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The regional structure of the Hungarian agriculture in the beginning of the 20th century

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Author is dealing with the development of Hungarian agriculture from different regional points of view: of the ecological-geographical, the ethnic-national, or the cluster regions (created by cluster-analysis) which were described in the study using about 700 variables. Based on the more than 100 000 computerized data and analyzing them by mathematical-statistical methods (correlation, regression, factor and cluster-analysis) the author determines which factors or factorgroups played decisive role in forming the regional structure of the Hungarian agriculture. The regional research based on the data before WWI is suitable for understanding how far agricultural modernization got to in the different areas, how the regions made the best of their natural resources and conditions or to what extent they were able to compensate (with technology, working practices and racionalization) the unfavourable conditions. Finally, this study also demonstrates the results of calculations which show the role of agriculture and its three main sectors in the GDP in pre-1918 Hungary on county level.

Key words: agriculture, modernization, regional structure, factor and cluster-analyses, Hungary

Author's Abstract

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Regionalni ustroj ogrske agrikulture na začetku 20. stoletja

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Avtorica obravnava razvoj ogrske agrikulture z različnih regionalnih vidikov: ekološko-geografskega, etnično-nacionalnega oz. z vidika regij grozdov (na podlagi analize grozdov), v študiji opisanih s pomočjo približno 700 spremenljivk. Na osnovi analize več kot 100.000 računalniško obdelanih podatkov avtorica s pomočjo matematično-statističnih metod (korelacija, regresija, analiza grozdov in dejavnikov) določi dejavnike oz. skupine dejavnikov, ki so igrali odločilno vlogo pri oblikovanju regionalnega ustroja ogrske agrikulture. Regionalne raziskave, ki temeljijo na podatkih izpred prve svetovne vojne, omogočajo razumevanje stopnje razvoja kmetijske modernizacije na različnih območjih, vpogled v izkoriščanje naravnih virov in danih pogojev v posameznih regijah ter obseg sposobnosti premagovanja neugodnih pogojev (s pomočjo tehnologije, načinom delovanja in racionalizacijo). Študija ponazori rezultate izračunov, ki prikazujejo vlogo agrikulture in njenih treh glavnih panog pri ogrskem bruto domačem proizvodu na nivoju županij v obdobju pred letom 1918.

Ključne besede: agrikultura, modernizacija, regionalni ustroj, analiza faktorjev in grozdov

Avtorski izvleček

Introduction

This study that fills in a gap in Hungarian historiography both concerning the topic and the methods[1], is based on the researches of previous decades, when a lot of details are known about the development and regional structure of Hungarian agriculture during Dualism (1867–1918). However, historians have not examined the agriculture of pre- 1918 Hungary (including Croatia) from the regional aspect yet. Some studies have been published in connection with the rural economy of certain smaller districts[2], but the comparison of these data as well as the detailed analysis about the regional structure of the whole agrarian sector is still missing. In this study, the regional structure of Hungarian agriculture is analysed in the first decade of the 20th century (between 1906 and 1910). Our main aim was to reconstruct the regional structure of agriculture on the basis of several different – but also interconnected – factors. We intended to examine the relationship of these regions with each other as well as with the whole country. The first decade of the 20th century seems to be the most suitable time to draw a picture of the Hungarian agriculture and the stage of development and characteristics of the agricultural regions before Hungary fell apart after the First World War.

In spite of several initiatives and partial results[3], the following statement of Peter Gunst – made in 1979[4] – is still prevalent nowadays: "researches related to Hungarian economic and social history have neglected the emergence and development of regions so far. […] Hungarian history overstresses only two fields, i.e. the examination of the national development and local history. […] Naturally, the same holds true for the researches connected to agrarian history, too. Researches in the field of Hungarian agrarian history have taken into consideration neither the specific attributes of certain regions, nor the circumstances of their establishment or any unique features of their development. Researches connected to agricultural history have to be comparative so that divergent characteristics as well as the common features of certain areas could be compared and contrasted."

[1] The author ows lots of thanks to Czeferner, Dóra, (MA student at the University of Pécs) for making the first English version of this paper.

[2] Mihály Mózes and László Katus studied the economy of certain regions, while others, like, Tibor Bernát and György Enyedi attempted to reconstruct the regional structure of agriculture in contemporary Hungary.

[3] György Kemény, Ferenc Fodor, Béla Bulla.

[4] Gunst, Mezőgazdaság, agrártudomány, agrártörténet, p. 202.

Sources, methodology and analytical tools

Our study reconstructs and analyses the regional structure of agriculture in pre-1918 Hungary with multivariable database analysis with statistical-mathematical methods. We collected and computerized the whole range of statistical data concerning the agriculture of each county at the turn of the 19th and 20th century. However, we acknowledge, that we should have examined smaller agrarian units than counties in order to draw more precise dividing lines between certain agrarian zones, but, unfortunately, sources regarding the most important data of agricultural production have been published by counties. This refers to our most essential source, titled "The agricultural production of the Lands of the Holy Hungarian Crown between 1901 and 1915", too. From this collection, we had been processing the data concerning crop production between the years of 1906 and 1910[5]. These data had been complemented with the data of viniculture between 1906 and 1910. Fundamental sources were given by the data of animal census carried out in 1911. Geographical-ecological conditions are represented in the best way on the bases of the distribution of land use and the cadastral net income of landed property, the data of which were found in the cadastral survey published in 1909. Facts and figures related to the number of agrarian population, the rate of employment as well as data concerning the structure of properties are gained from the census of 1910. Data – related to machinery and land-tenuring – collected by the agricultural surveying of 1895 was also computerized and processed. Furthermore, we made use of the suffrage survey which have not been used by Hungarian agrarian historiography so far and comprised on taxational structure of the whole male-population of the country that has turned twenty-four.

After completing our database from the above-mentioned statistical sources, we composed variables which characterize the agriculture of different counties. These variables are suitable for statistical analysis. Variables, on the one hand, are ratio numbers that describe structures (crop production, livestock, means and machinery, properties). On the other hand, they are variables indicating the counties' level of development. There are aggregates and synthetic indicators among the variables which play an essential role in our calculations, especially those that are counted in values. They enable us to compare the agricultural sectors with each other. Data regarding values of crop production are given by the contemporary sources. However, in the case of animal husbandry, contemporary figures are not at disposal. Thus, we made an attempt to estimate the net value of livestock farming from the number and type of animals given in the sources in each county. Synthetic indicators characterising the agriculture's level of development represent the contribution of agriculture and its branches to the gross domestic product. Quantitative variables, influencing the development level of crop production, i.e. horse power, livestock, number of mortgaged properties, values assured by insured property, structure of properties and industrial units, employment of paid work, literacy of agricultural

[5] This is the harvested area, the amount and value of production of 40 plant species.

workers and variables indicating market potentials (proportion of non-agricultural population, density of railroad network, proportion of corn- and livestock dealers etc.) were also considered.

We created a database comprising about 700 indicators, including indices related to the national average in each case. This is an important outcome of the research work, as it may be the basis and starting point of further researches dealing with the agriculture of pre-1918 Hungary. The majority of the variables – 400 – are grouped into tables on county level which helped us to analyse the traditional classifications of regions used in Hungarian historiography: the statistical regions, the ethnic-national and the ecological-geographical ones. More than 100 variables are represented in digitalised maps as well. Departing from the usual outlay of economic maps we intended to illustrate whether a county had reached the level of development corresponding to the national averages or not and how much the difference had been. Naturally, in some cases it is clearly visible that the development of certain counties did not reach – or, on the other hand, they managed to surpass – the national average. Finally, maps attached to the chapters discussing the ecological-geographical and ethnic-national regions indicate the regions' relative order to one another.

Statistical regions

The classification according to *statistical regions* (right bank of River Danube, territory between the Danube and River Tisza, right and left banks of the Tisza, territory between River Maros and Tisza, Transylvania and Croatia) were created by Károly Keleti – head of the Hungarian Statistical Office – in the 1880s for grouping and publishing the data in censuses. (Map 2) Naturally, these areas cannot be described as homogeneous agrarian districts. The comparison among their agricultural production is unnecessary and senseless, as they integrate regions with totally different agrarian conditions. We would like to make this evident with some examples: in Békés county – which lies at the left bank of Tisza – the cadastral net income of landed property per acre are 1505 fillers, while in Máramaros[6] it is only 86 fillers. In proportion to one another, every region carries these extreme values in itself. (Map 1) E.g. the cadastral net income of landed property per acre is 1125 fillers in Pozsony[7], while in Árva[8] it is only 160 fillers. In Croatia, the two extremes are represented by Szerém[9] (1244 fillers) and Lika (69 fillers). Since the majority of monographs dealing with the Hungarian agriculture during Dualism have followed this classification, we considered it essential to broaden the knowledge, which have been accumulated in connection with this topic so far. However,

[6] Maramureş – contemporary name (Map 1 shows the counties in pre-1918 Hungary), now in Rumania.

[7] Bratislava (county) – contemporary name.

[8] Orava – in Slovak, now in Slovakia.

[9] Srijem – in Croatian, now in Serbia and Croatia.

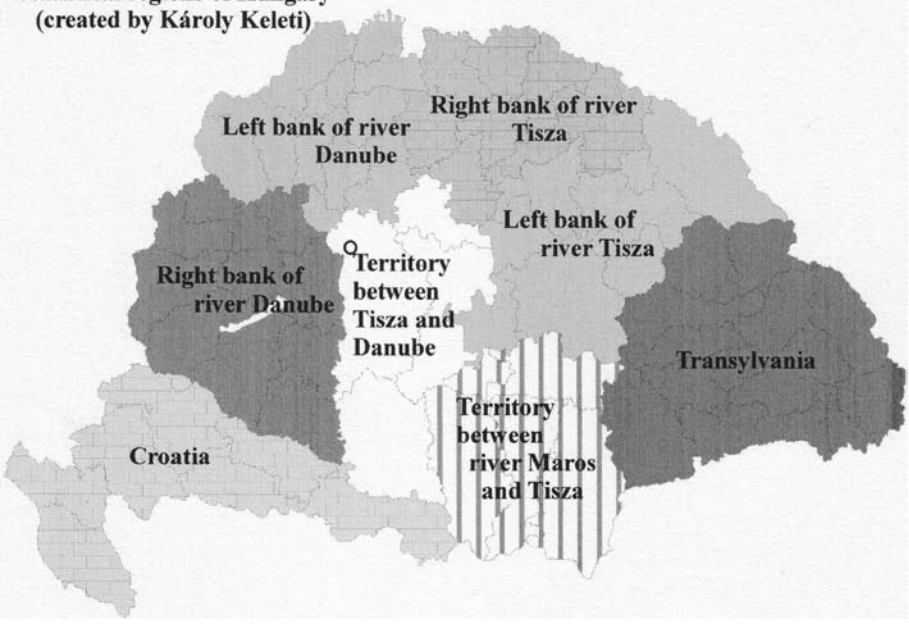
due to the above-mentioned reasons, the summary introducing certain regions has been neglected in this dissertation.

Map 1

Administration of Hungary by counties in 1910

Map 2

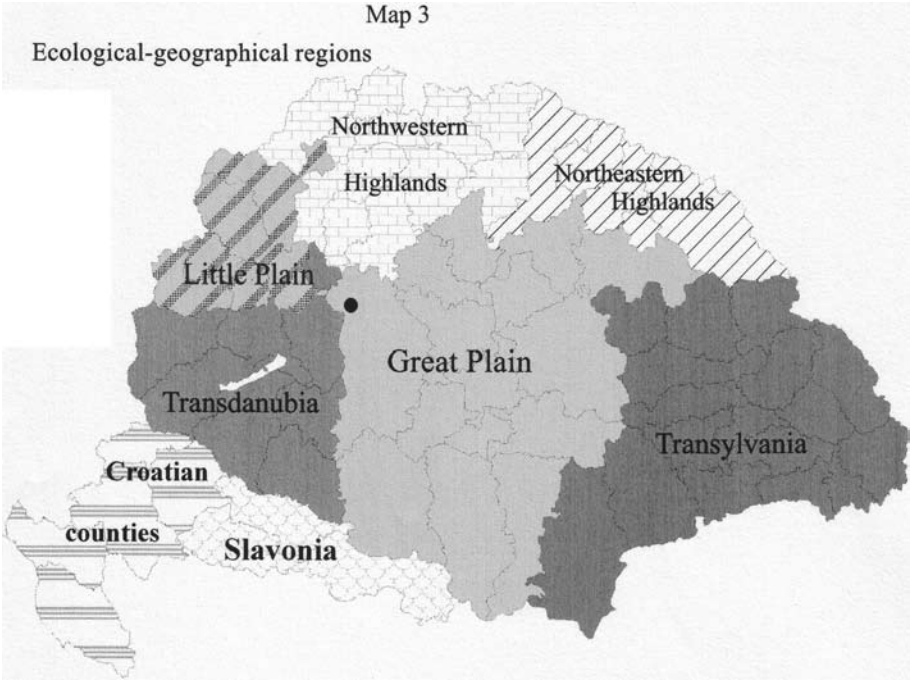
Statistical regions of Hungary (created by Károly Keleti)



Ecological-geographical regions

Ecological-geographical regions (Map 3) have been studied according to the classification of Ferenc Fodor[10]: Little Plain, Transdanubia, Great Plain, North-western Highlands, Northeastern Highlands, Transylvania, Croatian counties and Slavonia. Sharp dividing lines can be traced within these 8 geographical regions on the basis of cadastral net income of landed property and the distribution of land use by cultivation. One of the groups (Transdanubia, Little Hungarian Plain, Great Hungarian Plain and Slavonia) is homogeneous; differences within its regions are small, while the other group (Highlands, Transylvania, Croatian counties) behaves the other way. On the other hand, the averages of the more homogeneous group remarkably surpass the national average in case of most variables, the averages of the other group are much lower than that. Interestingly enough, members of these two groups of the ecological-geographical regions get often mixed up with each other in case of several variables. The North-western Highlands and Slavonia often change places with each other, which obviously can be explained by historical reasons. The North-western Highlands, for example, had always been a densely-populated and steadily developing area. During the Ottoman occupation, it was integral part of the Kingdom of Hungary and had been well-known about its colourful and highly-developed culture. We can say that these advantages in some respects were able to counteract the unfavourable geographical conditions of this territory. The North-western Highlands was not only in close territorial connection with the Little Plain but – together – they functioned as the second largest industrial area of the

Map 3



[10] Fodor, Magyarország mezőgazdasági földrajza, I slightly modified the regions.

country in the second half of the 19th century. For this reason, the proportion of the agrarian population was the lowest in these two regions (North-western Highlands, Little Plain) as opposed to Slavonia, where these indicators proved to be much higher than the national average. Both regions can be characterised by possessing extended woodlands. 30% of Slavonia and 40% of the North-western Highlands were covered by large forests. Values of cadastral net income of landed property per acre and per one member of the agrarian population expressively indicate that the North-western Highlands had to cope with the least favourable geographical conditions. Nevertheless, this region managed to react to the challenges of national and international economy successfully. Animal husbandry came into focus, mainly cattle were raised as dairy animals for milk and other dairy products, and this was reflected in the changing structure of crop production as well. Slavonia, however – similarly to the Great Plain – was characterized by monocultural crop production (wheat, maize), while the territory of North-western Highlands tried to adjust to market conditions by cultivating hay and sugar beet. Although the density of livestock was the largest in Slavonia and this region had belonged to the traditional hog raiser regions, the combination of cattle breeds did not supply the demands of market at the beginning of the 20th century. Impacts of the extensive animal husbandry reacted upon the crop production, too, because it did not secure the fertilising of plough-lands. While Slavonia possessed more draught animals, than the North-western Highlands, the latter one proved to be more developed in terms of productive forces, both of traditional and modern means of production. Furthermore, both the structure of workers and their level of schooling in the North-western Highlands enabled them to adopt modern technology. The survival of *zadrugas* almost everywhere in Slavonia resulted in a narrowly-spread paid work mainly employed in the largest estates. Literacy and schooling level of agricultural workers proved to be much lower in Slavonia than in the North-western Highlands, where they surpassed the national average.

We may draw similar conclusions in case of the other 3-3 regions: geographical conditions attached by different economic and social policy strongly determined the opportunities of certain regions. These factors often influenced the investments of capitalist economy (e.g. railway constructions). Regions that realized the importance of market potentials in agrarian production and the standard of labour-force was suitable to compete with the economic challenges from outside managed to rise above the others, even if their geographical conditions were least favourable. This is clearly evident in case of the three more developed regions. Between the two regions enjoying the most advantageous geographical conditions, the Great Plain had still preserved its monocultural crop production (wheat, maize) at the beginning of the 20th century. On the other hand, the Little Plain had switched over to a refined cultivation structure. Furthermore, animal husbandry had been developed to an equivalent sector to crop production. *The multiple disadvantage of the population of the peripheries – North-eastern Highlands, Transylvania, Croatian counties – were due to several factors. Apart from the ecological-geographical conditions of the periphery, the working culture of their population – rooted in*

historical traditions – also prevented the evolution of modern, market-oriented production. Moreover, the absence of necessary investments and the inadequate and rigid agricultural production (e.g. one-sided corn-production on the slopes of alpine pastures of the Northeastern Highlands instead of stock-raising and dairy-farm) *resulted in the backwardness of these peripheries*.

To sum up the agricultural production of the ecological-geographical regions it is the value of crop production per one agricultural earner, per one agricultural inhabitant and per acre of intensively cultivated land that mostly determine the development level of these regions. This statement is prevalent in regional level. At the level of counties – (e.g. Brassó[11] county) – it might have occurred that the quality of human resources successfully counterbalanced the harsh geographical conditions. In case of Slavonia, Transylvania and the North-western Highlands, our observations indicate that human element is able to influence the development-stage of historically-formed working culture as well as the organization of work (*zadruga*). We suppose that the following statement is valid not only for the industrial sector but also for the agriculture: *"Environment is only one among those variables which affect the activity of men. Even the richest territories remain undistinguished, if human beings do not utilize them."*[12]

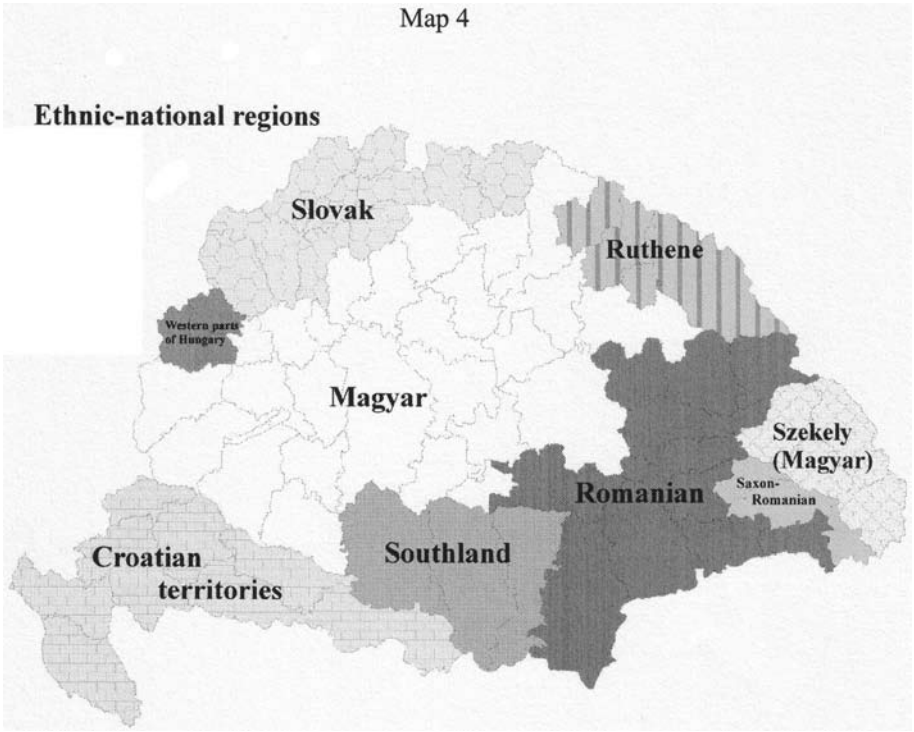
Ethnic-national regions

If the agricultural system is examined according to ethnic-national regions[13] (Slovak, Ruthene, Romanian, Transylvanian Saxon, Magyar, Szekely and Croatian territories as well as multi-ethnic regions of the Southland and the western parts of Hungary), two clearly separable groups of regions can be recognised on the basis of geographical conditions. (Map 4) In the western and southern parts of Hungary, as well as in the counties inhabited by Magyars the features of terrain, climate and soil-conditions proved to be favourable for agricultural production. The situation of the Slovak, Szekely, Ruthene, Transylvanian Saxon and Croatian regions was more disadvantageous. The region of 28 counties inhabited by mainly Magyars (representing 79% of the total population of the region) takes the third rank considering all (agrarian) indicators, preceded by the West of Hungary and the Southland (with a great difference). Both regions (West of Hungary, Southland) taking the first and second rank as well as achieving the best results in agriculture were multi-ethnic and multi-cultural. Moreover, they both had well-developed infrastructure as well.

[11] Braşov – contemporary name.

[12] Mcguire, A vállalkozási magatartás, p. 282.

[13] Katus, Über die wirtschaftlichen, p. 149–216. On the basis of the 1900 census Katus created 'homogeneous' ethnic-national regions where one ethnic group exceeded 50%, however 3 out of his regions became 'mixed' regions, because none of the ethnic groups living there exceeded 50%. I slightly modified his classification: I cut the Magyar ethnic region consisting of two regions separeted from each other into two: the Szekely region and the Magyar region. (Map 4)



In case of some indicators, the Southland managed to surpass Western-Hungary, for example, the amount of income generated by one property is the highest in the Southland. Yet, if all indicators are taken into consideration, we have to admit that the Western parts of Hungary – inhabited by Magyar, German and Croatian population – were able to draw the biggest profit from the geographical conditions. They managed to reorganize their agriculture to become versatile and market-oriented. Not only one branch of production (cultivation of plants) – and not only the cultivation of one plant species – got improved; crop production and animal husbandry both played important role. Besides the cultivation of corn, growing of fodder-crops was essential, as well. In addition to satisfy the demands of food industry sugar beet was also cultivated. Within animal husbandry, the manufacturing of milk and dairy products gained importance, as it had to meet the needs of the growing population of cities and towns. Moreover, the growing demand of wool breeding of sheep got an essential role again. Due to the structure of crop production and manorial farming – established and shaped by the Batthyányi, Széchenyi and Esterházy families from the second half of the 18th century – two different types of hired workers can be observed. In Western Hungary, manorial villains were replaced by yearly hired workers (they were more defenceless than day-labourers, but at the same time their life and job were more secure than that of the day-labourers). Due to the nature of maize-production and viniculture in the Southland, day-labourers were employed at mainly medium-sized farms, owned by peasants. It must be added that only educated workers were able to modernize certain branches of the economy. They had a chance to get to know and use

up-to-date methods and agricultural implements as well. The two regions were different from each other in this respect, too; for the benefit of Western Hungary.

On the basis of cadastral net income of landed property per one person, geographical conditions of Slovak, Croatian and Szekely agrarian regions as well as Rumanian, Saxon and Ruthene counties were disadvantageous. The favourable position of the Croatian and the Slovak regions is indebted to the fact that northern parts of the Little Plain (to the Slovak region) as well as Slavonian counties (to the Croatian region) were territorially connected to them. On the other hand, these regions represent the two extremes in connection with one of our most substantial indicators, the productivity of labour-force. Due to the traditionally different type of agriculture (*zadruga*-system, large scale of female labour), the high density and also the high proportion of the agrarian population in addition to the different cultural level of the agricultural workers proved to be divergent. In the Slovak region, where the degree of supply with draught-horse was fairly low, human resources were able to counterbalance the harsh circumstances. Thus, among the 6 disadvantageous ethnic-national regions, this area managed to gain the first rank – by surpassing the national averages – as a consequence of the efficiency of labour-force. In Croatia, however, where the supply with draught-horse was one of the highest, the gross production value per one agrarian worker proved to be the lowest in the whole country. Saxon region also belonged to those areas, which reached high – or sometimes the highest – average yields by employing efficient labourers, up-to-date technology and traditional work culture. Although, the cadastral net income of landed property was the lowest in the Szekely region, the productivity of labour-force managed to counterbalance this in some aspects. The Ruthene region's opportunity for closing up appeared to be modest due to several factors. On the one hand the ecological-geological conditions of the region was the worst of all. On the other hand, farming and husbandry failed to adapt these conditions. Finally, the procedures of the emancipation of serfs also failed to adjust to the geographical conditions of the region. All geographically disadvantageous ethnic-national regions belonged to the peripheries of Hungary, which means that crucial capital investments – i.e. construction of railways – did not reach these regions. During this period, infrastructure played an essential role in the development of modern economy in finding new markets and in the establishment of industrial units. The urgent need of railways emerged mostly in the case of Ruthenian, Szekely and certain Romanian regions. Furthermore, shortage of capital contributed to the inadequate quality and quantity of capital equipment, too. Last but not least, industrialisation was also an important factor in taking West of Hungary ahead of the Southland. The situation was similar concerning the relative advantage of the Slovak and to some extent the Saxon regions opposite to the Ruthenian, Croatian and Romanian areas.

The different agricultural structure of the ethnic-national regions cannot be traced back to government policies. We have a large amount of data indicating how the state administration supported financially and institutionally the peripheries to improve and modernize their agriculture during the 1890s. "Since the first wave of

industrialization had already reached the northern and the eastern regions during the 1880s, the closing up of peripheries – inhabited overwhelmingly by national minorities – had begun to the average economic development of the country […] The industrialization of the ethnic-national regions was highly facilitated by state subsidies, as the majority of industrial subventions were brought to these areas."[14]

Besides ecological-geographical conditions, the level of agricultural production was influenced on a large scale by human resources and work culture. At the same time, our research confirmed the observation of contemporary economic and scientific experts, namely that *the living standard of certain groups of people – belonging to the same ethnic minorities but living in different parts of the country – was different* (e.g. Serbians in Baranya County and in the Southland, Romanians in Transylvania and in the Southland). In the case of Romanians, this supposition is sustained by facts of common knowledge reported by the historiography. At the turn of the 19th and 20th century, the centre of Romanian political, economic and social life shifted from the southern parts of Transylvania to the regions of Banat and the Great Plain which were inhabited by Romanian people.

On the other hand, one well-known viewpoint of international literature was reinforced in our research, too.[15] *"People vary from their fellow companions because their surroundings, culture and society is different. Simultaneously, if people of different ethnic origin are exposed to similar influences, they would behave similarly."* Our conclusions are not in contradiction because in agriculture – in the same way as in economy and in the whole society – "accumulation of time and knowledge is the primary factor which calls forth the transformation." *Besides the previously-mentioned factors, this time-factor was one of the most important reasons for the cultural delay of and the difference among certain regions' level of development.*

The net production value of agriculture

In our study, we estimated the value, agriculture – and its three branches (tilling of arable land, wine-culture and animal husbandry) contributed to the amount of Gross Domestic Product with. Since several experts have already carried out similar calculations, this value – concerning the national level – is well-known in case of the years preceding the First World War. The merit of our work is the calculation made on the scale of counties. Based on the literature on the methodology of regional economic analysis, the amount of GDP per capita produced by certain branches of economy are the best indicators of economic growth. Per capita income brought out by different regions gives the impression of the effectiveness of production carried out in that particular region. It also shows its degree of supply with material and intellectual goods. To conclude, all these factors are able to indicate

[14] Katus, A nem magyar népek gazdasági és társadalmi helyzete p. 1004.
[15] Mcguire, A vállalkozási magatartás, p. 293.

the region's level of development. We managed to obtain the most comprehensive synthetic indicators, which are inevitable to decide which factors led to the forming of the regional structure of the Hungarian agriculture. We calculated the *gross and net production value* created in agriculture and in its three branches. We also calculated these values in relation with the agrarian population, with the people employed in agriculture and to the amount of cultivated land.

The net value of agriculture per one member of the agrarian population and worker proved to be the highest mostly in the counties of Transdanubia and the Great Plain. In addition to them the Saxon Brassó (Transylvania) and Abaúj-Torna, Szepes (in the Northern Highlands) turned out to be the most productive and developed counties. On the other hand, among the 20 least developed counties no other regions then Transylvania, Croatia and the North-eastern Highlands can be found.

In the agriculture of the most developed counties, crop production was dominant. Viniculture's contribution to the net production value exceeded 10% in 5 counties (Heves, Pest, Esztergom, Tolna, Varasd[16]). In 39 counties – out of 71 (55%) – more than half of the agriculture's net production value was given by animal husbandry. Among these 39 counties, only 7 counties managed to surpass the national average in terms of net production value per capita, while the other 32 belonged to those counties whose accomplishment turned to be the poorest. Almost all of them had to cope with harsh ecological-geographical conditions, which mean that their cadastral net income of landed property calculated to one acre is low and the proportion of meadows, pastures and forests is high. This means that people in regions – with unfavourable geographical and climatic conditions – were forced to make their living mainly from livestock farming. Though, in the majority of these counties, the net value of agriculture per one member of the agricultural population and worker turned to be low which indicates the failure of livestock farming to fill the gap made by the low income of crop production in these areas. Which counties were successful among the stockbreeder counties and why? The answer is inevitable: where the productivity excelled the national averages. Some counties situated in the Highlands (Zólyom, Sáros, Szepes, Gömör, Liptó[17]), and Brassó[18] in Transylvania, which got even into the 20 most developed counties. Moreover, in case of the value of the animal product per capita it managed to gain one of the first ten ranks.

In regional terms, the contribution of animal husbandry was above 50% in Transylvania, in the Highlands and in the Croatian counties (64%). It approached 50% in Transdanubia, as well. Among the ethnic-national regions, animal farming proved to be the most important sector in the Ruthenian, Romanian, Szekely and Croatian counties. Among the geographical regions, Transdanubia, Slavonia, the Little Plain and the North-western Highlands surpassed the national average regarding the net value of stockbreeding per capita and per one wage-earner. Concerning the ethnic-national territories, the Western parts of Hungary, the region inhabited

[16] Varasd – Varaždin, now in Croatia.
[17] All of them now in Slovakia (Zvolen, Šariš, Spiš, Gemer, Liptov).
[18] Brassó – Brăşeu now in Rumania.

predominantly by Magyars, the Southland and the Transylvanian Saxon counties excelled the national average.

Moreover, we employed other methods to be able to compare the level of development of the counties with each other or with the national average. Out of 700 indicators available, we chose 146 variables which seemed to be the most suitable ones. The values of each variable are expressed with an index-number compared with the national average. After that, the average of the 146 indicators was calculated in case of each county one by one. The first ten ranks of the gained index-series are occupied by counties situated in the Little Plain and in Transdanubia (Moson, Sopron, Pozsony, Komárom, Esztergom, Győr, Nyitra, Fejér, Baranya, Tolna[19]). As a next step, we compared this rank order with the similar series of net production value per one acre and one agrarian inhabitant and with the series of gross production value per one acre and per one wage-earner. On the basis of the most important synthetic indicators of agriculture 16 counties reached the highest stage of development. Among them, seven were situated in the Little Plain (Moson, Sopron, Pozsony, Nyitra, Győr, Komárom, Esztergom) and three (Bács-Bodrog, Torontál, Békés) in the Southland. Four counties lied in Transdanubia (Fejér, Somogy, Tolna, Baranya), one (Brassó) in Transylvania and one (Szepes) in the Northern Highlands. In case of all three indicators, the agriculture of Moson county occupies the first place in the rank order. In the last 20 places of the county-rank order – in all three indicators – Transylvanian, North-eastern and Croatian counties are found.

Correlation-analysis shows us, that the profitability of agriculture (net production value per one agrarian inhabitant) is determined by the productivity of labour, more precisely by the efficiency of crop production. The efficiency of crop production was predominantly depended by ecological-geographical conditions and the supply with arable land. Factors, which were connected to the modernization of agriculture (hired work, tenure, cultural level of labour-force, amount of mortgage loan, insured values, railroad-density, and proportion of estates above 100 acres), also played important role. While up-to-date, intensive animal farming became more and more widespread at the beginning of the 20th century, the most important positions in the agricultural sector were still occupied by medium-sized farms and large estates which were adopting themselves to the changing conditions of capitalism.

The regional structure of the agriculture based on factor and cluster-analysis

Factor analysis and cluster analysis were carried out in various forms in terms of the entire agricultural sector – crop production and animal farming as well – with the initiation of 20–40 variables.

[19] Pozsony (Bratislava) and Nyitra (Nitra) now in Slovakia.

Factor-analysis – performed *to reveal the regional structure of crop production* – condensed the information content of the 38 original variables into 7 factors which altogether explained 83.5% of the variables' squared standard deviation. In *the first factor* – possessing an explanatory percentage of 44% – variables concerning the productivity of crop production as well as the size of the cultivated land per one earner are of greatest importance. This indicates the efficiency of crop production, on the one hand, which played important role in the forming of the regional structure of the Hungarian agriculture. On the other hand, productivity of work mainly depended on the degree of supply with arable land. Nevertheless, those variables are attached to the main factor with a considerable factor loading, which denote that agriculture had already started to become capitalized and market-oriented. This process is clearly visible, if we take a look at e.g. the proportion of paid workforce and land-leasing, the number of draught animals and insured values per one agricultural labourer, the amount of mortgage loan per one acre, the railroad-density, the proportion of merchants and motorization and the cultural level of workforce. It turns out that geographical conditions are still important, though they are not able to play an essential role in the agriculture of highly-developed regions any more. It is not surprising, that developed, market-oriented and capital intensive, profitable agriculture came into existence in those counties, where the proportion of large estates (above 100 acres) was relatively high. Counties, where highly developed and intensive farming became dominant, were situated – almost without exception – in the Great Plain (Bács-Bodrog, Torontál, Temes, Csanád, Csongrád, Békés, Jász-Nagykun-Szolnok, Hajdú and Szabolcs) and in Transdanubia (Moson, Győr, Komárom, Fejér). Among those counties, which were situated in the Highlands, only Szepes managed to join with this group.

The following three factors emphasize the roles of meadow farming (and animal farming as well), the structure of corn and viniculture in the forming of the structure of crop production. *Meadow farming* played an essential role among the mountains of Transylvania (Csík, Brassó, Fogaras, Szeben, Udvarhely, and Nagy-Küküllő) and in the high mountain ranges of the Highlands (Zólyom, Máramaros). Farming of these regions was characterised by big proportion of fallow and forests. Moreover, the predominance of small estates can be observed here, as the method of farming remained on a traditional level. Two types of regions can be distinguished with the help of the third factor, characterised by the *structure of corn*. In the first group, wheat and maize took the most outstanding role. Counties situated in the southern and eastern parts of the Great Plain (Torontál, Temes, Bács-Bodrog, Csanád, Békés, Jász-Nagykun-Szolnok, Arad) as well as Transylvanian counties (with the exception of Csík, Háromszék and Fogaras[20]) belong to this group. In case of the other group, the structure of crops was characterised by the predominance of potato, barley and oat. Counties belonging to this type lied in the Northern Highlands: Árva, Liptó, Trencsén[21], Sáros, Szepes and Zólyom.

[20] Csík – Ciuc, Fogaras – Făgăraş are in Rumania now.
[21] Trencsén – Trenčin now in Slovakia.

The largest *wine-growing* regions were situated in the middle of Hungary, along the two banks of River Danube (Baranya, Tolna, Esztergom and Pest) together with the North-eastern counties (Heves) and with Csongrád and Szerém[22] in the south. Zala was a typical wine-growing county among the south-western regions of Transdanubia, as well. The fifth factor describes the productivity and the yield of arable-lands, as it is in close connection with the gross production value per one acre. The sixth factor separates the production zones of industrial crops: counties situated in the Little Plain (Nyitra, Trencsén, Pozsony and Sopron) in the West of Hungary as well as in the eastern part of the country (Csanád, Hajdú, Szabolcs, Zemplén and Brassó). Variable indicating the proportion of field fodder is closely connected to the seventh factor. In geographical terms, several regions belong to this group. The transitional zone between the Great Plain and the Northern Highlands (Bars, Hont, Nógrád, Gömör and Abaúj-Torna), Fejér, Somogy, Zala, Vas and Veszprém counties in Transdanubia, and finally Háromszék, Nagy-Küküllő from Transylvania are connected to this factor.

Factor-analysis – performed *to reveal the regional structure of animal husbandry* – condensed the information content of the 22 original variables into 5 factors which altogether explained 81.3% of the variables' standard deviation. The explanation percentage of the first factor is 37.3%. In case of the second factor, it is 18.3%, 10.8% in the third, 9% in the fourth and 5.9% in the sixth.

The first factor describes the basic structure of animal husbandry comprehensively, because it clearly distinguishes between two types of livestock farming. On the one hand, *livestock farming* – mainly lard pig – was a *supplementary* section of intensive, profitable crop production. However, merino sheep were bred in large quantities as well. Draught animals were predominantly provided by horses in these counties. Field crops (mainly maize, oat and barely) were dominant in the fodder base. This model of animal husbandry characterised several counties of the Great Plain (Torontál, Temes, Bács-Bodrog, Csanád, Csongrád, Békés, Arad, Pest, Jász-Nagykun-Szolnok and Hajdú), the two counties in Slavonia (Szerém and Verőce[23]) and Baranya in the south of Transdanubia (northern neighbors of the Slavonian counties). On the other hand, counties where *livestock farming* was the *predominant* factor in the net agricultural production cattle-raising and sheep-farming – breeding of the racka-sheep and meat-sheep – played an important role. Meadows were dominant in the fodder base (Transylvania, Northern Highlands, Croatian counties).

The 2nd factor separate the predominant live-stock farming model into two types, as their territory circles around (from the East to the West) the Great Plain. In counties situated in Transylvania and in Eastern-Hungary (Alsó-Fehér, Fogaras, Kis-Küküllő, Háromszék, Udvarhely, Csík, Maros-Torda, Torda-Aranyos, Kolozs, Szolnok-Doboka, Szilágy, Ugocsa, Bihar, Szabolcs, Szatmár) primarily Hungarian cattle (this type was raised rather for meat than milk) were raised. In certain

[22] Szerém – Srijem in Croatia now.
[23] Verőce – Virovitica, now in Croatia.

counties, buffalos and racka-sheep were held in great numbers (Fogaras, Nagy-Küküllő, Brassó, Szeben, Kolozs and Szolnok-Doboka, Szilágy). Fodder base was given mainly by hayfields and pastures in these areas. In several counties lying in the eastern and North-eastern parts of Hungary (Bihar, Szatmár, Szabolcs, Hajdú, Borsod), Hungarian cattle were raised with merino sheep and swine were bred, too. In other counties of the cattle-area, dairy-cattle were dominant, i.e. in the Highlands (Trencsén, Turóc, Zólyom, Árva, Liptó, Gömör, Sáros, Szepes, Hont, Nógrád, Ung, Máramaros), in the Little Plain (Bars, Nyitra, Pozsony, Moson, Sopron), in Transdanubia (especially in its western counties like Vas, Zala, Veszprém, Somogy), several counties of Southern Hungary and in the Croatian counties. Besides dairy-cattle, mainly meat-sheep and pigs for their meat (rather than for fat) were also raised in these areas. In several counties situated in the Highlands, breeding of racka-sheep was considerable, too. In those territories, were dairy-cattle were bred – especially in Transdanubia and in the Little Plain – field growing of fodder-plants become more and more widespread. This type of plants as well as the spreading of cooperative creameries (characterising mainly Transdanubia) refer to the presence of an intensive animal farming. Factor loadings prove that breeding of dairy-cattle was more profitable, than Hungarian cattle. According to the third factor, animal husbandry yielded the highest income in Transdanubia (Somogy, Moson, Győr, Fejér, Baranya) and in the Highlands (Gömör, Szepes, Zólyom, Liptó). In Transylvania only Brassó county.

The fourth factor is the so called "sheep-factor", which indicates that the fodder base of sheep-breeding is assured by pastures. The largest flocks of sheep were grazing especially among the southern, eastern and northern ranges of the Carpathian Mountains and in the territory of the Croatian Karst (Hunyad, Szeben, Fogaras, Beszterce-Naszód, Krassó-Szörény, Liptó, Gömör and Lika-Krbava). Pasturing was essential in the Great Plain, in Hajdú county (Hortobágy) as well. *The fifth factor* denotes the close connection between the raising of merino sheep and lard pigs. This is a typical characteristic feature of big landlord farming, because the proportion of estates – over 100 acres of cultivated land – connected with this factor is significant (Fejér, Somogy, Szabolcs, Veszprém and Nógrád counties).

Finally, with the help of factor-analysis, we examined the elements determining *the regional structure of whole agriculture*. Besides the most characteristic variables concerning crop production and animal husbandry, we paid attention to all those variables that indicate the modernisation and capitalisation of agriculture. The principal component analysis carried out with 36 variables produced 7 factors, which altogether explain 83.7% of the variables' standard deviation. The extremely high eigenvalue of the first factor (17.70) indicates that its explanation percentage reaches as high as 49.2%, which is far higher than that of the 6 other factors' altogether. *The principal factor* is closely related to 6 variables (factor loading is over 0.7). Apart from this, 9 variables are linked with the principal factor (their factor loading is between 0.5 and 0.7). The principal factor expresses the complexity of the whole system. It indicates that both crop production (mainly arable land farming) and animal husbandry played essential roles in the forming of the regional

structure of Hungarian agriculture. On the other hand, these two sectors clearly separate from each other regionally and also in terms of their characteristic features and their level of development. Variables indicating the modern and effective way of farming are in close connection with the predominance of field growing. These are variables denoting labour productivity and profitability, i.e. gross production value calculated to one earner and net production value per one agricultural inhabitant. Modernization related to tilling of arable lands are shown by the relatively high factor loading of such variables as the amount of mortgage loans and insured property per one acre, the ratio of land leases and paid work, the usage of machines and the railroad-density. Factor loadings point out that consolidation of land holdings took considerable progress and the majority of fallow lands were broken up in those areas where crop production was the most developed. Favourable geographic conditions also contributed to the efficiency of crop production. This is reflected by the factor loading indicating the cadastral net income of landed property per one acre (0.61). Nevertheless, the aspect of geographical conditions had already lost its primary importance, which is obvious from the growing amount of mortgage loans variable and from the importance of paid work. Variables, such as the cultural level of workforce and the motorization as well as the railroad-density and the ratio of merchants (the latter ones both expressing close relations with the markets) are also essential. Mainly medium-sized farms and large estates are characterised by profitable crop production. Among animals, horses and pigs were attached to this factor with a relatively high positive factor-loading. By analysing the principal factor it turns out that certain features characterising traditional farming (high proportion of fallow land, lack of the consolidation of land holdings) continued to live in those territories, where the majority of net income sprung from animal husbandry. Neither of those variables denoting the degree of modernization correlates with variables which indicate the prevalence of animal husbandry and meadow-farming. While profitable crop production can be described with the breeding of horse and pig, typical stock-breeder areas can be characterised by the predominance of sheep and cattle. While the model of profitability can be observed in the Little Plain and in the southern areas of the Great Plain (Csanád, Békés, Torontál, Bács-Bodrog, Arad, even Jász-Nagykun-Szolnok, Hajdú as well as Moson, Sopron, Győr, Nyitra, Pozsony, Bars, Trencsén, Komárom and Esztergon), Transylvania as well as certain counties of Croatia and the Highlands belong to the model of traditional animal breeding.

The second factor clearly emphasises the role of viniculture in the shaping of the territorial structure (10%).

However, *the third factor* is more or less related to a dozen variables. This factor demonstrates that regions practising effective and up-to-date animal husbandry occupied large territories between zones characterized by either developed crop production or traditional, unprofitable animal farming. In these areas, livestock density and the considerable amount of income – originated from animal farming – were closely interlinked with developed crop production. This means that modernization of agriculture made considerable progress in these regions (leases,

railway-density, particularly outstanding cultural level of workforce). Counties which can be characterised by this model are lying in Transdanubia and in the south-western Highlands (Moson, Somogy, Győr, Baranya, Veszprém, Sopron, Szepes, Zólyom, Liptó and Gömör). Brassó, which is situated in Transylvania, belongs to this group as well.

While the third factor highlights livestock-density per one inhabitant, *the fourth factor* is related – with high factor loading – to the variable indicating livestock-density per one acre of the agricultural territory. This relatively big livestock-density per one acre is linked with high profit of crop production and with up-to-date methods of cultivation. Certain counties lying in the Little Plain, in Transdanubia and in Croatia can be described with this model. Brassó in Transylvania belongs here as well.

The fifth factor is also an animal-factor, stressing horse-breeder and hog-raiser counties of the southern part of the Great Plain along with large draught-horse supply with their developed wheat-growing and mechanical threshing of crops.

The sixth factor emphasises the role of pastures in Transylvania and in the south-western region of the Highlands (Liptó, Trencsén, Zemplén). Counties situated in the territory of Croatian Karst (Lika-Krbava, Modrus-Fiume) along with Hajdú, Pest, Arad and Csongrád counties in the Great Plain belong them as well.

The seventh factor turned out to be the factor of "modern market-tendencies", because merchants trading with food and agricultural products belong to it with large factor loading. Variables related to modernization are also closely connected with this factor (ratio of paid work and leases, ratio of mechanical threshing, amount of mortgage loan per one acre).

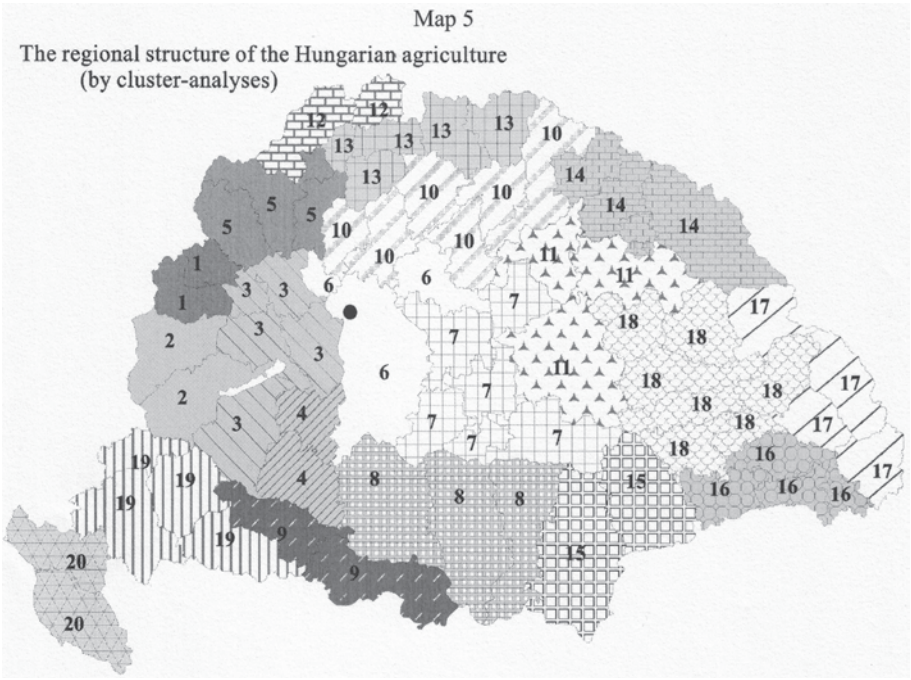
After the short description of these factors it is clearly visible, that factor-analysis highlights the dichotomy of modernizing and profitable crop production and traditional animal-husbandry as the two main characteristic features of Hungarian agriculture at the beginning of the 20th century. Furthermore, it also emphasises the significant role of modern animal-farming and viniculture. Each variable related to modernization was in close connection with the system (communalities over 0, 8), but the role of geographical conditions was important as well (communality of the cadastral net income of landed property per one acre is 0.84).

7. Factor-analyses revealed the factors that influenced the reconstruction of the regional structure of Hungarian agriculture in a comprehensive way. However, in order to classify the territorial units (in our case the counties) into homogeneous – or into analogous groups –, cluster-analysis is the most suitable method.

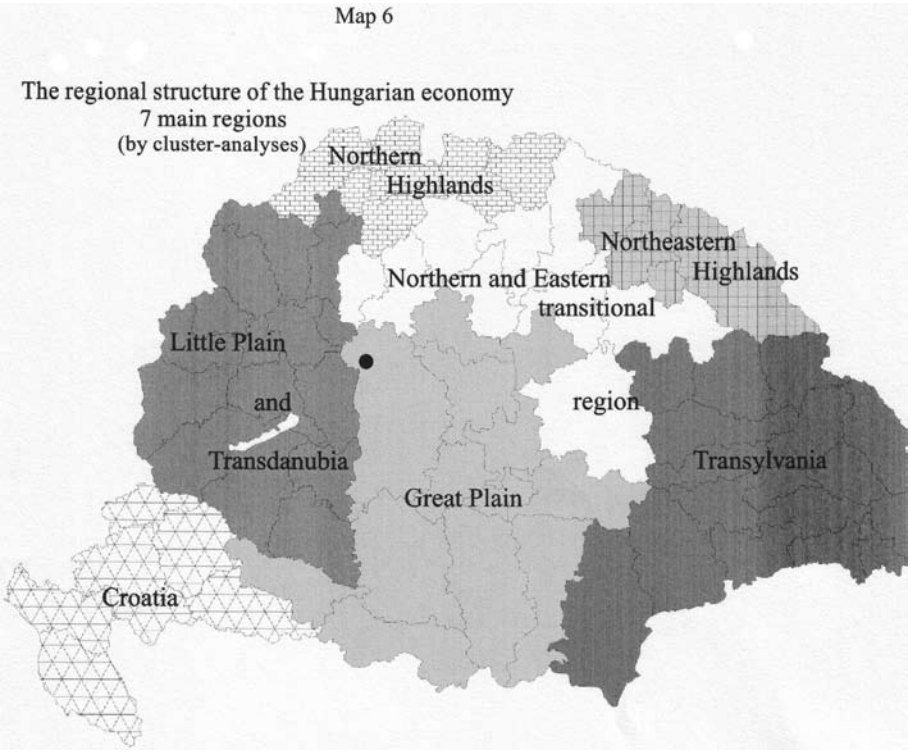
Cluster-analysis divides counties into homogeneous groups in a way that they do not form contiguous territories or regions by all means. From clusters – meaning types, rather than regions – determined by the computer, the researcher has to reconstruct larger units and regions constituting adjacent territories. We used k-means clustering, although we took into consideration hierarchical clustering dendogram, too. Regarding each group of variables we made k-means clustering with 10–25 cluster number. Our results were tested by F-testing method. Finally c*luster-analyses separated 21 contiguous territorial units based on the data of the*

71 counties in pre-1918 Hungary. Each cluster consists of 2–7 counties. Brasso, in Transylvania, stood alone in all clustering, separated from all other counties in Transylvania. It was usually attached to the Little Plain or western Transdanubian counties. However, Brasso was one of the smallest counties in pre-1918 Hungary and 40% of its inhabitants lived in the city of Brasso. This is why we finally put Brasso into the cluster-region of Southern-Transylvania where it territorially belonged (Map 5). If we diminished the number of clusters certain regions were attached into larger areas, so the 20 clusters formed 7 main cluster-regions (Map 6). The two maps show the result of our statistical analyses, the regional structure of the Hungarian agriculture in the beginning of the 20th century.

Out of the seven main cluster-regions it was Transdanubia and the Little Plain (Map 6) which comprised the agriculturally most developed and effective counties according to all variables. The most important indicators of the Northern Highlands and the Northern and Eastern Transitional Region (the 3th and 4th main cluster-regions) were around the national average, while the major values of their



1	North-western Transdanubia	11	Eastern transitional
2	South-western Transdanubia	12	North-western Highlands
3	Central-Transdanubia	13	Northern Highlands
4	South-eastern Transdanubia	14	North-eastern Highlands
5	Little Plain	15	South-western Transylvania
6	Danube-Tisza Interfluve	16	South Transylvania
7	Tiszántúl region	17	Eastern Transylvania
8	South-Great-Plain	18	Transylvanian basin
9	Slavonia	19	Croatian counties
10	Northern transitional	20	Coastline



output were not able to reach it. The 5th–6th–7th main cluster-regions, consisting of 27 counties, altogether proved to be the least developed: almost all variables were significantly lower in these three large regions than the national average.

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POVZETEK

Regionalni ustroj ogrske agrikulture na začetku 20. stoletja

Mariann Nagy

Študija s pomočjo matematično-statistične analize baze podatkov, ki vključuje skupine spremenljivk, rekonstruira in analizira regionalno strukturo ogrske agrikulture pred letom 1918. Zbrali in obdelali smo vrsto statističnih podatkov, ki zadevajo agrikulturo posameznih županij na prelomu 19. in 20. stoletja. Ustvarili smo bazo podatkov, ki zajema približno 700 kazalnikov in vključuje indekse, povezane z vsakokratnim nacionalnim povprečjem. Večina spremenljivk, t. j. 400, je razvrščena v skupine in tabelarno prikazana na nivoju županij, kar nam je omogočilo analizo tradicionalne klasifikacije regij, ki je v uporabi v madžarskem zgodovinopisju: statistične regije, etnično-nacionalne in ekološko-geografske. Poleg tega je več kot 100 spremenljivk prikazanih v digitaliziranih zemljevidih. Z odmikom od običajnega prikaza gospodarskih zemljevidov smo nameravali prikazati, če je županija dosegala stopnjo razvoja, ki se ujema z nacionalnimi povprečji, in morebitna odstopanja od le-teh. Seveda je v nekaterih primerih jasno razvidno, da razvoj posameznih županij ni dosegal nacionalnega povprečja, pri drugih pa ga je lahko presegal. Zemljevidi, priloženi poglavjem, ki obravnavajo ekološko-geografske in etnično-nacionalne regije, prikazujejo relativni vrstni red regij. Pridobili smo izčrpne sintetične kazalnike, neizbežne za določitev dejavnikov, ki so privedli do oblikovanja regionalnega ustroja ogrske agrikulture.