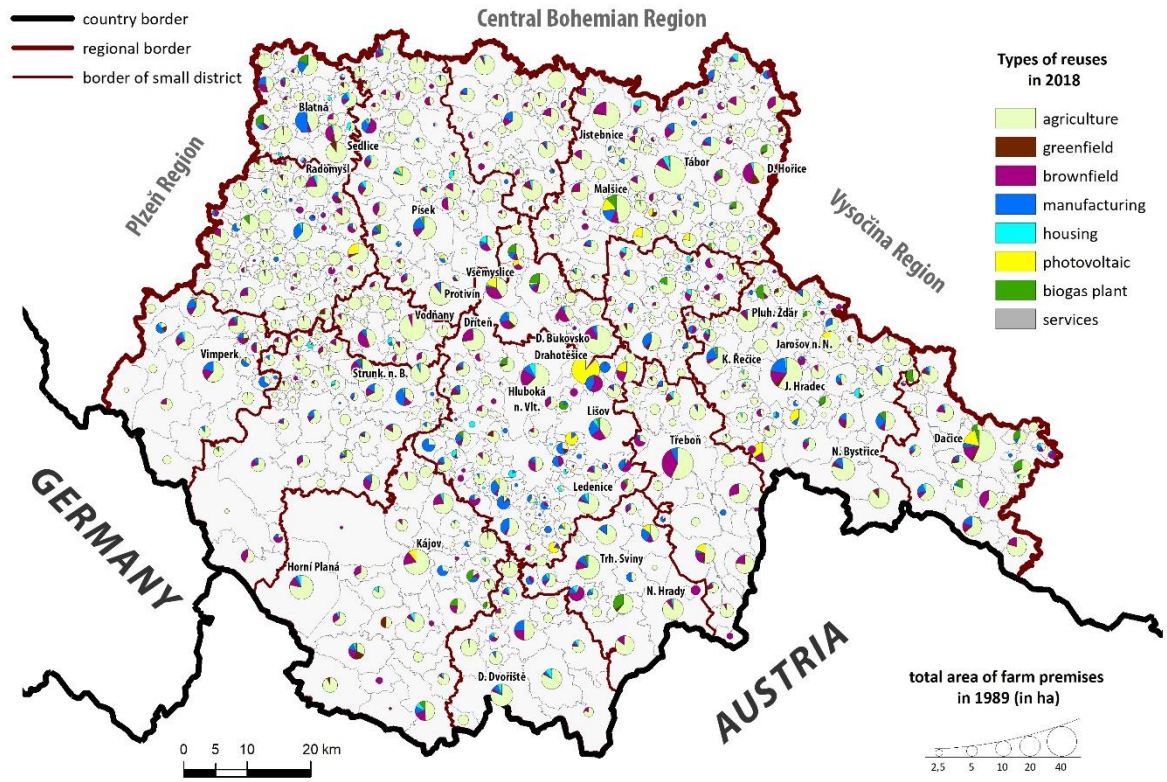

Figure 2. Distribution of rural farm premises among municipalities of the study area region. The total area of farms in 1989 is shown alongside the distribution of land use types in 2018.

Even though it is a peripheral region of the Czech Republic, it can be still divided into sub-regions, ranging from more central to distinctively peripheral. Peripheral areas occupy a third of the area of our study region, accommodating 10% of inhabitants of South Bohemia (Kubes and Kraft, 2011). There are two distinct types of peripheries – (i) peripheral border municipalities along the border with Germany (Bavaria) and Austria (Upper and Lower Austria), which account for 45% of the peripheral area in the South Bohemia region and 37% of their inhabitants, (ii) municipalities of the so-called inner periphery. At the same time, the centre of the South Bohemia Region – the city of České Budějovice (Budweis) – is the important subnational economic centre (Kubes, 2015; Navratil et al., 2018). Centres of NUTS IV regions serve as regional economic centres (Kubes and Kraft, 2011).

3.2 Data

To accomplish the aim of the present study, three types of data were gathered. Firstly, it was necessary to identify the localization of the pre-1989 rural farm premises; secondly, to determine their use in 2004 and its current use; and finally obtain and unify the information on its planned use based on territorial zoning plans (Figure 3).

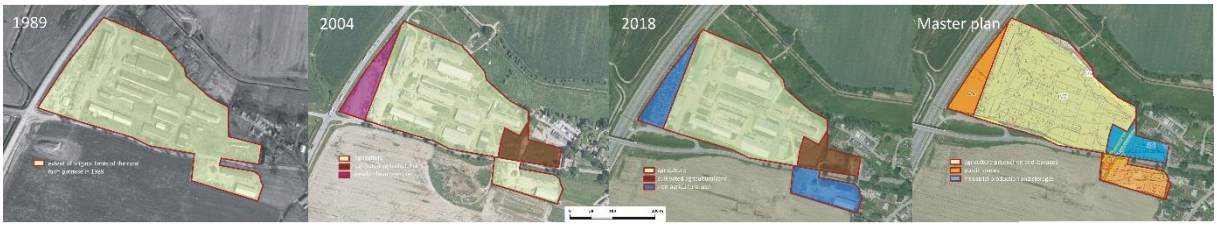

Figure 3. The use of rural farm premises in 1989, 2004, and 2018 and the existing plan.

3.2.1 Location of the pre-1989 rural farm premises

The identification of the pre-1989 rural farm premises followed the methodology of Navrátil et al. (Navratil et al., 2019). The topographic maps of Czechoslovakia with a scale of 1:25,000 from the late 1980s and the mid-1990s were used. The sites considered to be the pre-1989 rural farm premises were labelled in these maps as agricultural properties, cowsheds, pig farms, sheepfolds, poultry farms, horticultural fields, and stud farms (Krejci et al., 2019). Black and white prints of the aerial images from the early 1990s were used to delimit the borders of these properties. For the accuracy of the spatial data used, the analyses of utilisation and changes in utilisation were conducted with an accuracy of 10 × 10 metres. For further analysis, only premises with available information regarding planned uses (see part 3.2.3) were taken.

3.2.2 Current use of the pre-1989 rural farm premises

Data on the use of the pre-1989 rural farm premises in 2004 and 2018 were needed. There are not many choices how to obtain these data, and we decided to use aerial images that are freely accessible for South Bohemia – aerial imagery for the year 2004 was taken between the years 2003 and 2005; for the year 2018 between the years 2016 and 2018. The preparation of data also followed the methodology of Navratil et al. (Navratil et al., 2019) – two WMS services of the Czech Office for Surveying, Mapping and Cadastre were used: WMS – Orthophoto, WMS – Archival photo. For current use, a verification of this procedure was undertaken on 200 randomly selected premises that had been visited. Based on aerial imagery data, we were able to distinguish six categories of usage (at each different year):

- agricultural use (any type of agricultural use, including biogas plants),
- non-agricultural use (utilization for entrepreneurship but not agricultural one, including photovoltaic power plants),
- housing,
- cultivated agricultural land (land ploughed, used for grazing, or regularly mowed),
- derelict farm premises.

The spatial extent of those rural farm premises has increased in some cases since then, but this space enlargement was not taken into account for this study.

3.2.3 Planned uses of the pre-1989 rural farm premises

The planned use of land for municipalities is defined by the regulations within local development planning. The main legal framework for the local development, as mentioned above, is territorial zoning plans defined in Act no. 183/2006, §3, para 1. Based on this plan, the planned uses of individual sites can be assessed as well as the use of different land plots. The limits for the use of the given land are specified here, and particular uses that are allowed (or not allowed) are stated.

The issue of inhomogeneity of methods used for developing these plans made our work with territorial zoning plans complicated – there is no single methodology used for plans within the South Bohemia Region. Another issue is the level of details showed in individual territorial zoning plans. Dozens of various types of planned uses were narrowed to comparable types:

- agricultural production and storage (sites with the main agricultural function that might be to a limited extent also used for other business activities),
- general production and storage (sites dedicated for production activities undifferentiated whether for agriculture or industry, small crafts or businesses),
- industrial production and storage (sites with the primary use for industry, small crafts, or businesses),
- public spaces (rather a wide category that also includes sites of civic amenities and technical infrastructure; the reason for this combined use lies in the fact that huge overlaps of categories were found in plans among municipalities which could not be divided),
- the greenery (private owned sites except for gardens and orchards, and also publicly owned greenery, i.e., sites of protective greenery, natural sites, and forests),
- cultivated agricultural land (agriculturally cultivated land, both arable land, and permanent grasslands),
- housing (sites of mixed, rural, and individual housing, orchards, gardens, recreational housing),
- other (these are sites where particular planned use was not identified, in territorial zoning plans these sites were marked as mixed sites of built-up areas or built-up sites).

Digital and georeferenced maps of territorial zoning plans were available as WMS (at http://geoportal.kraj-jihocesky.gov.cz/gs/uzemni-plany-a-dalsi-nastroje-uzemniho-planovani/). Wrongly georeferenced plans were amended for our needs, and missing plans in this WMS were searched individually. As a result, the database for the South Bohemia Region involves complete information about planned uses of sites in the whole region except for municipalities that do not have territorial zoning plans (e.g. these were not authorized or declined by higher state authorities, or were not prepared yet). That counts only for 4.3% of the area of the pre-1989 farm premises. The sites labelled in the territorial zoning plans as “other” were omitted from further analysis.

3.3 Data analysis

Four hypotheses stated in Section 2.3 were tested separately by different statistical treatments.

In our first hypothesis, we aimed to test whether the location of DFPs in one of the three types of South Bohemian countryside (central, inner periphery, border periphery) had any impact on the type of the planned use of these premises. To achieve this, a chi-square test was applied. Its results were visualized utilizing the Pearson residuals of observed and expected values in the dot plot, where the size of the circle is proportional to the amount of the row and column contribution to chi-square, and positive residuals (where observed values are greater than expected values) are in shades of blue, negative residuals (where expected values are greater than values observed) are in shades of red.

Our second hypothesis relates to the question of whether the planned use of a site depends on the current actual use (derelict or otherwise). The Chi-square test was used here again. The visualization was performed by the association plot that depicts the Pearson residuals in the contingency table using the area of bar plot which allows us to easily read the results of the biggest differences between the observed and the expected values (Meyer et al., 2006; STHDA, 2016). The area of each

bar corresponds to the value of the Pearson residuals of observed and expected values in the same way as circles in the previously used dot plot. Positive residuals (where observed values are greater than expected values) are in shades of blue, negative residuals (where expected values are greater than values observed) are in shades of red.

In our third hypothesis, we attempted to find out the potential impact of the past use of the current DFPs (i.e. their use in 2004) on their planned uses. To perform this, the same statistical treatment, as in the previous hypothesis, was applied.

Our fourth hypothesis is not aimed at the present DFPs but at the ones which were derelict in 2004 but have been regenerated by now. Here we are interested in the correlation between the type of re-use and the planned type of use according to the territorial zoning plan. To do this, Kendall Tau correlation on the level of significance $p < .001$ was employed. Visualization was done by a graphical version of contingency table where each cell contains a dot whose size reflects the relative magnitude of the corresponding component, row and column sums are printed in the upper and right margins behind the labels (STHDA, 2016) – the so-called baloonplot (Galili, 2020).

All calculations were performed in R software with *vcd* package (Meyer et al., 2006), *corrplot* package (Wei et al., 2017), and *gplots* package (Galili, 2020).

4. Results

The database created by us includes 404,054 are of former communist agricultural cooperative farms and state farms. Out of this, 55,928 are are entirely unused or partly ruined or both, i.e. 13.84% of the entire area of the original sites. However, the cited number does not involve sites that have not been maintained since 2004, when the Czech Republic joined the EU.

The categories covering agricultural production (i.e. “agricultural production and storage” and “general production and storage”) dominate as far as the planned use is concerned, representing 64.84% in total. Thus, almost two-thirds of DFPs are destined for agricultural purposes. However, it also means that there could be an explicit loss of agricultural use for more than one-third of the present DFPs. The most significant proportion of that is destined for housing - 14.62% of the current area.

355 Table 1. Crosstabulation (in are) for present use and planned use of pre-1989 agricultural premises
356 according to the territorial zoning plans

Land use according to territorial zoning plan	Present land use				
	derelict farm premises	agricultural utilization	cultivated agricultural land	non-agricultural utilization	housing
agricultural production and storage	17685	124076	782	7632	418
general production and storage	18577	124529	1362	14154	994
industrial production and storage	2803	13005	283	7005	120
housing	8176	10279	1380	3018	6786
public spaces	2207	2846	483	3010	523
agricultural land	3402	7174	767	437	90
greenery	261	1610	283	159	14
other	1079	3960	305	98	28
without data	1734	9756	205	470	66

357 Note: Categories “without data“ and “other“ were not used in the analysis.

358

359 ## 4.1 Geographical circumstances of the planned use for derelict farm premises

360 Plans designating the use of DFPs depend on the location of the latter. Based on gathered data, there
361 is a significant difference concerning the number of sites suitable for various types of activities in
362 three monitored types of rural areas (chi-square = 816.78, d.f. = 12, p-value << .0001).

363 Agricultural and general production and storage types of planned use do not differ within the types
364 of rural areas (circles in Figure 4 are small in the light of blue indicating that standardized Pearson
365 residuals of observed and expected values are small). But the peripheral areas (border and inner) are
366 significantly more directed at housing development than central areas (Figure 4). Furthermore, DFPs
367 in the inner peripheries could be converted to agricultural land, and there is a lack of growth in the
368 category of industrial production and storage, which is more developed in the border municipalities.
369 In the border periphery areas, public areas are not much planned.

370

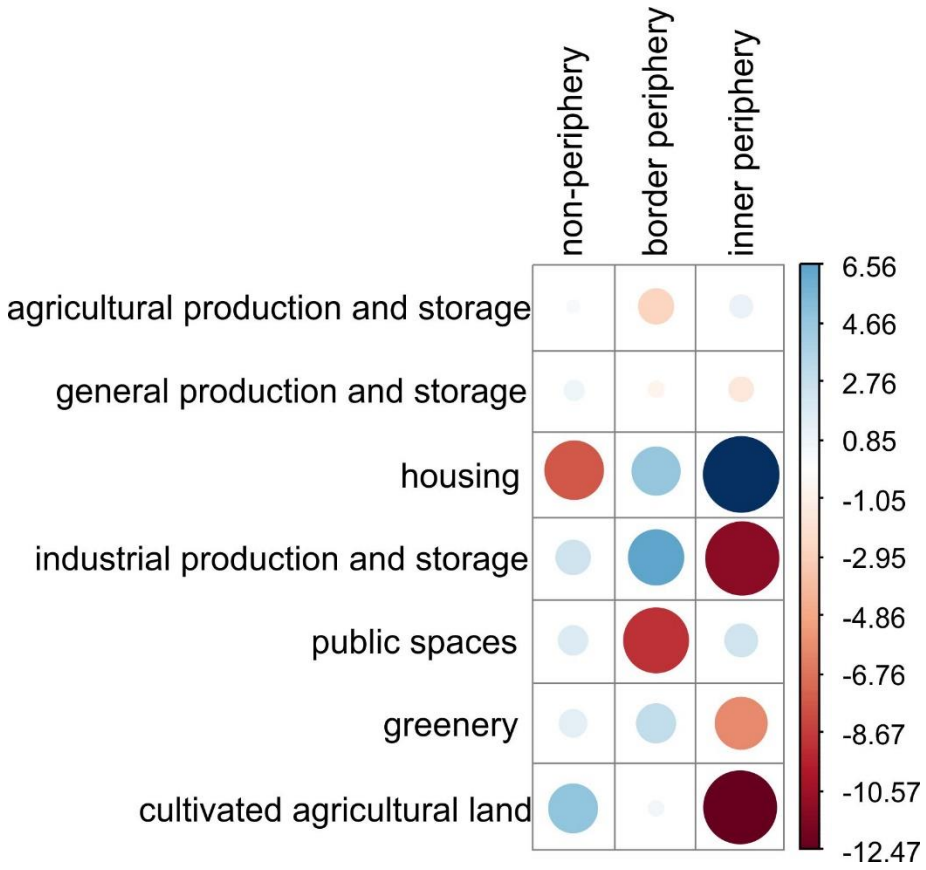

Figure 4. Crosstabulation of planned uses for present derelict farm premises in three types of the countryside (Kubes and Kraft, 2011).

Note: Standardized Pearson residuals of observed and expected values are shown. The size of the circle is proportional to the amount of the row and column contribution to chi-square. Positive residuals (where observed values are greater than expected values) are in shades of blue colour, negative residuals (where expected values are greater than values observed) are in shades of red colour.

4.2 Varieties of planned uses for all present usage of the pre-1989 farm premises

There is generally a direct relationship between the present uses and planned uses, but some uses are inconsistent. The differences among observed and theoretically expected values are strong and the statistical test is highly significant (chi-square = 107959, d.f. = 24, p-value << .0001). This relation is the strongest in the case of planned use for housing: 75.03% of the present sites used for housing are also planned for that land use according to territorial zoning plans (Figure 5).

The comparison of planned uses for DFPs (first column in Figure 5) with the other types of current use is our main interest here. We previously demonstrated that almost two-thirds of DFPs could be used for agricultural production. Now, our analysis demonstrates that these premises are significantly less determined for planned agricultural use (the bar is negative and in dark red) compared to areas with the current agricultural use (bar in positive and in dark blue). This difference applies also to general production and storage. The opposite is true for housing, public spaces, and cultivated agricultural land. Further, the planned utilization of present DFPs is similar to areas that were previously demolished and transferred to cultivated agricultural land (compare the first and the third column of bars in Figure 5).

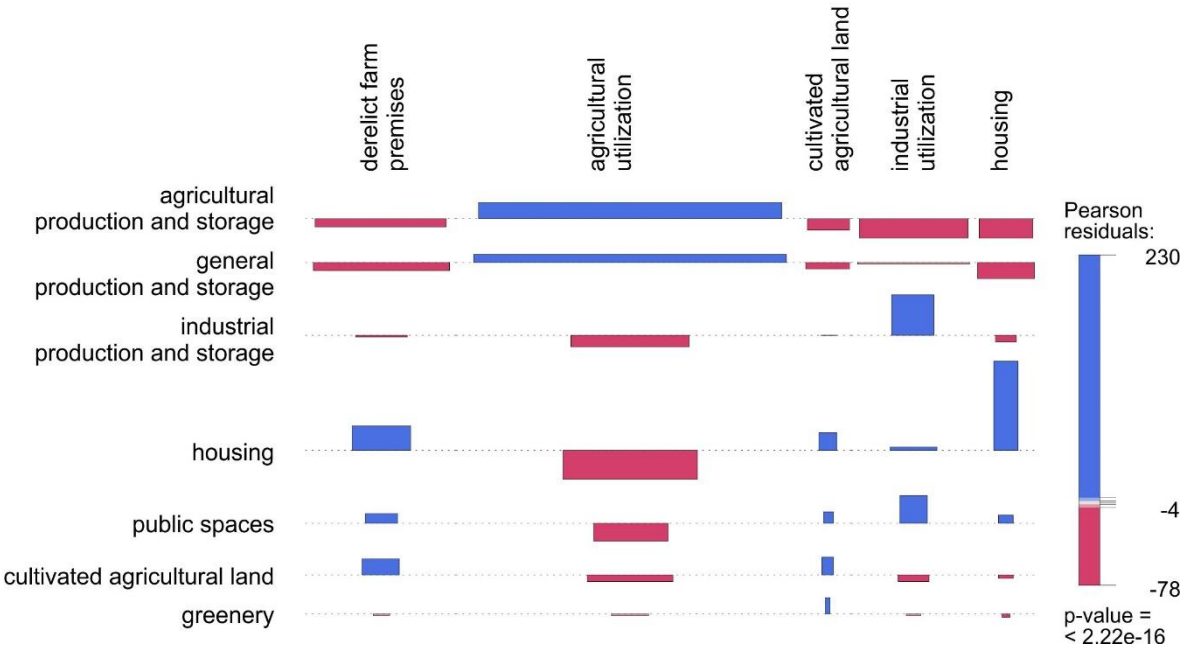

Figure 5. Crosstabulation of planned uses (in rows) and present uses (in columns) of all pre-1989 rural farm premises.

Notes: Association plot was used where the area of each bar represents the standardized Pearson residuals of observed and expected values in the same way as circles in the previously used dot plot. Positive residuals (where observed values are greater than expected values) are in shades of blue, negative residuals (where expected values are greater than values observed) are in shades of red.

4.3 The impact of the 2004 use of present derelict farm premises on their planned use

Almost two-thirds (64.29%) of the present (i.e. of all existing in 2018) DFPs were already DFPs in 2004. No DFPs emerged from the sites that were used for housing or as agricultural land in 2004. The area of new DFPs arising from rural farm premises that were used for industry in 2004 is negligible (0.92% from all DFPs existing in 2018).

The differences between the planned use for present-day DFPs and their status in 2004 (derelict or in use) are significant (chi-square = 3483.8, d.f. = 12, p-value << .0001). We have found that long-term DFPs (second column in Figure 6) have completely different planned use than the DFPs that emerged only after 2004 (first column of bars in Figure 6). While the long-term DFPs are planned to be used outside agriculture in the future, the new ones are focused mostly on agriculture activity.

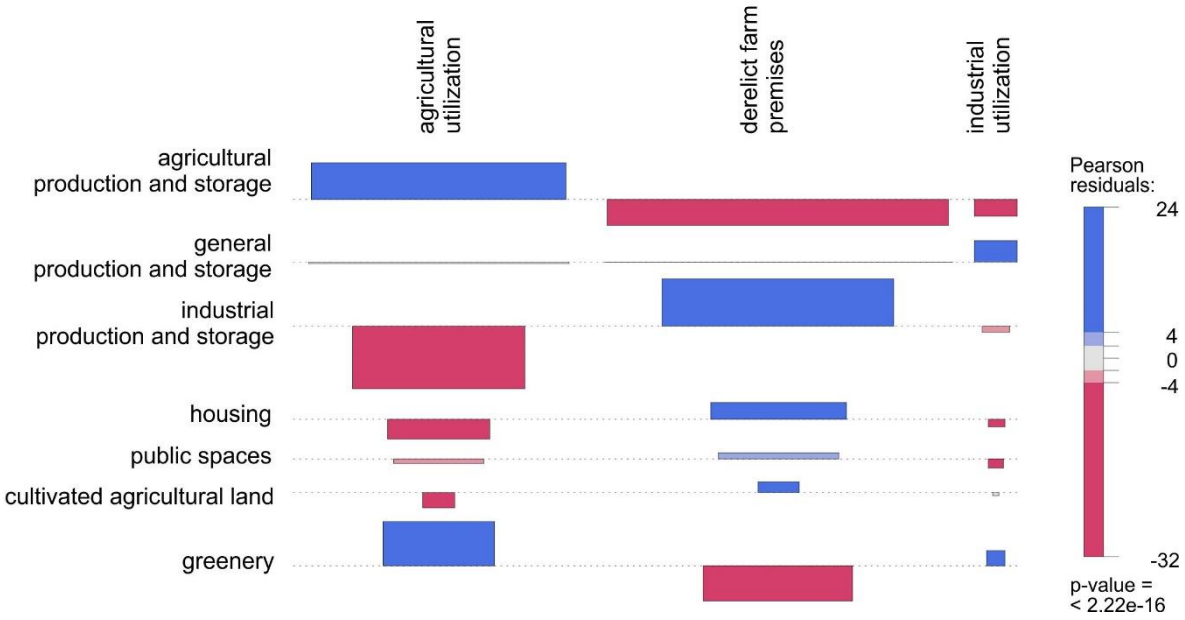

Figure 6. Crosstabulation of the uses of present derelict farm premises in 2004 (in columns) and planned uses (in rows)

Notes: Association plot was used where the area of each bar represents the standardized Pearson residuals of observed and expected values in the same way as circles in the previously used dot plot. Positive residuals (where observed values are greater than expected values) are in shades of blue colour, negative residuals (where expected values are greater than values observed) are in shades of red colour.

4.4 Planned uses of regenerated derelict farm premises

The type of regeneration of DFPs after 2004 follows the territorial plans to a large degree, although not completely. Derelict farms that were regenerated during 2004-2018 for agricultural uses were in the proportion of 84.58% already planned for agricultural use (i.e. 84.58% of all regeneration made between 2004 and 2018 for agricultural use was according to the plan of general production and storage or agricultural production and storage). In the case of housing, the share was 74.54% (i.e. 74.54% of all regeneration made between 2004 and 2018 for housing was according to the plan) and in the case of non-agricultural production 56.08% (i.e. 56.08% of all regeneration made between 2004 and 2018 for non-agricultural production was according to the plan). Only in the case of the planned free land (greenery and cultivated agricultural land) the real re-use according to the plan was minimal – 9.84%.

Table 2. Kendall Tau correlation coefficients among the types of use in 2018 for derelict farm premises regenerated in 2004-2018 (in rows) and planned uses according to territorial zoning plans (in columns). Coefficients in bold are significant at $p < .001$.

	agricultural utilization	cultivated agricultural land	non-agricultural utilization	housing
agricultural production and storage	**0,2662**	-0,0734	-0,0469	**-0,1974**
general production and storage	0,0745	0,0128	0,0887	**-0,1957**
housing	**-0,2600**	0,0063	**-0,1683**	**0,4840**
industrial production and storage	**-0,1042**	0,0085	**0,2301**	**-0,1342**
public spaces	**-0,1058**	0,0151	0,0738	0,0313
greenery	0,0314	0,0303	-0,0395	-0,0215
cultivated agricultural land	0,0749	0,0527	-0,0684	-0,0617

Regeneration for agricultural use is positively correlated only with the planned category agricultural production and storage. By contrast, it significantly negatively correlates with the planned use for housing, industrial production and storage, and public spaces (Table 2). Regeneration for housing highly significantly correlates with the planned use for housing and negatively correlates with the use of all types of production and storage. Regeneration for industrial production positively correlates with the planned use of production and storage and negatively with the planned use for housing. Those most important positive ties between planned uses and regenerations after 2004 are represented in the balloon plot (Figure 7) by the greatest dots – it is a graphical version of a contingency table where each cell contains a dot whose size reflects the relative magnitude of the corresponding component.

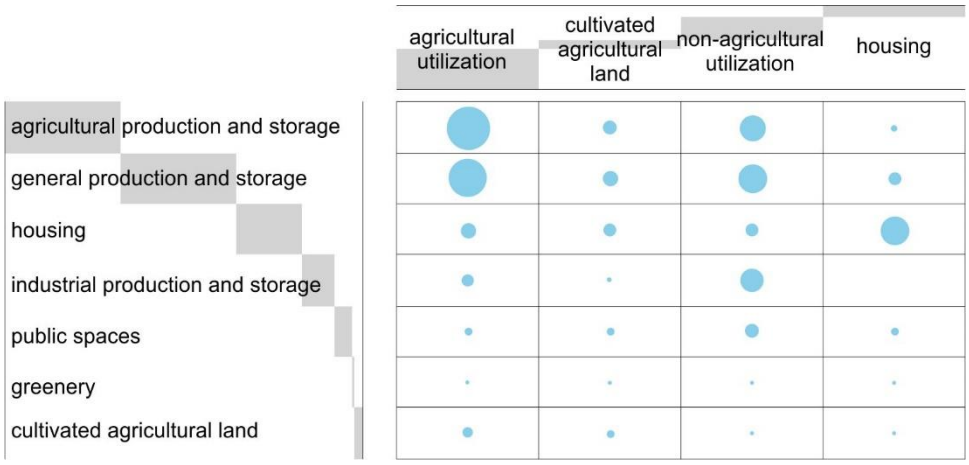

Figure 7. Balloon plot where each cell contains a dot, the size of which reflects the relative magnitude of the corresponding component; row and column sums are printed in the upper and right margins behind the labels.

5. Discussion

We have investigated the circumstances of planned uses of rural derelict farms. Based on the territorial zoning plans of all municipalities of the South Bohemia Region, we tested four hypotheses arising from the literature. The hypotheses were aimed at a comparison of present and planned types of the uses of the pre-1989 DFPs.

5.1 Spatial differentiation of planned uses for derelict farm premises

Our analysis reveals spatial differentiations as per **Hypothesis 1**. The demand for free spaces (planned use of the greenery and agricultural land) is higher in the non-periphery countryside, where this trend might be related to the need for the extension of the greenery in urbanized areas (De Sousa, 2006; Loures, 2015) and a required type of regeneration of derelict spaces and brownfields in general (Navratil et al., 2018; Nordh and Ostby, 2013). The greenery is also frequently planned in the borderland countryside. Such countryside in our study consists mainly of the tourist pleasure periphery – the Šumava Mountains that is one of the most significant recreational areas of the Czech Republic (Vagner and Perlin, 2010). The aim to improve the aesthetic quality of the environment is reflected in the substitution of derelict premises by high-quality aesthetic greenery (Hofmann et al., 2012). On the other hand, free areas are not planned in the inner periphery, as different uses are preferred here.

Another important feature is the spatial differentiation of the planned uses of rural derelict farms for light industry production and enterprise. The growth of the light industry is related to the non-periphery countryside, i.e. in the vicinity of urban centres with good accessibility – a phenomenon detected by other researchers too (Frantal et al., 2013; Klapka et al., 2016). Quite surprisingly, it is more frequently planned also for the borderland countryside. These are always less favourable areas for agriculture according to the division of the Czech Republic. Thus, some of the premises can be used for not intrusive light industrial production rather than agriculture.

The regeneration of DFPs to housing is the most prevailing type of planned use in the countryside of the inner periphery. It is now the most significant type of function of the countryside in the Czech Republic (Perlin et al., 2010). Housing is in this space perceived as the principal choice for regeneration – the only question is whether this planned regeneration will have success, as the demand for housing is lower in general and, for example, in Ireland, did not meet with good response at all (Norris et al., 2014). Housing is also planned to be a new, significantly important land use in the borderland countryside. There, it can represent not only housing as such but also recreational housing (e.g. second homes) which has been lately experiencing substantial growth in ECE (Petrikovicova et al., 2019), even though its impact in the locality was previously found to be negative (Hajimirrahimi et al., 2017).

5.2 Planned agricultural uses of derelict farm premises

The share of planned agricultural use of the DFPs may seem high (Table 1). However, when comparing the plans for the DFPs and for premises currently used for agriculture, the planned use of the former for agriculture is significantly lower (**Hypothesis 2**). This is also true when considering regenerated DFPs between 2004 and 2018 (**Hypothesis 4**). The regeneration to agriculture uses correlates well with territorial zoning plans. It is remarkable that also regenerations to industrial production also correlate very well with territorial plans.

Planned uses of DFPs and premises currently used for agriculture differs significantly. It may be caused by the experience of the municipalities with the development, when there is a significant replacement of agricultural use of these areas for different uses (e.g. industrial production or housing) as indicated before (Klusacek et al., 2013; Navratil et al., 2019). Based on our experience from field research, it concerns mainly small-sized premises located out of former communist rural centres with special governmental support, which are of little interest for economically strong agricultural enterprises. These firms have been dominating Czech agricultural production (Bezemer, 2000; Doucha and Divila, 2008; ÚZEI, 2010) and after the restitution, their new owners have not been interested to use small-sized premises as not economically viable (Jancak et al., 2019).

Territorial zoning plans thus take into account the ongoing transformations of the Czech countryside (Banski, 2019). They strive to find new uses for sites that have been decaying for a long period and have not been able to renew their agricultural function. Replacing the agricultural function of the sites by industrial function also correlates with the socio-economic indicators of the employment in these two economic sectors – agriculture employs less than 3% of the population of the Czech countryside, while industry employs circa 35% (Banski, 2019). The Czech countryside belongs to one of the most industrialized countrysides within the EU and thus is not as dependent on changes in agribusiness (Vaishar and Stastna, 2019) as, for example, some areas in Poland (Banski et al., 2018).

5.3 Long-term derelict farm premises

According to our analysis, the planned use of long-term DFPs and those originating after 2004 (**Hypothesis 3**) are different. Long-term DFPs are not planned for agriculture and agricultural land; they are aimed at production, housing, public services, and greenery.

It is obvious that the designers of territorial zoning plans are aware of the presence of long-term DFPs and see the future no more in agricultural use but in urbanization forces such as industrial production or housing. However, this could have a negative impact in the future on rural structures as pointed out by many studies (Moscovici et al., 2018; Zambon et al., 2019). Remarkably, this process is opposite in cities, and frequently there is an effort to use industrial derelict premises and brownfields in the towns for “urban agriculture” both in the garden (Mancebo, 2016; Sovova and Krylova, 2019; Specht et al., 2016; Toth and Timpe, 2017) and production types (Lord, 2015; Thomas and Lavkulich, 2015).

The existence of long-term DFPs is caused by the fact that the regeneration of them is less frequent than the regeneration of industrial brownfields in cities (Klusacek et al., 2020; Osman et al., 2015). Redevelopment of long-term DFPs is not usually in high demand in the economic climate of the Czech Republic (Skala et al., 2013; Svobodova and Veznik, 2009), and demolitions often remain as the only solution. On the other hand, a renewal of derelict premises through demolitions usually makes the regeneration projects expensive, which makes such efforts even more difficult and challenging from the economic as well as social point of view (Dyr and Mendel Univ, 2016; Klusacek et al., 2018; Krejci et al., 2016; Kunc et al., 2018; Limasset et al., 2018; Martinat et al., 2017).

6. Conclusions

This paper aimed to reveal the contours of the formal land-use policy applied to the ex-communist collectivized rural farm premises with special interest focused on the derelict farm premises (DFPs) in South Bohemia. As far as the planned use of DFPs is concerned, the use for agriculture prevails, yet its share is not even two-thirds. A significant proportion of the planned use accounts for housing. This

use has an important spatial context – countryside municipalities in the inner periphery, above all, differ significantly from the others concerning the emphasis put on the development of housing and at the same time, the low proportion of industrial production and enterprise and free space.

Another notable finding is a significant difference in the planned use of DFPs, on the one hand, and premises that are currently still used for agriculture, on the other. DFPs are substantially less frequently planned for agricultural re-use and more frequently planned for housing regeneration, demolition, or public buildings than is the case for the sites with current agricultural use.

We have identified a considerable number of *long-term* DFPs and the different strategies for their planned use compared with the strategy for the use of "new" dereliction. While the long-term derelict farm premises are frequently planned to be converted outside agriculture, the newly emerged DFPs retain their designation for agricultural activity.

By analysing all successful regeneration practices applied to the DFPs after 2004, it is evident that the type of actual regeneration generally follows designations in territorial zoning plans.

Even though the South Bohemian countryside is diverse and covers a broad spectrum of soil conditions (Perlin et al., 2010), it lacks areas that are most suitable for agriculture, like those that can be found, for example, in South Moravia. In South Bohemia, the focus on agricultural use results not so much from its excellent conditions for agriculture but rather from the peripheral status of the region, with little manufacturing in existence and low population density.

Our paper is also bringing inspiration for future research. First of all, it concerns the relationships between sustainability policies and the redevelopment of DFPs. The experiences of specific types of DFPs also need to be traced in more detail – for example, the fate of small farm premises that are not attractive for agricultural enterprises and are owned by individuals who are unable to deal with buildings of such dimensions. Another significant aspect is the economic impact of long-term DFPs on municipalities. Last but not least, the study of the topic would deserve to be extended to various other regions.

Acknowledgements

Funding: This work was supported by project No. 19-23870S from the Czech Science Foundation titled: "Between de-agrization and perforated development of rural space: The search for development patterns of post-communist agricultural properties".

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