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CHANGES OF SPATIAL DIFFERENTIATION IN LIVESTOCK BREEDING IN THE CZECH REPUBLIC AFTER 1990

Abstract: The article deals with the issue of spatial differentiation of livestock breeding in the Czech Republic after 1990. These activities are studied from the geographical point of view in relation to the transition from the centrally planned economy to the market economy with regard to the developments after country's accession to the EU. The first part concerns the changes having taken place during the period 1990–2001, with districts treated as basic units. In this part, special attention is paid to the changes in districts with predominantly mountainous and sub-mountainous natural conditions. In the second part, dealing with the period 2001–2005, regions are basic spatial units. The last part analyses the changes in spatial distribution of livestock during the whole period under consideration and a future development of livestock breeding is discussed.

Keywords: livestock breeding, spatial differentiation, Czech Republic, agriculture transformation, agricultural geography

INTRODUCTION

The Czech agriculture went through significant structural changes after the fall of the communist regime in 1989. Its importance changed as well. Czech agriculture entered the new market system from the centrally planned one, supported by massive subventions. Its crucial objective was maximum intensification of agricultural activities, regardless of existing natural conditions. High productivity and coveted food self-sufficiency were to be reached before 1989 by the use of mineral fertilizers. Agriculture was conceived as a certain type of industrial production (industrial agriculture). This approach, however, brought, apart from environmental problems, such as groundwater and soil pollution, soil

firming, increased erosion, high percentage of arable land in sub-mountainous areas, loss of biodiversity etc., and the ethical problems (for instance insufficient welfare of animals in high-capacity facilities or the rupture of farmer – soil relationship), in socio-economic difficulties (dependency of rural areas on agriculture, oversized capacities of agricultural facilities, etc.). Czech agriculture faces the consequences of all these processes even now. This article deals with the results of the structural changes mentioned on the example of livestock breeding (in the period 1990–2005).

AGRICULTURAL CHANGES AFTER 1990

Oversized Czech agriculture enjoyed, before the changes of the beginning of the 1990s, a completely different status than nowadays. While in 1990 the importance of agriculture for the national economy was at around 7.3% of gross domestic product, 14 years later it was at the mere 4.4% (2004). When analysing gross agricultural production in this period (in constant 1989 prices) we find out its 29% decrease to present CZK 77.3 billion (Green Report, 2004). The structure of gross agricultural production changed as well. While before 1990 it was characteristic to have unnaturally vast share of livestock production in the gross agricultural production (as late as in 1990 it was 58%), which was caused by an effort to intensify livestock breeding regardless of growing of the closely related crops (Jančák and Götz, 1997), after political changes the importance of crop production has been gradually increasing (between 1999 and 2003 the average share was 45% of gross agricultural production).¹

Changes in employment in agriculture were intense as well. According to the last census data (2001), 4.4% of the economically active population (230,475 persons) were employed in agriculture, forestry and fishing in the Czech Republic, while the preceding census of 1991 recorded 11.6% of economically active population. In combination with the above mentioned data for gross agricultural production we find out that there has been almost doubling of the productivity of labour per person employed in this branch. The importance of agriculture cannot be characterised only through economic data, the landscape function of agriculture is important, too. The communist view of agriculture affected this area as well. The Czech Republic preserves unnaturally high percentage of arable land (71.5%) in the European context, even though after 1990 arable land considerably shrank. Overall, in the period 1993–2005, agricultural land decreased by 5.5% (arable land by 4%), mainly in the sub-mountainous areas. Together with the decrease in the crop area (almost by one fifth compared to 1985), crop struc-

¹ In 2004 the gross value of crop production overtook livestock production (50.3%), which was, though, rather a consequence of exceptionally favourable climatic conditions in this year than of a systematic increase.

ture changed as well. Areas under alternative crops increased, although cereals do account for 60% of crop area, which considerably impedes their market use and every year a part of cereal crop remains unutilized. High proportion of cereals, as well as high percentage of arable land (71.5%) can be considered as heritage of socialist agriculture, which is preserved with state support until present. Apparently, the greatest changes were experienced in livestock breeding, the subject of this article.

METHODOLOGY

Geographical analysis is the main method used for assessment of spatial differentiation of livestock breeding. Intensity of breeding of particular livestock animals, their numbers, representation of individual districts (regions) and its changes were analysed in referential years of 1990, 2001 and 2005. The whole period 1990–2005 was divided for the sake of data comparability into two parts in which two different kinds of spatial units were assessed. In the first period (1990–2001) livestock breeding indices were analysed at the level of districts (77), with certain specificity taken into account. Given the changing areas of selected urban districts in the 1990s (Prague, Brno-město, Plzeň-město and Ostrava-město) and the impossibility of livestock data adjustment for a single spatial unit during the whole period, these districts were left out from the analysis of temporal changes. The Šumperk and Jeseník districts were united since the Jeseník district was created out of the Šumperk district in the second half of the 1990s and the relevant data do not exist. The number of analysed districts dropped, then, to 72. The second part of the period (2001–2005) was assessed in a different way. This was caused by a change in methodology and spatial units for which the Czech Statistical Office collects the data. Since 2002 the numbers of livestock are not collected in districts but only in regions. There are 14 regions but the data for the capital city of Prague (enjoying the status of a region) are united with the data for the Central Bohemian region. The number of units for this part of analysis is, then, 13. Districts can be composed to form the new regions, which, theoretically, should enable spatial comparison in the whole period under consideration. Unfortunately, the methodology of yearly registers of livestock changed as well. By conformity with methodology of Eurostat (since 2002) data on hobby farming activities of the population were left out from the registers, making comparison with earlier data rather complicated (see further). The 2001 data were adjusted according to the new methodology at the regional level.

Data needed for the calculation of livestock intensity (agricultural land for cattle and sheep and arable land for pigs, poultry and fowl) came from the Land

Resources Yearbooks (Ročenka půdního fondu 1990, 1993, 2001 and 2005) published yearly by the Czech Office for Surveying, Mapping and Cadastre.

Geographical literature, dealing with changes in the Czech agriculture after 1990 is not very extensive. Věčnick and Bartošová (2004) deal with geographical aspects of the Czech agriculture in the post-transformation period. These changes are analysed, for the first half of the 1990s, by Věčnick (1995), Bičík and Götz (1996), Ptáček (1996), a longer period is assessed by Bičík and Jančák (2002), Věčnick (2002). The analysis of changes in Czech agriculture starting with 1960 was carried out by Jančák and Götz (1997). Methodologically inspiring from the point of view of agricultural geographical research are works of Spišiak (1991, 2005), Götz and Novotná (1995), Jančák (2004), Bičík (2005), Robinson (2004), Bański (2001) or Kulikowski (2003, 2005). Differentiation of agriculture in highly productive agricultural areas is dealt with by Spišiak and Lelkes (2003) on the example of Slovakia, specificity of farming activities in mountainous and sub-mountainous areas are dealt with by Martinát (2004), organic forms of agriculture by Klapka et al. (2005) or ěufan (2001).

Intensive studies of agricultural economists should be mentioned as well. Hrabánková et al. (1994) studied, for example, the influence of regional policy on Czech agriculture, Horská and Spěšná (1994) dealt with the social context of agricultural transition. Relation between rural development and state of agriculture was followed up by Vaněk (2007).

LIVESTOCK BREEDING

The change in the economic system and the opening of domestic market for food imports from abroad had to affect the scale of Czech agriculture. The basic view of changes in livestock number in 1990–2005 is presented in Table 1. A considerable decrease was recorded in all the registered livestock animals. It is necessary, though, to be aware of the methodological change in the census of livestock animals. As implied earlier, since 2002 the so called hobby activities of the population are not listed among registered subjects. These were defined by the Czech Statistical Office as subjects farming less than 1 hectare of agricultural land or breeding less than 2 pigs, 4 sheep or 50 pieces of poultry (all subject breeding cattle are registered). This fact considerably complicates the comparison of data for livestock breeding (with the exception of cattle) with the period before 2001. Owing to the 2001 data, which are accessible for both methodologies used (they were recalculated) and supposing that trends in the development of numbers of individual livestock animals in these hobby activities are in the period 2001–2005 relatively stable (self-supplying activities do not succumb to market pressures as much), a detailed overview of the numbers of livestock animals in hobby activities, and qualified estimate of the total numbers of

livestock, can be obtained. While the numbers of pigs, sows and sheep increased by 1–2% for 2005 after recalculation and inclusion of hobby activities, not a significant increase, the number of poultry and fowl increased considerably (poultry by 10% and fowl even by around 30%), which radically changes the view of real changes of numbers of these livestock animals in the monitored interval. Poultry numbers oscillate around 90%, estimates for fowl reach 70%. The number of cattle decreased in 2005 by three fifth in comparison to 1990, the number of pigs by 40%. Sheep number experienced in this interval a drop by two thirds.

Table 1. Numbers of selected livestock animals in the Czech Republic in 1990 and 2005

	1990	2005	2005/1990 (%)
Cattle	3,506,224	1,397,308	39.9
– out of which cows	1,236,213	573,724	46.4
Pigs	4,789,898	2,876,834	60.1
– out of which sows	310,869	232,449	74.8
Sheep	429,914	140,197	32.6
Poultry	31,981,100	25,372,333	79.3
– out of which fowl	15,437,483	5,940,971	38.5

Source: *Soupis hospodářských zvířat k 1.1. 1990; Soupis hospodářských zvířat k 1.4. 2005.*

The main causes of changes in numbers of livestock animals in the Czech agriculture are the economic unprofitability of livestock breeding, cheap imports of meat and other products to the Czech Republic, primarily, though, the general transformation and restructuring of agriculture to fit market conditions. Financial accessibility and fears about transmission of animal diseases to humans (BSE, bird flu) play an important role, and are most probably factors substantially influencing consumption preferences of the Czech population (Table 2).

Table 2. Development of consumption of selected foodstuffs per capita in the Czech Republic in 1990–2003 (kg)

	1990	1995	2000	2003	2003/1990 (%)
Meat total	96.5	82.0	79.4	80.6	83.5
– pork	50.0	46.2	40.9	41.5	83.0
– beef	28.0	18.5	12.3	11.5	41.1
– poultry	13.6	13.0	22.3	23.8	175.0
Milk and dairy products	256.2	187.8	214.1	223.4	87.2
Eggs (pieces)	340.0	290.0	275.0	256.0	75.3

Source: *Statistická ročenka České republiky 2005.*

The table shows that after 1990 the consumption of meat in the Czech Republic decreased (by 15.9 kg per capita in 1990–2003). However, this is not true for all types of meat. Beef consumption drop (to 41% of that in 1990) was compensated by an increase of poultry consumption (by 175%). Nevertheless, pork remains the most popular meat in the Czech Republic despite medical warnings; its consumption even slightly increased after 2000. Milk consumption experienced at the beginning of the 1990s a considerable slump but later a positive increasing trend in consumption was recorded (87% in comparison to 1990). On the contrary, egg consumption systematically decreases since the beginning of the period analysed.

Future estimates are that poultry consumption will increase, while increase in consumption of fish (5.3 kg per capita in 2003) or rabbits (2.7 kg per capita in 2002) would be desirable. Popularity of pork in the Czech kitchens, however, will probably remain unchallenged. The numbers of livestock animals are probably not going to increase considerably, given the EU quotas and taking into account the abnormally low numbers of livestock animals in the Czech Republic in the second half of the 1990s. The following section concerns spatial differentiation of changes in individual livestock animal breeding, first in 1990–2001, at the level of districts, and then in 2001–2005, at the level of regions.

CHANGES IN SPATIAL DEVELOPMENT OF LIVESTOCK BREEDING IN 1990–2001

In 1990 more than 3.5 million of cattle were bred in the Czech Republic. Their number decreased till 2001 by 54%. Spatial distribution of the decrease in 1990–2001 is shown in Figure 1. It is evident that important decreases were experienced in the whole republic, with maximum in the Teplice district (decrease more than by 95%). Surprisingly high decreases (70% in average) were recorded in Prague and its nearer (the Praha-východ and Praha-západ districts) and more distant (the Kolín, Mělník and Kladno districts) hinterland and in the densely populated Karviná district (decrease by 93%). Decreases were also recorded in the Northwest Bohemia and Southern Moravia (by more than 70%). Generally, the most important decreases were registered in the hinterland of large urban centres (Prague, Brno, Ostrava, Plzeň, Liberec or České Budějovice) and in the most fertile districts (Znojmo, Břeclav). On the contrary, relatively lower decreases in the numbers of cattle (under 40%) can be found in the Českomoravská vrchovina highland (the Pelhřimov, Jihlava, Havlíčkův Brod and ěďár nad Sázavou districts), in the traditional cattle breeding sub-mountainous Ústí nad Orlicí district or in the mountainous districts in the northern part of the Šumava Mts. – Klatovy and Domažlice.

Intensities of cattle breeding per 100 hectares of agricultural land for 1990 and 2001 are next features studied. While in the first case a certain spatial balance is obvious (regardless of natural conditions) with local maximums in the Olomouc district (124 heads of cattle per 100 hectares of agricultural land), Eastern Bohemia (the Ústí nad Orlicí, Hradec Králové, Rychnov nad Kněžnou districts – more than 90 heads of cattle per 100 hectares of agricultural land) or in the Českomoravská vrchovina highland, eleven years later a substantial differentiation appeared. Relatively higher intensities (over 45 heads of cattle per 100 hectares of agricultural land) were preserved in the Southern and Eastern Bohemia and in the Českomoravská vrchovina highland (absolute maximum in the Ústí nad Orlicí district with 68 heads of cattle per 100 ha of agricultural land). Lower intensities appear on fertile areas, where the numbers of cattle decrease more sharply. Very low intensities are registered in the whole north-western Bohemia.

When assessing the changes in spatial distribution of cattle according to the shares of districts in the total numbers we find out that in 1990 ten districts with the highest numbers of cattle represented 22.4% of the total number, while eleven years later this figure increased to 29.8%. Thus, we see a concentration of cattle breeding with the stable basis for cattle breeding being mainly the districts of the Českomoravská vrchovina highland (Třebíč, ěďár nad Sázavou, Havlíčkův Brod, Pelhřimov), Eastern Bohemia (Ústí nad Orlicí, Svitavy), Southern Bohemia (České Budějovice, Jindřichův Hradec) and the Klatovy district in Western Bohemia. The Znojmo district registered probably the most important change with this respect. While in 1990 Znojmo, together with Třebíč, were the districts with the highest proportion in the numbers of cattle (2.6%) by 2001 this proportion dropped to only 1.3%. A reverse process is observed in the Domařlice district (2.5% in 2001). The maximum share in this year was registered in the district of ěďár nad Sázavou (3.8%).

There were 1.24 million cows in 1990. Until 2001 this number dropped by 50%. The whole decade of the 1990s was marked by the search for competitiveness in cattle breeding. Given the drop in beef consumption by more than two thirds, the possible way is breeding of milk cows. In the period considered the proportion of cows in the cattle increased from 35% (1990) to almost 39%. From the spatial point of view we can say that while in 1990 only in the Jablonec nad Nisou districts we registered an increased proportion of cows (over 40%), in 2001 there were 25 such districts (with maximums over 45% in the Jablonec nad Nisou, Děčín, Sokolov, Ústí nad Orlicí, Praha-západ and Chomutov districts). On the contrary, the lowest numbers of cows are registered in areas oriented at beef production (the Most, Mělník, Teplice, Vyškov, Beroun or Praha-východ districts).

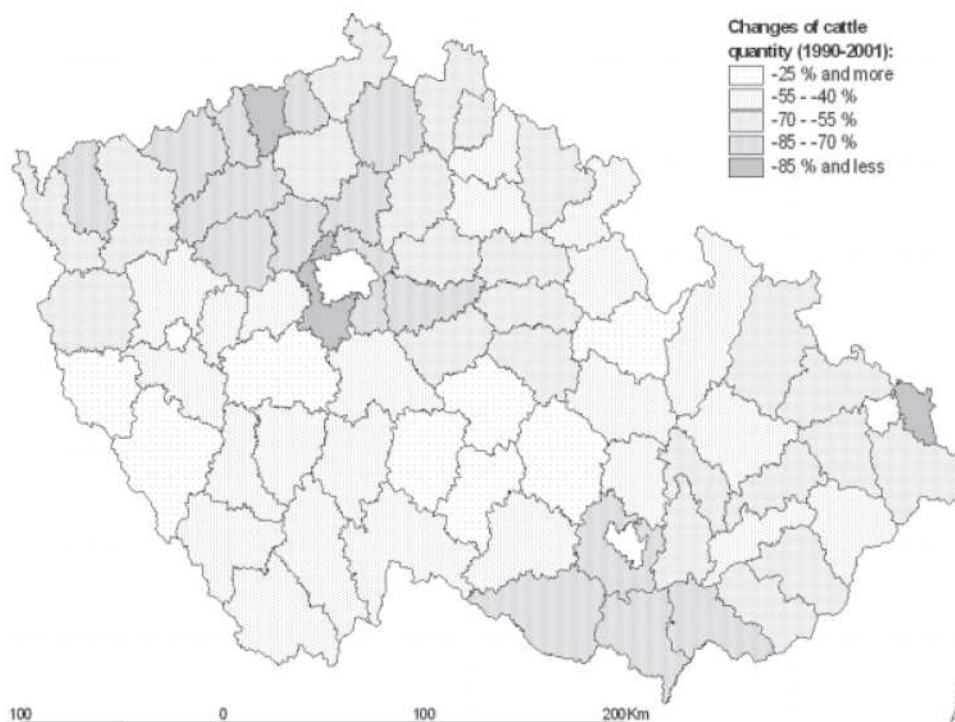


Figure 1. Changes of cattle breeding in the districts of the Czech Republic in 1990, 2001
 Source: *Soupis hospodářských zvířat k 1.3. 1990*; *Soupis hospodářských zvířat k 1.4. 2001*.

Figure 2 documents spatial distribution of changes in numbers of cows in the period studied. The trends are, like for intensity indices, in coincidence with changing numbers and intensity of the totals for cattle.

The analysis of spatial concentration of cows (proportion of cows in the total numbers for individual districts) showed that 10 districts with the highest numbers of cows accounted in 1990 for 22.1% of the total. This proportion increased in following 11 years to 29.8%, with similar spatial consequences as for cattle.

In the period studied there was a decrease in the number of pigs by one fourth, from 4.8 million in 1990 to 3.6 million in 2001. The spatial image (Figure 3) shows, apart from the prevailing decrease, which is much more markedly differentiated than in the case of cattle and cows, three districts having experienced an increase (the districts of Znojmo – by 11.6%, Rychnov nad Kněžkou – by 1.1%, and Ústí nad Orlicí – by 0.3%). The absolute figures confirm the importance of the increase only in the Znojmo district (by more than 23,000 pigs). The districts of Prachatice, Berou, Benešov, Náchod and Strakonice experienced only marginal decreases. On the contrary, the maximum decreases were registered in the districts of Most (93%), Praha-západ, Ústí nad Labem, Karviná and Praha-východ (54–69%). Yet, the decreases in the numbers of pigs are not as distinct as with cattle and cows. The highest absolute decreases were recorded in the Hradec Králové, Kolín, Brno-venkov districts (by more than 50,000 pigs), Hodonín, Praha-východ, Mladá Boleslav, Přerov, Plzeň-sever and Nový Jičín (by 30–50,000 pigs). A distinct area of decrease is

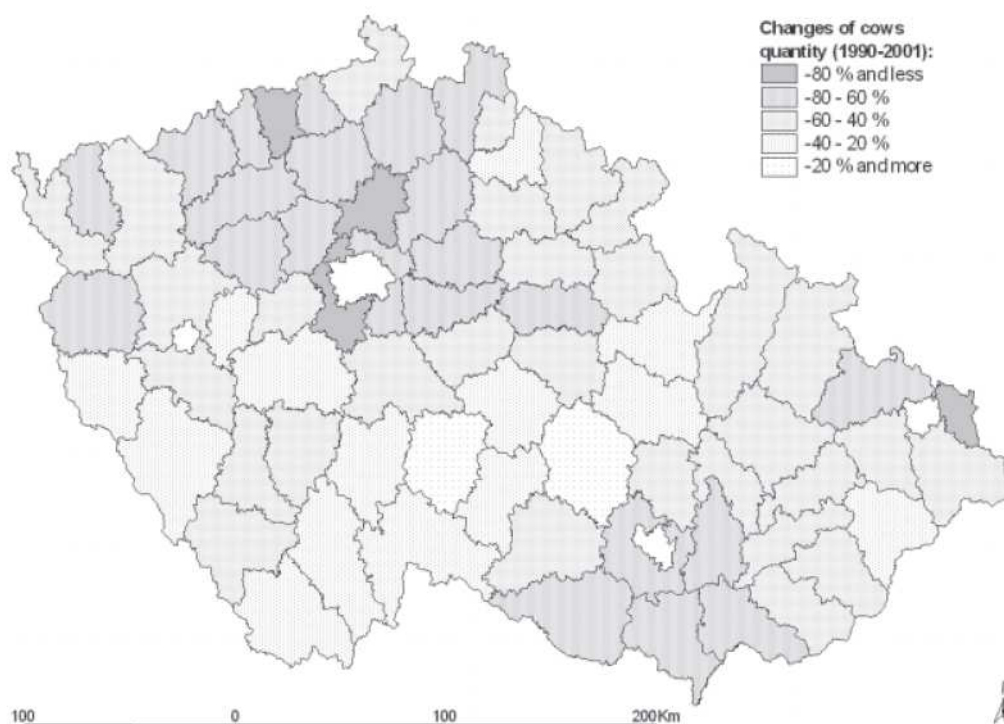


Figure 2. Changes of cow breeding in the districts of the Czech Republic in 1990, 2001
 Source: *Soupis hospodářských zvířat k 1.3. 1990*; *Soupis hospodářských zvířat k 1.4. 2001*.

formed by the hinterland of Prague, extending northwards, the Plzeň region, and the strip of districts along the Slovak border.

The proportion of districts with the highest numbers of pigs in the total numbers and their spatial distribution did not considerably change between 1990 and 2001, compared to other livestock animals (it is at 31.7%).

Breeding of pigs was in the 1990 most intensive in the Olomouc, Hodonín and Hradec Králové districts (more than 260 pigs per 100 hectares of arable land), Nový Jičín, Teplice, Brno-venkov, Pardubice and Jindřichův Hradec districts (more than 200 per 100 hectares of arable land). By 2001 an area of increased intensity of pig breeding (more than 150 pigs per 100 hectares of arable land) developed in Eastern Bohemia (districts of Hradec Králové, Pardubice and Rychnov nad Kněžnou), along with districts in the southern part of the country (districts of Znojmo with 213 and Jindřichův Hradec with 160 pigs per 100 hectares of arable land). On the contrary, very low intensity of pig breeding is registered in lowland areas of the north-western Bohemia.

Sheep breeding experienced in the period analysed the most important drop. As early as in 1990 there were almost 430,000 sheep. By 2001 we would be able to find in the Czech Republic only little more than 80,000 of them (drop by 79%). As it is suggested in Figure 4, the decreases are spatially distinctly differentiated. In 22 districts decreases exceeded 90%, then in 19 districts this number was higher than 80%. In absolute figures the area of Beskydy Mts. features the highest losses, of more than 46,000 sheep (districts of Frýdek-Místek, Nový

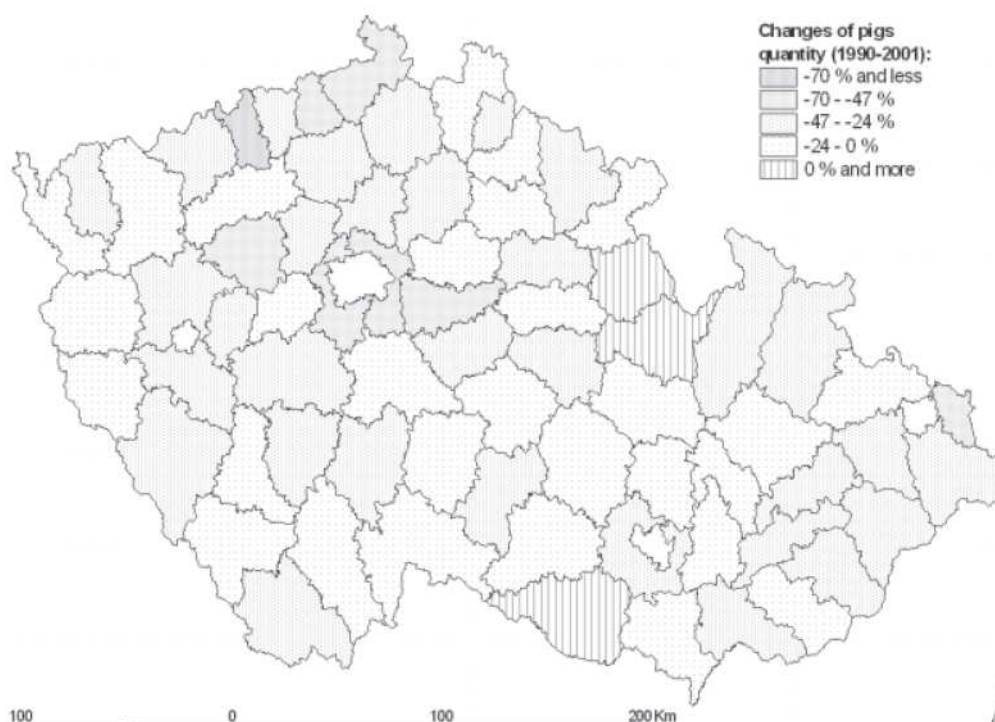


Figure 3. Change of pig breeding in the districts of the Czech Republic in 1990, 2001
 Source: *Soupis hospodářských zvířat k 1.3. 1990*; *Soupis hospodářských zvířat k 1.4. 2001*.

Jičín and Vsetín), where at the beginning of the 1990s more than 13% of sheep in the Czech Republic were bred. Relatively high decreases are, however, recorded in the strip of districts from Frýdek-Místek south-westwards towards Třebíč. In Bohemia, the most important decreases centred at the Krušné hory Mts., Plzeň region and Českomoravská vrchovina highland. On the contrary, the lowest decreases of the sheep numbers were recorded in the Sokolov, Příbram and Strakonice districts. The intensity of sheep breeding per 100 hectares of agricultural land was in 1990 the highest in the Beskydy Mts. region in the east of the country (maximum of 54 sheep per 100 hectares of agricultural land in the Frýdek-Místek district) and in north western Bohemia (districts of Teplice, Most, Ústí nad Labem). Locally, higher intensity of sheep breeding was registered in 1990 in the Blansko district in South Moravia. In 2001 the highest sheep breeding intensities were registered in the mountainous and sub-mountainous areas (the Vsetín district – 14 sheep per 100 hectares of arable land). Sheep breeding intensity dropped 10 times in the neighbouring Frýdek-Místek district, yet it ranked fourth in the sheep breeding intensity in 2001. The second concentration of higher sheep breeding intensity is in Western Bohemia (districts of Sokolov and Karlovy Vary). Sheep have almost completely vanished from districts of Nový Jičín and Teplice.

The share of 10 districts with the highest numbers of sheep in the total was 32% in 1990, while eleven years later it was already at 41.7% (however, the maximum was reached in 1997 – 47%).

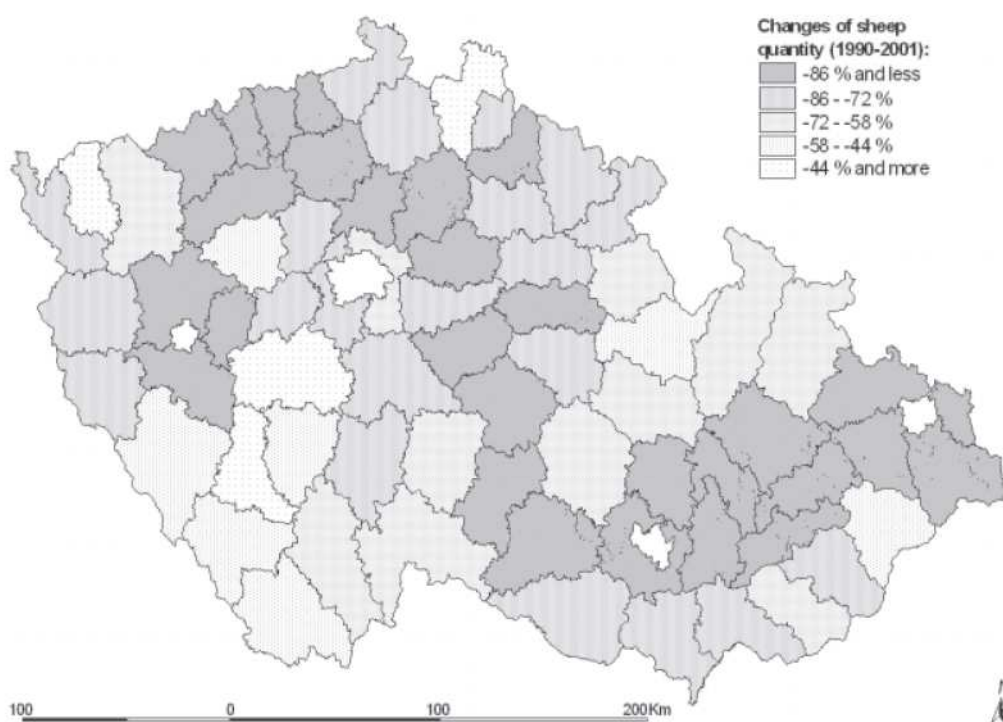


Figure 4. Changes of sheep breeding in the districts of the Czech Republic in 1990, 2001
 Source: *Soupis hospodářských zvířat k 1.3. 1990; Soupis hospodářských zvířat k 1.4. 2001*

Poultry breeding underwent a completely different development. The numbers slightly increased as compared to 1990, by 2%, to 32 million birds in 2001. Nevertheless, in some parts of the country dramatic drops in numbers took place. As examples we can mention the districts of Děčín, Brno-venkov and Prague with drops of more than half a million. In the Kutná Hora and Šumperk districts the decreases amounted to more than 300 thousand. The relative decreases were, however, the highest in the Ústí nad Labem district (by 93%), important limitations of poultry breeding are also observed in the Mladá Boleslav, Česká Lípa, Liberec and Karviná districts (decrease by more than 50%). On the contrary, close to half of districts experienced increases in the numbers of poultry, by more than 100% in the districts of Mělník, Prachatice, Znojmo, Trutnov, České Budějovice and Tábor (Figure 5).

The highest intensities (per 100 hectares of arable land) were in 1990 registered in north-western Bohemia – districts of Teplice and Ústí nad Labem (more than 4000 birds per 100 hectares of arable land). They were followed by Prague. Zones of higher intensities were located in 1990 also in Eastern Bohemia (maximums in the district of Pardubice), in surroundings of Brno (districts of Brno-venkov, Znojmo) and in Eastern Moravia (districts of Zlín and Uherské Hradiště). Eleven years later intensity of poultry breeding was spatially more differentiated. A new centre of poultry breeding developed in the Klatovy and Strakonice districts (around 2500 birds per 100 hectares of arable land – high poultry concentration noted in the whole of Southern Bohemia), high intensities

were registered also in the districts of Sokolov, Mělník (in the hinterland of Prague) or Nový Jičín (the region of Ostrava). Intensities remained high in Eastern Moravia and in almost entire Eastern Bohemia.

Index of spatial concentration (the share of 10 districts with the highest numbers) was in 1990 at around 25% of the total, while in 2001 it was at almost one third. The highest increase was registered in the district of Znojmo (5.8% of the total). At the beginning of the 1990s this district ranked in the teens with the share of 2.2%. On the contrary the district of Brno-venkov dropped in 2001 below the twentieth rank.

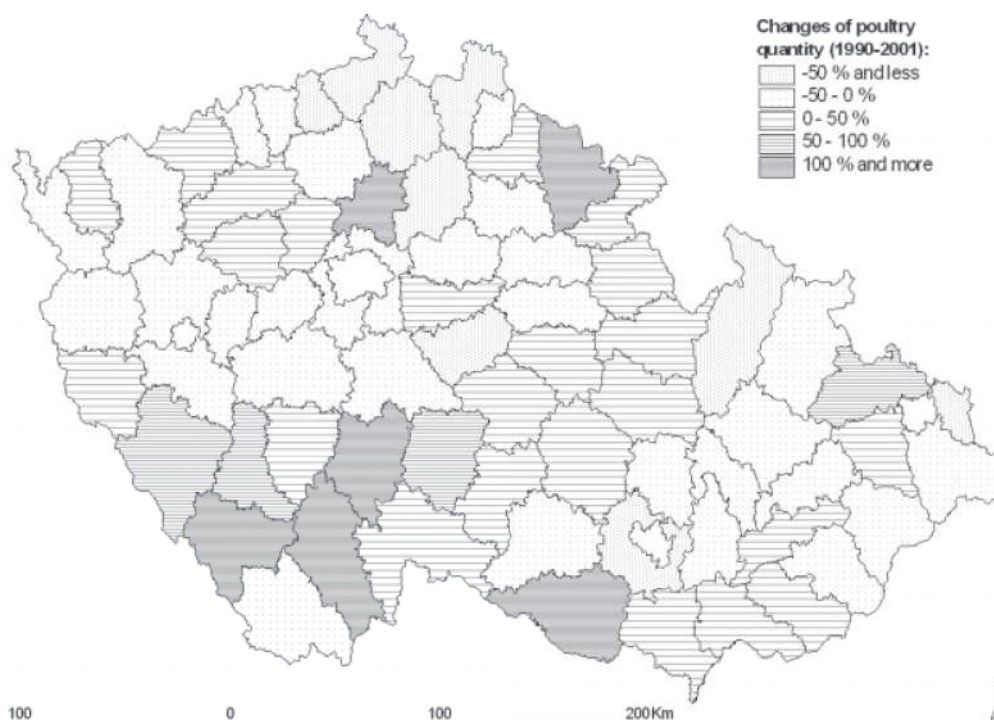


Figure 5. Changes of poultry breeding in the districts of the Czech Republic in 1990, 2001
 Source: *Soupis hospodářských zvířat k 1.3. 1990*; *Soupis hospodářských zvířat k 1.4. 2001*.

Conclusions concerning spatial distribution of fowl breeding are similar to those regarding poultry (Figure 6). There is a difference in the decrease of their numbers in the period studied (almost by one fourth, down to 11.7 millions birds). The shares in the total numbers of poultry and their change are more interesting. More than 80% of fowl were recorded in 1990 in the districts of Kladon, Mělník, Cheb, Pelhřimov and Jablonec nad Nisou, while other kinds of poultry dominated in the Teplice, Český Krumlov, Zlín, Ústí nad Labem and Most districts (less than 20% of fowl). Eleven years later the percentage of fowl in the poultry considerably decreased (by 12%, to approximately one third) and the districts of Třebíč, Mladá Boleslav, Klatovy, Jihlava and Znojmo joined the latter ones, mentioned above.

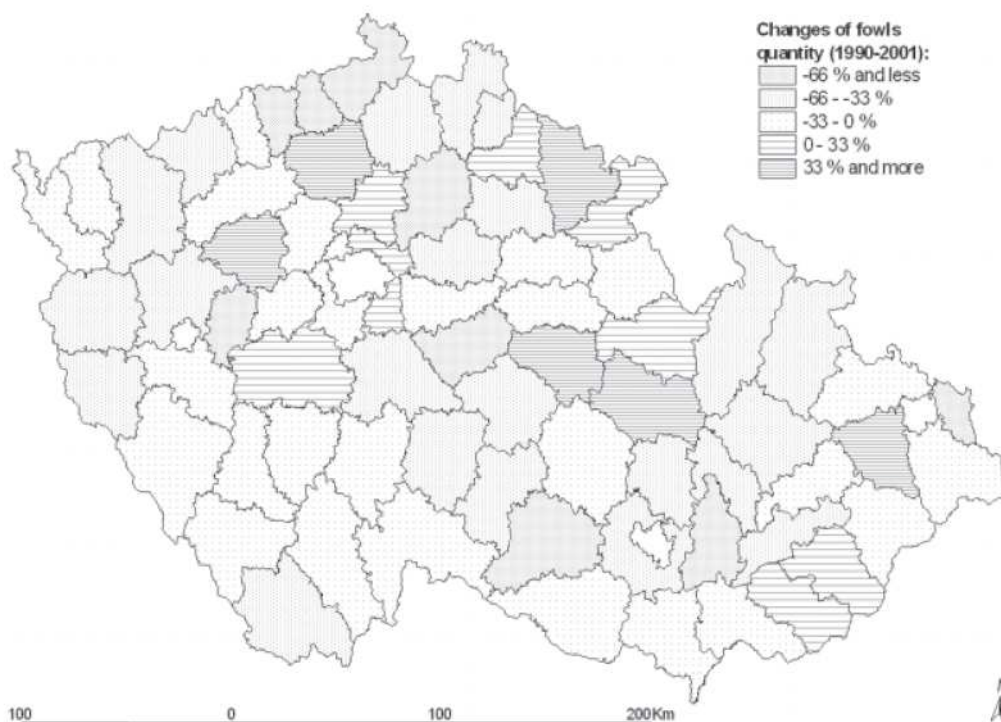


Figure 6. Changes of fowl breeding in the districts of the Czech Republic in 1990, 2001
 Source: *Soupis hospodářských zvířat k 1.3. 1990*; *Soupis hospodářských zvířat k 1.4. 2001*.

CHANGES IN SPATIAL DISTRIBUTION OF LIVESTOCK BREEDING IN 2001–2005

In this section we shall deal with spatial changes of livestock breeding in 2001–2005. As indicated before, in this time interval we analysed individual regions of the Czech Republic. These 13 spatial units (Prague being treated together with Central Bohemia) are too large for a more detailed analysis and their sizes differ considerably. Interregional differences and comparisons are thus reduced; we will pay only limited attention to them. These data do not contain the so called hobby activities of the population.

In 2001–2005 the decrease in the numbers of cattle in the Czech Republic continued (Figure 7). Compared to the preceding period the decrease was relatively very low (11.7%). The most important decrease was registered in regions of South Moravia, Ústí and Central Bohemia, where the numbers of cattle dropped by one fifth, an important decrease was registered in the region of Zlín, as well. On the contrary, the region of Karlovy Vary experienced as the only one an increase of 8.4%, but the intensity of cattle breeding remains relatively low. The highest intensity is observed traditionally in the Vysočina region (53 heads per 100 hectares of agricultural land) and in the regions forming the southern, eastern and western rim around Central Bohemia (more than 40 heads per 100 hectares of agricultural land). Central Bohemia, being the agricultural hinterland

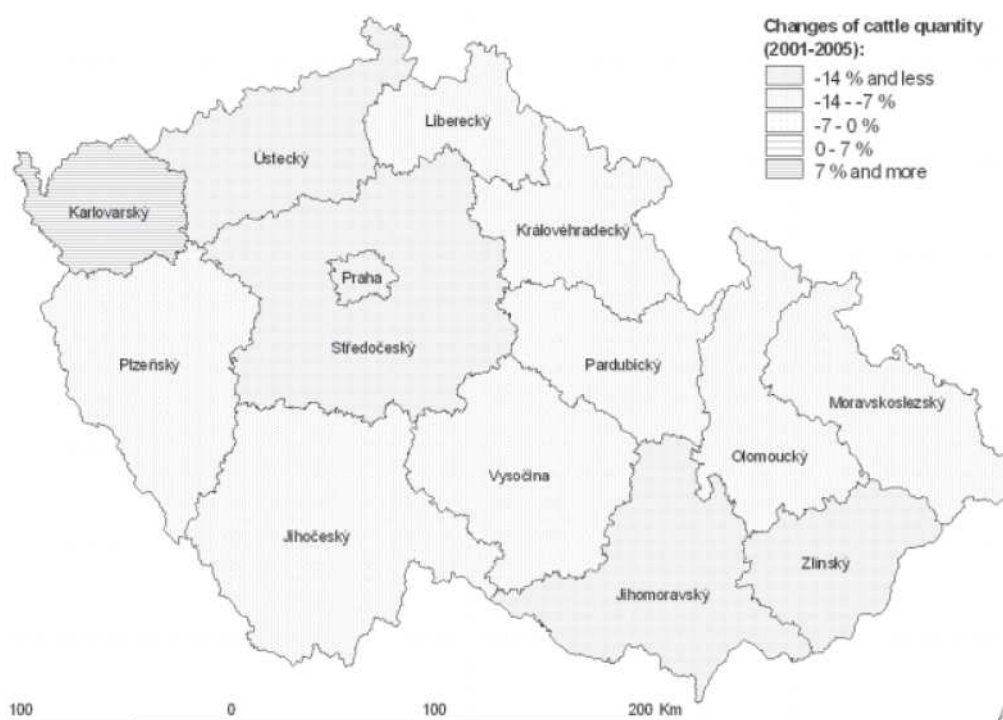


Figure 7. Changes of cattle breeding in the regions of the Czech Republic in 2001, 2005
 Source: *Soupis hospodářských zvířat k 1.4. 2001*; *Soupis hospodářských zvířat k 1.4. 2005*.

of Prague, has lower intensity of cattle breeding. The lowest intensity is registered in regions of South Moravia and Ústí (less than 20 heads per 100 hectares of agricultural land).

In 2001 30% of cattle were bred in two regions (Vysočina and South Bohemia). This share increased by 1% until 2005. A high share of the cattle number is observed also in Central Bohemia (11% in 2005), due, apparently, to the large area of the region.

The situation with cow breeding is similar (Figure 8). The share of cows in cattle in the period here considered increased (to 41% in 2005). The decrease of the number of cows in 2001–2005 is lower than of cattle, only by 6.2%. The highest decrease of the number of cows is registered in regions of Central Bohemia and Ústí (around 14%), while a serious increase was recorded only in the region of Karlovy Vary (like in the case of cattle) – 10%, a slight increase having been observed yet in the Liberec region. The absolutely highest decrease in the numbers of cows was registered, apart from the case of Central Bohemia (9445 cows), also in the Vysočina region. The increase in the numbers of cattle (and of cows in particular) in the region of Karlovy Vary can be probably linked to the vicinity of dairy processing facilities in Germany, where western Bohemian farmers export their products after the EU accession.

The regions of Vysočina, South Bohemia, and, somewhat less, Central Bohemia and Plzeň, can be considered to be the centres of cow breeding. In these four regions a majority of cows is bred.

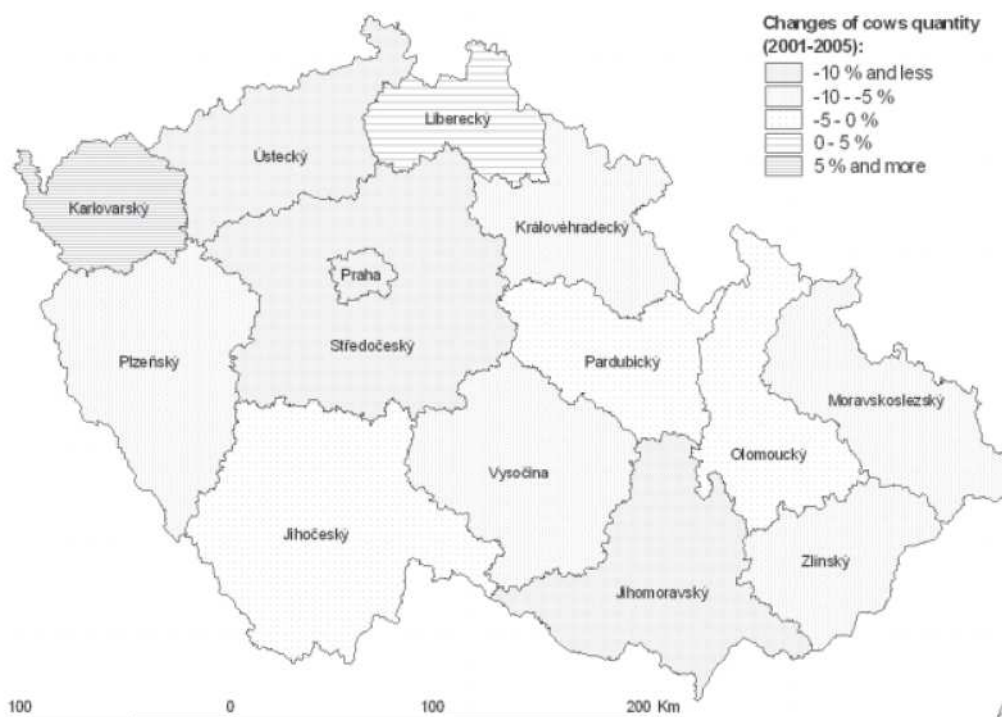


Figure 8. Changes of cow breeding in the regions of the Czech Republic in 2001, 2005

Source: *Soupis hospodářských zvířat k 1.4. 2001*; *Soupis hospodářských zvířat k 1.4. 2005*.

The number of pigs in the period here considered in the Czech Republic decreased approximately by 17%, the decrease being not as important as in the preceding period. In this period the decrease has a general character, the decline by more than one fifth recorded in 7 regions (with maximums in the Liberec and Ústí regions – the declines by 26% and 23%, respectively). A slight increase is recorded only in the Vysočina region (0.8%) – see Figure 9. As for the intensity of pig breeding, it was the highest in South Moravia, with 156 pigs per 100 hectares of arable land (the highest intensity being observed in the Znojmo district). More recently, this region was, after a decrease, overtaken by the Vysočina region (123 pigs per 100 hectares of arable land). High pig raising intensity is observed also in regions of Hradec Králové, South Bohemia and Olomouc (Figure 9). Low intensity is recorded in regions of Ústí and Liberec (less than 65 pigs per 100 hectares of arable land).

When analysing the shares of regions in the total numbers of pigs we find out that more than 55% of pigs are bred in only four regions (South Moravia, Central Bohemia, Vysočina and South Bohemia).

The development of the numbers of sheep after 2001 is very interesting (Figure 10). While in 1990–2001 there was a huge drop, after 2001 we register 60% increase. It is the highest in the region of Pardubice (by 112%), followed by Zlín and Central Bohemia (by more than 80%). The highest intensity of sheep breeding is recorded in the Karlovy Vary region, with almost 11 sheep per 100 hectares of agriculture land, followed by Zlín, Moravia-Silesia and Liberec.

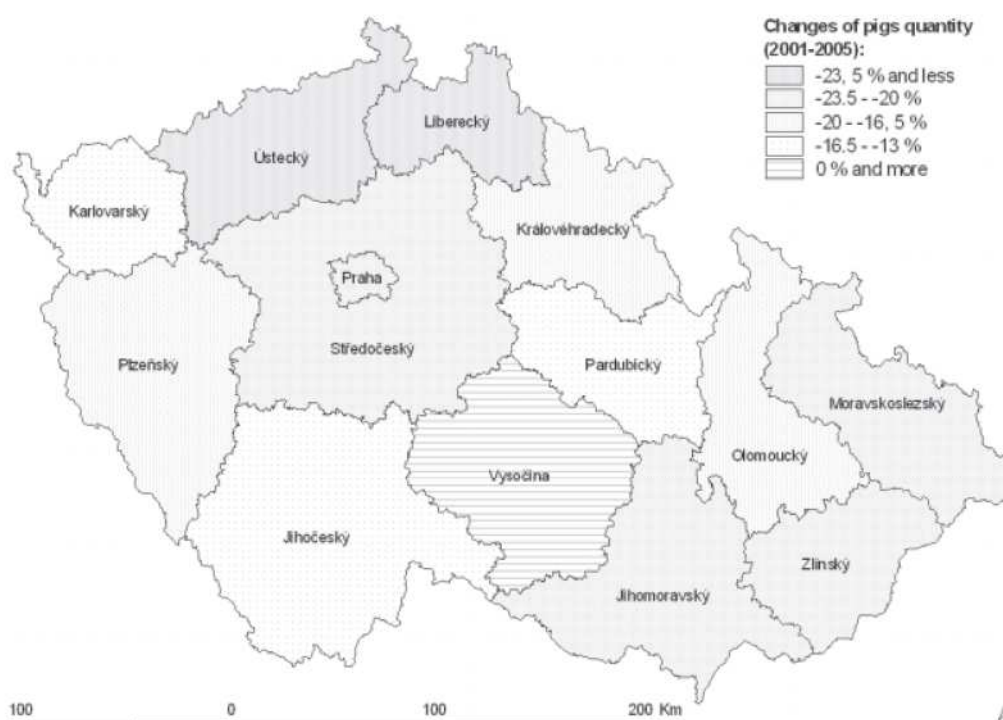


Figure 9. Changes of pig breeding in the regions of the Czech Republic in 2001, 2005
 Source: *Soupis hospodářských zvířat k 1.4. 2001*; *Soupis hospodářských zvířat k 1.4. 2005*.

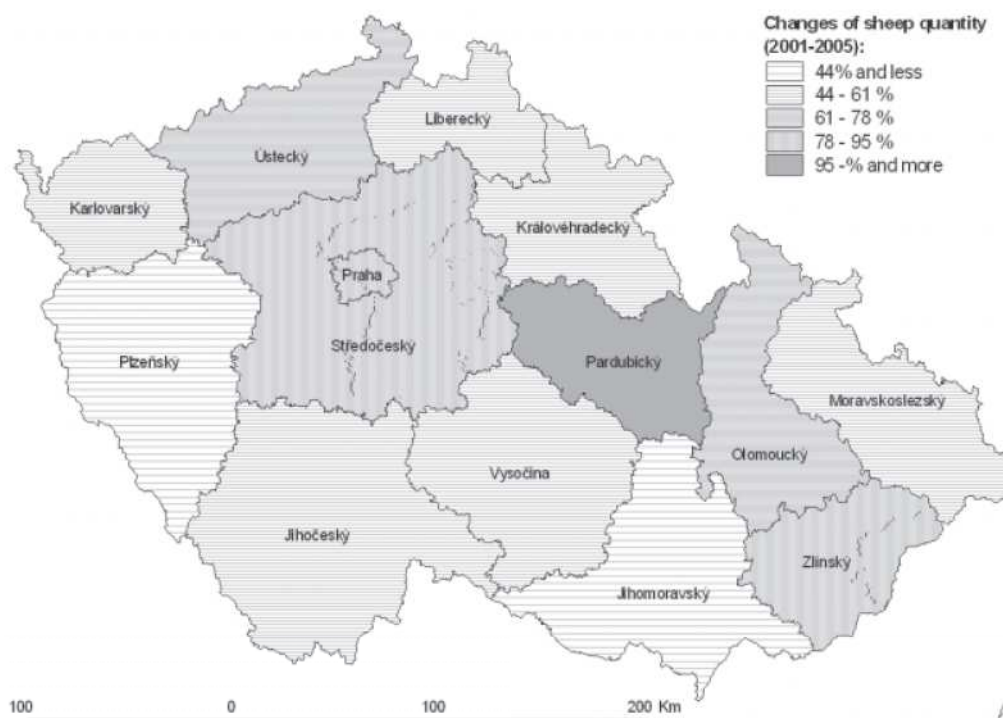


Figure 10. Changes of sheep breeding in the regions of the Czech Republic in 2001, 2005
 Source: *Soupis hospodářských zvířat k 1.4. 2001*; *Soupis hospodářských zvířat k 1.4. 2005*.

In terms of regional shares one third of sheep is bred in regions of South Bohemia, Plzeň and Karlovy Vary, then – almost one fifth in the eastern parts of the republic – the Zlín and Moravia-Silesia regions.

In the case of poultry breeding (without the so called hobby activities, which considerably influence the numbers, as shown before) the numbers decreased by 12% in 2001–2005. Spatial distribution of increases and decreases is highly differentiated. In three regions there was an increase (Central Bohemia, South Bohemia and South Moravia), in the first two cases by more than 7%. On the other hand, the highest decrease took place in regions of Karlovy Vary, Olomouc and Pardubice (by more than 40%, see Figure 11). In the case of the Pardubice region it was by far the highest absolute decrease of approximately 1.25 million of birds, while the increases in the hinterlands of Brno and Prague reached 300,000 birds.

The highest intensity of poultry breeding is observed in South Bohemia (1450 birds per 100 hectares of arable land), high numbers were also recorded in the densely populated Moravia-Silesia and South Moravia. Low intensity of poultry breeding is observed in regions of Vysočina, Liberec and Olomouc. As for the shares of regions in the total numbers, 55% of poultry is bred in Central Bohemia, South Bohemia and South Moravia, that is – by 10% more than in 2001.

Fowl breeding displays similar trends as poultry breeding. The overall decrease was, however, somewhat more distinct (15%). The highest numbers of

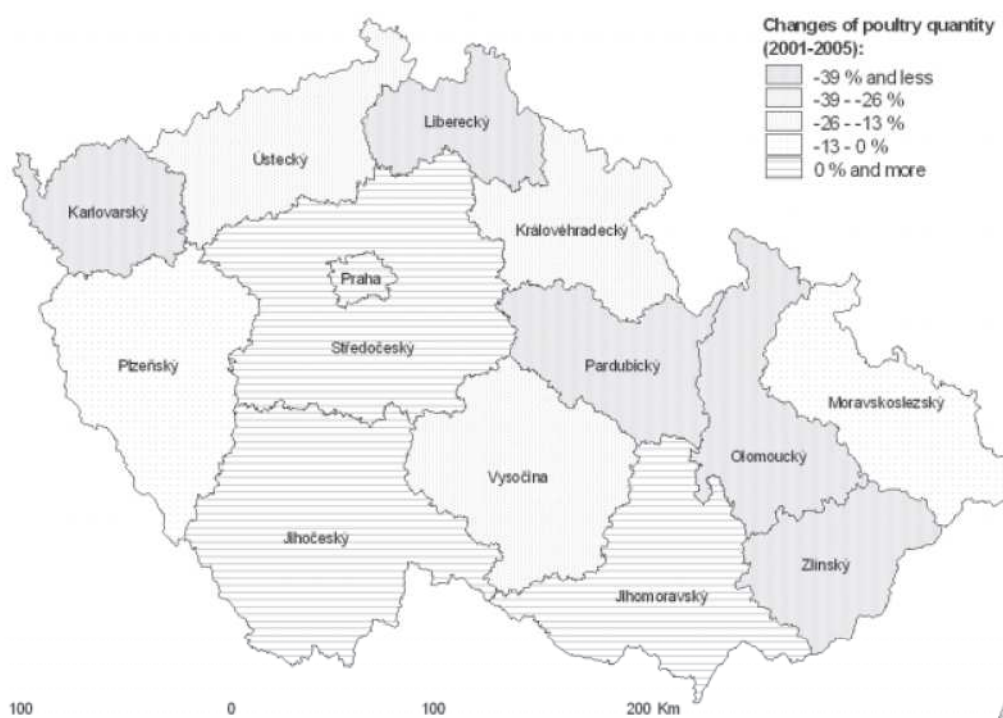


Figure 11. Changes of poultry breeding in the regions of the Czech Republic in 2001, 2005

Source: *Soupis hospodářských zvířat k 1.4. 2001*; *Soupis hospodářských zvířat k 1.4. 2005*.

fowl are bred in Central Bohemia (1.1 million), followed by South Bohemia, Hradec Králové, Pardubice and Ústí regions (600–800,000 birds). The highest relative numbers of fowl in poultry totals are registered in regions of Karlovy Vary, Hradec Králové, Pardubice and Olomouc (more than 35%). An important decrease of fowl numbers (Figure 12) was registered in the period studied in the regions of Liberec and Olomouc (more than 50%), on the contrary, an increase was registered in regions of Hradec Králové and Ústí (20% and 4% respectively).

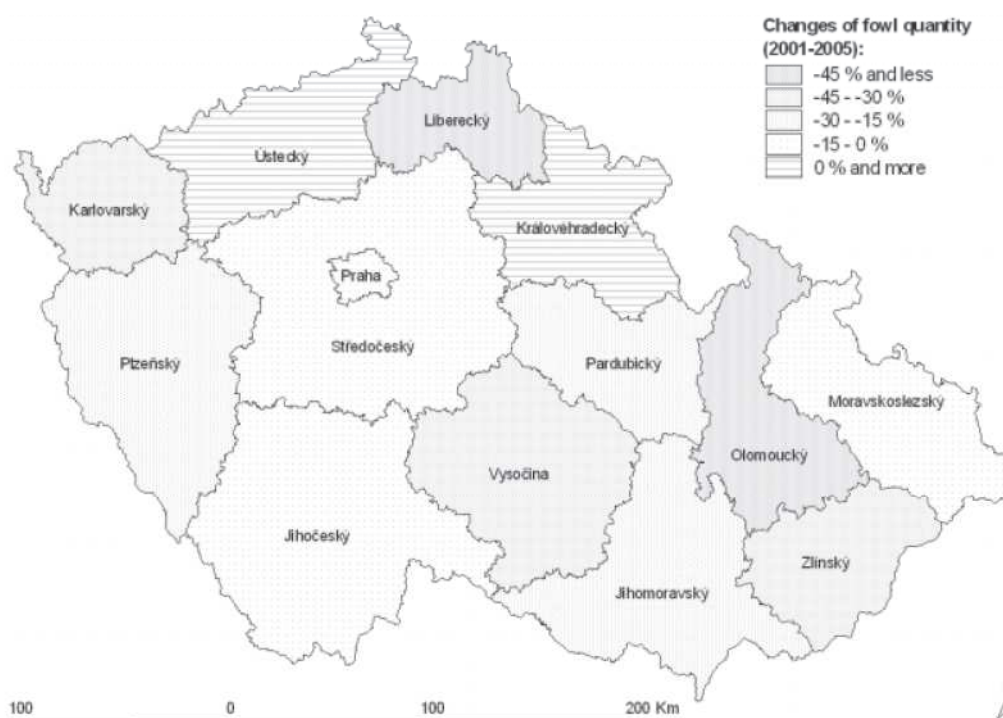


Figure 12. Changes of fowl breeding in the regions of the Czech Republic in 2001, 2005
 Source: *Soupis hospodářských zvířat k 1.4. 2001*; *Soupis hospodářských zvířat k 1.4. 2005*.

Fowl breeding is most intensive in eastern Bohemia (regions of Pardubice and Hradec Králové), in regions of Moravia-Silesia and Ústí, with more than 300 birds per 100 hectares of arable land. Higher intensity is recorded also in South Bohemia (250 birds per 100 hectares of arable land).

CONCLUSION

The numbers and the breeding intensity of all types of livestock decreased considerably in the period analysed. The number of cattle decreased since 1990 by 60%, of cows by 54%. As it is suggested in figure 13, the highest decrease in the number of cattle (by more than 80%) was registered in the fertile regions of

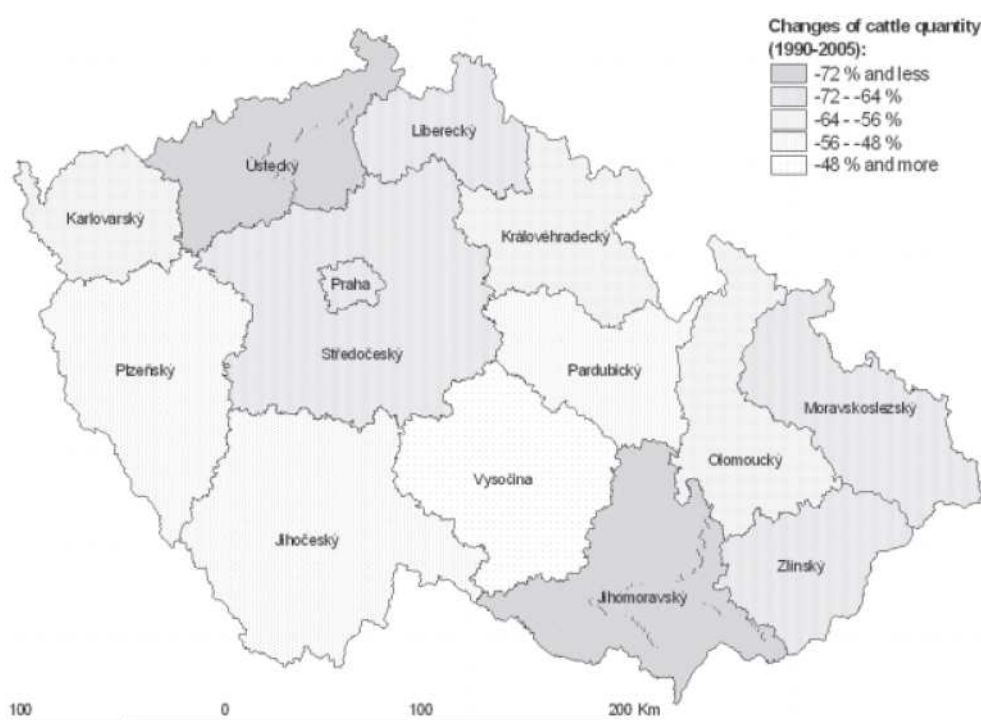


Figure 13. Changes of cattle quantities in the regions of the Czech Republic in 1990–2005
 Source: *Soupis hospodářských zvířat k 1.3. 1990*; *Soupis hospodářských zvířat k 1.4. 2005*.

South Bohemia and in region of Ústí. In the case of cow breeding we must also mention Central Bohemia, with decrease by more than 65% (Figure 14). The region of Vysočina was influenced relatively little, but even there the decrease by 40% in the numbers of cattle and cows took place. We can conclude that after 1990 the importance of milk cows increases at the expense of meat cattle. The primary trend is significant reduction of cattle breeding in fertile areas (South Moravia, Central Bohemia), while the mountainous areas experienced only relatively low decreases. As a future problem we can see reduction in cattle and mainly cow breeding in hinterland of large cities (Prague, Brno, Plzeň, Ostrava), where former facilities are still in use. In the peripheral areas these facilities have often fallen into disuse.

Assessing the changes in the numbers of pigs, sheep, poultry and fowl in 1990–2005 is methodologically very complicated (mainly for poultry and fowl, as explained before). Yet, we can attempt at least marking the main tendencies. There was 40% reduction in pig number after 1990. The decrease is general at the regional level (the biggest in Central Bohemia and Liberec). The reduction is again evident in the hinterland of large cities (Prague, Plzeň, Ostrava, Brno), increase is registered particularly in the Znojmo district and eastern Bohemia or the Hodonín district (Figure 15). However, high consumption of pork seems to secure the future of pig breeding in the Czech Republic.

Radical decrease in the numbers of sheep in the 1990s was partly compensated by an increase in the first years of the 21st century. Nowadays, the Czech

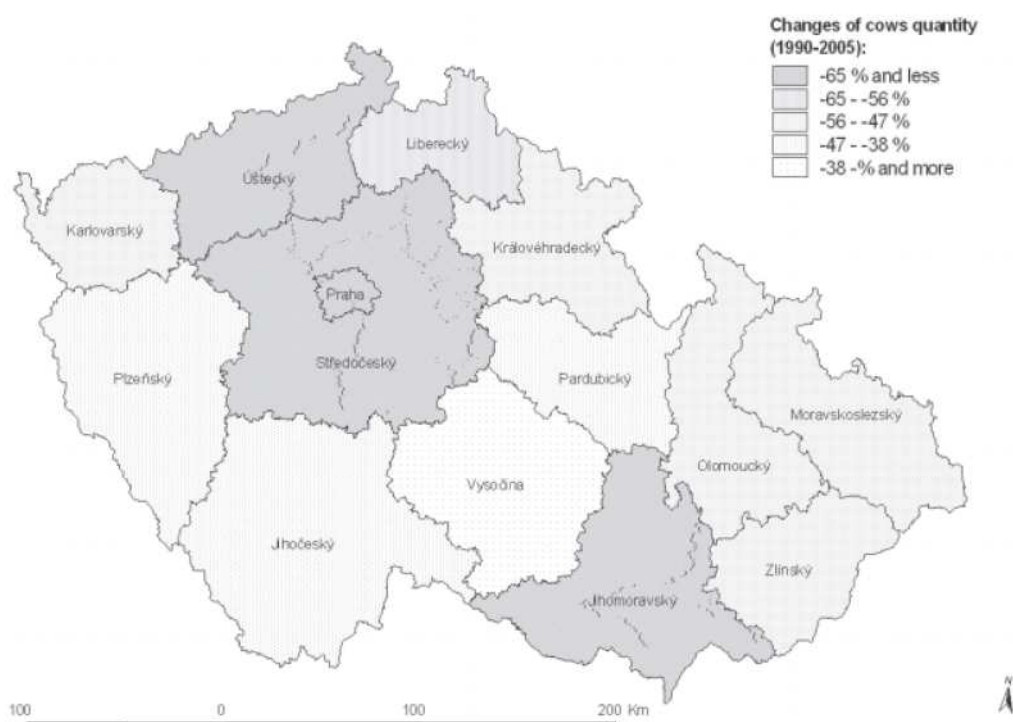


Figure 14. Changes of cow quantities in the regions of the Czech Republic in 1990–2005
 Source: *Soupis hospodářských zvířat k 1.3. 1990; Soupis hospodářských zvířat k 1.4. 2005.*

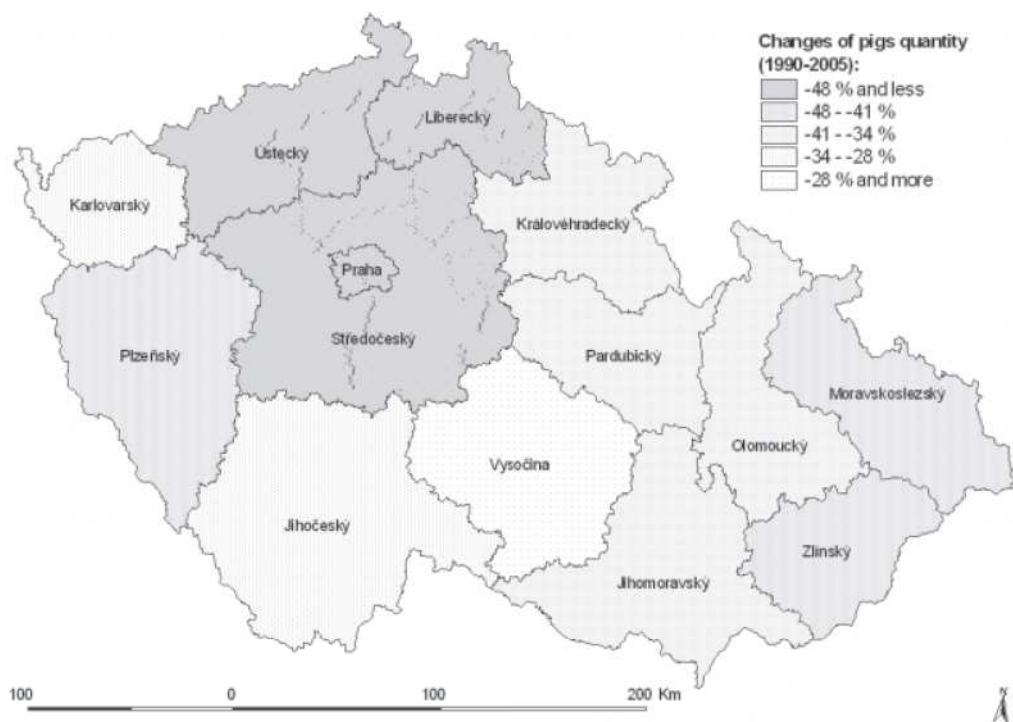


Figure 15. Changes of pig quantities in the regions of the Czech Republic in 1990–2005
 Source: *Soupis hospodářských zvířat k 1.3. 1990; Soupis hospodářských zvířat k 1.4. 2005.*

Republic has several centres of sheep breeding (Figure 16). Besides traditional Valašsko (districts of Vsetín and Frýdek-Místek), there are the region of Karlovy Vary (particularly the district of Sokolov) and the north western part of the Šumava Mts.

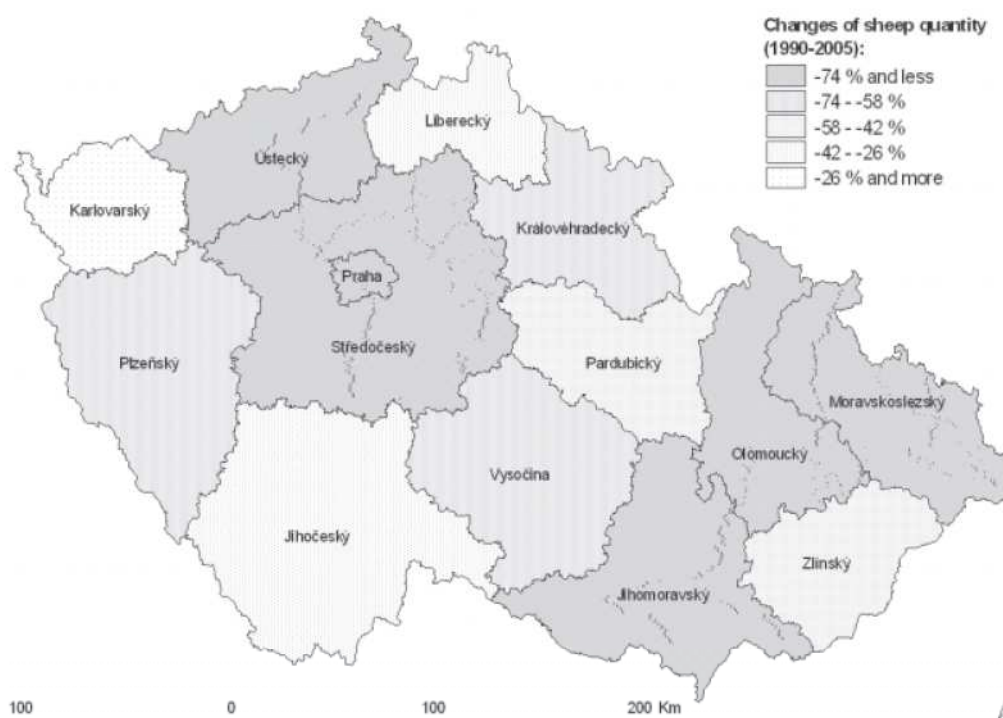


Figure 16. Changes of sheep quantities in the regions of the Czech Republic in 1990–2005
 Source: *Soupis hospodářských zvířat k 1.3. 1990*; *Soupis hospodářských zvířat k 1.4. 2005*.

Important decrease in the numbers of poultry took place after 1990 also in the hinterlands of large cities (Prague, Plzeň, Brno, and less significantly Ostrava). Around one tenth of the total numbers of poultry is bred by small farmers (up to 50 birds), this phenomenon being even more significant for the numbers of fowl (around one fifth). The highest numbers of poultry bred by small farmers are concentrated in Central Bohemia, South Bohemia, South Moravia and Moravia-Silesia, in regions of Liberec, Zlín and Vysočina, in terms of relative figures (more than 50%). The highest increases in the numbers of poultry are registered in South Bohemia and South Moravia, the highest decrease in regions of Karlovy Vary, Liberec and Olomouc (Figure 17). The same conclusions may be drawn for the changes in the numbers of fowl (Figure 18). As for the future of poultry breeding in the Czech Republic we can assume that thanks to the increasing popularity of poultry, Czech farmers will increase the numbers of poultry as well.

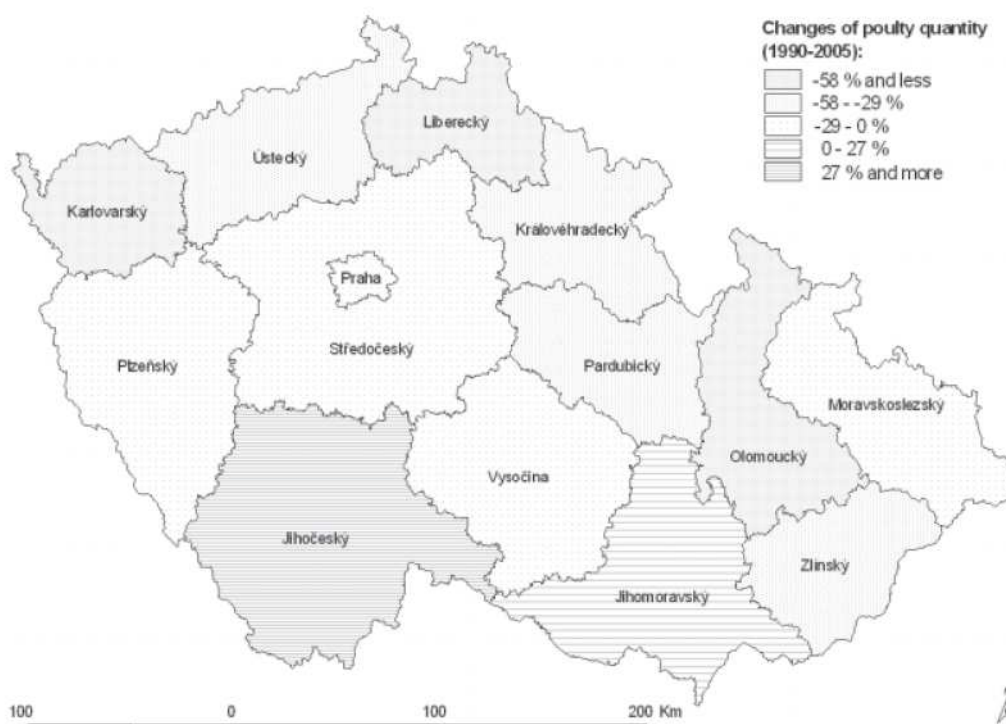


Figure 17. Changes of poultry quantities in the regions of the Czech Republic in 1990–2005
 Source: *Soupis hospodářských zvířat k 1.3. 1990; Soupis hospodářských zvířat k 1.4. 2005.*

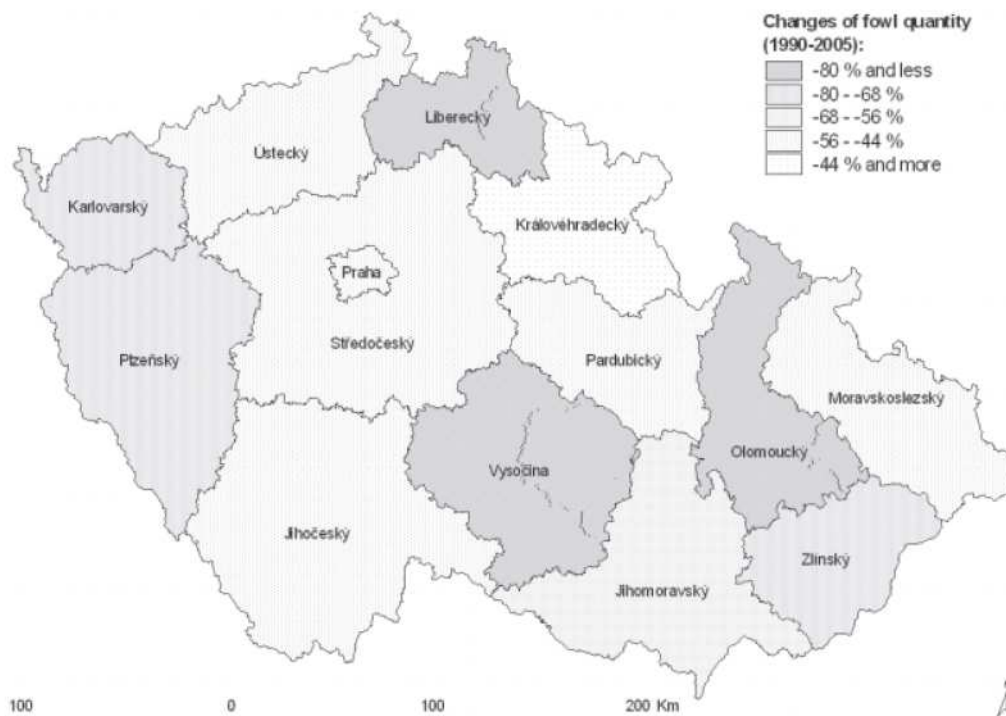


Figure 18. Changes of fowl quantities in the regions of the Czech Republic in 1990–2005
 Source: *Soupis hospodářských zvířat k 1.3. 1990; Soupis hospodářských zvířat k 1.4. 2005.*

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