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Citation for final published version:

Klusáček, P., Navrátil, J., Martinát, S., Krejč, 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. 10.1016/j.landusepol.2020.105248

Publishers page: <https://doi.org/10.1016/j.landusepol.2020.105248>

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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](https://doi.org/10.1016/j.landusepol.2020.105248)

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

Authors: Petr Klusáček, Josef Navrátil, Stanislav Martinát, Tomáš Krejčí, Oleg Golubchikov, Kamil Pícha, Jaroslav Škrabal, Robert Osman

Journal: *Land Use Policy*

Volume: 102, March 2021

DOI: 10.1016/j.landusepol.2020.105248

Highlights

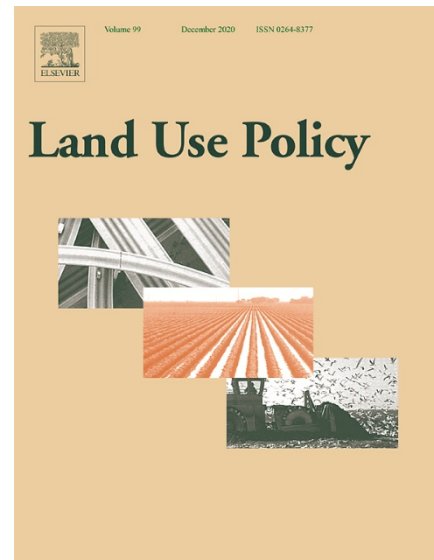
- Two-thirds of derelict farm premises experience long-term abandonment.
- Planning for derelict farm premises is different from planning for current agricultural use.
- Two-thirds of derelict farm premises are planned to be re-used in agriculture.
- Housing is another important re-use option for such 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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24 Key words:

25 Deagrization; derelict farm premises; brownfield; rural; Central Europe

26

27 1. Introduction

28 The emergence of human-made wastelands and derelict areas is a concern for sustainability. It
29 detaches land from its socially productive function and yet often has a detrimental effect on natural
30 ecosystems. Sustainability-minded land use policy seeks to find ways of reclamation, restoration, or
31 regeneration of such areas. This concerns not only post-industrial ‘brownfields’ in urbanised areas
32 (Dixon, 2007; Thornton et al., 2007), but also many manifestations of dereliction in the countryside.
33 Indeed, due to its ‘out-of-sight’, peripheral and resource-extracting character, the countryside often
34 becomes the host of abandoned anthropogenic ‘badlands’. This problem has been well-rehearsed,
35 for example, in the case of large-scale land degradation such as caused by opencast mining that
36 destroys original ecosystems (Sardinha et al., 2013). However, what has received less attention thus
37 far is the phenomenon of abandoned built-up areas located in rural areas, including the troubled
38 practices of their rehabilitation. This aspect is mostly discussed from the point of view of abandoned
39 villages and cultural conservation (Garcia and Ayuga, 2007; Güler and Kâhya, 2019; Jaszczak et al.,
40 2018) and not so much in terms of abandoned farm-related premises and associated land-use policy.

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

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

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

60 De-collectivization of post-communist agriculture has resulted in four principal types of relationships
61 between land ownership and land use: (i) large landowners involved in large-scale commercial
62 production of agricultural products, (ii) farmers with small or medium-sized farms, (iii) landowners
63 with no farming activities, and (iv) people who are employed elsewhere but still keep their small or
64 medium-sized farms (Zakeviciute, 2016). The distribution between these four types varies across
65 post-communist countries (Banski, 2019; Bezemer et al., 2006; Csatari et al., 2019; Czyzewski et al.,
66 2018; Jancak et al., 2019; Kacz et al., 2019; Zakeviciute, 2016). The main reasons for this are
67 differences in ownership of agricultural land and its utilization (Banski, 2019) and also the changes in
68 ownership during the transformation process. In cases where only a small portion of landowners
69 continue to practice agriculture commercially, like in the Czech Republic, large enterprises dominate,
70 although many family farms continue to grow food for satisfying their owners' food consumption
71 (Bezemer, 2000; Csatari et al., 2019; Doucha and Divila, 2008; Lindbloom, 2012; Spisiak et al., 2008).
72 As these small farmers are unable to fully utilise and reconstruct large-scale premises remained from
73 centralised farms, while old buildings requiring maintenance and regeneration are also not attractive
74 for larger entrepreneurs, a wave of abandonment has appeared during the transformation process
75 (Klusacek et al., 2013; Skala et al., 2013). Even following the accession of the CEE state to the EU in
76 2004, abandoned sites still materially dominate many rural communities in these countries (Veznik
77 and Konecny, 2011).

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

82 Planning for the future of large premises from times of collectivized agriculture in CEE countries is
83 part of not only deep transformation processes of agricultural production (Banski, 2018) and rural
84 society (Perlin et al., 2010) in the Central Europe, but it is also part of the transformation of the
85 whole agricultural sector of the EU challenging food security (EU, 2019b), market changes (EU,
86 2019c), and climate change (EU, 2019a). The development of agricultural entrepreneurship in CEE
87 countries is an integral part of the agricultural development of the EU within the arms of Common
88 Agricultural Policy (Czubak and Pawlowski, 2020). This topic is thus also important in the context of
89 the transformation of the agricultural sector in the EU as a whole.

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

93

94 2. Contextual background and hypotheses

95 2.1 Derelict farm premises – definitions of terms

96 Many farm premises were built in the Czech Republic during the era of collectivized agriculture, i.e.
97 between 1948 and 1989. By premises, we understand a land plot with buildings (Merriam-Webster,
98 2020). We will use the term ‘farm premises’ for former collective farms and state farms premises
99 that served the purpose of agricultural production. These often comprise a fenced area with all
100 buildings used for agricultural production or storage, technical support, administrative buildings, as
101 well as close surroundings connected to these buildings (Krejci et al., 2019, 2020). Only premises of
102 collectivized agriculture are of our interest, as these were typical of large-scale farming during the
103 communist era. By the term ‘derelict farm premises’ (or DFPs) we understand farm premises that
104 were built between 1948 and 1989 for collectivized communist agriculture but lost their function and
105 were abandoned after 1989 (Figure 1).

106 In planning literature, abandoned, disused, and neglected sites that used to be utilized but are now
107 waiting for re-use, are commonly referred to as brownfields, no matter what was their original use.
108 That is why sites similar to those of our interest here are sometimes referred to in the literature as
109 agricultural brownfields (Klusacek et al., 2013). However, certain confusion emerges along with this
110 definition, because ‘brownfield’ places the emphasis on possible contamination of these sites and,
111 above all, its industrial character (CEN, 2014). Furthermore, agricultural buildings do not typically
112 count as ‘previously developed land’ as associated with brownfields (Smith, 2002). Such fallow and
113 vacant tracks of the land of former agricultural production, which are currently available for
114 development, are often seen as ‘greenfields’ (De Sousa, 2000). If the site is yet heavily contaminated,
115 the terminology of ‘blackfields’ (Krzysztofik et al., 2012) or ‘greyfields’ (Newton, 2010) may be used.
116 What is more, ‘wastescapes’ also adds to this terminology barrage (Amenta and van Timmeren,
117 2018). To avoid confusion, we use ‘derelict farm premises’ (DFPs) as the more straightforward term
118 for our purpose.



119

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

123

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

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

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

145

146 2.2 Land-use planning and territorial zoning plans in the Czech Republic

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

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

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

166

167 2.3 Derelict farm premises and the development of the countryside

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

177 **Hypothesis 1:** The planned use of the present-day DFPs will differ according to the location of the
178 site.

179 As Perlín et al. argue for the Czech Republic (Perlin et al., 2010), at least eight types of the
180 countryside might be identified as per its regional development trends, including: developing rural
181 areas; their neighbouring non-developing rural areas; Moravian peripheries; well-served Moravian
182 rural areas; problematic recreational rural areas; intense recreational areas; structurally affected
183 rural areas; and rural areas without clear development identity. It was also previously found that the
184 likelihood that DFPs are regenerated correlates with the location of the site relative to a city (Green,
185 2018; Navratil et al., 2018). Kubes and Kraft (Kubes and Kraft, 2011) propose the following types,
186 which we will use in our analysis: (i) borderland peripheral rural areas, (ii) inner peripheral rural
187 areas, and (iii) centrally located rural areas.

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

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

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

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

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

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

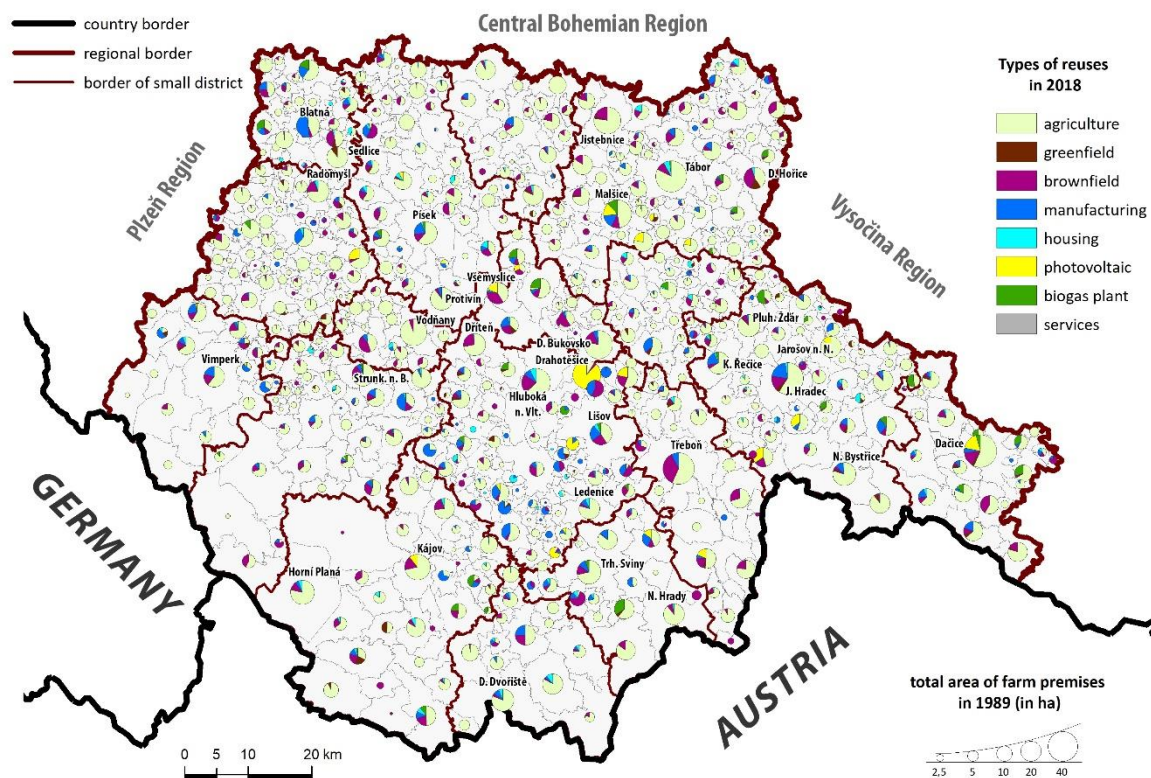
211

212 3. Methods

213 3.1 Study area

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

223



224
 225 Figure 2. Distribution of rural farm premises among municipalities of the study area region. The total
 226 area of farms in 1989 is shown alongside the distribution of land use types in 2018.

227
 228 Even though it is a peripheral region of the Czech Republic, it can be still divided into sub-regions,
 229 ranging from more central to distinctively peripheral. Peripheral areas occupy a third of the area of
 230 our study region, accommodating 10% of inhabitants of South Bohemia (Kubes and Kraft, 2011).
 231 There are two distinct types of peripheries – (i) peripheral border municipalities along the border
 232 with Germany (Bavaria) and Austria (Upper and Lower Austria), which account for 45% of the
 233 peripheral area in the South Bohemia region and 37% of their inhabitants, (ii) municipalities of the
 234 so-called inner periphery. At the same time, the centre of the South Bohemia Region – the city of
 235 České Budějovice (Budweis) – is the important subnational economic centre (Kubes, 2015; Navratil et
 236 al., 2018). Centres of NUTS IV regions serve as regional economic centres (Kubes and Kraft, 2011).

237
 238 **3.2 Data**

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



244

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

246 [3.2.1 Location of the pre-1989 rural farm premises](#)

247 The identification of the pre-1989 rural farm premises followed the methodology of Navrátil et al.
 248 (Navratil et al., 2019). The topographic maps of Czechoslovakia with a scale of 1:25,000 from the late
 249 1980s and the mid-1990s were used. The sites considered to be the pre-1989 rural farm premises
 250 were labelled in these maps as agricultural properties, cowsheds, pig farms, sheepfolds, poultry
 251 farms, horticultural fields, and stud farms (Krejci et al., 2019). Black and white prints of the aerial
 252 images from the early 1990s were used to delimit the borders of these properties. For the accuracy
 253 of the spatial data used, the analyses of utilisation and changes in utilisation were conducted with an
 254 accuracy of 10 × 10 metres. For further analysis, only premises with available information regarding
 255 planned uses (see part 3.2.3) were taken.

256

257 [3.2.2 Current use of the pre-1989 rural farm premises](#)

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

- 267
- 268 • agricultural use (any type of agricultural use, including biogas plants),
 - 269 • non-agricultural use (utilization for entrepreneurship but not agricultural one, including
 270 photovoltaic power plants),
 - 271 • housing,
 - 272 • cultivated agricultural land (land ploughed, used for grazing, or regularly mowed),
 - 273 • derelict farm premises.

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

276

277 [3.2.3 Planned uses of the pre-1989 rural farm premises](#)

278 The planned use of land for municipalities is defined by the regulations within local development
 279 planning. The main legal framework for the local development, as mentioned above, is territorial
 280 zoning plans defined in Act no. 183/2006, §3, para 1. Based on this plan, the planned uses of
 281 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.

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

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

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

311

312 3.3 Data analysis

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

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

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

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

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

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

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

342

343 4. Results

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

348 The categories covering agricultural production (i.e. “agricultural production and storage” and
349 “general production and storage”) dominate as far as the planned use is concerned, representing
350 64.84% in total. Thus, almost two-thirds of DFPs are destined for agricultural purposes. However, it
351 also means that there could be an explicit loss of agricultural use for more than one-third of the
352 present DFPs. The most significant proportion of that is destined for housing - 14.62% of the current
353 area.

354

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.

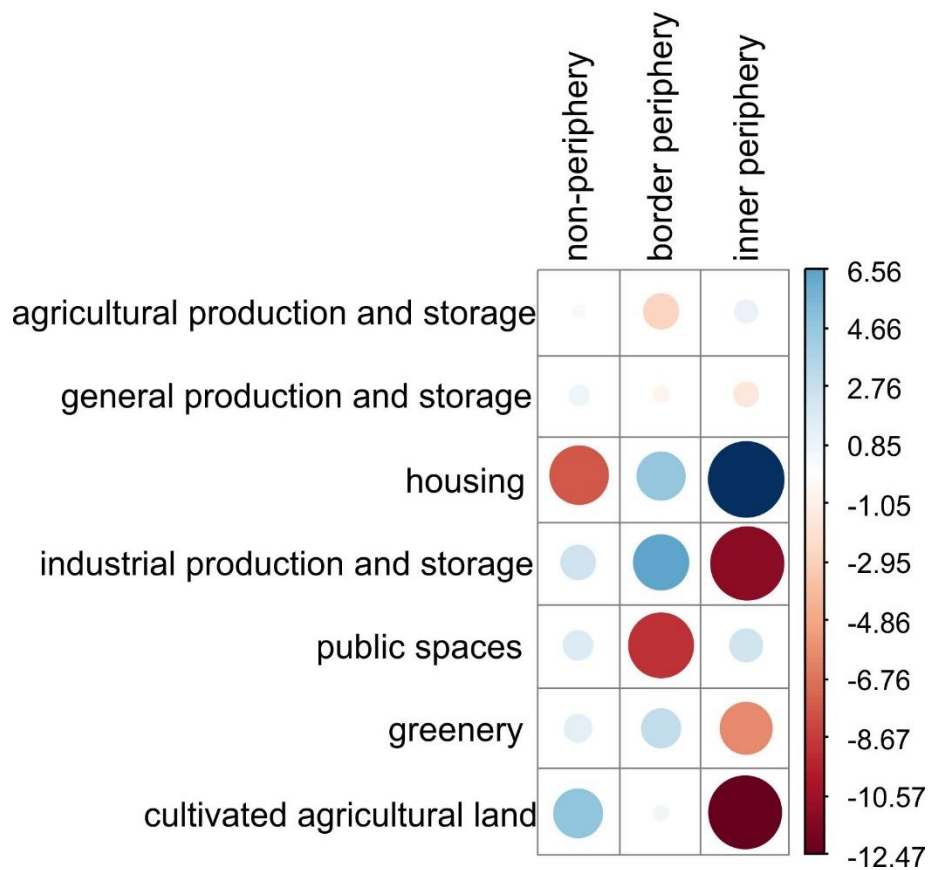
358

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



371

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

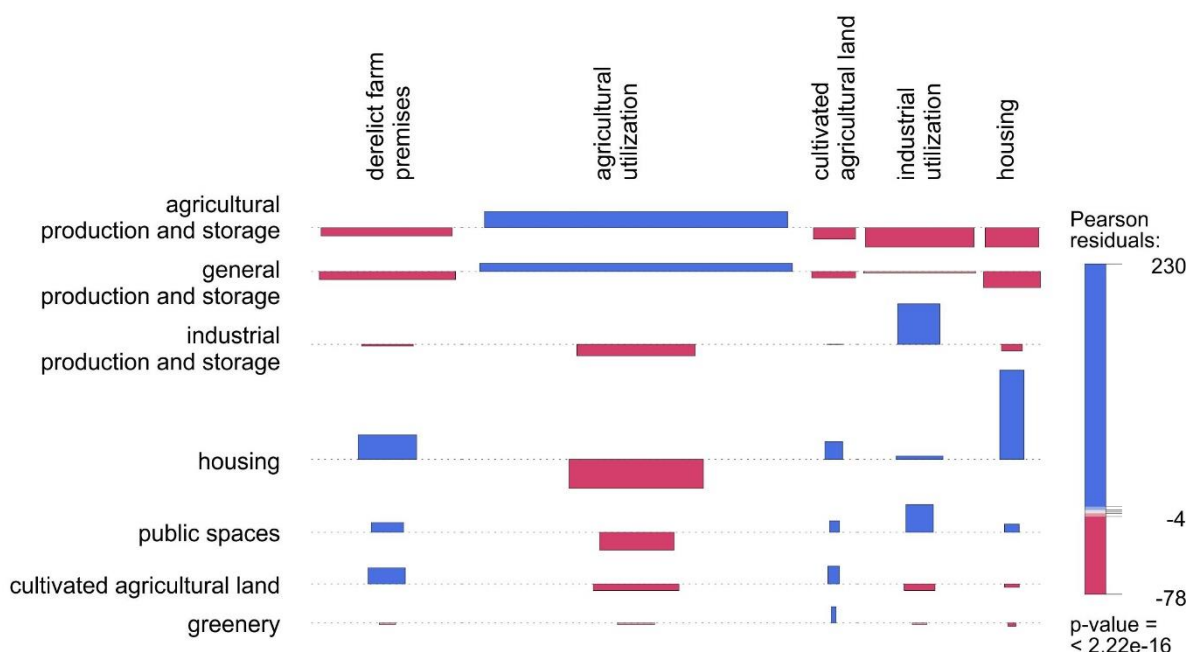
374 Note: Standardized Pearson residuals of observed and expected values are shown. The size of the
 375 circle is proportional to the amount of the row and column contribution to chi-square. Positive
 376 residuals (where observed values are greater than expected values) are in shades of blue colour,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

379

380 4.2 Varieties of planned uses for all present usage of the pre-1989 farm premises

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

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



396

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

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

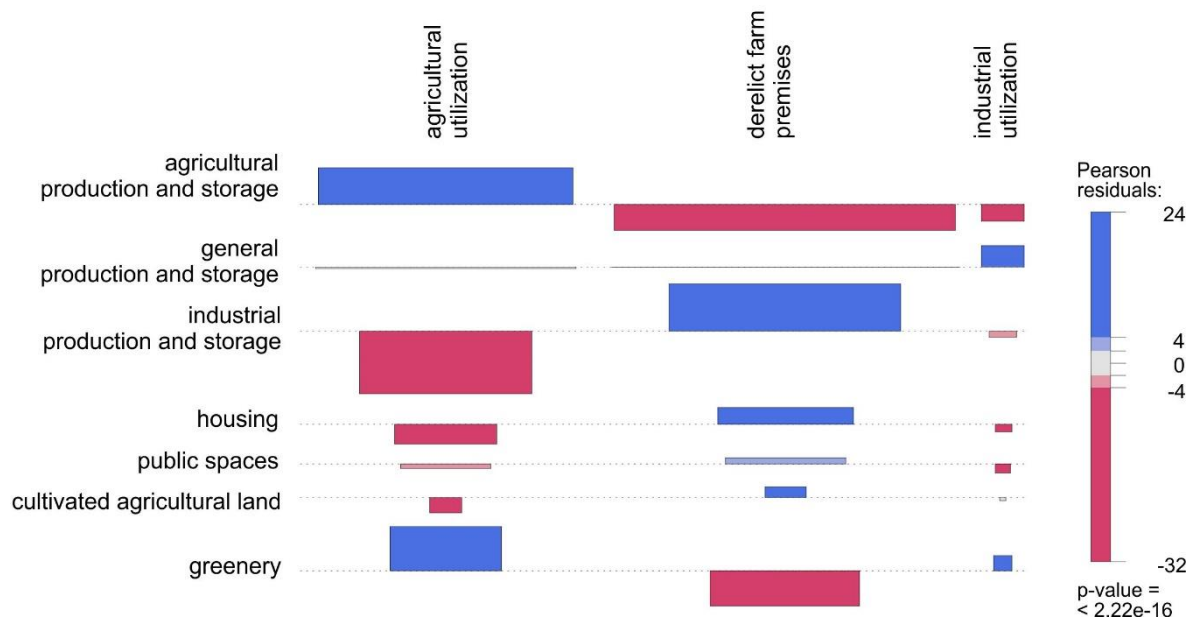
404

405 **4.3 The impact of the 2004 use of present derelict farm premises on their planned use**

406 Almost two-thirds (64.29%) of the present (i.e. of all existing in 2018) DFPs were already DFPs in
 407 2004. No DFPs emerged from the sites that were used for housing or as agricultural land in 2004. The
 408 area of new DFPs arising from rural farm premises that were used for industry in 2004 is negligible
 409 (0.92% from all DFPs existing in 2018).

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

415



416

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

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

424

425 4.4 Planned uses of regenerated derelict farm premises

426 The type of regeneration of DFPs after 2004 follows the territorial plans to a large degree, although
 427 not completely. Derelict farms that were regenerated during 2004-2018 for agricultural uses were in
 428 the proportion of 84.58% already planned for agricultural use (i.e. 84.58% of all regeneration made
 429 between 2004 and 2018 for agricultural use was according to the plan of general production and
 430 storage or agricultural production and storage). In the case of housing, the share was 74.54% (i.e.
 431 74.54% of all regeneration made between 2004 and 2018 for housing was according to the plan) and
 432 in the case of non-agricultural production 56.08% (i.e. 56.08% of all regeneration made between
 433 2004 and 2018 for non-agricultural production was according to the plan). Only in the case of the
 434 planned free land (greenery and cultivated agricultural land) the real re-use according to the plan
 435 was minimal – 9.84%.

436

437

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

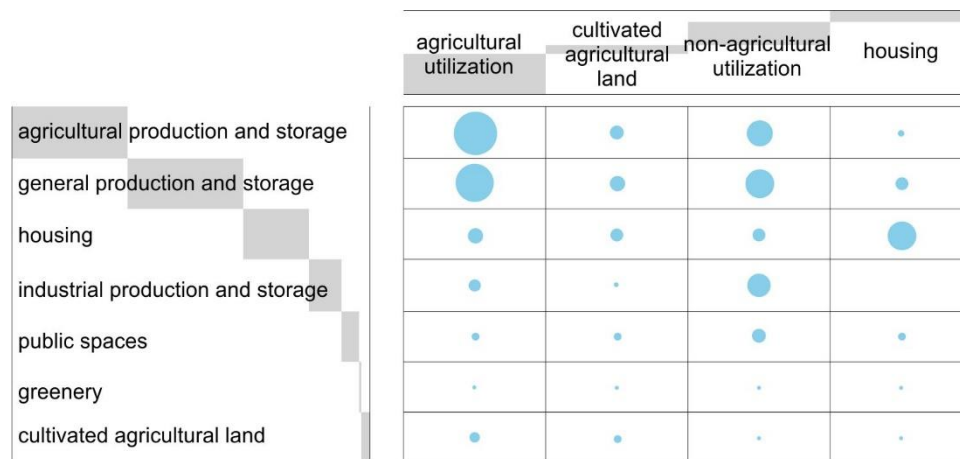
	agricultural utilization	cultivated agricultural land	non-agricultural utilization	housing
agricultural production and storage	0,2662	-0,0734	-0,0469	-0,1974
general production and storage	0,0745	0,0128	0,0887	-0,1957
housing	-0,2600	0,0063	-0,1683	0,4840
industrial production and storage	-0,1042	0,0085	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

441

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

452

453



454

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

458

459 5. Discussion

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

464

465 5.1 Spatial differentiation of planned uses for derelict farm premises

466 Our analysis reveals spatial differentiations as per **Hypothesis 1**. The demand for free spaces
467 (planned use of the greenery and agricultural land) is higher in the non-periphery countryside, where
468 this trend might be related to the need for the extension of the greenery in urbanized areas (De
469 Sousa, 2006; Loures, 2015) and a required type of regeneration of derelict spaces and brownfields in
470 general (Navratil et al., 2018; Nordh and Ostby, 2013). The greenery is also frequently planned in the
471 borderland countryside. Such countryside in our study consists mainly of the tourist pleasure
472 periphery – the Šumava Mountains that is one of the most significant recreational areas of the Czech
473 Republic (Vagner and Perlin, 2010). The aim to improve the aesthetic quality of the environment is
474 reflected in the substitution of derelict premises by high-quality aesthetic greenery (Hofmann et al.,
475 2012). On the other hand, free areas are not planned in the inner periphery, as different uses are
476 preferred here.

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

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

494

495 5.2 Planned agricultural uses of derelict farm premises

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

502 Planned uses of DFPs and premises currently used for agriculture differs significantly. It may be
503 caused by the experience of the municipalities with the development, when there is a significant
504 replacement of agricultural use of these areas for different uses (e.g. industrial production or
505 housing) as indicated before (Klusacek et al., 2013; Navratil et al., 2019). Based on our experience
506 from field research, it concerns mainly small-sized premises located out of former communist rural
507 centres with special governmental support, which are of little interest for economically strong
508 agricultural enterprises. These firms have been dominating Czech agricultural production (Bezemer,
509 2000; Doucha and Divila, 2008; ÚZEI, 2010) and after the restitution, their new owners have not been
510 interested to use small-sized premises as not economically viable (Jancak et al., 2019).

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

519

520 5.3 Long-term derelict farm premises

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

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

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

540

541 6. Conclusions

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

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

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

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

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

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

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

571

572 Acknowledgements

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

576

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