



## Evaluation of the Floodplain Farming of the Settlements of Nagykunság Based on the First Cadastral Survey\*

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River control was perhaps the most significant form of anthropogenic environmental intervention in the Carpathian Basin, and in recent decades it has been the focus of considerable attention in the scientific community. However, in order to be able to evaluate this intervention, we need to know more about the floodplain management before the river regulations. In this essay, I provide data concerning the eighteenth-century floodplain management, on the basis of the first cadastral survey documents. According to Klára Dóka and other researchers, the settlements of the region along the Tisza River were in crisis in the early nineteenth century because the floodplain farming system was not adequate to sustain the growing population. However, they based this conclusion on sources concerning population growth, and they did not substantiate their essential contention concerning overpopulation with accurate data on production and consumption. I have sought to determine whether there really was an overpopulation crisis in Nagykunság at the end of the eighteenth century. The main question concerns the relationship between production and needs. The next question is whether the farmers had excess grain which they could take to markets. In other words, was the floodplain farming system profitable? My research constitutes a contribution to the debate between Bertalan Andrásfalvy and Miklós Szilágyi on floodplain management. The first cadastral survey documents contain detailed and reliable data on the management of the settlements, and I contend that they are more accurate and useful than the tax censuses which were compiled at the same time. The first step in the research was to establish the average annual consumption of the population. According to the data of the cadastral survey, production exceeded the needs of the population in each settlement, and the value of the production surplus covered the tax burdens. Wheat had a marketable share of the yield, come to 30–40 percent of the total. Assuming that livestock breeding was even more advantageous, one could contend that the floodplain farming system was profitable. However, natural resources are distributed disproportionately as a result of property relations. In Nagykunság, this found its most dramatic embodiment in the *redemptus-irredemptus* contrast. There were several events in the late eighteenth century, such as the construction of the Mirhó dam and migration to Bácska, on the basis of which researchers have inferred that the floodplain farming system was in crisis, but the cadastral survey suggests otherwise. Keywords: floodplain farming system, carrying capacity, overpopulation, production statistics

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My research seeks to determine whether (and to what extent) floodplain farming was differentiated in the eighteenth century, whether it was able to satisfy the needs of the settlements, and how much marketable produce surplus was available to sell. In my study, by Nagykurság I do not mean the geographical landscape delimited on the basis of natural geographical aspects. I refer more narrowly to the Nagykur District, a political-administrative entity of eighteenth-century Hungary which formed part of the present-day Jászkarajti District. I examined the water management of the six settlements which constituted Nagykurság at the end of the eighteenth century: Karcag, Kisújszállás, Túrkeve, Kunhegyes, Kunmadaras and Kunszentmárton.

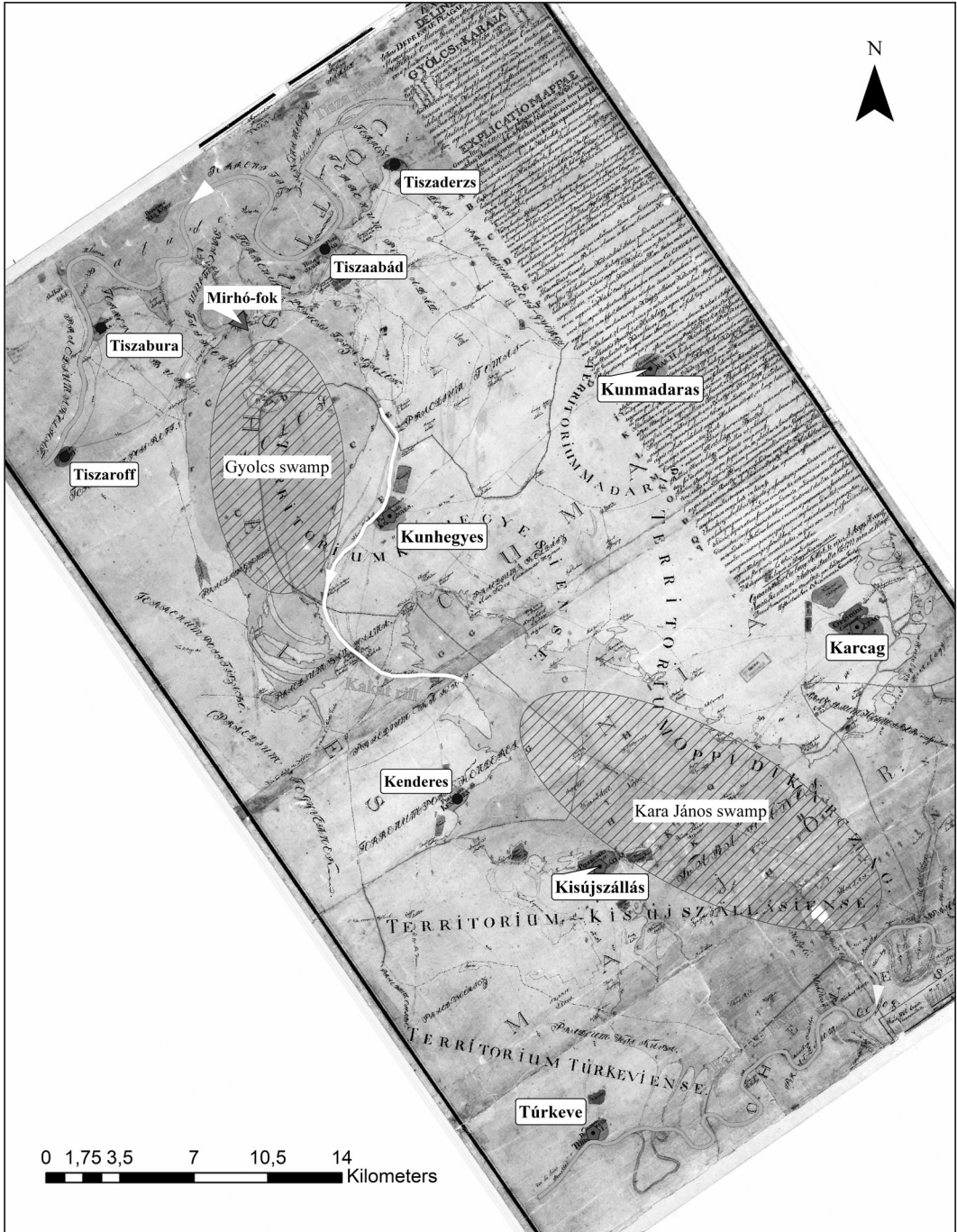
The study of floodplain farming in Nagykurság is mainly justified by the fact that the population of the area carried out the first significant water regulation works in the Central Tisza Region in Hungary (well before the great river regulations of the nineteenth century took place), the so-called Mirhó Dam. The scour channel (*fok*)<sup>1</sup> was first closed in the middle of the eighteenth century, but the rudimentary rampart erected at that time could not withstand major floods, despite frequent repairs. In 1776, the owners of Heves County demolished the rampart. They claimed that due to a decrease in the floodplain reservoir capacity, they were experiencing higher levels of flooding on the right bank of the Tisza. The settlements of the Nagykur district submitted a complaint about this almost immediately, but the permission required to reconstruct the dam was obtained only in 1785, and the rampart was rebuilt only in 1787, and even the owners of Heves County helped with the works.<sup>2</sup> The flood relief work carried out by the settlements of the Nagykur district is considered in the secondary literature, primarily works on water history, one of the antecedents of the periodic regulations of the nineteenth century, and it is mostly treated as an indicator of the crisis faced by the farming system.<sup>3</sup> Klára Dóka strove to reveal the origins of the elimination of floodplain farming by examining the farming of the settlements along the Tisza at the beginning of the nineteenth century. In her view, extensive floodplain farming faced a crisis by the turn of eighteenth and nineteenth centuries, as it could no longer meet the needs of an increasing population, which prompted the communities to

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1 *Fok*: scour channel, stream bed, channelising water flow from the river onto floodplain during floods and draining it back during the falling stage.

2 On the history of the construction, see: Sugár, *A Közép-Tiszavidék két kéziratot térképe*, 53–57; Szabó, “A ‘Mirhó-gáttjának’ építése.”

3 Károlyi, “A magyar vízi munkálatok rövid története,” 59; Fejér, *A vízjárások 200 éve*, 17.



Map 1. Hydrographic conditions of Grand Cumania (Nagykunság) at the end of the eighteenth century. Map drawn by the author using the following map: JNSZML T30.

transform the previous system and intervene in the environment.<sup>4</sup> However, based on my research carried out in recent years, I have considerable doubts about the need to eliminate floodplain farming behind the construction of the Mirhó Dam.<sup>5</sup> The construction of the dam in 1786 alone cannot be considered evidence of overpopulation,<sup>6</sup> it is necessary to assess the economic condition of the settlements, i.e. to carry out a production-need-based study.

### *An Outstanding Source: The First Cadastral Survey*

During the period of enlightened absolutism, many valuable sources were created in connection with the economic, social, and environmental conditions of the country, of which, from the perspective of the questions at hand in this essay, the census and the military and cadastral survey should be highlighted. Of these, the cadastral survey is a lesser-known source, which is mainly due to the territorial mosaic character of the preservation of documents, as most of the documents created in preparation for the sharing of public burdens fell victim to the resistance of the estates after the emperor's death.

The documents are valuable in part because they strove for completeness (i.e. they recorded all lands, regardless of whether the owner had tax exemption) and in part because they are based on cutting-edge statistical methods (homogeneous data structure, averaged data, etc.) and the survey was conducted professionally (through a well-established institutional system and by qualified engineers). We are well acquainted with the process according to which the survey was conducted, as the survey instructions<sup>7</sup> survived and through the thorough exploratory work of statistician Zoltán Dávid.<sup>8</sup> These are a great help in assessments of the reliability of the data.<sup>9</sup>

In the area under examination, a complete survey document survived only in connection with Kunszentmárton.<sup>10</sup> As for the other five settlements, only the so-called summary sheets are available.<sup>11</sup> However, such sheets also survived

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4 Dóka, "Gazdálkodás a Tisza árterein."

5 Rózsa, "A 18. századi árvízmentesítések vizsgálata."

6 The needs of the population exceed production.

7 MNL OL P. 6. 1. 21.

8 Dávid, "Magyarország első kataszteri felmérése."

9 For a source-critical analysis of the first military survey, see: Rózsa, "Az első kataszteri felmérés környezettörténeti forrásértéke."

10 JNSZML V. 1900. 792.

11 JNSZML IV. 2. 76.

in the case of all the settlements in Kiskunság and Jászság, which thus make possible a comparative analysis. In the second half of the twentieth century, Dávid attempted to map the surviving documents of the cadastral survey, and he published some of the data (183 settlements) in a study, along with his analysis of the data.<sup>12</sup> The data provided by Dávid provided an opportunity for me to compare the floodplain farming used by the settlements of Nagykunság with the farming used in the settlements in other regions.

### *Indicators of Agricultural Cultivation in Nagykunság at the End of the Eighteenth Century*

The settlements of Nagykunság were characterized by differentiated farming after repopulation in the eighteenth century. The leading sector was livestock farming, as livestock enjoyed better market sales opportunities and optimal environmental conditions. Grains were grown mainly for subsistence purposes, the sale of surpluses at the market was typical in the middle of the century. In the nineteenth century, as a result of the grain boom, the importance of arable crop production increased steadily, and self-sufficiency was replaced by commodity production. Tibor Bellon has thoroughly examined the farming in the settlements of Nagykunság in the eighteenth and nineteenth centuries.<sup>13</sup> However, as an ethnographer, he ignored in-depth statistical analyses and did not explore the process of structural change in detail. If one examines floodplain farming, the relative weight of crop and livestock production compared to each other is by no means a marginal issue. Most researchers assume there was a grain boom at the focal point of water regulations. As grain production can be carried out only at high risk in a floodplain environment, it was necessary for the area to be free from floods.<sup>14</sup>

In the cadastral records, the data on meadows and pastures are the most uncertain, as the extents of utilization in floodplain environments varied depending on the intensity and duration of floods, which also provided a good opportunity for farmers to make the *batár*<sup>15</sup> areas (the peasants' individual plots along, with the buildings of the village and, often, areas of communal meadow, woodland, vineyards and/or pasture) used for grazing appear to be useless

12 Dávid, "Adatok a mezőgazdasági termelés nagyságáról."

13 Bellon, *Karcag város gazdálkodása*, 24; Bellon, *Nagykunság*, 90.

14 Károlyi, "A magyar vízi munkálatok rövid története," 83–84, Somogyi, "A vízrajzi viszonyok szükségyszerű átalakításának felismerése," 150.

15 Outskirts, agrarian area around the settlement.

at certain times of the year. In terms of meadows and pastures, Karcag and Kisújszállás were in the worst situation. The average of 2.5 *katasztrális hold*<sup>16</sup> per capita calculated here is particularly low compared to Túrkeve (5.13 *katasztrális hold/capita*) and Kunhegyes (4.84 *katasztrális hold/capita*). This is due to the hydro-geomorphological conditions, as the former two settlements lie deeper<sup>17</sup> and they directly border the Berettyó River. The average in the settlements of Nagykovács (3.71 *katasztrális hold/capita*) is higher than the average in the settlements of Jászágó (2.80 *katasztrális hold/capita*), but it lags far behind the average of nearly 10 *katasztrális hold/capita* of the settlements in Kiskovács, with a large *batár* area and typically low population density. However, it is worth drawing a comparison with the areas outside Jászágó as well. Most settlements in Nagykovács had a lower average than the average of 4.22 *katasztrális hold/capita* in Heves County and Külső-Szolnok County, but they were in a better position than Győr County, which had an average of 2.23 *katasztrális hold/capita*, Moson County (2.5 *katasztrális hold/capita*), and Sopron County, with an average of 0.58 *katasztrális hold/capita* (except for Kisújszállás and Karcag).<sup>18</sup> Although a land size/person similar to or worse than that of the control areas was observed in Nagykovács, and the highest yielding meadows and pastures were found here. In Nagykovács, the average hay yield was 10 quintals (1,000 kilograms) per *katasztrális hold* while in Jászágó it was only 7.3 quintals (730 kilograms) and in Kiskovács it was 3.5 quintals (350 kilograms).

Much more reliable conclusions can be drawn on the basis of the data on ploughland than the aforementioned data. In the settlements of Nagykovács, the average ploughland per person was 1.55 *katasztrális hold*, which is significantly less than the average in the settlements of Jászágó (2.94 *katasztrális hold/capita*) and Kiskovács (4.14 *katasztrális hold/capita*). The average in the settlements of Nagykovács lags behind the average in the settlements of Heves- and Külső-Szolnok (1.96 *katasztrális hold/capita*), Moson- (1.74 *katasztrális hold/capita*) and Győr County (1.68 *katasztrális hold/capita*), but it far exceeds the average in those of Sopron County (1.03 *katasztrális hold/capita*). However, if we subtract the *demesne* lands from all the ploughlands, it is 0.90 *katasztrális hold*

16 *Hold* was used as a unit of measurement in the cadastral survey. A *katasztrális hold* contained 1600 *négyszögöl* this was recorded in the survey documents. 1 *katasztrális hold* = 1600 *négyszögöl*, 1 *négyszögöl* = 3,5966 m<sup>2</sup> (SI) so 1 *katasztrális hold* = 5755 m<sup>2</sup>

17 71 percent of the area of Kunhegyes is above 87 m B.a. (B.a: Its height above the Baltic Sea), while 56 percent of the area of Túrkeve is below 85 m B.a.

18 For the data on which the calculation is based see, Dávid, “Adatok a mezőgazdasági termelés nagyságáról.”

per capita in Heves- and Külső-Szolnok County, 1 in Győr, 1.74 in Moson, and 0.92 in Sopron County.

The 1.55 *katasztrális hold* per capita does not seem low compared to the data from the four counties, but it is depressingly low compared to Jászság and Kiskunság. Looking at the area size per capita in Nagy-kunság alone, we should assume a serious growth constraint or overpopulation, but it sheds a different light on the data if we also take into account the quality of the lands, i.e. their yield averages. The yield average in Nagy-kunság was 9.1 *pozsonyi mérő* (*p. m.*) (1 *pozsonyi mérő* = between 53.72 and 62.08 liters) per cadastral acre, which is well above the 3.83 *p. m.* per cadastral acre in Jászság and the 2.45 *p. m.* per cadastral acre in Kiskunság. In the 183 settlements surveyed by Dávid, the ploughlands produced an average grain yield of 7.7 *p. m.* Of course, I also had the suspicion that there might be some statistical error behind the exceptionally high yield averages or inaccurate or false yield data from Kiskunság and Jászság. There are no indications that the data on the settlements of Jászság and Kiskunság would be skewed downwards or the data on Nagy-kunság upwards. Only a comparison with the grain production potential<sup>19</sup> can be considered a resource-critical tool. The average wheat production potential of the settlements of Nagy-kunság is four points better than that of Jászság and seven points better than the average in the settlements of Kiskunság. The average yield per settlement calculated on the basis of the cadastral survey shows a strong correlation with the wheat production potential, and thus the cadastral data seem reliable. The high yield average in the settlements of Nagy-kunság and the low ploughland area per capita suggest that, at the time, only the high-quality lands optimal for arable crop production were utilized on the *batár* of the settlements. Thus, low ploughland per capita should not itself be considered a sign of overpopulation. Rather, it may indicate a lower preponderance of crop production compared to livestock production.

Most researchers agree that in the eighteenth century, pastoral farming was the most important agricultural sector in Nagy-kunság, and arable crop production was carried out only for self-sufficiency.<sup>20</sup> However, we have data on the market

19 Grain production potential is calculated by taking into account the parameters determining the crop production of the *batár* of the given settlement, i.e. climate, soil conditions, etc. The data are for the present, but the extent of soil and climate change is supposed not to reach the critical level which would prevent applying the data to the eighteenth century with some uncertainty. Many thanks to László Pásztor, an employee of the Institute for Soil Science and Agricultural Chemistry, Centre for Agricultural Research, the Hungarian Academy of Sciences for the data related to the wheat production potential of the settlements' *batárs* (outskirts, agrarian area around the settlement). See for details: Fodor and Pásztor, "The agro-ecological potential"; Fodor et al., "Coupling the 4M crop model."

20 Györffy, *Nagy-kunsági krónika*; Bellon, *Nagy-kunság*.

sales of grain from the middle of the eighteenth century as well. In 1750, palatine Miklós Pálffy ordered a survey of the economic strength of the settlements of Jászkunság to be conducted in order to levy taxes more proportionally. According to this census, the landholders of Nagy-kunság mostly sold their grain on the markets in Miskolc and Debrecen,<sup>21</sup> but we have no data on the volume of the grain trade. For example, the landholders of Kunszentmárton mentioned that some landholders did not sell any *mérő* of grain in 10 years. Thus, the information concerning which markets the farmers sold their grains on does not suggest in itself that grain production was determined by production for marketing. Examining the cadastral data, we can clearly see that the ploughland per capita shows a small variance in the settlements of Nagy-kunság (1.1–2 cadastral acres per capita), i.e. the extent of ploughland was relatively closely related to the population, which indicates self-sufficiency in the sector. If we assume that crop production was under extensive compulsion to grow, whether due to market conditions or unsatisfied domestic need, the amount of ploughland would be determined not by the population but by the amount of potentially suitable areas. All this, of course, is only true if we rule out the possibility that the ploughland had already reached its maximum possible extent and the small standard deviation of the ploughland per capita was purely coincidental. We have already seen that the hydro-geomorphological features of the *határs* of the Nagy-kun settlements are different, and consequently their agricultural potential is also different. It therefore hardly seems likely that the ploughland reached its maximum extent, and thus the relationship between the extent of ploughland and the size of the population is not a statistical coincidence but an indication of self-sufficiency in crop production. Of course, this does not exclude the possibility that in years of high yields the surplus that was produced over the domestic consumption needs of the population was sold on the market. However, we can only venture conclusions concerning how much this amount may have been (and this is an important question of this study) if we also have estimates for consumption.

### *Calculation of Population Needs*

Determining the grain needs of the peasant farms in Nagy-kunság is a very difficult task, as we have to take into account a number of variables (proportion of meat and cereal consumption, dietary habits, differences in nutrient requirements

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21 Bagi, “A Jászkun Kerület,” 254–66.

by gender and age groups, the impact of work activities, etc.) on which we have only sporadic data. However, as the relationship between production and consumption is a key issue in evaluating farming, despite these difficulties, we find a relatively large number of estimates in the literature and in contemporary statistical sources. In the present study, given the absence of adequate resources, I neither intend to estimate the contemporary needs of individuals, families, or peasant farms nor do I wish to contribute directly to the debates in this regard. I tried to bridge the problem of uncertainty by using estimates offered by several researchers and contemporary sources together, and since the sources so far provide little support, I assess their relevance to Nagy-kunság and the conditions of the relatively short period (the end of the eighteenth century) only to the extent needed.

The following estimates have been used for the annual grain need per person/family/household:

- Géza Perjés' estimate for the eighteenth century: 3.5 q = 7.51 p. m./capita/year,<sup>22</sup>
- István Orosz' estimate: 5 kila = 5 p. m./capita/year,<sup>23</sup>
- The average consumption used in the 1868 harvest statistics: 5 p. m./capita/year,<sup>24</sup>
- According to István N. Kiss' estimate, a family's minimum need for bread grain is: 6 q = 13 p. m./family/year,<sup>25</sup>
- In 1782, based on the aggregation of the Miskolc city council on grain need: 18 p. m./family/year,<sup>26</sup>
- Based on the censuses conducted in the Triple Districts during the Napoleonic Wars: 6 kila/capita/year,<sup>27</sup>
- Based on the 1816 Triple District Census: 1 kila barley/capita/year, 1 kila wheat/capita/year.<sup>28</sup>

Three of the data are estimates made after the fact and four were arrived at by contemporary public administrations. In order to make the calculations easier, I converted the needs to p. m., i.e. the unit of measurement that was also used in the cadastral survey. I did not consider the use of metric measurement units appropriate, because during conversion, *pozsonyi mérő*, which is one of the

22 Perjés, "Mezőgazdasági termelés," 240–42.

23 Quote by: Bagi, "Adatok a növénytermesztés nagyságához," 38.

24 Keleti, "Az 1868. évi aratás kenyérterményekben," 160–61.

25 Quote by: Gyimesi, "Adalékok Miskolc gabonaellátáshoz," 482.

26 Ibid.

27 Quote by: Bagi, "Adatok a növénytermesztés nagyságához," 38.

28 Ibid., 41.

liquid measurement units, has to be converted to a weight measure, which can only be done with significant uncertainty.<sup>29</sup>

The lowest average need comes from the 1816 census, but these data are related to the “poverty census” and thus they should be interpreted as the minimum need of the population, and if the total grain production of any settlement did not reach the total population need calculated according to this, it indicates severe overpopulation. István N. Kiss’ estimate of 6 q/family, i.e. converted and rounded to 13 p. m./family/year, divided by the average family size of 5 people calculated on the basis of József’s census data, means an average consumption of 2.6 p. m./person/year. The consumption of 18 p. m./family/year, determined by the Miskolc City Council in 1782, corresponds to an average consumption of 3.6 p. m. per person, and thus, together with the former, it is one of the lower estimates. The average value is consumption used in the 1868 harvest statistics and the census made during the Napoleonic Wars, and István Orosz also assumed a similar annual need per person. The most well-founded estimate seems to be that of Géza Perjés, who estimated the main annual need at 3.5 quintals, (7.51 p. m.) based on calorie needs and taking into account a whole range of variables (work intensity, age and gender-related differences, the calorific value and milling characteristics of grains, etc.). In connection with his estimation, the biggest question is how livestock farming can be adapted to the population of the central settlements of the Great Plain; he himself drew attention to this uncertainty factor as well.<sup>30</sup> However, in the communities of the Great Plain, which were mainly engaged in livestock farming, the proportion of grains in the average diet may have been lower, and this may have been especially true for floodplain settlements, where fish, game, and fruit (with regard to floodplain orchards) may have been a proportionally larger part of the average diet. Another question is the extent to which the average daily consumption of 4,000 calories per an adult man, calculated by Perjés (and this seems high even seen from the perspective of today), can be generalized in the eighteenth century. In view of all this, Perjés’ data can be considered a kind of “upper” estimate.

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29 In the eighteenth-nineteenth centuries, liquid measures were used instead of weight measures to measure cereals. In the 18-nineteenth centuries, the size of *pozsonyi mérő* changed from 74 *ices* to 64 *ices*, i.e. between 62.08 and 53.72 liters. *Pozsonyi mérő*, therefore, corresponds to 46.5 or 40.29 kilograms of grain. This uncertainty can no longer be accepted in the order of tens of thousands of *pozsonyi mérő*. For conversions, see Bogdán, *Magyarországi űr-, térfogat-, súly- és darabmértékek*, 345.

30 Perjés, “Mezőgazdasági termelés,” 236–37.

The issue is further complicated by the question of what we exactly mean by food or bread grain in the era. During the cadastral survey, the yields of four cereals (wheat, rye, barley, and oats) were recorded. In peasant culture, of these, wheat and rye clearly appeared as food grains, while oats appeared essentially as fodder crops. However, barley can be classified in either category only with reservations. According to Miklós Szilágyi, little care was taken to store the barley in the eighteenth century, so it was probably considered a lower value grain.<sup>31</sup> However, cereal porridge was the daily food of the people of Nagykunság, and according to sources, barley porridge, which was called *gerslin*, was also consumed.<sup>32</sup> The population clearly sought mainly to consume bread grains, but after the depletion of these stocks, the consumption of barley as porridge could also have been considered. I tried to bridge the uncertainty about the general use of grains by comparing the needs with three basic categories, namely bread grains (wheat and rye), food grains in the broad sense (wheat, rye and barley), and the total grain yields (wheat + rye + barley + oat).

### *Need / Production*

If we calculate using the lowest average consumption (2 p. m./person/year), we see that the settlements of Nagykunság addressed many of the food needs of the population with wheat, and if we take bread grain and food grain into account, 5–6 fold overproduction occurs. The total settlement need calculated in this way should clearly be considered a minimum need for survival, and if the yield per cadastre calculated on the basis of the averages over the course of several years were close to or below this value, it would indicate severe overpopulation. In the settlements of Nagykunság, however, even the wheat yield exceeded this multiple times, and there was no settlement in Jászkunság where the production would remain below this value. (Table 1).

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31 Szilágyi, *Az árpa veremlése*.

32 Elek, “Értünk kunság mezején,” 103.

Table 1. Production and need based on the highest and lowest average consumption.

Source: JNSZML IV. 2. 76.

Calculated with the estimate from the 1816 census (in p.m.)						
	Wheat			Barley		
	Net production <sup>1</sup>	Need <sup>2</sup>	Difference (percent) <sup>3</sup>	Net production	Need	Difference (percent)
Karcag	38,645	7,580	410	41,555	7,580	448
Kisújszállás	24,365	5,266	363	27,359	5,266	420
Kunhegyes	16,206	3,666	342	14,386	3,666	292
Kunmadaras	12,648	3,966	219	18,782	3,966	374
Kunszentmárton	20,169	2,985	576	20,355	2,985	582
Túrkeve	18,604	3,934	373	26,846	3,934	582
Calculated with a consumption of 5 p. m/person/year						
	Grain bread (wheat and rye)			Edible cereals		
	Net production	Need	Difference (percent)	Net production	Need	Difference (percent)
Karcag	48,192	37,900	27	89,747	37,900	137
Kisújszállás	29,965	26,330	14	57,324	26,330	118
Kunhegyes	20,187	18,330	10	34,573	18,330	89
Kunmadaras	24,493	19,830	24	43,275	19,830	118
Kunszentmárton	26,564	14,925	78	46,919	14,925	214
Túrkeve	31,558	19,670	60	58,404	19,670	197
Calculated with the estimate made by Perjés						
	Grain bread (wheat and rye)			Edible cereals		
	Net production	Need	Difference (percent)	Net production	Need	Difference (percent)
Karcag	48,192	56,980	-15	89,969	56,980	58
Kisújszállás	29,965	39,585	-24	57,924	39,585	46
Kunhegyes	20,187	27,558	-27	35,564	27,558	29
Kunmadaras	24,493	29,813	-18	45,436	29,813	52
Kunszentmárton	26,564	22,439	18	47,094	22,439	110
Túrkeve	31,558	29,573	7	58,737	29,573	99

1 Without the need for seeds. In the cadastral survey, seed was deducted from the crop and this net yield was also recorded. I used this in all my calculations.

2 Only in terms of human consumption.

3 As a percentage of need.

The mean value of the average consumption estimate is given by the 3–5 p. m./person/year calculations. The total population needs calculated on the basis of this were met by the wheat yield only in Karcag and Kunszentmárton, but in the latter, 35 percent of the wheat yield (a relatively high proportion) was overproduction. If we also add the rye yield to this, there is no longer any settlement in Nagykunság where there was underproduction, and in the case of Kunszentmárton and Túrkeve, there was even a surplus of 60–70 percent. If we add barley to this, a 100–200 percent overproduction arises in Nagykunság.

However, the situation is less favorable if we calculate with the average annual consumption of 6 and 7.51 p. m., which form the upper estimates. Wheat production alone does not meet the entire needs in any of the settlements, and an underproduction of 10–30 percent can be observed in terms of bread grain. Exceptions are Kunszentmárton and Túrkeve, where bread grain met the needs and there was even an overproduction of 6–18 percent. However, if we consider food grain, a more favorable picture emerges, as production exceeded the needs in all settlements and, moreover, Kunszentmárton and Túrkeve produced 100 percent more than they needed.

As we can see, due to the uncertainty on the consumption side, it is difficult to accurately assess the relationship between production and consumption; however, some important conclusions can be drawn from the data. Production exceeded the minimum need by several times in all settlements, which makes it clear that there was no serious overpopulation. However, according to Géza Perjés' estimate, the production of the settlements only slightly exceeded consumption. It is, however, important to note that Perjés' calculations assume an extremely ideal consumption even for later periods. Thus, in the years of average yields, the population could have had plenty of grain to sell, not to mention the years of good yields. As production exceeded 4–5 times the minimum need, the worse-than-average years could not have caused more serious disturbances; at most the complete crop yield might have been consumed. Of course, it would be misleading to assess the relationship of production and consumption solely on the basis of physiological needs, to which we must certainly add the various types of tax burdens as well.

In the case of the settlements of Nagykun, the tax books (*Conscriptio facultatum*) of four settlements, Karcag, Kisújszállás, Túrkeve and Kunszentmárton, remained for the years of 1780, but in the case of the latter two, the column of the paid amount remained unfilled. In the year of 1784/85 the population of

Karcag paid a tax of RFT (Rhine Forint) 4,958,<sup>33</sup> and that of Kisújszállás RFT 2,856.<sup>34</sup> The amounts include both the war tax (*contributio*) and the habitation tax (*domestica*). The amount of taxes did not exceed 7 percent of the total cadastral income for a settlement. Taking into account the assumed highest grain need per capita in the two settlements of Nagykun (Perjés), we can calculate with 32,829 p. m. surpluses in Karcag and 18,339 p. m. in Kisújszállás, considering the whole grain crop together. Calculated on the basis of the average prices of wheat, rye, barley and oats (based on market prices reported in the cadastral survey), this is about 13,470 and 7,029 RFT.<sup>35</sup> It follows that, in principle, the full amount of taxes could be paid merely from the sale of surplus grain. Considering the presumably higher benefits of livestock farming, the amount of war and habitation taxes alone did not impose an unbearably high burden on the population. This is, of course, a theoretical calculation as we do not know what proportion of the crop was actually marketable. Unfortunately, I did not find any summary data on the in-kind part of the war tax, but I assume that its burden might not have been greater than that of the part paid in money. I did not find any data on the exact distribution of the annual 12,600 RFT palatine census, either; however, based on the value calculations of the surplus crops in Karcag and Kisújszállás, it could hardly have been an unbearable burden. In 1837, Márton Bartsik, the archivist of Jász-kunság, made a summary of the benefits in money and extraordinary in kind ones provided by the Jász-kun District between 1735 and 1837.<sup>36</sup> According to this, the largest produce delivery for military purposes for the period of 1750 and 1800 took place in 1760, when the three districts delivered 60,000 p. m. of grain. This was 5.91 percent of the total annual grain production of the districts. It is also a clear indication that a total of 573,471 p. m. of grain collected on extraordinary occasions amounted to 56 percent of the annual average production of the district during hundred years.

In the above calculation of grain surplus only the physiological need and tax burdens were considered however, it is important to take into account feed requirements and and storage losses too. József Glósz examined the balance of grain production throughout the country, calculating with 9 p.m/capita/years of needs, of which 5 liters of physiological needs and 4 liters of other

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33 JNSZML, V. 100. 145.

34 JNSZML, V. 200. 1. a./2

35 *Rajnai forint*, taxes were paid in that currency.

36 Papp, "A Jász-kunok száz éves áldozatai."

needs, which include tax burdens, animal feed and storage losses.<sup>37</sup> Assuming an average consumption of 9 liters, there was an overproduction of 52 percent<sup>38</sup> in Nagykun District, Túrkeve (103 percent) was in the best position and Kunhegyes (17 percent) was in the worst. It should be noted, however, that farmers in the Nagykun district did not pay the landlord's tax, and compared to other landscapes, there was probably less grain used for fodder here, because grazing was typical and pastures were rich, so the average consumption of 9 p.m/capita/years seems a lot. However, indicated the good situation of cereal production is by the fact that even with this high average demand, a significant surplus of cereals can be observed.

According to Glósz's calculations, there was a small underproduction in Nagykunság in the first half of the nineteenth century.<sup>39</sup> However, according to the cadastral survey, with the same average demand that Glósz used, there was a 26 percent overproduction in the Jászkun District at the end of the eighteenth century. This can be explained by the fact that between 1780 and 1840 the population increased by 74 percent, but the arable land by only 29 percent. Given that the comprehensive river regulation that allowed for greater extensive development of crop production only began in the mid-nineteenth century, this does not seem unrealistic. This study confirms Glósz's remark that county-level statistics may mask significant regional differences. The overproduction was 26 percent in the Jászkun District, but there were significant regional differences: the overproduction was 52 percent in the Nagykun District, 11 percent in the Jász District and 22 percent in the Kiskun District.

### *Distribution of Resources*

The analysis of production and need presented so far is a highly theoretical calculation, as I have compared the total needs of the settlements with the total production, but relative overpopulation can also result from a large inequality in the distribution of resources. In principle, it can be assumed, for example, that the grain crop, which supplies the entire population of the settlement, is concentrated in the hands of a few landowners who constitute a small part of society, and thus the majority of the population faces food insecurity. The social

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37 Glósz, "Területi hiány és felesleg," 125.

38 In this calculation I have already taken into account oats, which I have omitted so far because they were feed.

39 Glósz, "Területi hiány és felesleg," 126.

division created by redemption<sup>40</sup> (landowner redeemers/irredeemers displaced from land ownership) brought with it the possibility of such a situation. Fortunately, the individual sheets<sup>41</sup> of the cadastral survey also provide an opportunity to examine the estate structure, but such a document has survived only in connection with Kunszentmárton. However, there is no indication that my findings regarding Kunszentmárton cannot be generalized to the other five settlements with due caution.

In Kunszentmárton, 473 landholders were registered during the cadastral survey, i.e. persons with at least an internal plot (with a house, a garden), 17 of whom did not have any ploughland, meadows, pastures, or vineyards. According to other sources, 269 redeemer landowners lived in the settlement, and thus it seems that even irredeemer landholders obtained access to land cultivated in the system of the land community during the cadastral survey period. In the landed estate structure of Kunszentmárton, however, the marked social response line formed by redemption emerges clearly. At first glance, the structure of the landed estate (Table 2) gives a strongly negative picture, as 26 landless and 183 (38 percent of all landholders) family heads with less than one cadastral acre was recorded. From the point of view of overpopulation, it can undoubtedly be considered negative that almost 46 percent of the population had little or no ploughland or meadow that could be cultivated, as this clearly resulted in a continuously intense demand for land. However, it is also important to point out that a favorable structure of landed estate emerges within the stratum of the redeemers (practically the landholders with land of more than 1 cadastral acre in the table). Among redeemers, especially in the case of ploughland, the landholders in each category and the total cultivated area in that category are

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40 The population of Jászság and Nagy- and Kiskunság redeemed themselves for the landlord's jurisdiction in 1745, and in exchange for the money paid at that time, the districts gained administrative, judicial, and economic autonomy, an event called redemption, which derives from the Latin word *redemptio*. The right of redemption, which came into force after 1745, divided society into two large groups, the full-fledged redeemers, who contributed to the costs of redemption, and the irredeemers, who were left out of it. Redeemers, in proportion to their contribution to redemption, acquired so-called capital land, which they freely possessed, and the holdings could be inherited and sold. Irredeemers were in principle not excluded from land ownership, but in practice the right of pre-emption of redeemers significantly limited their access to land. Even irredeemers could obtain access to pastures, meadows, and unallocated, so-called redistributed lands (melon, tobacco, and maize, etc.) at redemption in the eighteenth century, but at the end of the century, irredeemers began to be displaced from the common lands. See for details: Bánkiné, *A Jászkun Kerület közgazdasága*, 23–34.

41 A sheet listing all the owners of each settlement one by one, in which all the holdings cultivated by certain farmers were recorded.

Table 2. Structure of the landed estate in Kunszentmárton based on first cadastral survey

Distribution of ploughland				
(cadastral acre <i>katasztrális hold</i> )	Number of landowners in category	percent	Total area of the category	percent
No arable land	39	8	-	-
– 0.99	182	38	27	0.46
1 – 4.99	31	7	94	1.59
5 – 9.99	39	8	293	4.95
10 – 19.99	64	14	983	16.59
20 – 39.99	85	18	2,344	39.57
40 – 79.99	30	6	1,638	27.65
80 – 159.99	2	0	190	3.21
160 –	1	0	355	5.99
Distribution of meadow				
No meadow	167	35	-	-
– 0.99	78	16	20	0.45
1 – 4.99	41	8	116	2.59
5 – 9.99	56	11	428	9.55
10 – 19.99	62	13	847	18.89
20 – 39.99	47	9	1,311	29.24
40 – 79.99	17	3	963	21.48
80 – 159.99	5	1	519	11.57
160 –	1	0.2	280	6.24

relatively proportional.<sup>42</sup> Accordingly, in this social stratum, i.e. in the actual landholders, land subdivision was not yet so widespread; this stratum could be less characterized by internal tension. Undoubtedly, the pressure of the stratum of irredeemers gradually became more severe on that of the redeemers, but the key question in judging overpopulation is how great this pressure could have been and whether it could be managed under the given conditions.

In 1786, hundreds of mostly irredeemer families migrated to Bácska as part of the chamber's efforts to relocate sectors of the population. Relocation is interpreted by most researchers as a symptom of a crisis in the community when internal tensions have reached a level so critical that they trigger emigration.

42 This can be contrasted with the national situation at the end of the nineteenth century, when smallholders with less than 5 acres, representing 53.47 percent of the landholders owning 7.52 percent of the total, cultivated land. Katus, *A modern Magyarország születése*, 450.

In connection with this, however, I would like to mention my hypothesis that emigration was motivated more by the benefits of the chamber's relocation efforts than by internal social tension. This seems to prove that the councils of the Nagykun settlements initially strove to impede<sup>43</sup> the organization related to emigration, and the landlords of Külső-Szolnok County wanted to allow emigration from their villages only on condition that the families moving away find new landholders to take their place.<sup>44</sup> This behavior seems illogical if we assume that the settlements were facing an overpopulation crisis.

As the statistics show, the relatively large number (38 percent) of Kunszentmárton's heads of families were landless peasants or smallholders, and consequently landholders with lower levels of wealth and property. However, the stratum of irredeemers was also highly differentiated. On the one hand, there were landholders who had significant numbers of livestock, and on the other, there were herdsmen, horse herdsmen, shepherds, etc.,<sup>45</sup> who played an important role in livestock farming and otherwise enjoyed relatively high social prestige. It is very important that smallholders in the land statistics who cultivated less than one cadastral acre not be clearly considered social outcasts living at the poverty line, as most of them were servants and laborers in the service of redeemer landowners who had an income above the subsistence level. In the eighteenth century, the lord-peasant relationship was strictly regulated centrally by district administrations and at the local level by settlement councils: they prevented lords from luring contracted peasants away, sanctioned unilateral breaches of contract by the lord or peasant, and also set wages.<sup>46</sup> The initial impediment to the organization of emigration was clearly motivated by the fear of losing a labor force. At the agrotechnical level of the eighteenth century, the existence of this stratum providing a labor force was a normal condition for the operation of the farm, as the labor force of a family alone may mostly not have been sufficient to cultivate the estates of redeemer landlords with medium and large lands.<sup>47</sup>

According to the cadastral survey, 209 landless farm peasants or dwarf holders lived in Kunszentmárton, and they accounted for 38 percent of all

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43 Szabó, *Kunbgyesi "földtelen emberek Feketitsre" költözése*, 43.

44 Bagi, "Egy bácskai kirajzás," 133.

45 See this for more details: Györfly, *Nagykunság*, 7–28.

46 On the wages of employees and the employment system, see: Szabó, "Megélhetőség Kisújszálláson."

47 According to Imre Wellmann, a serf who had more land than half a serf plot had to hire or use a day-laborer. See: Wellmann, *A magyar mezőgazdaság*, 147. In Kunszentmárton, at the end of the eighteenth century, 18 percent of the owners had more land than 11 *katasztrális hold* (on a country average, this is half a serf plot).

landholders. It is worth comparing this ratio with regional and national averages, but this is difficult to do. Of the surrounding settlements, the individual sheets survived only in Tiszaszalók (it is a part of Abádszalók today). The settlements of Jászkunság cannot be compared with one another due to lack of sources. In Tiszaszalók, the ratio of cottars with less than one cadastral acre was quite high, 61 percent. Of course, the socage settlement can only be compared with the privileged Kunszentmárton with certain reservations, as the landholders classified as cottars in the former may have had access to the allodial land of the landlords. Accordingly, the data for Tiszaszalók are likely to be skewed upwards in terms of the ratio of landless peasants or dwarf holders. Furthermore, the question may arise whether the very high ratio of cottars can be attributed to some peculiarity of the settlement. However, the ratio of socage and allodial lands and the ploughland per person is close to the averages in the settlements of Heves and Külső-Szolnok Counties,<sup>48</sup> and on the basis of its urbarium, it does not differ from the settlements along the river Tisza, either.<sup>49</sup>

According to the census in Nagykunság, the ratio of male cottars was 36 percent of all adult men. This ratio was 39 percent for the whole of Jászkunság, 48.5 in Heves and Külső-Szolnok Counties, 51 percent in Pest County, 32 percent in Győr County, and 51 percent for the whole of the Kingdom of Hungary.<sup>50</sup> In Nagykunság, therefore, the ratio of the landless peasants does not seem striking. At the time of the socage settlement, 27.12 percent of the cottars in the Kingdom of Hungary belonged to the category of housed cottars and 6.23 percent to the category of houseless cottars. By 1791, this proportion rose to 29.64 and 9.25 percent, respectively. Also in 1791, the ratio of housed and houseless cottars was 33.16 percent and 11.66 percent respectively in the counties of the Great Plain.<sup>51</sup> Based on these, on the other hand, the ratio of irredeemers of 38 percent with no land or little land but with a house in Kunszentmárton seems a bit high.

An important issue associated with overpopulation is the standard of living of the lower social strata. Fortunately, the individual sheets of the cadastral survey indicated not only the extent of the land cultivated by certain landholders, but also their yield. In Kunszentmárton, only 39 landholders (7 percent) were listed who did not produce any kind of grain, and 30 percent of them produced less than 5

48 The data on the settlements were published: Dávid, "Adatok a mezőgazdasági termelés nagyságáról," 123–24.

49 The urbariums are published: Soós, *A jobbágyföld helyzete*, 25–42.

50 For the data based on the calculation see: Danyi and Dávid, *Az első magyarországi népszámlálás*.

51 Quotes the data: Wellmann, *A magyar mezőgazdaság*, 69–70.

p. m., which was the lower annual need of a person. 53 percent of landholders produced 13 p. m. meeting one family's minimum annual need on their own land, and 46 percent of landholders harvested more than 37.5 p. m.<sup>52</sup> regarded as the upper estimate (Perjés). Thus, in terms of the distribution of production (Table 3), and thus 30 percent of landholders produced below the subsistence level, roughly 7 percent of them produced 13–40 p. m. needed only to provide for the family, and 46 percent also produced a surplus. Thus, a significant part of families produced a marketable surplus. However, I have to nuance the picture that emerges from the survey data at two points. My calculations refer to food grain, which also includes barley, the consumption of which as porridge may have been a stop-gap solution. A further criticism of the calculation may be that it records the average yield. Landholders with an average production of roughly 40 p. m. may have been the ones who were able to ensure their own crop supply even in poorer crop years. This applies to 54 percent of all landholders.

Table 3. Distribution of cereal production among individual landholders in Kunszentmárton based on first cadastral survey

Distribution of cereal production*				
( <i>pozsonyi mérő</i> )	Number of landholders	percent	All cereals produced in category	percent
Less than 1	66	13.95	48	0.03
1 – 4	78	16.49	1.076	0.6
5 – 9	70	14.80	1.626	0.91
10 – 19	17	3.59	852	0.48
20 – 39	23	4.86	2.363	1.33
40 – 79	36	7.61	7.945	4.46
80 – 159	65	13.74	29.654	16.65
160 – 319	81	17.12	65.559	36.81
320 – 639	32	6.77	51.309	28.81
640 –	5	1.06	17.646	9.91

\* The cadastral data of Kunszentmárton coincide with the estimation of József Glósz of the average yield of the categories of serf plots. See: Glósz, "A birtokviszonyok hatása," 206. The average yield of the estates belonging to the 40–50 Hungarian lunar category was 267 p. m. (According to Glósz, this category had a yield of 280 p. m.), 25–30 *magyar bold* – 176 p. m. (Ibid., 185), 20–21 *magyar bold* – 133 p. m. (Ibid., 140), 13–15 *magyar bold* – 90 p. m. (Ibid., 90), 5–10 *magyar bold* – 42 p. m. (Ibid., 46), 3–5 *magyar bold* – 22 p. m. (Ibid., 23). 1 *magyar bold* = 0,76 *katasztrális bold*.

52 The 37.5 p. m. presumably covered ample the needs of a family, if we calculate average consumption of 7.5 p. m./capita/year and a family size of 5 people.

Based on the above, it seems that at the end of the eighteenth century, the structure of landed estate in Kunszentmárton did not yet show significant fragmentation of the estate, which contradicts the hypothesis according to which the settlement was largely overpopulated. However, the optimal condition observed in the settlement cannot necessarily be considered valid for the whole of Nagy-kunság. In the other settlements of Nagy-kunság, the ratio of irredeemers was lower, which, however, does not only mean that there were fewer social tensions and, consequently, less hunger for land, but also that there may have been a less favorable structure of landed estate within the stratum of landowners, as all the cultivable land was shared between several owners. This could have been somewhat offset by the fact that the land available was proportionally larger, but this was not the case, as the utilized area per capita in Kunszentmárton (5.71 cadastral acres/person) exceeded the average in the settlements in Nagy-kunság (5.31 cadastral acres/person). However, these uncertainties are not greater than the uncertainties in the analyses that have been conducted by researchers so far. Based on the data of the cadastral survey, it can be stated that the amount of natural resources in relation to the population and the distribution of resources at the turn of the century were still relatively optimal, at least compared to other areas.

### *Assessment of the Economic Condition: Conclusions*

The main question of the present study was whether the settlements of Nagy-kunság were afflicted by overpopulation due to failing to meet basic food needs and thus to what extent the anthropogenic interventions in the ecosystems (the construction of Mírhó Dam) could have been motivated by a kind of extensive growth compulsion. Due to the limited sources which were produced during and survive from the time, the question cannot be answered with certainty, but from the data of the first cadastral survey, which has been undeservedly neglected in environmental history research so far, many conclusions can be drawn which are new compared to assessments carried out by researchers previously.

According to the data of the cadastral survey, the grain production of the settlements of Nagy-kunság met the domestic consumption needs of the population, and taxes as well as the feed needs of animals too, and the population also had a surplus that could be sold on the market in normal and good crop years. The population of the settlements grew arable crops mainly for self-sufficiency, which is indicated by the relatively close relationship between the size

of the ploughland and the population. The structure of the landed estate, i.e. the most important natural resource and the distribution of agricultural land, was still optimal at the end of the eighteenth century, both at national and regional levels.<sup>53</sup> The overpopulation which, according to Klára Dóka, was an issue in the case of the settlements along the Tisza and the resulting growth compulsion can be detected only to a small extent in the case of the settlements of Nagykunság, along with the social tensions resulting mostly from redemption. The farming of the settlements of Nagykunság was characterized by the optimal utilization of environmental resources, and thus by high average yields (especially in the case of grain production).

The construction of the Mirhó Dam can undoubtedly be attributed to the confrontation between nature and man, but this is probably not due to the need to change the existing land use system, but to changes in the system due to external factors, in our case to the periodic changes in climatic conditions. This is indicated by the fact that the complaint letters written before the construction of the dam mention disturbances arising in the use of areas already under cultivation (flooded meadows all year round, ploughlands and vineyards protected by dykes, etc.) and do not formulate the need to involve new areas.<sup>54</sup> The grain boom which emerged later and which forced the floodplain communities of the Carpathian Basin to change to dryland farming can't have been behind the construction of the Mirhó Dam in chronological terms, either. If we accept the picture which emerges on the basis of the cadastral data, i.e. that the farming system at the end of the eighteenth century was relatively optimal, it is also unlikely that the goal of the farming communities involved in dam construction would have been to eliminate the farming system which had been in use until then. With regard to the construction, it is also worth noting that the dam was erected in the first half of the eighteenth century (i.e. in the initial period of reorganization), which suggests the possibility that the existence of the dam was a normal condition for floodplain farming. The intervention was rather the only active element of the basically passive floodplain farming carried out by the settlements of Nagykunság, similar to the way in which the settlements of Sárköz selected the scour channels (*fők*) that were unfavorable to them. Thus, the aim of building the Mirhó Dam could not have been to drain the area, but to create a more regulated water system. Based on the above, I agree with Zsolt Pinke, who suggests that

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53 Dóka, "Gazdálkodás a Tisza árterein."

54 JNSZML V. 200. 1. a./a.

water management work was caused by the environmental challenges caused by intermittent climate change, and I also agree that the conflict among settlements stems from differences in hydro-geomorphological conditions.<sup>55</sup> However, given that floodplain management appears to have been statistically profitable and that significant quantities of marketable grain were available, in my opinion pressures from population growth may have played little role in dam construction in the eighteenth century.

My results are an adjunct to floodplain management debates too. The opinions of two significant researchers on the topic, Bertalan Andrásfalvy<sup>56</sup> and Miklós Szilágyi,<sup>57</sup> differed mainly on the question as to whether floodplain management was profitable and well-planned. My results are closer to Andrásfalvy's opinion on efficiency, as floodplain farming was profitable even in terms of field crop production, despite the fact that in the Nagykun District this sector was secondary. The study I have done does not in itself provide an opportunity to assess the other side, the planning of floodplain management, so I cannot contribute to the discussion in this respect.

However, the validity of my findings is limited by certain source-critical considerations, three of which are worth highlighting. In the case of the cadastral data, despite the fact that they provide much more reliable and less indirect information compared to the dical tax censuses of the period, there are a number of uncertainties. The uncertainties are rooted, on the one hand, in the fundamental problems of statistics and, on the other, in the much-mentioned interests of farmers in data distortion. The basic statistical problems include, for example, how much variance we have to reckon with in the case of the average yield, and the extent to which the pressure system caused fluctuations in production. The second major uncertainty factor is the determination of need. We have very little information on contemporary consumption patterns, especially at a given time and place, and the relatively large standard deviation of the estimates can be attributed to this. Moreover, need, like overpopulation, must be regarded as a relative concept. The third factor of uncertainty is the livestock farming sector as the cadastral survey provides data only indirectly

55 Pinke, "Alkalmazkodás és felemelkedés," 258.

56 Bertalan Andrásfalvy examined farming before the river regulations in the settlements of Sárköz along the Danube and found planned and productive floodplain management, which he called *fokgazdálkodás*. See: Andrásfalvy, *A Sárköz ősi ártéri gazdálkodása*.

57 Examining the Tiszavidék, Miklós Szilágyi did not find any traces of active floodplain management similar to that observed in Sárköz, and he doubted that the farming system before the river regulations would have been planned or very productive. See: Szilágyi, "Az ősi ártéri gazdálkodás elméletéhez."

in this regard. The main point is, therefore, that there are uncertainties about both the need and the production side, but in my view, they do not exceed the uncertainties about the types of sources used by researchers so far (e.g. tax censuses). Moreover, the cadastral survey also allows analyses which were not feasible on the basis of these other sources.

One of the important aims of the present study was to shed light on the need to reevaluate the statements made about floodplain farming, as in the light of newer sources, some questions are approached from a different perspective. It is also worth reconsidering these questions in light of new source-critical findings related to the sources used so far. The synthesizing character of environmental history requires that the statements made so far be checked from time to time, taking into account new findings in different disciplines and reevaluating prevailing conclusions if necessary.

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