Regional classification of the Czech Republic, based on the production orientation of agricultural enterprises

Regionální členění České republiky na základě výrobního zaměření zemědělských podniků

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Abstract: The article describes the layout of plant production and livestock density in the Czech Republic in 2003 according to a sample survey of the Czech Statistical Office. The production orientation of agricultural enterprises is defined as a small amount of market products that represent the predominant part of revenues. Grain crops, pork meat, milk and non-food crops represent the production orientation of Czech agriculture. These commodities represent more than 70% of total agricultural production in the Czech Republic. In this article, the authors have attempted to define a regional classification according to production orientation of agricultural enterprises and intensity of agricultural production.

Key words: land use, production orientation, regional classification, revenues of crop production, agricultural animal's density

Abstrakt: V příspěvku je popsáno rozmístění rostlinné výroby a hustota hospodářských zvířat v České republice v roce 2003 na základě výběrového šetření Českého statistického úřadu. Výrobní zaměření zemědělských podniků je definováno jako malý počet výrobků tržní produkce, které tvoří převážnou část výnosů. Výrobní zaměření českého zemědělství tvoří produkce obilovin, vepřového masa, mléka a technických plodin. Tyto komodity tvoří více než 70 % celkové produkce zemědělství v České republice. Autoři se v příspěvku pokusily o regionální rozdělení na základě výrobního zaměření zemědělských podniků intenzity zemědělské výroby.

Klíčová slova: využití půdního fondu, výrobní zaměření, regionální členění, výnosy rostlinné výroby, hustota zvířat

INTRODUCTION

In the world, the use of agricultural land is oriented towards grain crops and rice growing. These plants occupy 66% of world land. The highest amount of land is occupied by wheat 22%, rice 13%, maize 11% and feterite 10%. Other grain crops grown in the world are barley, millet, oats and rye. Another important group of plants are oil crops, especially soya beans and rape seed. They are grown on, in total, 7% of world agricultural land. Only approximately 5% of agricultural land is used for non-food crops, such as cotton, tobacco and caoutchouc. Pastures cover approximately 20% of world agricultural land (Jeníček, Krepl 2002).

In the Czech Republic, the agricultural land worked by active farmers covered the surface of 3 619 million hectares in 2003. The greatest part of the agricultural land, 2 687 thousand hectares (74.3% of agricultural land) has been used as arable land. 859 thousand of hectares are pastures (23.7%). Hop gardens cover the surface of 6 thousand hectares and vineyards 12.6 thousand hectares (Ministry of Agriculture 2004).

According to the Czech Statistical Office data, the significantly highest number of agricultural enterprises still runs a combination of plant production and animal husbandry which means they are oriented towards the classical agricultural production. The second most significant specialization is orientation towards plant production, third in the row is orientation on animal husbandry (ČSO 2004).

Production orientation in the Czech Republic is aimed at three basic commodities – grain crops, per-

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manent hayseed, and oil crops. Surfaces of these crops cover more than 75% of all agricultural land in the Czech Republic.

In 2009, the Czech Republic will transfer to the Simplified Farm System (SFS). One of the tendencies of farmers in the EU is the transfer from the simplified system of direct payment to regional differentiation of direct payments (Doucha, Divila 2005). These regional principles are usually derived from the current level of direct payments; therefore, one of the possibilities of regional classification of the Czech Republic for the purposes of direct payments may be the classification according to production orientation.

MATERIAL AND METHODS

Annual publications of the Department of Agriculture of the Czech Republic – Situational and Perspective Reports, Agricultural Situation Report and Agriculture, which are compiled on the basis of research of the Czech Statistical Office, Agricultural Chambers, Research Centers and other national and international institutions, all are concerned with changes in plant production structure and with land use (Ministry of Agriculture 2004).

In the article, the authors used calculations and evaluations made on the basis of the Czech Statistical Office data, they also used the Structural Agricultural Inquiry Report 2003. This report provides data concerning structure and activity of enterprise units in agriculture and fishery. These data are obtained in the regular structural research organized in all EU states and candidate states preparing for the accession to the EU. From this research, these data were used: numbers of observed subjects, division of agricultural land according to crops, proper and rented land area, worked and unused land area and ecological agriculture. The observed entities were farming units – corporate bodies and natural persons in agriculture and fishery. The data are processed by the method of selection research (ČSO 2005).

The indicators were observed according to territorial administration, i.e. they were classified according to regions and further, in greater detail according to the former districts of the Czech Republic (NUTS 4). From the data provided by the Czech Statistical Office, these items of information were calculated: main commodities of plant production revenues in separate districts as area product, average revenue product in the district and average prices of agricultural producers. In a similar way, commodity revenues from animal production have been calculated, i.e. the number of animals per district, average efficiency and average prices by agricultural producers. Districts have been classified to five principal groups according to main types of production orientation based on the ratio of average revenues per each commodity.

RESULTS AND DISCUSSION

Agricultural land represents 54% of the total land area of the Czech Republic; arable land represents 39% of the total area of agricultural land. The percentage of arable land has been only very slowly decreasing in

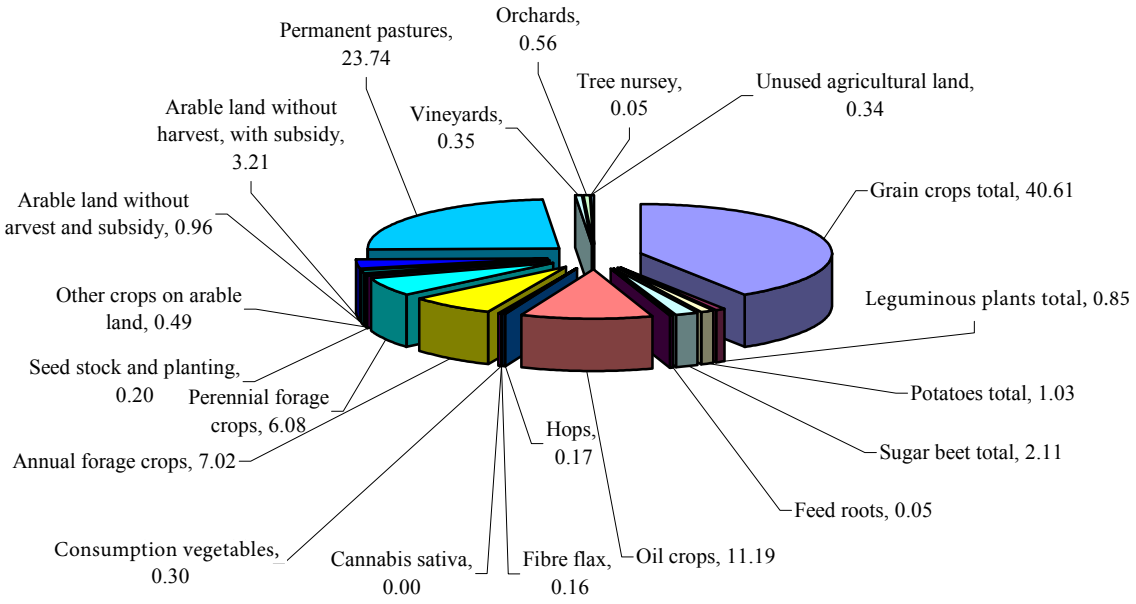

Figure 1. Structure of plant production in the Czech Republic (areas rate in %)

the last years, from 75% in 1991 to 72% in 2002 and in 2003 it has increased to 74%. According to the average calculated from the 15 EU states, the percentage of arable land is 52%. Comparable is Germany with 48% of total area of agricultural land, where the percentage of arable land is 69% and France with 54% of agricultural land and 62% of percentage of arable land.

The largest areas of agricultural land in the Czech Republic are used for grain crops production. In 2003 this area was 1 469 769.7 hectares, which is 40% of agricultural land. Second ranks the use of agricultural land as permanent pastures (TTP) 859 261.7 hectares (23.7%) and third is oil crops which covered in 2003 the area of 404 862.7 hectares, which is 11.2% (Figure 1).

Concerning other plants, from the point of view of surface rates of the agricultural land, the most important are annual forage crops on arable land (7.0%) and perennial forage crops on arable land (6.1%).

The rate of areas of the total area of agricultural land of the majority of regions of the Czech Republic is characteristic by the great number of grain crops. South Moravia (53.56%), Central Bohemia (49.64%) and Olomouc Region (42.23%) are regions with the highest rate of grain crops.

The highest rate of permanent pastures is in the regions of Karlovy Vary (55.7%), Liberec (53%), Zlín (33.9%), Moravia-Silesia (37.5%). The areas of grain crops rank second in these regions. In all regions except of Vysočina, the oil crops rank third in the land use. In Vysočina, the annual forage crops rank third.

From Table 1, it is evident that largest area of agricultural land is in Central Bohemia. In 2003, there was the highest production of grain crops, 1 142 198 tons, which is 20% of total production, of colza 91 539 tons (24%) and of sugar beet 876 443 ton (25%). South Moravia is the greatest producer of the legumines, 10 293 tons (16%), grape vine, 61 600 tons (91%). The greatest amount of potatoes was harvested in Vysočina in 2003 – 168 295 tons (38%). The region Ústecko is the greatest producer of hops, in 2003, there were harvested 2 795 tons which is 51% of the total production. In South Bohemia, there was harvested most of hay fodder from permanent pastures, 368 797 tons, which is 17.5%. The average revenues of principal crops according to regions are given in Table 2.

The territorial unit NUTS 4 (former districts) was used to a more detailed regional classification. The

Table 1. Areas of main crops harvest according to regions in 2003 (in hectares)

Region	Grain crops total	Legumines total	Potatoes total	Sugar beet total	Oil crops total	Annual forage crops	Perennial forage crops	Permanent pastures	Agricultural land total
Praha	11 937	424	87	684	4 698	682	883	8 332	29 902
Středočeský	282 983	3 737	7 557	18 944	88 650	36 205	36 038	52 627	570 087
Jihočeský	156 409	2 585	4 883	0	37 598	36 245	24 116	152 036	437 163
Plzeňský	115 729	3 037	1 646	0	31 868	27 894	18 249	101 139	318 131
Karlovarský	22 239	646	142	0	7 720	2 286	6 713	54 483	97 888
Ústecký	86 927	1 119	948	4 694	28 889	7 008	9 020	50 736	212 985
Liberecký	21 193	424	337	448	5 663	3 957	5 391	48 984	92 422
Královéhradecký	89 145	3 014	1 259	9 634	22 575	19 476	17 043	57 741	236 553
Pardubický	91 707	2 759	1 914	5 760	27 306	22 113	18 685	50 639	238 605
Vysočina	164 545	4 226	13 665	212	36 322	40 261	30 639	80 484	392 158
Jihomoravský	198 390	4 590	2 527	9 998	51 174	19 551	18 527	17 558	370 430
Olomoucký	102 232	2 202	800	16 183	26 013	16 900	14 283	47 597	242 090
Zlínský	52 197	1 139	478	3 022	14 110	10 866	10 124	53 443	157 865
Moravskoslezský	74 139	692	1 058	6 758	22 278	10 625	10 435	83 464	222 638
Czech Republic	**1 469 770**	**30 595**	**37 302**	**76 339**	**404 863**	**254 069**	**220 147**	**859 262**	**3 618 918**

Source: Czech Statistical Office

districts have been classified according to the type of production orientation. The first group – **1 Mixed Plant Production** includes the districts, where the rate of the general plant production revenues is larger than 1/3 but smaller than 2/3, or where the revenues from permanent crops are greater than 1/3 but smaller than 2/3 and in the same time the revenue rate of cattle breeding and breeding of other animals consuming fodder is smaller or equal to 1/3. Revenues of general field production are the revenues from production of grain crops, oil crops, the leguminous plants, root crops and non-food crops.

Table 2. Principal crops yields according to regions in 2003 (tons/hectares)

Region	Grain crops total	Legumines total	Late potatoes	Sugar beet	Rape	Forage crops on arable land total – hay	Permanent pastures – hay
Praha	4.46	2.42	18.53	46.79	1.94	5.45	2.53
Středočeský	4.11	2.08	19.17	45.42	1.66	5.17	2.42
Jihočeský	3.55	1.71	20.46	-	1.37	5.05	2.42
Plzeňský	3.51	1.70	20.06	-	1.42	4.85	2.42
Karlovarský	3.62	1.25	21.54	-	1.37	3.96	2.41
Ústecký	4.20	1.96	18.27	44.84	1.75	5.25	2.41
Liberecký	3.67	1.77	20.68	45.86	1.51	4.47	2.41
Královéhradecký	4.18	2.19	19.76	45.16	1.76	5.12	2.43
Pardubický	3.96	2.19	20.55	45.31	1.59	4.97	2.41
Vysočina	3.65	1.74	21.04	44.08	1.38	4.83	2.41
Jihomoravský	4.06	2.20	16.40	42.92	1.45	4.97	2.24
Olomoucký	4.41	2.24	19.20	46.35	1.75	5.21	2.44
Zlínský	4.33	2.18	19.83	45.34	1.70	5.42	2.43
Moravskoslezský	3.88	1.80	19.75	45.11	1.54	4.66	2.42
Czech Republic	**3.95**	**1.98**	**20.08**	**45.20**	**1.55**	**4.99**	**2.41**

Source : Czech Statistical Office

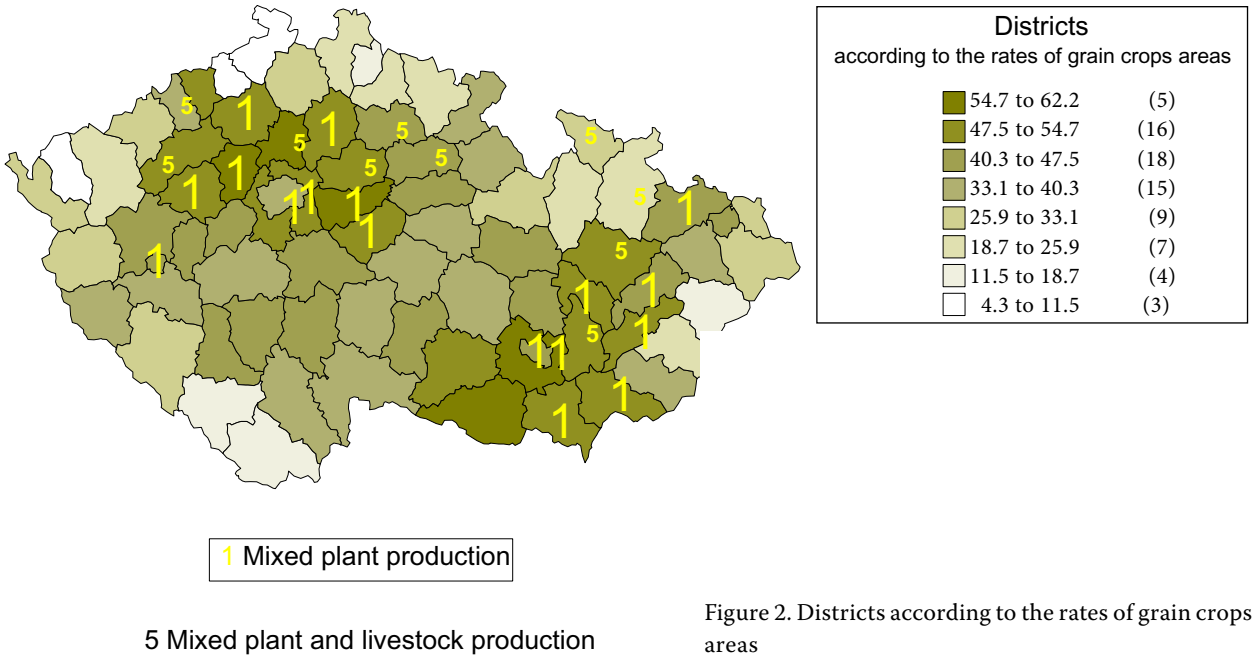

Figure 2. Districts according to the rates of grain crops areas

The rate of revenues from general plant production is the largest in the district Prague-West (62%) and the lowest in the district Kroměříž (37.7%). The districts Brno-city, Břeclav and Hodonín are an exception, the predominant part of revenues of agricultural activity (more than 50%) supply vineyard revenues.

Districts specialized in crops production are given in Table 3. The areas of grain crops (Figure 2), which are in average higher by 10%, cover the rate of agricultural land which is higher than the average in the CR. The oil crops areas cover the second largest rate of agricultural land, which is by 4% higher than the average in the CR. Sugar beet is another important commodity in these districts, the areas it covers represent in average 4% of agricultural land, which is by 2% higher than the average in the CR.

The area rates of fodder crops (by 2.5%), potatoes (0.4%) and permanent pastures (16.1%) are lower than the average in the CR. The land use in these districts is characteristic of a high percentage of arable land, over 88.7%, while the average in the Czech Republic is about 74% and the mean elevation above sea level is between 317 and 490 m above sea level.

Pig and poultry breeding range to 25% in these districts and cattle, sheep and goat breeding reach to 20%. Cattle density in these districts is 0.253 head/ha of agricultural land, which is 61% of the CR average. The average density of milk cows is 0.085 head/hect-

Table 3. Mixed plant production

Region	Plant production – land area in % of agricultural land						Livestock rates in head/hectare of agricultural land						Arable land (%)	Middle altitude
	grain crops	potatoes	sugar beet	oil crops	forage crops	permanent pastures	cattle	milk cows	suckler cows	pigs	sheep, goats	poultry		
Kladno	62.19	0.22	4.43	**16.88**	6.86	2.00	0.143	0.055	0.007	0.583	0.015	6.22	96.3	331
Kolín	57.28	0.89	4.11	**21.86**	9.11	2.80	0.181	0.072	0.005	0.947	0.013	3.72	94.8	352
Kutná Hora	50.51	0.88	4.58	13.40	**15.04**	7.20	0.351	0.125	0.005	0.985	0.016	9.28	**90.6**	387
Mladá Boleslav	47.54	1.58	8.79	13.90	**14.62**	4.65	0.315	0.104	0.004	0.847	0.006	0.96	94.4	317
Praha-východ	50.01	1.47	4.05	**19.27**	8.10	8.45	0.219	0.052	0.019	0.862	0.043	1.18	88.7	344
Praha-západ	53.19	0.22	3.43	**20.33**	7.53	5.28	0.155	0.059	0.010	0.319	0.046	2.80	93.5	363
Rakovník	48.96	0.30	0.00	20.41	10.13	6.80	0.205	0.059	0.019	0.675	0.013	6.74	91.9	418
Plzeň-město	47.49	0.36	0.00	13.35	7.06	22.78	0.201	0.047	0.030	0.399	0.023	0.07	75.7	337
Litoměřice	49.16	0.97	4.69	**14.44**	9.75	7.27	0.218	0.065	0.014	0.566	0.027	4.97	88.6	489
Brno-město	46.58	0.80	0.16	11.65	9.16	11.75	0.169	0.039	0.015	1.137	0.029	6.12	76.9	335
Brno-venkov	57.57	0.73	3.63	**11.23**	12.44	2.63	0.248	0.099	0.001	1.129	0.009	9.22	**94.3**	372
Břeclav	48.98	0.84	1.02	14.80	9.16	0.84	0.185	0.065	0.001	1.090	0.005	17.06	**85.0**	351
Hodonín	48.84	0.36	1.04	14.93	9.03	8.73	0.191	0.073	0.005	1.805	0.013	11.89	**83.6**	490
Prostějov	49.87	0.47	8.43	13.61	**13.87**	6.29	0.373	0.134	0.007	1.239	0.008	2.27	91.8	466
Přerov	45.83	0.30	6.54	14.53	**13.43**	9.31	0.391	0.140	0.008	0.891	0.012	2.26	88.8	422
Kroměříž	49.61	0.31	5.36	12.03	**15.87**	7.68	0.425	**0.147**	0.013	1.205	0.009	8.01	90.8	525
Opava	45.64	0.71	7.85	**13.88**	9.32	15.85	0.335	0.114	0.027	0.696	0.006	18.23	**82.3**	474
Czech Republic	**40.61**	**1.03**	**2.11**	**11.19**	**13.10**	**23.74**	**0.414**	**0.130**	**0.035**	**0.972**	**0.032**	**8.426**	**74.4**	**525**

Source: Czech Statistical Office

are, which is 65% of the CR average and the density of suckler cows is in average 0.011head/ha, which is 31.6% of the CR average. The density of pigs in these 17 districts is 0.905 head/hectare and their number is close to the republic average (93.1%). On the contrary, the sheep and goat density is very low, 1.7 head/100hectare, which is by 53% less than the average in the CR. The total number of poultry is in average 653 head/100 hectare, which is 77.5% of the average in the CR.

The land use and the average densities of farm animals in these districts indicate the orientation of agriculture especially towards crop production and intensive farming.

The second group – **2 Cattle and other fodder-fed animals breeding,** is formed by the districts where the revenue rate from cattle and other fodder-fed animals breeding is greater than 2/3. The revenues from cattle and other fodder-fed animals breeding are the highest in the district Jablonec nad Nisou (85%) and the

Table 4. Cattle breeding and breeding of other animals consuming fodder

District	Plant production – land area in % of agricultural land				Livestock rates in head/hectare of agricultural land						Arable land (%)	Middle altitude
	grain crops	oil crops	forage crops	permanent pastures	cattle	milk cow	suckler cows	pigs	sheep, goats	poultry		
Ústí nad Labem	4.37		0.80	86.50	0.210	0.042	0.046	0.030	0.109	0.232	10.2	433
Jablonec nad Nisou	12.09		10.99	70.37	0.532	0.222	**0.045**	0.109	0.062	0.444	25.0	670
Semily	25.00	5.52	15.38	48.32	0.661	**0.271**	0.026	0.450	0.073	0.210	49.6	836
Vsetín	14.00	2.47	9.69	68.97	0.583	0.177	**0.066**	0.298	0.220	0.612	29.7	737
Czech Republic	**40.61**	**11.19**	**13.10**	**23.74**	**0.414**	**0.130**	**0.035**	**0.972**	**0.032**	**8.426**	**74.4**	**525**

Source: Czech Statistical office

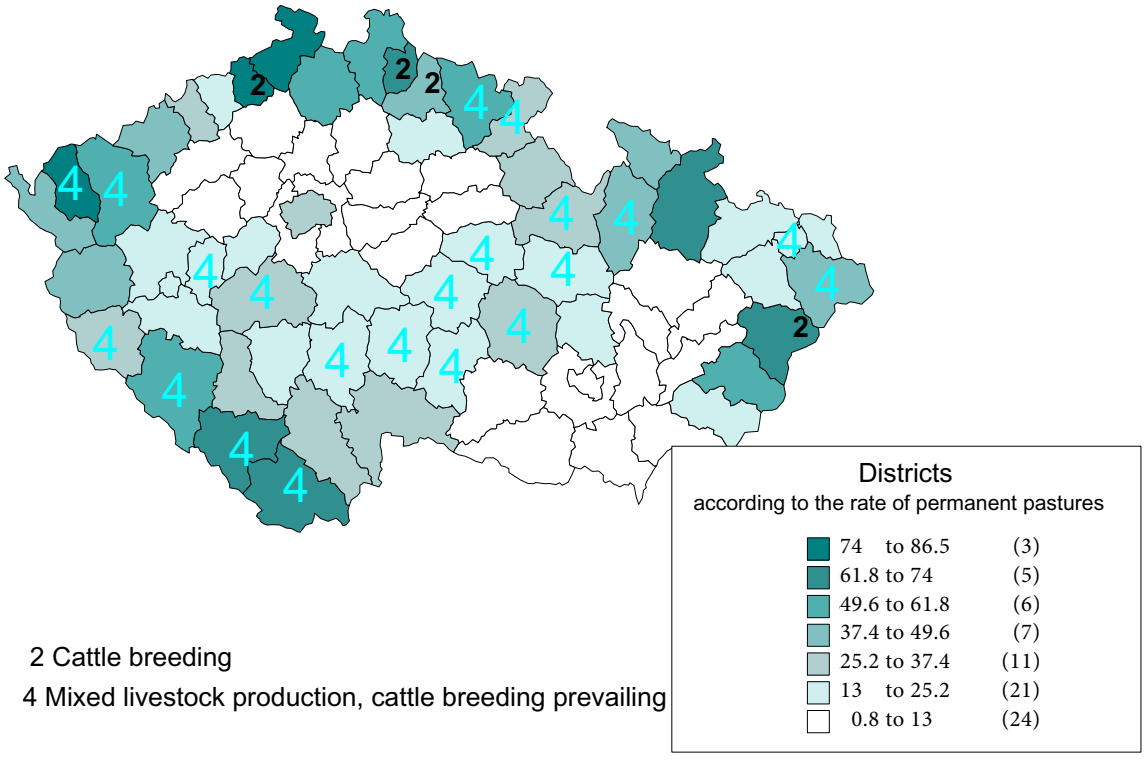

Figure 3. Districts according to the rate of permanent pastures

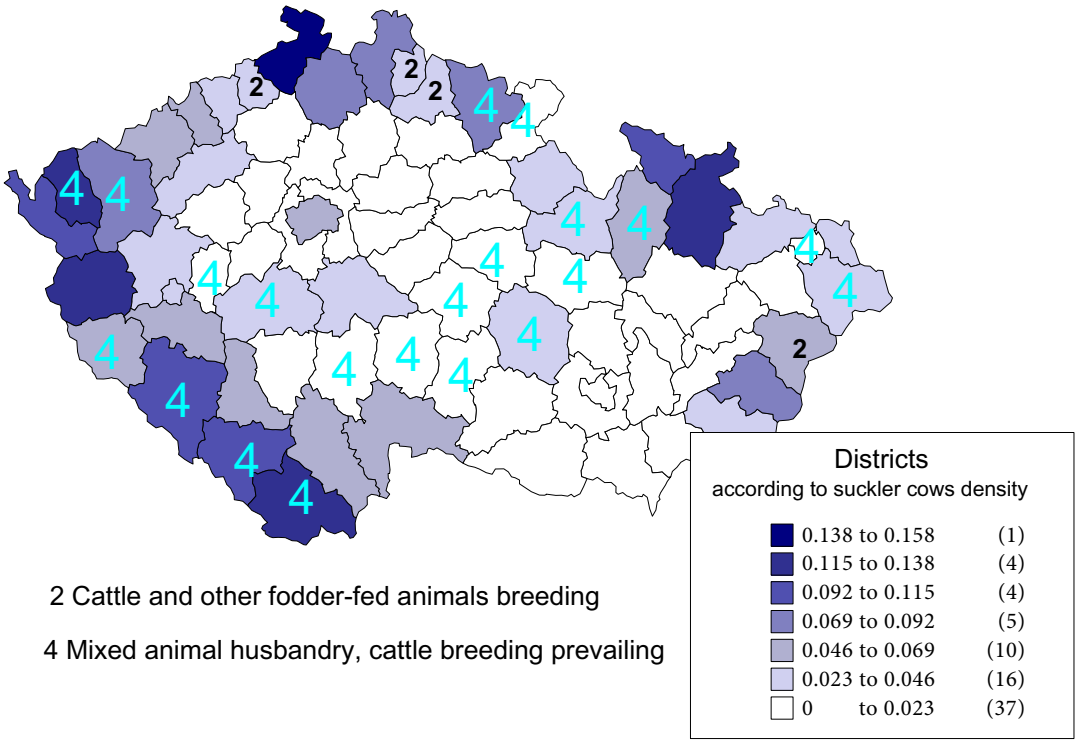

Figure 4. Districts according to suckler cows density in head/ha of agricultural land

lowest ones are in the district Semily (70%). In these four districts, cattle density is 0.497 head/hectare of agricultural land, which is 120.1% of the CR average, the average density of milk cows is 0.178 head/hectare, which is 137.3% of the CR average and the suckler cows density is 0.046 head/hectare, which is 128,4% of the CR average (Figure 4). The pig and poultry breeding revenues are very low in these districts and they reach only to 10% in average. In the 2nd group, the pig density is 0.222 head/hectare, which is 22.8% of the average. On the contrary, the sheep and goat density is 12 head per 100 hectares, which is 361% of the CR average. The total numbers of poultry are very low, 37 head per 100 hectare, which equals 4.45% of the CR average.

Districts specialized in cattle breeding are given in Table 4. Revenues from the general plant production reach to 12%. The largest share of agricultural land is covered by permanent pastures (68.5% in average) which are higher by 44.8% than the average in the CR (Figure 3). The second largest share is covered by areas of grain crops. Their share in the agricultural land reaches from 4.4% to 25% and they is lower by 26.7% than the average in the CR. Another important commodity are forage crops on arable land. Their areas represent 9.2% of agricultural land which is by almost 4% a smaller share than the CR average.

The land use in these four districts is characteristic of low percentage of arable land, which reaches from 10.2% to 49.6% and it is lower in average by 45.8% than the average in the Czech Republic. The mean elevation is from 433 to 836 m above sea level.

The land use and average densities of farm animals in these districts indicate orientation of the agricultural production towards cattle breeding and extensive farming (Střeleček et al. 2004).

The third group – **3 Pig, Poultry and Other Grain-fed Animals Breeding,** is formed by districts where the revenues of pig and poultry breeding and breeding of other grain bred animals are higher than 2/3 (Table 5). The highest pig and poultry revenues are in the district Karviná (71.7%) and the lowest revenues are in the district Chomutov (68.2%). The pig density in these three districts is 1.70 head/hectare, which is 175.4% of the Czech Republic average and the poultry density is 42.4 head/hectare, which is almost 504% of the average in the Czech Republic.

Cattle and sheep breeding revenues are substandard in these districts. In average, their share is 8.6% of total basic agricultural production. Cattle density is very low in these three districts, 0.173 head/hectare of agricultural land, which is 41.7% of CR average. The average milk cows density is 0.031 head/hectare, which is 24% of the CR average but the suckler cows density is, on the contrary, above-average and it represents 0.040 head/hectare, which is 112.3% of the CR average. The sheep and goat density in these districts is also above-average, 4 head/100 hectares, which is 115% of the CR average.

Table 5. Pig, poultry and other grain-fed animals breeding

District	Plant production – land area in % of agricultural land					Livestock rates in head/hectare of agricultural land					Arable land (%)	Middle altitude
	grain crops	oil crops	forage crops	permanent pastures	cattle	milk cows	suckler cows	pigs	goats, sheep	poultry		
Chomutov	32.62	10.90	6.58	39.68	0.197	0.009	0.064	0.670	0.042	57.14	55.2	723
Teplice	49.56	13.83	2.36	18.63	0.086	0.007	0.024	2.978	0.020	1.67	72.3	536
Karviná	32.54	13.75	10.47	22.63	0.235	0.078	0.031	1.466	0.049	68.56	67.3	311
Czech Republic	**40.61**	**11.19**	**13.10**	**23.74**	**0.414**	**0.130**	**0.035**	**0.972**	**0.032**	**8.426**	**74.4**	**525**

Source: Czech Statistical Office

General plant production revenues represent in average 21% in these districts. The largest share of agricultural land is covered by grain crops areas (38.2% in average), however their land area is smaller by 2.4% than the average in the Czech Republic is. The second largest rate is covered by permanent pastures areas; it reaches to almost 27% of agricultural land, which is by 3.2% more than the CR average. The oil crops are another important commodity of these districts. They cover 12.8% of agricultural land, which is by 1.6% higher share than the average in the Czech Republic. Percentage of arable land can reach in these districts from 55.2% to 72.3% and it is by 9.5% lower than the CR average. The mean elevation is from 311 m to 723 m above sea level. The land use and average farm animal density indicate orientation of the agricultural production towards animal husbandry, especially pig and poultry breeding, besides, there is a higher rate of suckler cows and of sheep and goats.

It is possible to divide the fourth group – **4 Mixed animal husbandry,** into two subsets:

4a) predominant cattle breeding, where the yield share from cattle breeding and from breeding other animals bred on fodder is higher than 1/3 and smaller or equal to 2/3 and in the same time yields from any other activity are not higher than 1/3.

4b) predominant pig and poultry breeding where yields from pig and poultry breeding and from breeding of other animals bred on grain are higher than 1/3 and lower or equal to 2/3. In the group, 4 mixed

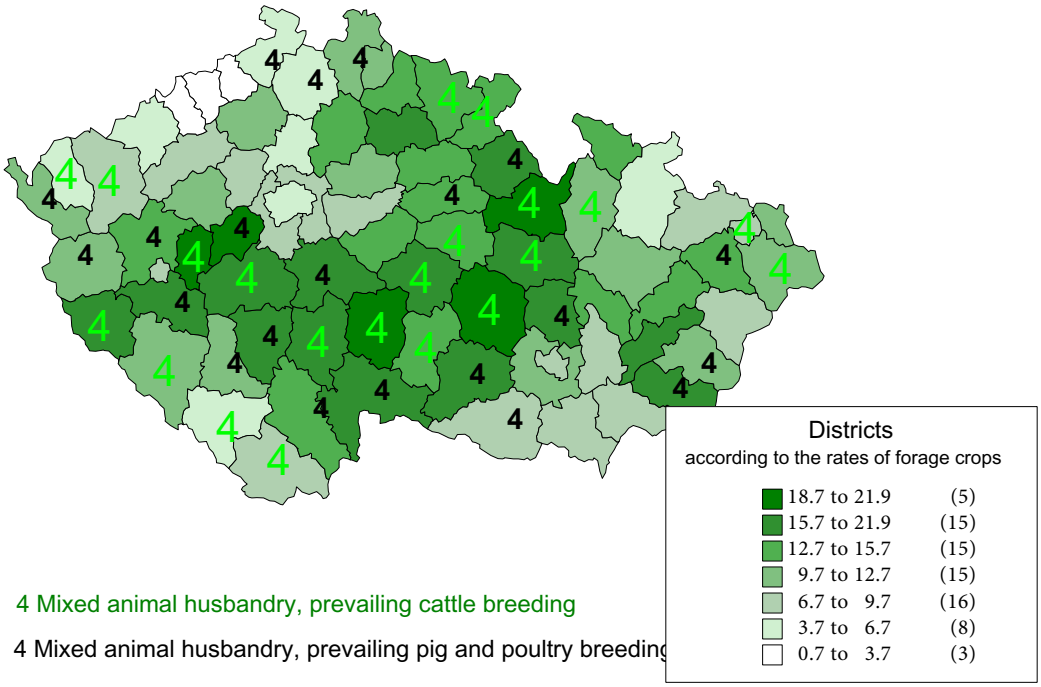

Figure 5. Districts according to rates of forage crops areas

animal productions, there belong 42 districts, and to both subsets 21 districts belong equally (Table 6).

Districts specialized in animal production and where the cattle breeding are predominant are indicated in Table 6. Cattle, sheep and goat breeding yields represent in average 49%. The highest ones are in the district of Prachatice (58%) and the lowest revenue rate is in the district of Chrudim (38%). The stocking rate in these areas is 0.543 head/hectare, which is 131.4% of the CR average. The average milk cow density is 0.164 head/hectare, which is 126.4% of the CR average and suckler cow density is 0.049 head/hectare which is 134% of the CR average (Figure 4).

Pig and poultry breeding yields represent in average 28%.The pig density in these 21 districts is 0.734 head/hectare, which is one third of the Czech Republic

Table 6. Mixed stock production – predominant cattle breeding (**4. a**)

Regiont	Plant production – land area in % of agricultural land						Livestock rates in head/hectare of agricultural land					Arable land (%)	Middle altitude
	grain crops	potatoes	oil crops	forage crops	permanent pastures	cattle	milk cows	suckler cows	pigs	sheep, goats	poultry		
Příbram	38.19	1.40	11.43	17.41	25.27	0.532	0.176	0.034	0.757	0.020	4.111	74.0	553
Český Krumlov	16.43	0.21	5.74	9.61	66.11	0.527	0.100	0.130	0.479	0.057	2.916	33.4	875
Prachatice	18.66	0.48	2.99	6.00	68.75	0.592	0.151	0.097	0.599	0.113	6.102	29.3	894
Tábor	43.61	1.78	11.98	16.67	18.96	0.480	0.153	0.017	0.653	0.013	5.926	80.5	539
Domažlice	36.59	0.22	11.27	17.41	28.92	0.659	0.203	0.048	0.750	0.024	7.712	70.1	699
Klatovy	27.41	1.08	5.00	11.71	50.05	0.619	0.151	0.092	0.559	0.088	13.883	49.4	865
Rokycany	44.04	0.21	7.29	21.17	17.96	0.569	0.201	0.016	0.888	0.018	2.475	79.8	486
Karlovy Vary	22.14	0.19	7.56	7.51	56.57	0.333	0.048	0.086	0.381	0.098	0.256	39.7	782
Sokolov	10.60	0.01	4.59	6.18	74.68	0.324	0.001	0.130	0.121	0.135	0.065	23.1	683
Náchod	34.37	0.60	9.65	15.16	28.91	0.517	0.175	0.021	0.960	0.049	2.913	68.5	439
Trutnov	22.76	0.43	5.59	14.09	53.00	0.503	0.144	0.076	0.682	0.044	0.566	45.8	933
Chrudim	39.58	1.33	11.27	15.34	18.73	0.492	0.179	0.015	0.989	0.040	10.619	77.6	499
Svitavy	41.72	0.66	12.75	16.54	18.31	0.515	0.186	0.023	0.888	0.013	14.226	80.0	524
Ústí nad Orlicí	30.04	0.57	7.66	20.44	33.71	0.735	0.260	0.035	0.735	0.053	9.682	64.7	427
Havlíčkův Brod	39.53	4.50	10.11	17.45	21.93	0.588	0.218	0.015	1.031	0.023	0.420	76.4	481
Jihlava	41.27	2.92	10.74	15.51	21.98	0.556	0.191	0.022	0.997	0.014	3.770	76.6	630
Pelhřimov	36.32	6.80	8.60	20.92	21.54	0.608	0.226	0.013	0.776	0.008	1.820	77.8	582
Žďár nad Sázavou	38.20	2.98	6.42	18.75	28.00	0.674	0.230	0.029	1.156	0.036	1.621	70.8	546
Šumperk	24.94	0.44	6.81	12.11	48.58	0.464	0.120	0.069	0.646	0.039	2.208	49.3	856
Frýdek-Místek	25.92	0.86	6.12	12.25	48.79	0.547	0.198	0.033	0.713	0.109	3.119	49.9	775
Ostrava-city	44.09	0.48	11.05	8.54	23.16	0.578	0.129	0.019	0.661	0.022	5.217	66.1	271
Czech Republic	**40.61**	**1.03**	**11.19**	**13.10**	**23.74**	**0.414**	**0.130**	**0.035**	**0.972**	**0.032**	**8.426**	**74.4**	**525**

Source: Czech Statistical Office

average (75.6%). On the contrary, the poultry density is very low, only 474 head/100 hectares, which is 56.3% of the average in the CR. The numbers of sheep and goat are relatively high if compared with the average in the CR: 4.8 head/100 hectares, which is 151% of the CR average.

The general plant production yields are in average 24%. The highest share of agricultural land in these districts is covered by permanent pastures areas (Figure 3), in average their share is higher by 13.1% than the average in the Czech Republic (36.85%). The second highest rate (32.2%) is represented by the areas of grain crops which are by 8.4% less than the average in the CR. Another important commodity in these districts is forage crops on arable land. The areas covered by it represent 14.3% of agricultural land, which is by 1.2% more than the average in the CR (Figure 5).

The areas covered by potatoes almost equal the average of the Czech Republic (being higher by only 0.31%) while the rate of oil crops covered areas is by 2.8% lower. The land use in these districts is typical of the lower degree of tilth, by 13% less than the av-

Table 7. Mixed stock production – pig and poultry breeding prevailing (**4.b**)

Region	Plant production – land area in % of agricultural land						Livestock rates in head/hectare of agricultural land					Arable land (%)	Middle altitude
	grain crops	potatoes	oil crops	forage crops	permanent pastures	cattle	milk cows	suckler cows	pigs	sheep, goats	poultry		
Benešov	44.52	1.71	13.38	16.52	17.30	0.461	0.151	0.034	1.191	0.028	10.310	82.2	467
Beroun	41.11	0.24	8.07	21.88	20.01	0.343	0.103	0.013	2.692	0.025	0.793	78.7	416
České Budějovice	38.53	0.19	9.16	14.83	30.31	0.524	0.167	0.050	1.107	0.027	12.703	69.1	689
Jindřichův Hradec	37.78	1.86	7.40	16.37	30.98	0.549	0.165	0.048	1.144	0.022	8.824	68.1	590
Písek	42.19	1.10	10.79	16.26	22.16	0.483	0.173	0.018	1.260	0.010	12.806	77.1	519
Strakonice	42.46	1.84	9.83	12.42	25.98	0.510	0.148	0.047	1.332	0.055	15.922	72.7	610
Plzeň-jih	39.99	0.50	12.72	15.82	24.19	0.530	0.157	0.063	1.066	0.015	5.831	74.9	476
Plzeň-sever	46.71	0.52	12.64	15.53	15.52	0.387	0.127	0.028	0.910	0.022	6.644	83.4	478
Tachov	26.65	0.16	10.69	10.19	45.32	0.416	0.062	0.136	0.750	0.029	4.573	51.4	555
Cheb	27.24	0.13	9.32	10.35	48.56	0.303	0.039	0.095	0.706	0.041	7.159	49.3	619
Děčín	6.77	0.04		6.46	79.12	0.455	0.023	0.158	0.090	0.066	10.736	16.6	445
Česká Lípa	26.21	0.22	7.53	4.89	52.85	0.297	0.050	0.079	0.697	0.034	5.811	42.5	513
Liberec	19.34	0.23		10.30	53.99	0.423	0.100	0.072	0.714	0.075	2.906	37.6	666
Rychnov nad Kněžnou	34.63	0.64	7.44	16.28	31.07	0.578	0.199	0.034	1.172	0.077	21.283	65.2	461
Pardubice	44.65	0.79	15.34	14.88	9.61	0.297	0.113	0.022	1.175	0.016	12.086	89.4	300
Třebíč	53.03	0.85	10.80	17.63	9.74	0.470	0.166	0.013	1.339	0.019	7.674	89.2	491
Blansko	43.36	0.63	5.89	18.58	18.95	0.467	0.168	0.012	1.093	0.016	5.475	79.0	478
Znojmo	60.75	0.88	14.61	8.38	1.28	0.158	0.061	0.001	2.201	0.010	18.253	95.5	346
Zlín	24.18	0.28	6.76	10.09	50.91	0.364	0.082	0.084	0.405	0.124	21.606	47.0	509
Nový Jičín	38.85	0.33	12.79	15.37	22.79	0.402	0.149	0.022	1.638	0.032	12.448	76.0	681
Uherské Hradiště	36.50	0.18	11.75	15.86	22.78	0.402	0.137	0.041	0.910	0.037	12.673	73.5	570
Czech Republic	**40.61**	**1.03**	**11.19**	**13.10**	**23.74**	**0.414**	**0.130**	**0.035**	**0.972**	**0.032**	**8.426**	**74.4**	**525**

Source: Czech Statistical Office

erage in the Czech Republic and the mean elevation oscillates between 271 to 933 m above sea level.

The land use and the average farm animal density in these districts indicate orientation towards animal husbandry, specialized in cattle breeding.

Districts specialized in animal husbandry and prevailing pig and poultry breeding (4b) are indicated in Table 7. The highest pig and poultry breeding yields are in the district of Beroun (60%) and the lowest ones are in the district of Uherské Hradiště (34%). The pig density in these districts is 1.123 head/hectare, which is 115.6% of the average in the Czech Republic. Poultry density is above average as well, 1 031 head/hectare which is 122.4% of the Republic average.

The cattle breeding yields represent in average 34%, the highest ones being in the district of Děčín (56%) and the lowest ones in the district of Znojmo (7.6%). Stocking rate in these districts amounts to 0.420 head/hectare of agricultural land, which is 101.6% of the CR average. The average rate of milk cows is 0.121 head/hectare, which is 93.2% of the Czech Republic average. The suckler cows rate is relatively high in these districts, 0.051 head/hectare, which is 143% of the average in the CR. The sheep and goat rate is 3.7 head/hectare, which is 115.9% of the CR average.

Yields from general plant production in these districts are in average 22.5%, the highest rates are in the district of Pardubice (31.9%) and the lowest rates are in the district of Děčín (8.8%). The highest rate of the agricultural land is covered by areas of grain crops, 36.9%, which is by 3.7% a lower rate than the average in the CR. The second largest rate covers permanent pastures. Their areas represent 30.6% of agricultural land (by 6.4% more than the average in the CR). Further important commodity in these districts is forage crops on arable land. The areas they cover represent 13.76% of agricultural land, which is a slightly above average rate (by 0.65%). On the other hand, the areas of oil crops in these 21 districts are slightly below average (by 0.82%) and the rate of potatoes areas is by 0.4% below average. Percentage of arable land in these areas is slightly below average, its rate being 67.5%, while the average in the Czech Republic is 74%. The mean elevation oscillates between 300 and 689 m above sea level, which means that the range is significantly smaller than by group 4a – prevailing cattle breeding. The land use and average rates of farm animals in these districts indicate specialization in agriculture in animal husbandry and especially pig and poultry breeding.

The fifth group – **5 mixed plant and livestock production** includes districts where the share of revenues from general crops production is higher than 1/3 and in the same time the yields rate from cattle and other fodder-fed animals breeding, or breeding of pigs, poultry and other grain-fed animals is higher than 1/3.

Table 8 gives districts with mixed plant and livestock production. The highest general plant production yields are in the district of Most (57%) and the lowest ones are in the district of Jeseník (33.7%). In average, the largest areas of agricultural land are covered by grain crops (44.1%) (Figure 2), the rate of which is higher than the average in the Czech Republic by 3.5%. Permanent pastures represent the second largest rate (18.84%), which is by 4.9% less than the CR average. However, it is necessary to add that there are significant differences between the particular districts concerning land use, depending whether there are higher yields from cattle or from pig and poultry breeding.

In the first case (the yields rate from general plant production is higher than 1/3 and in the same time the yields rate from cattle and other fodder-bred animals breeding is higher than 1/3), the districts of Most, Jičín, Jeseník and Bruntál are concerned. In these districts, yields from cattle and sheep breeding oscillate between 50 to 35% and pig and poultry breeding yields reach to 17% in average.

In these districts, the rate of grain crops areas is significantly lower than the average (32.2%) and on the other hand the permanent pastures rate is distinctively higher (39.3%). At the same time, the area rate and the rate of other crops are below average, while suckler cows rate is highly above average, 0.073 head/hectare (205.7% of the average in the CR). The same concerns sheep and goat rate 0.054 head per hectare (167.8% of the CR average).

Other districts of the 5th group specialize their livestock production rather in pig and poultry breeding. The pig and poultry breeding yields reach from 33.6% (Louny) to 42% (Mělník). Cattle breeding revenues are in average 16.7%.

The rate of grain crops areas represent 52.1%, which is by 11.5% more than the average in the CR. Sugar beet areas are also above average, 5.96% and the same concerns oil crops, 15.54%. Yet the permanent pastures rate (5.2%) and forage crops on arable land rate (10%) are below average. Compared with the preceding districts, the pig rate is significantly higher here, 1.25 head/hectare (128.6% of the CR average). The same can be said concerning poultry: 942 head/hectare (111.8% of the CR average). The cattle rate is significantly lower than in the preceding districts (Figure 6) but the milk cow rate is not very different.

Table 8. Mixed plant and livestock production

District	Plant production – land area in % of agricultural land					Livestock rates in head/hectare of agricultural land					Arable land (%)	Middle altitude
	grain crops	potatoes	oil crops	forage crops	permanent pastures	cattle	milk cows	suckler cows	pigs	sheep, goats		
Most	37.79	10.41	2.77	35.55	0.262	0.038	0.054	0.109	0.066	0.226	56.8	580
Jičín	41.49	10.64	17.42	14.51	0.455	0.182	0.006	0.889	0.014	8.014	83.0	361
Jeseník	28.67	11.15	12.92	42.88	0.417	0.081	0.101	0.218	0.070	1.934	55.8	813
Bruntál	20.67	6.04	4.21	64.33	0.385	0.044	0.131	0.178	0.065	1.691	35.0	848
Mělník	55.22	18.20	6.41	1.84	0.091	0.024	0.005	1.029	0.007	16.114	95.1	333
Nymburk	53.70	15.18	11.21	1.79	0.253	0.083	0.018	0.955	0.006	13.045	96.7	232
Louny	52.43	19.90	7.21	4.91	0.164	0.034	0.028	0.938	0.005	9.354	93.3	361
Hradec Králové	47.26	12.30	13.92	9.17	0.353	0.126	0.011	1.578	0.016	5.337	89.1	268
Vyškov	54.30	19.03	8.94	2.74	0.192	0.070	0.002	1.363	0.010	7.805	95.1	394
Olomouc	49.50	8.64	12.32	10.69	0.421	0.150	0.018	1.637	0.005	4.876	87.5	440
Czech Republic	**40.61**	**11.19**	**13.10**	**23.74**	**0.414**	**0.130**	**0.035**	**0.972**	**0.032**	**8.426**	**74.4**	**525**

Source: Czech Statistical Office

The percentage of arable land is significantly various in group 5 districts and it oscillates from 35 to 96.7%. The mean elevation goes from 232 to 848 m above sea level. To this group, there belong districts with very different climatic conditions and therefore with different farming intensity.

Figure 7 represents graphically the rate of main crops areas depending on the growing percentage

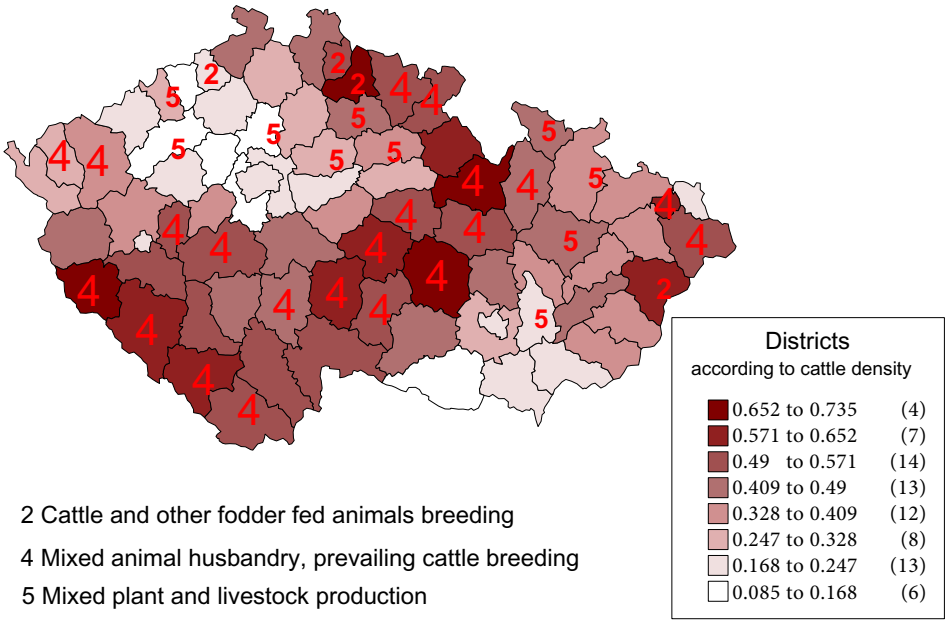

Figure 6. Districts according to cattle rate in head/hectare of agricultural land

of arable land. It is evident from the figure, that the rate of grain and oil crops grows lowlier than the percentage of arable land, i.e. that with the growing percentage of arable land, the rate of areas of other crops grows and the arable land is used for production of a larger scale of crops. The rate of forage crops areas on arable land grows in accordance with the increasing percentage of arable land to average

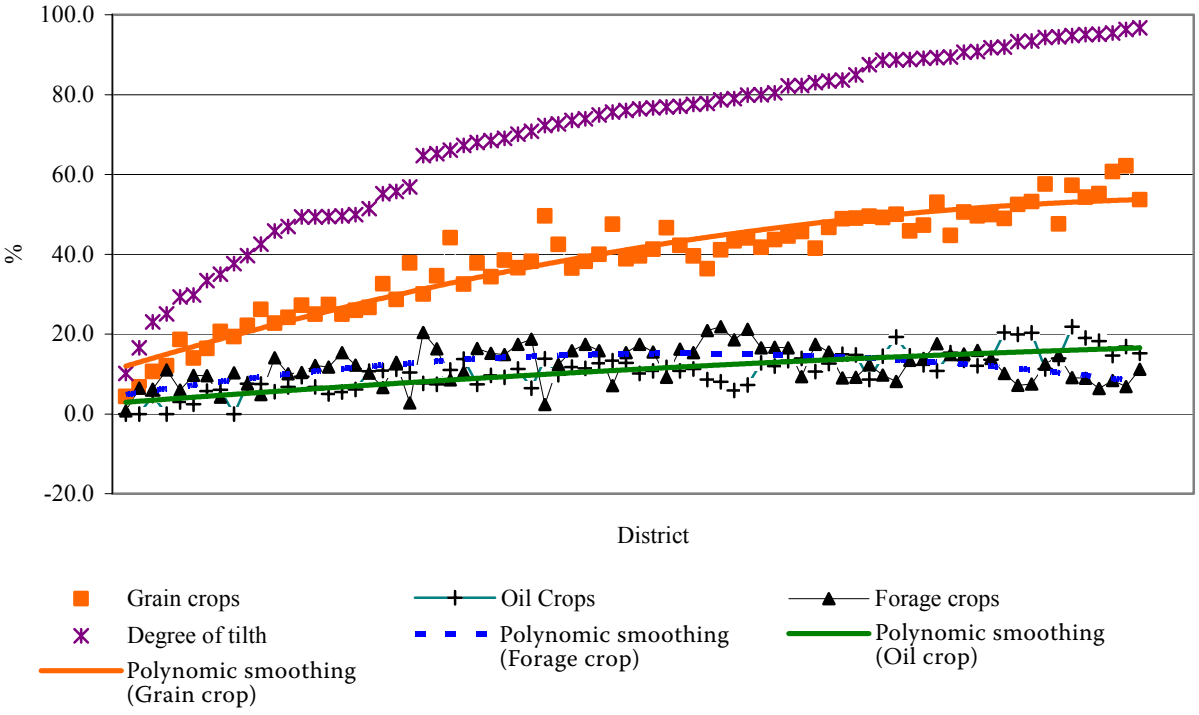

Figure 7. Dependence of main crops area rate on the percentage of arable land

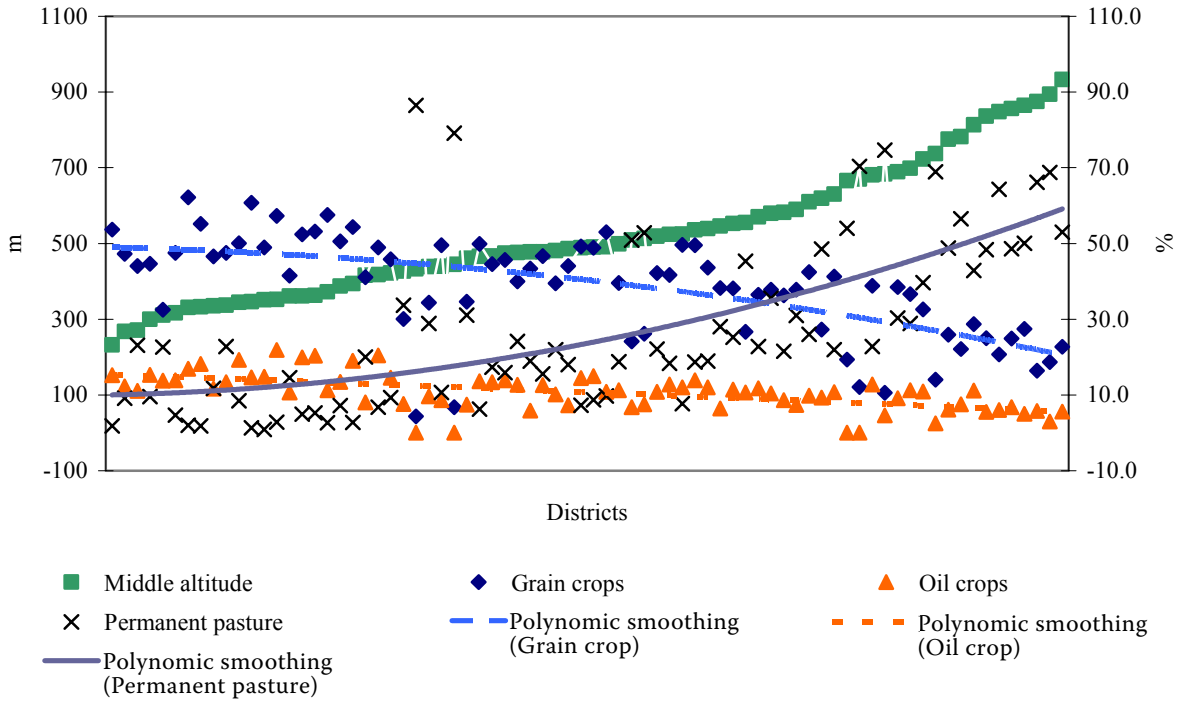

Figure 8. Dependence of main crops area rate on the middle altitude

value and with an above average percentage of arable land the rate of forage crops decreases. This means a decrease of forage crops areas in the districts with an above-average rate of permanent pastures areas.

Figure 8 represents districts according to the growing middle altitude. It is apparent that the rate of permanent pastures areas grows according to the increasing middle altitude, which happens accordingly. The rate of grain and oil crops decreases, more significant is the decrease of grain crops rate.

The area of farms specialized in organic farming represented in 2003 apx. 145 000 hectares, which is 4% of total area of agricultural land and the areas of farms in transitional period were in 2003 41 000 hectares (1.2%). The majority of farms engaged in organic agriculture are orientated towards both, crops production as well as towards animal husbandry (Jánský et al. 2003). The rate of farm areas orientated solely towards crops production is only 0.11% (4 002 hectares).

In the region of Karlovy Vary, there is the highest rate of organic farm areas, 28 thousand hectares (28% of agricultural land). The region of Moravia-Silesia with 22 thousand hectares (9.9%), of Ustí 16.2 thousand hectares (7.7%), the region of Zlín with 14.2 thousand hectares and the South Bohemian region with 14 thousand hectares (3.3%) are other regions with relatively high rate of organic farming.

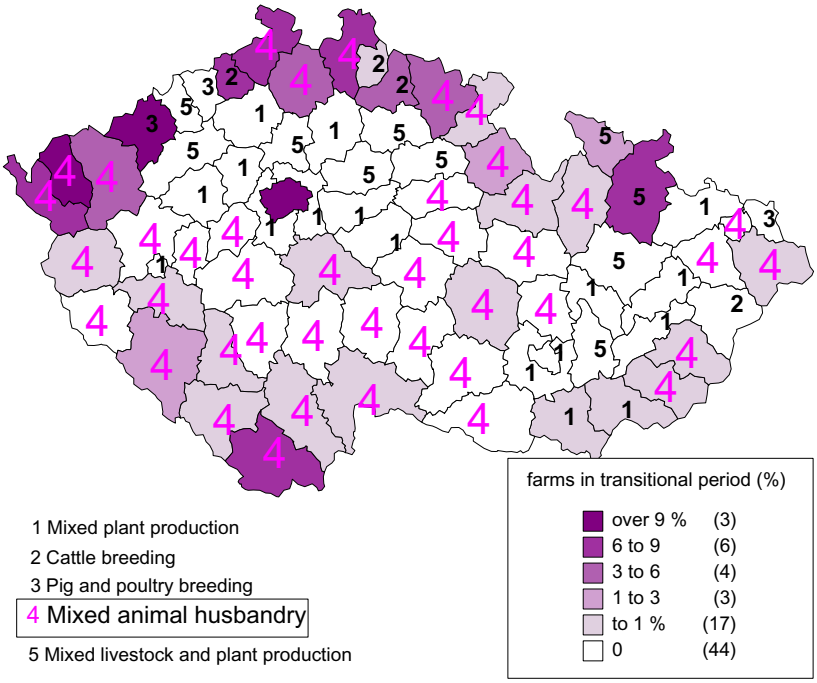

Figure 9. Organic farming – farms in transitional period

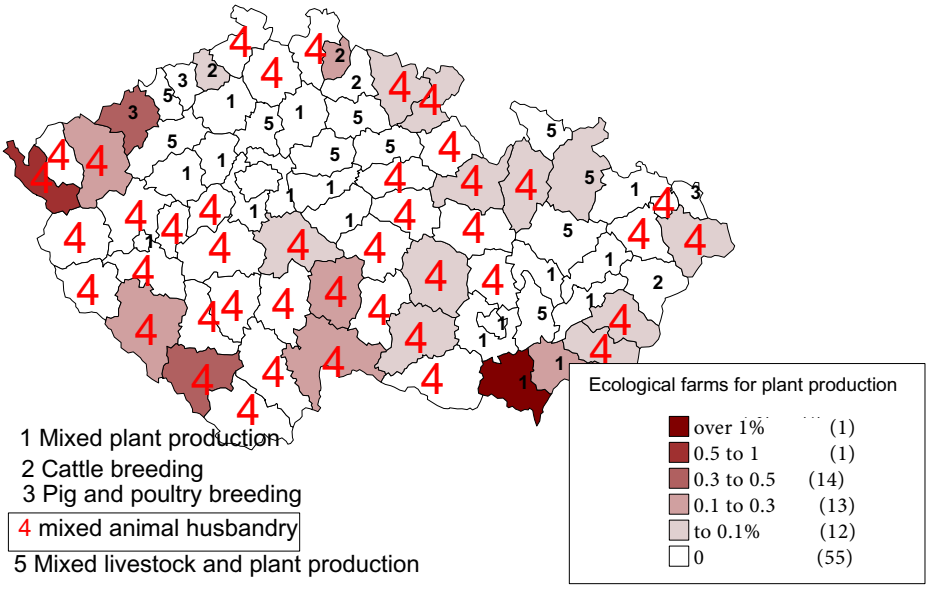

Figure 10. Organic farming – crops production farms

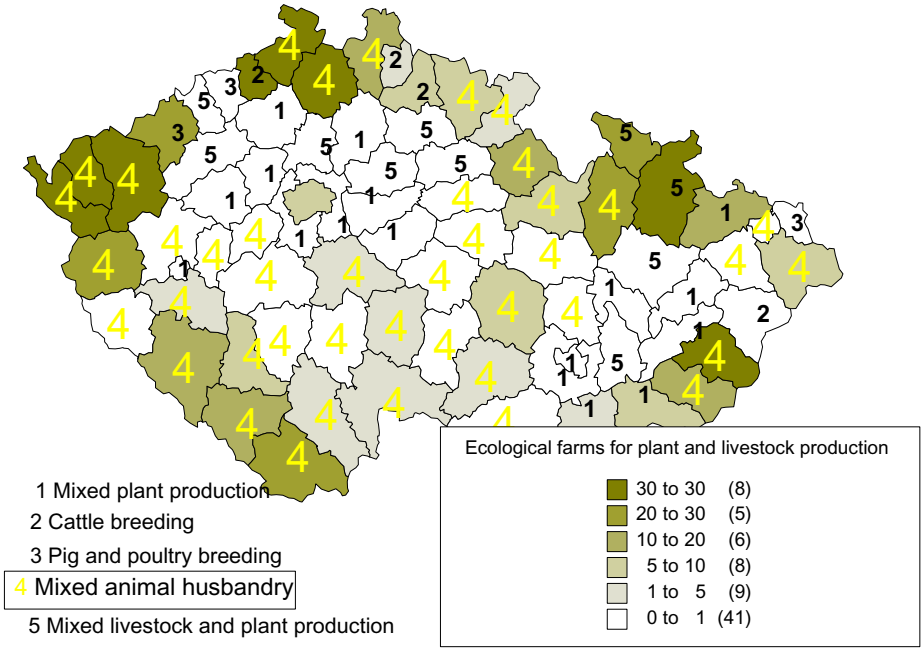

Figure 11. Organic farming – crops production and animal husbandry farms

In the Prague region, 15.4%, and in the region of Karlovy Vary, 7.5%, there are the highest rates of farm areas in the transitional period areas. According to districts, the highest rate of farm areas in transitional period is in the district Sokolov – 25% of agricultural land, further in the district of Chomutov (10.9%), Ústí nad Labem (8.9%), Děčín and Bruntál (8.4%) (Figure 9).

The rate of areas of organic farms orientated towards crops production is very low in all districts. It surpasses the value of 1% only in the district of Břeclav, where it represents 920 hectares of agricultural land (Figure 10).

The majority of organic farms produce both, crops production and animal husbandry. The highest rates of organic farming areas oriented towards crops production and animal husbandry are in the districts Děčín (31.2%), Karlovy Vary (30.9%) and Cheb (26.9%) (Figure 11). It is evident from Figure 9–11, that organic farming is run in the Czech Republic almost exclusively in the LFA areas.

CONCLUSION

Since 2007 the Czech Republic will have to create a system of regional direct payments. The given payments would operate in a determined region and the basis for the regional payment amount should be the volume of existing direct payments (EU Council 2003). One of the possibilities of regional classification of the Czech Republic for the purpose of direct payments could be the classification according to type of production orientation (Figure 12).

According to intensity of agricultural production and prouction orientation of each district, it is possible to divide the districts of the Czech Republic into four regions (Figure 13) for the purposes of regional principle of direct payment allotment, which we can mark I to IV.

Region I are districts with production orientation on **principally cattle breeding**, where the rate of permanent pastures is higher than 30% of agricultural land. The farm businesses are oriented towards extensive agricultural production with below average grain crops yields (Věžník, Bartošová 2004), the suckler cow rate or sheep and goat rate is above average in general. These districts are: Český Krumlov, Prachatice, Klatovy, Tachov, Cheb, Karlovy Vary, Sokolov, Děčín, Chomutov, Most, Ústí nad Labem, Česká Lípa, Jablonec nad Nisou, Liberec, Semily, Trutnov, Jeseník, Šumperk, Vsetín, Zlín, Bruntál, Frýdek-Místek, Domažlice and Ústí nad Orlicí. The total land area of this region is 863 203 hectares.

Region II includes districts where the production is orientated towards **mixed animal husbandry**, especially cattle breeding. The permanent pastures area is higher than 20% of agricultural land. The agricultural enterprises production in these districts is oriented towards milk and meat production and production of proper fodder. These districts are: Příbram, České Budějovice, Jindřichův Hradec, Strakonice, Plzeň-south, Náchod, Rychnov nad Kněžnou, Havlíčkův Brod, Jihlava, Pelhřimov, Žďár

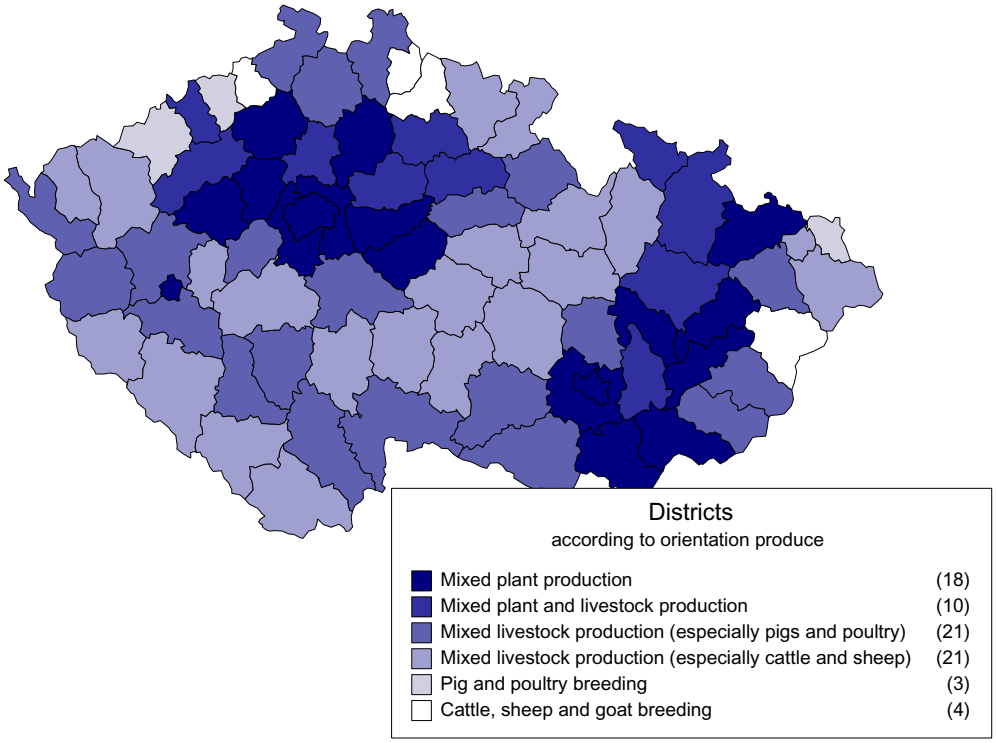

Figure 12. The possibility of regional classification according to production orientation

nad Sázavou and Uherské Hradiště. The total land area is 777 901 hectares.

As **Region III** we will designate districts with **mixed crops production and animal husbandry** and with the percentage of arable land higher than 70%. These districts show a similar rate of crops production and animal husbandry revenues. Prevailing are general crops production, pig breeding, poultry breeding or milk production. Districts Benešov, Beroun, Písek, Tábor, Plzeň-City, Plzeň-North, Rokycany, Teplice, Jičín, Chrudim, Svitavy, Třebíč, Blansko, Karviná, Nový Jičín and Ostrava-City belong to the Region III. Its total land area is 694 306 hectares of agricultural land.

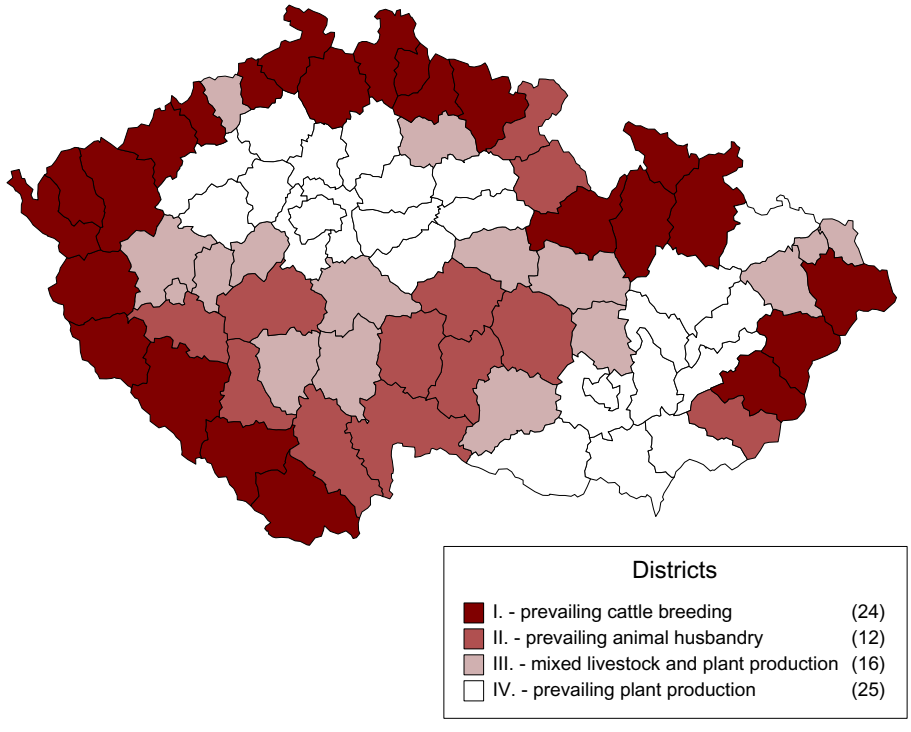

Figure 13. Possibility of regional classification according to intensity of agricultural production and production orientation

Region IV includes districts with the dominant production orientation in **crops production** and with the percentage of arable land more than 80%. The agricultural enterprises in these districts are oriented towards intensive agricultural production with above average grain and oil crops revenues, with a significant rate of permanent cultures and a low rate of farm animals. Animal husbandry is oriented towards pig and poultry breeding and towards milk cows breeding. These districts are: Praha, Kladno, Kolín, Kutná Hora, Mělník, Mladá Boleslav, Nymburk, Praha-East, Praha-West, Rakovník, Litoměřice, Louny, Hradec Králové, Pardubice, Brno-City, Brno-Country, Břeclav, Hodonín, Vyškov, Znojmo, Olomouc, Prostějov, Přerov, Kroměříž, Opava. The total land area is 1 283 507 hectares.

There are two important factors for classification of the system of regional direct payments:

a) Aggregation level of the region

b) The payment amount assessment in the region

The Federal Republic of Germany has chosen as the aggregation level of the region the Federal Republics. From the declaration of the EU representatives it is evident, that the assessment of aggregation level is in competence of each member state. The possibility of the choice of the aggregation level leaves the decision to the member states whether they are going to support by direct payments specializations in each district or whether they are going to operate against this specialization.

The principal difficulty in the choice of aggregation level is the degree of homogeneity of the region from the point of view of production orientation of enterprises. If the regional direct payments are going to be derived from historical framework, than we can suppose, that the greater homogeneity from the production orientation will be in the region, the more favorable the level of direct payment will be for a greater number of enterprises in the region.

A higher aggregation level will, on the other hand, mean a greater universality of direct payments and therefore a non-standard economic result of enterprises in the given region.

The above specified regions are based on standard classification of production orientation of enterprises in the system of FADN. The basic aggregation level is the production orientation of the district and the aggregation is transposed to a higher regional unit.

The classification of regions according to production orientation of agricultural enterprises in the region according to the EU typology is a ground for discussion concerning the aggregation level of the regional direct payments.

REFERENCES

Doucha T., Divila E. (2005): Possible impacts of the Czech agricultural policy after the EU accession on the land market and land usage. Agricultural Economics – Czech, *51* (5): 185–193.

Jánský J., Živělová I., Novák P. (2003): Economic efficiency of agricultural enterprises in the system of organic farming. Agricultural Economics – Czech, *49* (5): 242–246.

Jeníček V., Krepl V. (2002): Developmental trends of world agriculture. Agricultural Economics – Czech, *48* (11): 519–529.

Střeleček F., Lososová J., Kvapilík J. (2004): Development of livestock in numbers and structure from the regional and administrative aspekt. Agricultural Economics – Czech, *50* (2): 47–58.

Tvrdoň J. (2005): Economic aspects of rural areas sustainable development. Agricultural Economics – Czech, *51* (1): 12–19.

Věžník A., Bartošová L. (2004): Selected regional geographical differences of the Czech Republic agriculture, after the transformation processes. Agricultural Economics – Czech, *50* (5): 207–216.

Reform of CAP: the final compromise of the chairmen and the Committee (2003). EU Council, Luxembourg.

Soil – situational and outlook report. Ministry of Agriculture of the Czech Republic [on-line]. [cited: 2004-12-03] http://www.mze.cz/.

The 2003 Statistical Annual of the Czech Republic (2004). Czech Statistical Office, Prague.

The Green Report (2003). The report on state of agriculture of the Czech Republic., Department of Agriculture of the Czech Republic [on-line]. [cited: 2004-12-16] http://www.mze.cz/.

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