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LAND USE AND LANDSCAPE CHANGES IN CZECHIA DURING THE PERIOD OF TRANSITION 1990–2007

I. Bičík, L. Jeleček: *Land use and landscape changes in Czechia During the period of transition 1990–2007*. – *Geografie–Sborník ČGS*, 114, 4, pp. 263–281 (2009). – The article analyzes land use changes and their influence on landscape development in Czechia during the complex period of transition after 1990 to a democratic system with a capitalist economy. To analyze the database of cadastral data on land use of about 13,000 comparable basic territorial units (CTU) and their regional differentiation the typology method (the establishment of types of changes in CTUs and their portion of all CTUs) was used above all. At the same time tables follow the periods which formed over the long-term the preceding land use situation in Czechia at the start of the transition (1845–1948 and 1948–1990). Ascertained changes and trends in land use changes are then interpreted on the basis of searching out and explaining the main political, economic and social factors (or societal driving forces) that caused them. Their interaction with natural conditions is taken into account as well.

KEY WORDS: land use changes – landscape development – societal driving forces – societal transition – Czechia.

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1. Introduction

In this article we describe the fundamental land use changes during the period of transition on the background of the past two centuries. We also take into consideration the impact of natural conditions and the interactions of societal and natural driving forces representing two groups of factors for land use changes. The concept of societal driving forces and its contribution to land use changes and landscape change research were characterized by Bürgi, Hersperger and Schneeberger (2004, p. 857): “Landscape is the prime sphere, where the combined effects of society and nature become visible. As societies and nature are dynamic, change is an inherent characteristic of landscapes.” (compare, e.g. Brandt, Primdahl, Reenberg 1999; Bičík, Jeleček, Štěpánek 2001; Bičík 2002; Jeleček 2002; Mareš, Štych 2004). Holistically grasped, land use changes in their dialectical feedback represent “...the forces that cause observed landscape changes. They are influential processes in the evolutionary trajectory of the landscape” (Bürgi, Hersperger, Schneeberger 2004, p. 858). Lambin and Geist (2007) analyzed the following main factors influencing land

use changes: natural variability, economic and technological factors, demographic, institutional, and cultural factors, and globalization.

To sum up, societal driving forces have been the major influential factors in the past two centuries in respect to land use and land cover change. Increasing the intensity of agricultural land use (soils) in lowlands became an economically more effective way to increase the level of production. Therefore, extensive agricultural production in hilly and mountainous regions decreased greatly and has been restructured in many places or areas.

The collapse of the communist regime in 1989 ended the era of the “socialist” economy. The peaceful split of Czechoslovakia into two independent states, Czechia and Slovakia, followed in 1992. Since the 1990s, there has been substantial economic change, generally characterized as the beginning of “transition”.

Transition in Czechia has been a new and hitherto unknown process of moving society and the economy from a centrally and rigidly planned economy to a market-oriented one (for more details, see Hampl et al. 1999; Bičík, Götz 1998; Turnock, 2001, Bičík, Jančák 2001; Bičík, Jančák 2004). The transition of Czech society and economy is an extraordinarily complex process for several reasons. Above all, there are substantial changes in the organization of economic life, and these changes affect every member of the formerly totalitarian society. From an economic point of view, transition can be perceived as a dynamic process of modernizing the economy and society. In Western Europe and other developed countries, this modernization process has been going on continuously in response to global pressures (internationalisation and globalisation, the oil crisis, the Gulf War, etc.). In totalitarian countries, however, these international and global pressures were limited because of the closed nature of the economy and society at the state level, or by the operation of the former COMECON (Council of Mutual Economic Aid) directed by the USSR.

Czechia, due to its turbulent past, forms a unique model area for the study of land use changes as affected by societal driving forces. There are four specific issues or events which together constitute this uniqueness:

1. Czechia experienced three profoundly different economic and social systems: a) “traditional” liberal capitalism in a variety of types between 1845 and 1948 (with 6 years of Nazi German totalitarian rule in 1939–1945); b) the “communist regime” or “non-market economy” of 1948–1989; c) the contemporary period of the “global” market economy. All these systems specifically influenced land use structure and types of its changes.
2. The Transfer of the German population from Czechoslovakia to Germany and Austria after World War II. This process caused massive depopulation mainly in the border regions of Czechia and fundamentally changed land use/cover changes (LUCC) in these areas, especially along the “Iron Curtain”. The Czech population was not able to fully resettle these regions despite massive support from the government; instead towns and rural municipalities at lower elevations and in better locations were resettled.
3. Since the Industrial Revolution in Czechia starting in the first half of the 19th century several key political events changed the geopolitical and geoeconomical position of the state and thus affected land use patterns remarkably: 1867 (the beginning of dualism Austria-Hungary), 1918 (the foundation of an independent Czechoslovakia), 1938 (the partition of Czechoslovakia), 1948 (the onset of the communist regime), 1989 (the reintroduction of democracy and capitalism; the opening of the national economy to foreign markets) and 2004 (EU membership and the adaptation of its agricultural policies).

4. Availability of detailed maps for use as quantitative archival and statistical data sources based on cadastral mapping from the 1st half of 19th century in the so-called Franciscan or Stabile Cadastre covering more than 170 years of land use development in Czechia, Austria and Slovenia, down to the cadastral unit level (Jeleček 2006 b).

2. The LUCC database

The first cadastre providing detailed and exact maps of cadastral units or cadastral territories was developed and it can be used up to now. It was the so-called Stabile (also Franciscan) Cadastre established in the first half of the 19th century, when the exact borders of cadastral units (also cadaster) were measured and drawn on maps. Then their structure (i.e. borders of plots of land, parcels, including their numbering, property data, soil fertility, etc.) was elaborated. The methodology of cadastral mapping initially distinguished ca. 50 categories of land use, currently only 12 categories (Jeleček 2006a).

The land use database was developed by the LUCC research team from archival data containing some 13,000 cadastral units covering the entire territory of Czechia (Database LUCC Czechia 2001). The cadastral data of 1845 and 1948 were received from the Central Land Survey and Cadastre Archive files. More recent land use data (1990, 2000) came from the computerized database of the Czech Office for Surveying, Mapping and Cadastre in Prague. Each settlement, i.e. village, township, and city is composed of one (for villages and townships) or more (for cities) cadastral units. The cadastral unit does not have any administrative function – it is only a basic territorial unit, according to which cadastral data including statistics and maps is set up. Currently, the territory of Czechia is composed of approximately 13,027 cadastral units. Their average area covers 609 ha.

The area of about 25 % of cadastral units has changed, and in the course of time (1945–2000) new cadastral units were created (by dividing old ones). For the sake of comparison, our research team developed some 8,910 comparable so-called comparable territorial units (CTU) by joining those CUs whose areas changed over the period examined. The average area of one CTU is 886 ha. Approximately 70 % of the CTUs consist of one cadastral unit only; the rest is composed of two or more, so that CTU areas do not differ more than by 1 % in the four compared years of 1845, 1948, 1990 and 2000. Here we would like to emphasize that we use only CTU as a tool of measuring and comparing.

3. Terms and context of the topic in literature

3.1. Discussion of basic terms

First it was necessary to call attention to the slight instability of the terms “land use” and “land cover”, which requires discussion. This is indicated for example by an overview of several definitions formulated primarily for landscape management, or land itself. Georgie and Nachtergaele (2009), deem that the term land use “...is often used improperly to describe some regional to global datasets which contain a mixture of both ‘land use’ and ‘land cover’ information. ‘Land use’ is in reality quite distinct from ‘land cover’”. The FAO’s official definition of land use reads: “Land use concerns the products and/or benefits

obtained from use of the land as well as the land management actions (activities) carried out by humans to produce those products and benefits.” The FAO’s definition is equivalent to our definition of land use. This is evidenced by the use of the same terms for land categories in land use statistics in individual countries of the world kept by the FAO since the 1960s, and which are thus named: arable land, permanent cultures, permanent grasslands and forest areas, and further according to the comprehensive categories of: agricultural land, arable land together with permanent cultures, remaining areas and data about total area and area of the state not including water areas (that is the area of land). This allows for at least an approximate international land use change comparison in individual countries of the world, and in the case of Europe mostly for the approximate last 40 years.

According to De Bie (2000) land use is a “...series of operations on land, carried out by humans, with the intention to obtain products and/or benefits through using land resources”. Turner II’s broader definition (1995, p. 20) is: “Land use involves both the manner in which the biophysical attributes of the land are manipulated and the intent underlying that manipulation – the purpose for which the land use is used.” It can thus be determined that the term “land use” in this case is partially included with that which is normally perceived to be “land cover”. According to the figure therein (Turner II et al. 1995, fig. 3, p. 20) labelled “Differentiating land cover and land use” categories of land use are (being intentional or purposeful), e.g. logging, grazing, agroforestry, wilderness conservation, cities = residential and production technology, etc. In contrast land cover categories are forests, permanent grassland, arable land, wetlands and non-biotic constructions. Land use and land cover are defined oppositely then in the above mentioned definitions, including our understanding of land use as a set of land area categories, whose names are derived from the purpose and manner of their use.

The term “land use” may be conceptualized as the “colonization of Earth’s ecosystems” by people, which can be analyzed to be such socioeconomic activities that affect ecosystems in order to gain favourable results or changes in ecosystem processes that have been caused by these interventions (Krausmann et al. 2001, p. 2). Encyclopaedia of land use (Geist, ed. 2006), in which entries for “land use” and “land cover” are paradoxically missing, serves as proof of disagreement in understanding land use changes. It is clear that in this field of research no paradigm-terminology agreement has been made, which is thus a challenge for future research.

Several definitions of land use and land cover also exist within Czech geography. Lipský (1994, p. 249) formulated the landscape ecology definition: “Land use is spatial structure, which has a direct influence on the course of energy and material flows in the landscape. Not only is the areal representation of individual elements important, but also above all their mutual arrangement and internal characteristics, such as type, size, shape, origin and age, structure, and connectivity or isolation. The critical role of linear formations (corridors) connected to the network is emphasized in the agricultural landscape.”

The term “land use” used by Bičík’s team (“areas use”), i.e. whether it is a complex of individual land categories or types of land (arable land, meadows, etc.) explicitly does not arise from Lipský’s definition. The terms “land use” and “landscape use” can be considered synonyms, for in contrast to the term “land cover” they express its economic, and thus anthropogenic, aspects and potential. The term “land use” is concisely characterized with the geographic (holistic) approach by Kupková (2001, p. 120): “An anthropogenic factor is a

basic condition of being able to talk about land use. Land use is thus, in contrast to land cover always the result of interaction between society and nature, and data describing land use thus testifies to human activity in the land". Therefore the author logically comes to the conclusion that with the help of this data we should attempt to "quantify the influence of human activities on the land, definitely, yet roughly or to a certain extent in a simplified manner" (Kupková 2001, p. 89).

The term "land use" can thus be understood as a more general, simplifying term and for geographic land use research using the records and statistical (archival) method the most appropriate.

The category "land cover" expresses the actual cover of the landscape, i.e. what is growing on the land – what an observer would see. Comparing the content and function of both terms brings up the idea that the term "land use" with its categories of land and other parameters can be considered a rather anthropocentric term; the term "land cover" is rather biocentric, or perhaps geoinformatic, which thus suits ecologists more including landscape ecologists, or other experts studying the landscape in greater territorial detail.

3.2. Context of the topic in literature

Recently, there has been very distinct motivation to analyse land use changes and this analysis is being developed further. We witness it primarily in important international projects focusing on the interactions of nature and society in long-term time development at the macro-regional, or even on a global, level. The writings of Turner II, Meyer (1994) and Robinson, Douglas, Huggett (eds. 1997, again 2002), and Worster (1990) are very inspiring for the study of long-term land use changes. These publications demonstrate the entire range of disciplines examining global environmental changes and the influence of human society on these changes (Global Change).

At a more general level it is necessary to recall the idea of Hampl (1992, 1999), who differentiated three basic phases of nature – societal interactions, dominated by determination, competition or cooperation. They correspond to different stages in the evolution of human society where the gradual release of society from its external determination by natural conditions and evolution of new sorts of internal (social) or external (socially geographical) organizations is underway.

Long term land use development is studied as a social metabolism especially by Austrian geo- and social ecologists and other scientists using similar historical data from archives (Haberl, Batterbury, Moran 2001; Haberl, Erb, Krausmann, Adensam, Schulz 2002; Krausmann, Haberl, Schulz, Erb, Darge, Gaube 2003), and more recently Kušková, Gingrich and Krausmann (2008), who analyse the development of social metabolism processes and energy flows (extraction of biomass, fossil fuels, energy consumption) on the territory of the former Czechoslovakia over the past 170 years and compare them with land use changes in the same period. This is all in the context of the transition from agrarian society to industrial and then post-industrial society.

Slovene geographers have a similar database at their disposal to the one in Czechia. Gabrovec, Kladnik and Petek (2001) present a way of working with cadastral data and covering the territory of the entire country (Slovenia) with procedures and results most similar to those used in Czechia. Their work is based on similar land structure studied in Slovenia between 1896 and 1999.

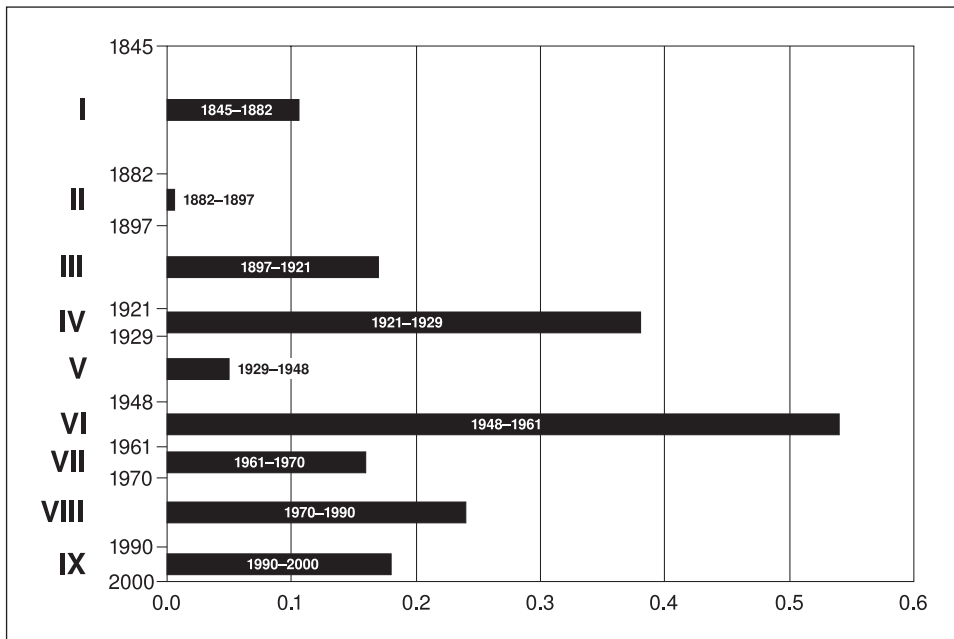


Fig. 1 – Index of change (axis x, % of total area of Czechia) in the last one and a half century recounted per average of one year in the observed period. Notes: I: The Revolution of 1848/49; The abolition of serfdom, land becoming a free good; Climax of the Agricultural Revolution; The dominant impact of differential rent I; The extensive development of agriculture. II: The transition to agricultural intensification; Greater impact of differential rent II; Competition with cheaper grain from the U.S.A.; The drawn-out Agrarian crisis. III: A boom in agriculture; the 1st phase of the technological-scientific revolution in agriculture; the impact of World War I. IV: The 1st land reform; Onset of the use of electricity and the combustion engine in agriculture; State monopoly on grain trade; Policy of customary protection of the domestic agrarian market. V: The large economic crisis of 1929–1933; the impact of World War II; German occupation of Czechia. VI: The transfer of the Czech Germans 1945–1948; The 2nd land reform; Extensive development of the economy and its nationalization; Collectivization of agriculture. VII: Economic depression; Attempts at agricultural intensification deepening; Completion of collectivization. VIII: Economic stagnation; Joining of small cooperatives and state farms; Simplification of rural landscapes with large plots of land; The Agricultural Land Protection Act approved in 1976. IX: Re-introduction of the market economy; Restitution of private property and land; Capital transition of cooperatives (cooperatives of owners) and privatization of state farms; Increase of small-scale farming; Competition between Czech and more better subsidized agricultural products from abroad.

Source: Database LUCC Czechia 2001, Charles University in Prague. The index of change shows the balance of areas in Czechia from the total area on which total of any category of land changes occurred.

They created publications evaluating land use change according to individual cadastrs and regions in Slovenia over the course of one century (Gabrovec 1995, Gabrovec, Kladnik 2001). Their approach to dynamic land use is influenced by the specific natural conditions in Slovenia and the development of the society differentially using this territory. Mountainous and alpine regions that were formally carefully used as alpine pastures are today mostly abandoned; mountain villages are abandoned and a secondary natural landscape

has formed. In contrast the littoral region and the fertile lowlands on the edge of the Pannonian Basin are intensively used for agriculture and are urbanized, and natural elements there are threatened, or in demise. On the bases of changes in individual land use categories on the territory of Slovenia according to increases in area of four monitored categories (arable land and permanent cultures, forest areas, permanent grasslands, and built-up and remaining areas) four dominant processes and three levels of dominance of these processes have been defined: weak, medium and strong dominance.

4. Major political and economic factors ranked according to the power of their impact

To explain land use changes and problems during the period of transition in Czechia, the historical roots of land use changes and the state of the landscape in the 1980s need to be looked for, i.e. to know their major economic and political driving forces from the beginning of capitalism in Czechia. This theme has been worked up in analytical studies by members of the team (e.g. Bičík, Chromý 2006; Bičík, Chromý, Jančák, Jeleček, Kupková, Štěpánek, Winklerová 2001; Chromý, Jančák, Winklerová 2003, Chromý, Rašín 2006; Kabrda 2004a; Kabrda 2004b, Kabrda, Jančák 2007), whose findings will be summarized in the forthcoming monograph. The definitions of the main SDFs of LUCC not only in Czechia, were defined in the English language encyclopaedia of land use (Gheist 2006, Jeleček 2006b). Here we shall name only:

Major factors affecting land use in Czechia in the 20th century (ranked according their “historical weight”): Results of WW II, the transfer of German population from the border regions of Czechia, the creation of the “Iron Curtain” after 1948; Takeover of political power by the Communists in 1948 and forty years of rule by the communist regime, nationalization of industry, agriculture (socialisation of agriculture: 98 % of agricultural land was used by Unified Agricultural Cooperatives and state farms), the impact of the centrally rigidly directed planned economy; The birth of independent Czechoslovakia and land reform in 1920s; The political, economic and social revolution in 1989 and the comeback of democracy, freedom and a capitalist/free market economy; EU accession (2004 and EU agrarian policy) and the Schengen accession (2007) are not well visible, but in the near future will influence our land use structure and agriculture deeply; Cyclical development of the economy and the changes of geopolitical and geo-economic position of Czechoslovakia and then Czechia (1918, 1938, 1945, 1948, 1989); The impact of World War I (Bičík, Jeleček 2004). We can read the major societal driving forces and their impact on land use changes in Czechia 1845–2000 (Fig. 1).

5. Political and economic transition in Czechia after 1989

5.1. The period 1990–1994

Permanent changes in laws, the volume and structure of production, prices and wages, and changes from long-term stabilization were the most important in this period. From the point of view of land use and landscape, changes were important for the deep reorganization of the rural landscape. The transition of agriculture led to deep structural changes due to new laws and rules for

privatisation and massive large-scale restitution of land property (nowadays there are 3.5 million land owners, but less than 1 % of them has begun to farm again). The reorganization of socialist cooperatives (some 65 % of agricultural land) could start with owner cooperatives when all the restitution requests were realized. It is interesting that all of these demands had to be approved by a meeting with all of a cooperative's members (some of them were totally without any land or real estate) as well as owners (or their ancestors, i.e. children/grandchildren etc.) who owned land, stables, machines, cattle etc. before the creation of socialist cooperatives. The second most important producer in socialist agriculture – state farms (they used some 35 % of agricultural land, the majority being located in border regions) – were privatized on the basis of privatization projects. These projects were mostly prepared by the managers of state farms for tenders directed by the Ministry of Agriculture. Managers had the best information about big state farms and it was one of the main reasons for their high success rate in winning in tenders. But it was also a way how to support the “traditional structure” created during the socialist period. It was one (but not the most important) reason why farmers, who had restituted land, faced much worse conditions when they started farming anew. These quick processes influenced also the decrease in the number of employees in agriculture, forestry and the fish industry (from some 600,000 to 200,000 in 2006) and the division from socialist farms, construction, industrial and assembling workshops without any agricultural functions. These newly created parts (enterprises, facilities) were privatized and lost a good chance for earning extra profit from non-agricultural activities.

The government pursued great changes in agricultural policy. In this period, all traditional production supports in agriculture were terminated. These changes influenced the decrease of Czech agricultural intensity, which seems to be an exception on the Europe-wide scale at that time. The first period of transition brought some special problems to solve. New managers emerged in the process of privatization and had different starting positions; the best managers stayed with informed people and were joined with old communist “structures”. Big privatized properties directed by special ministerial officers presented opportunities for corruption, but only in some cases has it been proven. Society till 1989 overall developed a very uniform and relatively good standard of living. The Czech rural population had never in the past enjoyed such similar standards of living in comparison with the urban population. The transition of rural society produced again differences in property and new social structuring.

5.2. The period 1995–2004

The beginning of this period is connected to the completion of restitution (perhaps as much as 90 %) and also the privatization of the majority of state farms. Therefore, a new property structure in the rural landscape was installed. At the beginning of this period private persons owned most of agricultural land (and some 20 % is still in state hands), but agricultural land use resulted in different structures in comparison to the former structure of the communist regime. The Czech Office for Surveying, Mapping and Cadastre put great effort into fixing many of the mistakes made during the communist regime and creating written records. The completion of the Cadastre (including legal relations to real estate property) has yet to occur. Right in the middle

of this period the process of creating new “complex land parcels regulation” began, involving the application of remote sensing, extended field mapping and hard work with owners in haggling over new use and trades-off their parcels, etc. This process of regulating new plots of land has only occurred in some 5 % of Czechia, it is extremely demanding and it is planned to take two decades and will require the budgeting of billions of crowns.

No production subsidies were applied within this period, but farmers could get some support for projects within special programs focused on grassland cutting, repairing ponds and streams, rural roads, etc.

The decrease in size of both arable and all agricultural land continued during this period. Some plots of both categories were abandoned. The loss of subsidies provided by the socialist state especially in naturally less favoured areas and the impact of differential rent I operation in the revived market economy influenced larger decreases of arable land and agricultural land regionally in mountainous and sub-mountainous regions. In both grassland and forest area, growth is visible. Also relatively deep changes in the structure of agricultural production occurred: the share of crop production rose from 44 % to 49 %, the share of some plants grown on arable land is now much higher (rape, corn, sunflower), there was a large decrease of dairy cows (about 40 % of the 1990 amount) and milk products, a large decrease in cattle breeding caused smaller amount of natural manure to be used on arable land, etc. The amount of applied artificial fertilizers went up step by step (the average amount of NPK applied in 2004 represents some 120 kg/ha, 1989 cca 240 kg/ha and 1992 cca 40 kg/ha).

New agro-complexes started to be formed. Many big food industry plants collapsed in the first years of the transition. Similar fates met many other big food plants, newly built at the end of the totalitarian regime. But at the same time many smaller plants were built up and renovated mainly in agricultural regions with surpluses (potatoes, milk, meat, vegetables, fruits and wine production).

Rural space obtained and strengthened non-production functions in which many farms participated. Environmental and nature protection became more important. Some areas around big cities were transformed into suburbs; there are also special functions for different forest areas (water protection areas, recreational function, cutting timber forests, etc.). But it is very surprising that approximately in one third of 8,903 CTU there was a significant increase of permanent grassland in the period after 1990. It happened for the very first time in the long time period 1845–2000 and is still continuing.

The increase of meadows and pastures to the detriment mainly of arable land was connected to technological changes in cattle breeding during the 1990–2000 period. About 95 % of cattle was gradually concentrated to (big) new cowsheds and fed industrially prepared feed and forage from arable land. The decrease of domestic beef, milk, and cheese consumption after 1990 and the visible decrease of agricultural intensity contributed to the process of permanent grasslands areas increase acreage especially in hilly and mountainous regions where now 7–8 months a year open air cattle fattening is dominant. This change is present in differential rent II function’s impact on regional reorganization of agriculture.

5.3. The period after 2004

When Czechia joined the EU, only a few hundred unsatisfied restitution applicants remained, who requested around 1 % of agricultural land. About

20 % of the total agricultural land is still in the hands of the state (in 2005). The majority of that land is located in those border regions in which the land was the property of the Czech Germans who after 1945 were transferred to Germany.

This land cannot be sold to foreigners until 2012, but the Czech government has begun a discussion about shortening this period. Some foreigners on the base of cooperation with willing Czech partners started farming in Czechia; this was enabled by Czech partners registering their ownership in the cadastral register as official owners of the farm. The system of subsidies is developed, but subsidies can be used only for non-production functions. The extent of abandoned arable land reached almost 10 % of its total registered area in Czechia (2003), in 2005 decreased on the half. It is also significant to mention that there were some owners “waiting” for joining the EU. After joining the EU the subsidies in agriculture again evidently became smaller in comparison with the subsidies of farmers in old EU Member States. Stratification of user and owner structures of agricultural land rose.

One of the largest changes in the rural landscape in this period was the intensification of suburbanization, especially around big agglomerations. Due to this process, agriculture is losing the best or good fertile soils in lowlands, which are being turned into built up areas, roads, and recreational gardens (allotments) and light industry. There are also areas for family housing, and areas for services or stores. Rural areas are changed by these processes into areas with new functions, and arable, or agricultural land, is lost forever. In peripheral and semi-peripheral regions we can observe some agro-brownfields. These are buildings and areas earlier used by big cooperatives and state farms for cattle and pig breeding in big cowsheds, and stores, barns, garages for agricultural machines and tools, and industrial workshops. Many of these investments from the totalitarian period are now in many cases empty and threatened by robbing. Some of them are used for planned purposes; some of them are rented for non-agricultural use. All processes mentioned here have influenced the formation of a new agro-complex, which deeply differs from the one from the totalitarian era. As far as land use changes are concerned typical processes involve increases in forest and grassland size as well as a continuation of increases in “built up” and “remaining areas”. Another serious impact on land use changes is going on in the surroundings of large cities. Suburbanization occurs when city inhabitants move to townships and villages to live in new family houses. These are often built on arable land, or in better cases, on grasslands.

6. The position of the period of transition in the long term typology of land use changes

The period of transition represents a return to a market economy and at first sight a return to former land ownership relationships and the organization of landscape management. Today as well, large enterprises dominate farming, and there are only several thousand independent farmers, and most of those who restituted land rent it out for a low price. Despite many changes the organization of the entire agro-complex has maintained many elements founded on large-scale farming of the past. Economic pressures coming from within Czechia, as well as after 2004 mainly from the EU, have influenced land use and the conditions and developments of land use categories and classes.

Tab. 1 – Typology of the changes of the macrostructure in CTU of Czechia 1990–2000. Macrostructure: agricultural land, forest areas and other areas (water + built-up + remaining).

| Type | CTU number | % | Size 2000 (ha) | % |
|-------|------------|--------|----------------|--------|
| +++ | 141 | 1.58 | 54,187.7 | 0.69 |
| ++- | 1,904 | 21.39 | 1,500,680.7 | 19.03 |
| + - + | 490 | 5.50 | 418,246.8 | 5.30 |
| + -- | 1,234 | 13.86 | 905,517.0 | 11.48 |
| - + + | 2,543 | 28.56 | 2,368,246.6 | 30.02 |
| - + - | 905 | 10.17 | 946,005.0 | 12.00 |
| -- + | 1,686 | 18.94 | 1,693,655.3 | 21.48 |
| Total | 8,903 | 100.00 | 7,886,539.1 | 100.00 |

Source: Database LUCC Czechia 2001, Charles University in Prague

Therefore it is important that these pressures are compared with the previous land use categories and classes.

We use two methods to do so. The first evaluates the landscape's macrostructure based on agricultural land, forest areas and other areas (water + built-up + remaining) through a simpler form of increases and decreases in area between two time periods. This allows seven categories of land macrostructure transition categories to be distinguished (Tab. 1).

Comparing the development of the shortest land use change period (1990–2000) with the preceding period (1948–1990) documents a fundamentally different situation. In our opinion a decade is too short a time for significant land use changes to occur. What more the fundamental change in ownership relations when land was returned to 3.5 million people through restitution certainly influenced the variety of changes in land use. The oldest period (1845–1945) was influenced by the fact that in more than 60 % of CTUs there was forest growth (whether we count the portion of CTUs or the area of units). In only a quarter of CTUs did the area of agricultural land grow and in a full 75 % other areas grew (built-up + water + remaining). The second period concentrated the number and area of each type to 90 % – i.e. CTUs where agricultural land decreased and forest and other areas increased. Thus, the period of transition with its varying types of land structure dynamics presents a specific phase of development. Of course we presume that after completing the database in January 1, 2010 that the transitional development of twenty years will be projected in the representation of two or three types.

Table 2 is based on the methods of Slovene geographers (Gabrovec, Kladnik, Petek 2001) and with a certain amount of generalization it documents main landscape change processes. It is based on simplified land structure in four basic categories: total arable land + permanent cultures, also permanent grassland area (meadows + pastures), forests and total built-up and remaining areas. The largest positive growth in area is divided by the sum of all area growth and is multiplied by 100. The resulting number expresses how the most significantly growing category contributed to total positive changes. If the portion is larger than 75 % it is a strong process, if it is between 50–74.9 % it is of medium intensity, and if the portion is 25–49.9 % it is weak. Depending upon which unified category is in question we can talk about three levels of

Tab. 2 – The typology of main landscape change processes 1990–2000 (according to Gabrovec, Kladnik, Petek 2001)

| | Type | CTU number | % | Size (10 ³ ha) | % |
|----|--|------------|--------|---------------------------|--------|
| 1 | strong afforestation | 114 | 1.28 | 141.1 | 1.79 |
| 2 | moderate afforestation | 72 | 0.81 | 58.7 | 0.74 |
| 3 | weak afforestation | 16 | 0.18 | 8.5 | 0.11 |
| 4 | strong grassing over | 2,255 | 25.33 | 2,099.6 | 26.63 |
| 5 | moderate grassing over | 269 | 3.02 | 274.4 | 3.48 |
| 6 | weak grassing over | 27 | 0.30 | 42.2 | 0.54 |
| 7 | strong urbanization | 380 | 4.27 | 394.5 | 5.00 |
| 8 | moderate urbanization | 154 | 1.73 | 187.2 | 2.37 |
| 9 | weak urbanization | 27 | 0.30 | 60.7 | 0.77 |
| 10 | strong intensification | 553 | 6.21 | 348.9 | 4.42 |
| 11 | moderate intensification | 176 | 1.98 | 128.6 | 1.63 |
| 12 | weak intensification | 15 | 0.17 | 12.0 | 0.15 |
| 13 | proportion of changes less than 1% of area | 4,845 | 54.42 | 4,129.9 | 52.37 |
| | Total | 8,903 | 100.00 | 7,886.5 | 100.00 |

intensity in the processes of agricultural intensification, establishing grasslands, afforestation and urbanization.

The main landscape change process in the period 1990–2000 is unanimously the establishment of grasslands, that is, growth in the area of meadows and pastures. Considering the fact that record keeping for individual land categories in this period appreciably lags behind their true area in the field (the area of arable land is fundamentally smaller than is recorded – by as much as 300,000 ha in 2003), the true area of permanent grasslands is larger than the data table shows. The second most important process of the period of transition is urbanization (strong and medium), involving the intensive influence of suburbanization in the hinterlands of major cities, which was a result of large investments into service, storage and logistics areas and residential housing. There is surprising, that half of units realized no changes in land use structure, more certainly changes were lower than 1 % of CTU's individual size.

It is possible to roughly divide the territory of Czechia into five different types of land use changes:

1. Regions with relatively good natural conditions, stabilization of higher share of arable land especially in lowland areas; land use changes will take place especially from arable land (reaching more than 70 % of CTU area) to built-up and other areas.
2. Regions with relatively good natural conditions and with a higher share of arable land, but influenced by very strong suburbanization, which started after political changes in 1990, but whose intensity was highest especially in the period 1998–2007. The population of Prague's urban region, where suburbanization has been the strongest increased in the period 1991–2001 by +11 %, in the period 2001–2006 by +8 % (and in the sub-region Jesenice

by +100 %, and in the sub-region Kamenice by +50 %). This extreme population increase caused deep changes in land use (transition of arable into built-up and other areas) in all territories giving them new special functions for permanent housing, stores, shopping malls, etc.

3. Regions with middle and high changes in structure and decreases of agricultural land (changes from arable – to grasslands – to forest areas) and weak afforestation are situated in hilly regions at altitudes above 550 m. There are many regions where it is possible to successfully apply a rural policy of the 21st century – the multifunctional rural landscape. Such policies still bring and will bring extra money not only from farming (such as organic farming), but also from other activities such as agro tourism, horse riding etc. as mentioned above. Especially, under these conditions there are farms that could receive special support for non-production activities (cutting and grazing grasslands to maintain their species composition, environmental and protection work, reconstruction of paths, streams and ponds, etc.). Such a policy pursues a very important objective, namely to enable rural inhabitants to live in the countryside and keep the rural landscape in a good state, because it often has many other functions besides agriculture.
4. Regions with a very steep decrease of arable land as well as grassland and strong afforestation, where the share of agricultural land gradually decreased from the end of 19th century and accelerated after 1945. They are almost only rarely used as pastures and strong afforestation is occurring (above 600 m). These processes have been in progress since joining the EU.
5. In regions with relatively low population densities the landscape was transformed into national parks (Šumava, Podyji) or other forms of landscape preservation (all forms of preservation are applied in almost one fifth of the Czech territory). There is a visible decrease of human activity, especially in agriculture, the landscape has a higher share of forests and grasslands, and land use structure after declaration is relatively stable. Hiking, biking, walking and skiing are preferred, but in some places with bad effects on the main function – nature preservation. Creating new national parks influences the size of some land use categories. Their “primary zones” are proclaimed to be remaining areas without taking reality into account (usual categories: forest and grassland). We can see the opposite situation in abolished military areas. There were any changes of landscape inscribed in cadastral evidence when other areas were transformed into real forests, grassland and other categories.

Usually only small parts of the landscape (bigger parts are located in reclaimed mining areas and dumps) farther from houses and other human activities were turned into specific areas of “new wilderness”. There are parts of uncultivated agricultural land on slopes, narrow stream valleys, old mines and open pits, where new habitats are located. Some of them are also some core areas for the survival and expansion of new flora and fauna species. The progress of this “new wilderness” is influenced by the large decrease in agricultural intensity over the last 15 years, and some sources claim that about 5 % of all state territory has this special “land use”.

In conclusion we must emphasize that during the period of transition processes continued that led to further differences in land structure at the lowest level of CTU. Simultaneously, greater accumulations of CTU – with similar structures (and development) were formed and larger typological regions with similar land structures were formed. Their functions still differ significantly and therefore differences in land structure between them are increasing.

8. Conclusions

The period of transition from after 1990 to the present is characterized by several specific periods with differing political and economic developments. This with a certain phase delay came out in the change in functions that society gives to various parts of the landscape. Therefore land use in the hinterlands of Prague and other large cities has been changed the most significantly by suburbanization. In these areas agricultural land (predominately arable) has been transformed to expansive built-up areas, gardens, orchards and remaining areas (for transportation, storage, logistics, etc.). This poorly managed process of suburbanization gradually proliferated after 1990 and reached its maximum near most cities between 1996 and 2005 in terms of taking up agricultural land. This resulted in population growth in these newly built-up areas, consisting predominately of family houses in the hinterlands of most municipalities. Despite the experience of Western Europe and North America, where this process began much earlier, several things have not been ensured in these newly urbanized places in Czechia: a necessary amount of public and transportation area, appropriate construction activity in terms of urban planning, and the architectural quality of buildings (including social amenities – schools, education, health, services, and shops). Therefore several authors speak about urban sprawl. The Prague urban region (the hinterlands demarcated by the territorial districts of Prague-west and Prague-east) experienced an extraordinary growth in population. Thus, it is a logical result that on part of the cadastral territory of most of these rapidly growing areas natural conditions fundamentally changed – especially the biota and the hydrological regime. Furthermore they are characterized by a loss of arable land, according to cadastral office records, which however in the field is in reality arable land lying fallow, due to being built-up (Spilková, Šefrna 2009).

Land structure in two other significant typological regions seems to be relatively stable. In fertile lowlands (outside of the immediate hinterlands of large cities), where crop production is significantly concentrated, only small land use changes occurred. A large portion of arable land with better quality soils dominating was preserved and only exceptionally has it been taken up by large investments.

In contrast to the fertile lowlands are mountainous regions, where the portion of forests on the area of CTUs is around more than 50 % of the area. Here arable land ceased to exist at the end of the 19th century already, and was transformed into pastures, meadows and forest; remaining arable land was almost completely transformed into meadows and pastures in the early years of the communist regime. This was mostly due to political factors and economic factors, which in these regions caused most of the arable land to shift to the category of meadows or pastures in the 1950s and the later shift of this grassland to forests. Considering its low natural fertility and largely unsuitable position to the market (they were mostly in the sparsely populated border regions), it did not economically pay to invest capital in arable land (crop production).

This “two-tiered landscape change” is certainly characteristic, albeit at a lower intensity after 1990, for less fertile sub-mountainous and hilly areas of the interior of Czechia. After 1990 farmers farming here stopped getting relatively generous subsidies from the state, which allowed them to even grow unsuitable crops. Therefore in the period 1990–2000 grassland (meadows and pastures) growth was characteristically the dominant process of landscape

transition for 25 % of all CTUs. This transition of agriculturally utilized land has resulted in a significant restructuring of cattle breeding. In these regions (as well as in data for all of Czechia) there is a noticeable shift from stabled dairy cattle breeding to stable and pasture raising with a higher portion of meat-producing breeds of cattle. We must supplement our conclusions based on data from cadastral records. This is evidenced by data stating that in 2003 about 300,000 ha of arable land was long-term fallow land, but without any change in the register of the cadastral office. This means that at the beginning of the century in about 50 % of CTUs in Czechia, growth in permanent grasslands was the dominant feature of landscape transition. The accession of Czechia to the EU initiated a decline in the area of arable land lying fallow (that is de facto now permanent grasslands) in connection with expected agricultural subsidies from the EU.

The third type of significant landscape change is represented by regions that were declared to have various degrees of nature and landscape protection, especially national parks (Šumava Mts., Krkonoše Mts., Podyjí, České Švýcarsko) and UNESCO biosphere reserves (e.g. Třeboňsko, Křivoklátsko, the Bílé Karpaty Mts., etc.). In total almost 20 % of the territory of Czechia is protected to some degree. Being declared protected was connected with lowering the intensity of farming in these areas, and in some parts agricultural production was outright prohibited. Demarcating the primary zones of protection in national parks has resulted in the administrative shift of all of these defined areas to the category of remaining areas (which also included storage and logistics areas, etc.) although there was no change in the field. National parks have become a part of the economically important tourist industry, and for example in Šumava the development of economic activities in several municipalities is significantly restricted.

The database that we use allowed us to come up with several fundamental research conclusions. Above all, over the last nearly two centuries of keeping land use records, there have been significant changes in land use. Whereas in the past the land structures of individual CTUs were mutually similar, their structural differences gradually grew, as did regional differentiation. Currently these differences are at their greatest. Simultaneously, larger territorial units were created (typological regions of specific functions) differing in land use structure. Of course the internal similarity of land structures of individual CTUs, which make them up, is high in contrast.

Current agricultural and environmental policy in Czechia is ever more emphatically trying to create a multifunctional rural landscape. It is certain that in a developed society various functions and tasks are given to the landscape and thus in an intensively utilized landscape conflicts of function occur. In our opinion the fundamental conflict is a result of tendencies in long-term land use development that lead to significant functional differentiation of the above mentioned typological regions and with this policy aimed at a multifunctional landscape.

In conclusion we would like to point out that we will continue to research long-term landscape changes. On the one hand we will expand the database of land use in Czechia to include other dates (1896 and 2010) and will add other characteristics on the cadastral territory level. We are also preparing several choropleth maps for the upcoming Landscape Atlas of the Czech Republic, as well as a study of model regions of specific functions from the point of view of their land use development.

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VYUŽITÍ PLOCH A ZMĚNY KRAJINY ČESKA V OBDOBÍ TRANSFORMACE 1990–2007

Článek je především jedním z výstupů databáze LUCC UK Prague, která soustřeďuje data o využití ploch v Česku na úrovni 8 903 srovnatelných územních jednotek vytvořených z údajů jednotlivých katastrů pro osm kategorií ploch v letech 1845–1948–1990–2000. Sledované kategorie představují ornou půdu, trvalé kultury, louky a pastviny (v úhrnu zemědělská půda), dále lesní plochy, vodní, zastavěné a ostatní plochy (poslední tři charakterizované souhrnně jako jiné).

Výzkum využití země je zvláště v Česku důležitý nejen pro hospodaření vlastní země, ale i v širším mezinárodním kontextu, a to zejména z následujících důvodů: identifikace a explanace významných změn sociálně ekonomické situace území Česka; odsun českých Němců a proměna nedosídlené krajiny pohraničí ovlivněné navíc výstavbou železné opony; podstatné změny využití krajiny vyplývající z proměny geopolitické situace ve Střední Evropě. V archívech jsou k dispozici potřebné podklady v podobě detailní informace o stavu a vývoji využití krajiny Česka v posledních cca 170 letech.

Druhá kapitola obsahuje charakteristiku databáze, jejího vytváření, informace o úpravě struktury sledovaných kategorií a územní struktury pomocí srovnatelných územních jednotek (SÚJ, v angličtině CTU).

V kapitole 3 jsou diskutovány především základní používané termíny a nejednotnost terminologie jak v domácím, tak v zahraničním odborném tisku. Diskutovány jsou zejména zásadní termíny, jakými jsou „land use“ (využití ploch, někdy nepřesně překládán jako využití půdy – ne všechny sledované kategorie jsou ale kulturou či půdou) a krajinný pokryv (land cover). Krátce je diskutován i trend vývoje interakce mezi přírodou a charakterizovány jsou některé přístupy studia krajinných změn, resp. změn ve využití ploch (případně země). Podobná datová základna je k dispozici v Rakousku (databáze pro celé území Rakouska zatím není připravena) a ve Slovinsku (databáze podobnou naši je téměř hotova).

Další část příspěvku je zaměřena na hodnocení významu jednotlivých politických a ekonomických hybných sil, které se ve Střední Evropě významně podílely na změnách využití ploch v dlouhodobém kontextu. Obrázek 1 dokumentuje vývoj využití ploch pomocí indexu změny za celé území Česka za minulých více než 170 let a rozvádí v popisu hlavní hybné síly, které zde působily.

Pátá kapitola příspěvku hodnotí politickou a ekonomickou transformaci Česka po roce 1989 v několika etapách. Prvá etapa je datována obdobím 1990–1994 a jako hlavní procesy uvádí restituce, transformaci zemědělských družstev, privatizaci státních statků. Dokumentuje začátek poklesu počtu ekonomicky aktivních v zemědělství (ze cca 600 tis. osob na 200 tis. v roce 2004). Je zmíněn vliv ukončení státních dotací do zemědělství jako klíčový důvod poklesu jeho intenzity, který ovlivnil přechod na tržní ceny s dopadem na spotřebu obyvatelstva. Následující etapu 1995–2004 ovlivnilo faktické ukončení restitucí, počátek prací na komplexní pozemkové úpravě a obnovování přesnosti evidence půdy Katastrálním úřadem. V tomto období nebyly poskytovány žádné produkční dotace, prostředky šly pouze do údržby luk, rybníků a vodotečí, resp. venkovské dopravní sítě. Také došlo ke změnám ve struktuře zemědělské výroby zvýšením podílu rostlinné výroby a změně osevních ploch, kdy podstatně vzrostl podíl řepky olejky, kukuřice a bioprodukce. Ve struktuře využití ploch pokračuje trend nárůstu lesních ploch a také opouštění orné půdy, jak jejím nevyužíváním (ponecháním půdy ladem), tak převodem do kategorií louky či pastviny. Právě nárůst rozlohy těchto kategorií (od roku 2002 v evidenci sloučených do trvalých travních porostů) charakterizuje plných 35 % všech sledovaných srovnatelných územních jednotek v letech 1990–2000 a dokumentuje pokles intenzity hospodaření českého zemědělství a strukturální změny v chovu skotu. Těsně před připojením Česka do EU byl rozsah nevyužívané orné půdy odhadován až na jednu desetinu jejího rozsahu (asi 300 000 ha). Třetí perioda navazuje po připojení Česka do EU v roce 2004 a jde o období dovršení transformace zemědělství, kdy nová družstva vlastníků obhospodařovala asi 28 % zemědělské půdy Česka. Její 44% podíl využívaly soukromé firmy (společnosti s r. o., akciové společnosti, obchodní společnosti apod.), asi čtvrtinu pak soukromí majitelé – farmáři. V této periodě se podstatným způsobem změnila i vlastnická, velikostní a územní struktura navazujících odvětví agrokomplexu. Také suburbanizace významným způsobem změnila způsob využití ploch především v zázemí větších měst.

Dále je provedeno hodnocení změn využití ploch pomocí dvou základních typologických metod. Jednak jde o typologii úbytků a přírůstků tří sumárních kategorií (zemědělský půdní fond, lesní a jiné plochy), jednak o aplikaci „slovinské“ metodiky hlavních krajinných procesů. Tabulka 1 dokumentuje rozložení typů změn sumárních kategorií v období 1990–2000. Tabulka 2 pak výsledky hodnocení podle slovinské metodiky. Podle obou typologií vychází jednoznačné závěry srovnání změn využití ploch této periody s dlouhodobými trendy. Především se podstatně liší ve významném nárůstu trvalých travních porostů, pokračujícím nárůstem dlozhy zastavěných a ostatních ploch především v zázemí velkých měst. Pokračováním dlouhodobých trendů v transformačním období vidíme především v dalším úbytku zemědělského půdního fondu v horských a podhorských oblastech a ve formování větších územních celků s podobnou strukturou ploch a jejich vývojem. Závěrem jsou uvedeny hlavní typologické regiony z hlediska struktury ploch: úrodné nížiny s vysokým podílem orné půdy, suburbánní zóny s dobrými podmínkami pro zemědělství pod tlakem zástavby, podhorské oblasti s nárůstem trvalých travních porostů a lesních ploch ale relativní stabilitou využití ploch, horské oblasti s pokračujícím úbytkem zemědělského půdního fondu a vysokým podílem lesů, regiony s významnými ochrannými funkcemi s limitovaným způsobem hospodářského využití krajiny.

Závěry shrnují dosažené výsledky hodnocení transformačního období z hlediska využití ploch. Patrné je výrazné členění na jádrové oblasti ovlivněné intenzivní suburbanizací a intenzivním zemědělstvím úrodných nížin a oblasti periferní. Ty charakterizuje především dlouhodobý pokles intenzity zemědělského využití, který pokračoval i v transformačním období. Přechodné oblasti mají v tomto období relativně stálou strukturu využití ploch s výjimkou lokalit a linií velkých, především dopravních investic. Dlouhodobý vývoj struktury ploch potvrzený i transformační periodou formuje větší územní celky podobné struktury ploch (i jejich vývojových trendů) vyplývající z funkcí, které modernizující se společnost jednotlivým územím určuje. Je otázkou zda tento zjištěný trend není v rozporu s proklamovanou politikou multifunkční venkovské krajiny.

Obr. 1 – Průměrný roční index změny ve využití ploch Česka od poloviny 19. století do roku 2000 (některé hlavní společenské hybné síly změn ve využití půdy). I – revoluce 1848/1849; zrušení poddanství, půda a pracovní síla volným zbožím, dovršení zemědělské revoluce, dominantní vliv diferenciální renty I; II – přechod k růstu intenzifikaci zemědělství; větší vliv diferenciální renty II; konkurence levnějšího obilí z USA; vleká krize v zemědělství; III – konjunktura v zemědělství; první fáze technicko-vědecké revoluce v zemědělství, zejména na velkostatku; důsledky vlivu 1. světové války; IV – první pozemková reforma; nástup využití elektřiny a výbušného motoru v zemědělství; obilní monopol státu; ochranná celní politika; V – velká hospodářská krize počátkem 30. let 20. století, vliv 2. sv. války, německá okupace Česka; VI – odsun československých Němců; nástup komunistického režimu, druhá pozemková reforma, extenzivní vývoj hospodářství a jeho nacionalizace, kolektivizace zemědělství, masivní industrializace; VII – hospodářská deprese; pokusy o větší intenzifikaci zemědělství, dokončení kolektivizace; VIII – hospodářská stagnace, spojování družstev do větších celků, velké bloky polí a simplifikace rurální krajiny, vliv zákona o ochraně zemědělského půdního fondu, intenzivní bytová výstavba; IX – návrat kapitalismu a tržní ekonomiky, restituce pozemkového vlastnictví; transformace družstev a statků v jiné kapitálové formy, rozšíření zemědělské malovýroby, silná konkurence více dotovaných produktů z EU; X – příprava a realizace vstupu do EU, konkurence lépe dotovaných zahraničních zemědělských produktů starých členů EU.

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