Theses of a doctoral (PhD) dissertation

ANALYTICAL EVALUATION OF PLANT PRODUCTION RESULTS IN THE SZABOLCS-SZATMÁR-BEREG COUNTY

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1. INTRODUCTION

The situation of domestic agricultural production deteriorated at the national economy level and lost its traditional comparative advantages. In the second half of the previous century, as a result of the rise of Hungarian agriculture, it needed more and more land, so biodiversity decreased and ecological systems were damaged. The main reasons for this are land reorganizations (areas treated in the same way), intensive plant protection and the use of fertilizers, and the transformation of grazing. After the radical production disaster caused by the regime change, agricultural productivity has started to grow slowly. It is not near the results of the pre-1990s nor is even close to the values of the 1970s. Compared to the 2000s, it has already stabilized and started to develop slowly with higher values. Over the past 16 years, it has been proven that after joining the European Union, agriculture will be the basis of livelihood in the "Hungarian countryside" and the multifunctional agricultural model of the European Union could not gain ground.

1.1. Significance of the topic

Agriculture, as a product-producing and value-creating activity, has a special but increasingly declining role in the structure of the Hungarian economy and thus in its overall performance. Based on its significant potential, it influences and determines its phenomena, processes and directorates, both in terms of food production and nature conservation. Interpreted in this systemic way, the fundamental question for agriculture and humanity is whether we are able to preserve ecological and economic diversity, the natural number and diversity of our natural resources, the richness of flora and fauna? In a complex system such as the resource crisis, population explosion, ensuring healthy food production, energy demand, and life and job security in rural areas **(Takács – Sinóros-Szabó, 2019)**. Technological and technical development in agriculture is the basis for population growth. The growth rate of the population has slowed down recently, but given the expected numbers, complex, new solutions must be found to ensure water, food and energy supply, while all solutions must be based on the protection of the environment and biodiversity.

1.2. The problem

The basis of competitive and economically profitable grain production is the closest and most economical use of scarce resources, the optimization of costs and the increase of revenues. The factors influencing production must be constantly examined, because

environmental changes have a significant effect on the volume of food production and the safe production and supply. The evaluation and analysis of the results and opinions of the micro-region and the farmers give the statistical values of the larger units. The exploration and enumeration of strengths, weaknesses, opportunities and threats that characterizes farming, and the decision making regarding production conditions had always been a difficult task. However; data is needed to analyze the condition of the sector, to recognize its capabilities, to reduce its disadvantages or just to take advantage of its competitive advantages.

1.3. Objectives of the dissertation and hypotheses of the research

Based on my evaluations related to my dissertation, I formulated the following goals:

- Collection and analysis of crop production results in Szabolcs-Szatmár-Bereg county (with the help of questionnaire surveys and semi-structured interviews).
- Exploring the specifics of crop production in Szabolcs-Szatmár-Bereg county.
- County-specific production, definition of economy, at district and county level.

According to my hypothesis, agricultural companies and production groups, which typically farm on hundreds of hectares, engage in profitable grain production according to market decisions. Small farms develop their sowing structure according to their possibilities. Will the development of the domestic use of grain in other ways appear in the development directions of the coming years in their decisions?

Can it be established that the agricultural enterprises produce the final product? It is necessary to choose the opportunities, strategic orientations and financing capacity of small businesses separately from those of large companies. When analyzing their plans, it is worth observing the operation of SMEs (small and medium-sized enterprises) along specific objectives.

In what extent the controversial irrigation and precision (site-specific) farming is present on the level of farmes in cultivations. How do they feel about ownership and production concentration? Is the hypothesis that the concentration of ownership is rejected and that production collaborations will be strengthened rather correct?

Integration has always been a difficult issue in the life of Hungarian agriculture. The criteria for willingness must be analyzed separately for the participating economic organizations. The situation of each economy is completely different, according to its

future role in integration. Are the benefits of integration and the disadvantages of integration appreciated? After considering the advantages and disadvantages, the answer to the integration steps can be given. Perhaps developing a relationship system in another form is more appropriate?

Based on the processing of the literature related to crop production and my previous research, I try to prove the following assumptions in relation to the objectives formulated above.

Hypothesis 1 (H1): – Farmers choose production concentration instead of property concentration. Farmers in Szabolcs-Szatmár-Bereg county are reluctant to co-operate on the basis of property and choose to co-operate in the direction of looser production associations in order to achieve economic goals.

Hypothesis 2 (H2): – The production of raw materials, which represents low added value, is being replaced by the production of processed products.

Hypothesis 3 (H3): – In the development of irrigation management, the owner can and wants to bear the high investment cost, he has information and knowledge about its advantages.

Hypothesis 4 (H4): – In the development of precision farming, the owner can and wants to bear the high investment cost, he has information and knowledge about its advantages.

2. LITERATURE REVIEW

Based on the capabilities and endowments of agriculture, it is the most significant economic resource of Hungary. The totality of the endowments and the system approach determine its importance **(Csete – Láng, 2005)**. Hungarian agriculture (expertise, land quality, climatic and topographical conditions) has significant potential even in international comparisons **(Romány, 2002; Huzsvai, 2006)**. Compared to countries with more developed economies, sustainable rural development that provides quality, landscape and environmental protection can be the key to the challenges facing our agriculture **(Nagy – Kith, 2014; Antal, 2005)**, its practical application may become appropriate in the interpretation and solution of multifaceted problems, in avoiding its consequences **(Soltész et al., 2005)**. The rapidly changing economic-natural environment, technological knowledge transfer and demographic change may call into question paradigms that were considered definitive **(Dinya, 2018)**.

Farmland is the most valuable natural treasure of Hungary **(Várallyay, 2012; Harsányi et al., 2005)**, it means the same as the Hungarianness **(Harsányi et al., 2006)**, the basis of sustainable management **(Kátai, 2012)**. In order to successfully meet the challenges of a fundamentally changing world, our primary task is to assess the available, renewable resource, which accounts for 30% of national resources, and to strive for social consensus, to develop a framework for their conservation use. **(Nagy, 2005; Nagy, 2019)**. The energy needs of technology and the conservation of natural resources can only be achieved through a systems approach. **(Nagy – Sinóros-Szabó, 2014)**.

It can be analyzed in the context of regional development and agriculture **(Sinóros-Szabó, 2012a)**. Its results define the state of economic, technological and social development. Through a focus on solutions and activities that protect the natural environment. The use of this close link is based on methods that are well applicable to all economic, social and natural environments and defines its whole structure **(Sinóros-Szabó, 2018; Takács – Sinóros-Szabó, 2019)**, and can thus be correctly interpreted in terms of technological, economic and social developmentl **(Sinóros-Szabó et al., 2005)**. This way of thinking is even more pronounced and strengthened when we look at border spatial environments, as the connecting role and nature of development processes can be well demonstrated in different social, economic and natural environments and its prevalence can be examined in adaptive solutions **(Sinóros-Szabó, 2012c)**. The totality of future projects for each

farmer forms the rural development strategy. Projects, like individual farms, are different in size, nature and characteristics, but together they form key areas for rural development, and as subsystems are interconnected. Food production, energy transformation, use and job creation form a unified structure of rural development. Their properties and characteristics can be interpreted in a system, which are embodied in projects **(Sinóros-Szabó, 2018)**. The primary and most complex issue in Hungary, and in particular in agriculture, is the development of the rural area. **(Sinóros-Szabó – Dinya, 2006)**.

The basis of the integrated scientific spatial approach and method, which complexly affects the development of the region, a large-scale, systematic, comprehensive, interdisciplinary study of the Great Plain of Hungary. To analyze and evaluate the needs of the economy and the characteristics of agriculture in a system of mutual relations with environmental conflicts, the characteristics of the settlement network, society, landscape and cultural structure, taking into account the various territorial problems of modernization, due to the multidisciplinary nature of the topic **(Sinóros-Szabó, 2012b)**. In other words, this methodological approach can be a precondition for building a collective consensus based on regionalism, an ecological and economically complex system, as a strategic endeavor.

Water is the basis of profitable agriculture. Hungary is a water surplus and exporting country. Groundwater and surface water resources are significant. Nearly 95% of surface waters come from outside the country, via 24 rivers. 114 km3 of water is supplied annually **(Engloner et al., 2018)**. Water will be the most profitable and valuable factor of production in Hungary, and its role in regional development is difficult to overestimate. The waters of the shallow aquifer are mainly endangered by the nitrate content of agriculture and untreated wastewater **(Pomázi – Szabó, 2018)**. Hungary's surface water supply is the highest in Europe at 11,000 cubic meters / year per capita. Its economic potential is currently underestimated in agriculture.

Quantitative and qualitative criteria of water resources are determined by the density points of population density, urbanization, economic activity, human consumption and agricultural activity. It can be used on the basis of ecological, sustainable farming **(Baranyi – Sinóros-Szabó, 2013)**. he size of irrigated areas in the 1970s was around 350,000 hectares. Today, it is under 140,000 acresOver the last 20-25 years, the size of irrigated agricultural land and the amount of water used have fluctuated **(Gyüre - Tanczné, 2018)**.

3. MATERIAL AND METHOD

3.1. The direction and tasks of the research

During the research:

1. I processed the literature related to the topic.

2. An open-ended questionnaire that complements the closed questionnaire with an income analysis of farmers who maintain cost-revenue records.

3. For in-depth analysis, I conducted semi-structured interviews with the excellence of the profession to refine, understand, and evaluate the data.

Based on the outlines above, my main tasks are:

- To examine the correlations between the information obtained and the regularity that seems to be generalizable in the agricultural enterprises operating in Szabolcs-Szatmár-Bereg county.
- Analyze how production cost developed at district levels in terms of cultivation costs. I compare the results to explore the heterogeneity of different areas based on their farming costs.
- In primary research, two questionnaire surveys were conducted based on data from the interviewed managers to summarize and evaluate their opinions, preparedness, and experiences. Made a summary picture of the characteristics of agricultural enterprises.

I conducted the research on four levels.

- **Level One (I.)** with the help of sixty agricultural advisor from the National Chamber of Agriculture in the county, I contacted 60 randomly selected farmers electronically with a closed-type Google Forms questionnaire.
- **Level Two (II.)** farmers who filled in corn and / or winter wheat cultivation and cost-income records, farmers' customers, filled in an open-ended questionnaire using the Microsoft Excel program.
- **Level Three (III.)** I analyzed the databases of AKI (Agricultural Economics Research Institute) and KSH (Central Statistical OfficeI supplemented the values of the freely available data and the test plant system with calculations according to my own methodology. I compared the results.

- **Level Four (IV.)** I personally contacted the agricultural farm producing maize or winter wheat, which can be considered significant on the basis of its production potential and / or production knowledge and farming diversification, achieved in the county by recommendation and conducted a semi-structured interview with the professional and owner management.

The essence of the semi-structured interview: I examine the economic and social connections revealed by the answers and analyze the nature of the observable basic trend. I will explore which trends in the development of sales and costs of maize and wheat production can be established. What strategy do they follow in making decisions? Are they able to take into account changes in the price of grain within a year when selling and buying? Do you have the necessary infrastructure background for this? How important do you consider the role of the factors underlying the production decision? What questions do you consider to be decisive for the tasks of the county's agriculture rooted in the past, perceptible in the present and looking for solutions in the future? I always asked for a recommendation and contact for the next interview partner. A total of 34 interviews were conducted during the research, with 25 contributing to the use of responses.

Consequently, I analyzed a unique database based on my own research. I would like to show directions to the decision support alternatives and variants of agricultural policy and agricultural economic issues. In addition, to highlight how the results of agricultural research prevail at the farmer level. According to the directions of regional development, the past experience of agricultural enterprises and their visions for the future.

3.2. Methodology of quantitative data collection

My research, which examines the changes in the results of agriculture, keeps the analysis of the crop production results of agricultural enterprises operating in the Northern Great Plain and within them in Szabolcs-Szatmár-Bereg county at the center of the research. I carried out my work in relation to one county (Szabolcs-Szatmár-Bereg county), and I examined specific enterprises within the given county. Using the records of public databases, I present the crop production potential of the field, including maize and winter wheat. Our research counted and analyzed data between 2013 and 2017. I examined the average yield for the three geographical units.

In the course of my research, I collected and calculated the above indicators for 2017 for maize and wheat. I used the values for the previous periods from the Agricultural Economics Research Institute (AKI) 2017 and 2018 publications "Cost and Income Situation of the Main Agricultural Sectors 2013-2015 and 2016, respectively". The sectoral data in this publication include data for around 1750 agricultural holdings for 2013-2015 and just over 1900 for 2016, representing around 110 000 agricultural holdings, which cultivated 95% of the land used by all registered farms **(Szili - Szlovák, 2018; Béládi et al., 2017).** In my own sampling, I analyzed data from 15 farms for maize. Regarding wheat production, I received data from 9 farmers, which I analyzed.

3.2.1. Primary data source

The basic population of the study is the agricultural entrepreneurial world of the county, to which I gained access through sixty agricultural advisor of the National Chamber of Agriculture (NAK) operating in Szabolcs-Szatmár-Bereg county.

The research took place between December 2018 and September 2019. 60 agricultural advisor participated in the design of the sample and the delivery of the questionnaires.

3.3. Methodology of qualitative research

My aim was to check the economic and social contexts revealed by the responses in the closed questionnaire. After analyzing the results obtained as the first phase of the research, I conducted the interviews to present the deeper correlations of some of the results. I personally contacted the agricultural farms producing maize or winter wheat, which can be considered significant on the basis of their production potential and / or production knowledge and farming diversification, which have been achieved by recommendation (snowball method) about the trends in maize and wheat production.

4. RESULTS

4.1. SWOT analysis of the agriculture of Szabolcs-Szatmár-Bereg county

Using the criteria of the SWOT analysis, I surveyed the external and internal environment of the county's agriculture and determined the positive and negative characteristics in which farmers have to produce. Based on the acronym SWOT analysis (strengths, weaknesses, opportunities, threats) prepared by the county farmers, the external and internal factors characteristic of the county agriculture were evaluated. Thus was born the analysis of the county (Table 1). The result of my study is that most of the criteria are considered by farmers in the county as an option. All other factors were classified into the other three groups.

Table 1: Results of the SWOT analysis (2019)

Factor/Characteristics	Strengths (%)	Weaknesses (%)	Opportunities (%)	Threats (%)
Quality and quantity of cereals	**45,8**	16,9	32,2	5,1
Climate and natural features	**32,2**	13,6	28,8	25,4
Land prices and rents	1,7	**54,2**	25,4	18,6
Change in the selling price of cereals	5,1	**54,2**	23,7	16,9
Available processing capacity	6,8	**47,5**	42,4	3,4
Available irrigation capacity	5,1	**50,8**	40,7	3,4
Supplying the growing population of the Earth	5,1	13,6	**50,8**	30,5
Changes in European cereal consumption	3,4	16,9	**61,0**	18,6
Sales opportunities within the European Union	5,1	28,8	**64,4**	1,7
Membership of the European Union	25,4	11,9	**62,7**	-
Bioenergy production	3,4	25,4	**67,8**	3,4
Experience and expertise of those working in the grain industry	32,2	18,6	**47,5**	1,7
Serving market needs	13,6	20,3	**64,4**	1,7
Subsidies	20,3	10,2	**67,8**	1,7
Technological advancement	6,8	10,2	**83,1**	-
Available storage capacity	10,2	39,0	**45,8**	5,1
Employing a skilled workforce	6,8	37,3	**50,8**	5,1
Extent of feeding and animal husbandry	11,9	42,4	42,4	3,4
Change in production costs	5,1	35,6	23,7	35,6
Producer sales	6,8	**44,1**	40,7	8,5
Scientific research	11,9	8,5	**79,7**	-
Producer cooperation and cooperation	3,4	47,5	47,5	1,7
GMO cultivation	3,4	15,3	27,1	**54,2**
Weather conditions	16,9	25,4	13,6	**44,1**
Development of agriculture in neighboring countries	3,4	15,3	27,1	**54,2**
Climate change	1,7	25,4	11,9	**61,0**
Pollution	3,4	16,9	10,2	**69,5**

Using the association coefficient, I examined the relationship between the questions. I use the Guilford scale for analyzes **(Guilford, 1956)**. The hypothesis of independence between the criteria, with a significance level of 5%, I obtained the relationship strength values in Table 2. In the case of the highlighted values, the value of the test function I calculated was higher than the critical values of the Chi-square, therefore the hypothesis of independence can be rejected for these, the relationship can be considered significant.

Table 2: Values of association coefficients in SWOT analysis (sign. p <0.05)

Characteristics	Factor				
	Age	**Gender**	**Educational attainment**	**Agricultural education**	**District**
Climate and natural features	0,312	0,149	0,190	0,188	0,297
Quality and quantity of cereals	0,111	0,095	0,178	0,239	0,286
GMO (genetic modification)	0,113	0,128	0,115	0,127	0,271
Membership of the European Union	0,085	0,099	0,187	0,084	0,370
Technological advancement	0,049	0,285	0,114	0,095	0,237
Scientific research	0,068	0,181	0,161	0,061	0,229
Weather conditions	0,117	0,129	0,158	0,176	0,261
Producer sales	0,169	0,259	0,164	0,176	0,249
Experience and expertise of those	0,033	0,351	0,123	0,146	0,259
Development of agriculture in	0,222	0,123	0,206	0,127	0,324
Changes in European cereal	0,168	0,060	0,128	0,026	0,212
Sales opportunities within the	0,248	0,096	0,163	0,105	0,248
Serving market needs	0,049	0,121	0,123	0,105	0,266
Employing a skilled workforce	0,307	0,062	0,216	0,160	0,227
Available processing capacity	0,160	0,199	0,167	0,214	0,304
Land prices and rents	0,076	0,233	0,142	0,119	0,191
Change in production costs	0,285	0,053	0,142	0,155	0,236
Subsidies	0,115	0,208	0,086	0,095	0,299
Producer cooperation and	0,274	0,040	0,133	0,214	0,231
Change in the selling price of cereals	0,096	0,116	0,106	0,137	0,224
Available irrigation capacity	0,226	0,059	0,178	0,243	0,224
Available storage capacity	0,252	0,138	0,129	0,175	0,271
Bioenergy production	0,213	0,052	0,111	0,072	0,226
Extent of feeding and animal	0,407	0,056	0,121	0,209	0,242
Climate change	0,226	0,162	0,138	0,164	0,249
Pollution	0,107	0,112	0,146	0,045	0,253
Supplying the growing population of	0,117	0,280	0,294	0,147	0,309

There is thus a link between gender and technological development, the experience and expertise of those working in the cereals sector, and the responses to supply to the growing population of the land. The relationship is also characterized by the use of age and skilled labor, changes in production costs, responses to feed and livestock production, and opinions on geographical affiliation (district) and membership of the European Union.

4.2. Results of concentration issues

We are not competitive abroad. Our only competitive advantage may be coordination. Integration is needed. It is no coincidence that such organizations have emerged around the world. It could be a very close integration, when only the land would remain owned by each farmer or looser, everyone would produce it himself. Based on the analysis of the data, farmers agree that sales, processing and sourcing should be negotiated together.

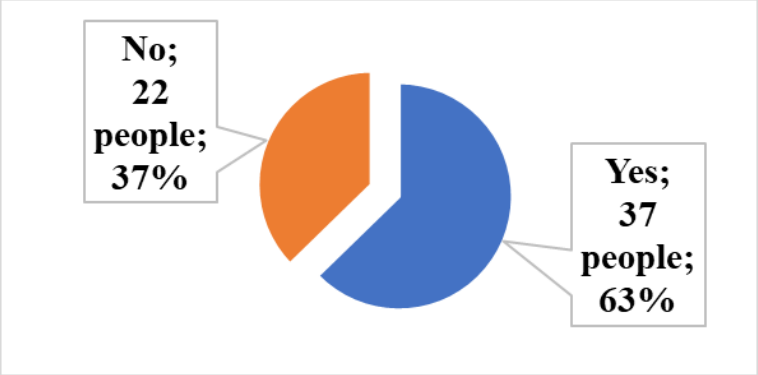

Figure 1. Judging a stronger concentration (2019)

The cross-tabulation analysis shows the internal indicators of the opinion on the concentration of arable land in one's own economy. Those under 40 are more supportive (13 percentage points), but both age groups see it as necessary. Men and women have the same opinion, but men see it as more necessary (16% points). Farmers in Ibrány and Csenger do not see the need. The majority of farmers in the other 7 districts do. Concentration is supported in groups trained by education and specialization (Table 3).

Table 3: Concentration of arable land in own farm, cell values (sign. p <0.05)

Characteristics	Factor				Total
	No	Yes	No	Yes	
Below 40	3	8	27 %	73 %	11
Above 40	19	29	40 %	60 %	48
Total	22	37			59
Female	6	6	50 %	50 %	12
Male	16	31	34 %	66 %	47
Total	22	37			59
Do not have	1	2	33 %	67 %	3
Basic	1	6	14 %	86 %	7
Medium level	17	22	44 %	56 %	39
High level	3	7	30 %	70 %	10
Total	22	37			59
Have agricultural education	21	32	40 %	60 %	53
Do not have agricultural education	1	5	17 %	83 %	6

Total	22	37			59

Continued from Table 3.

Baktalórántházi district	0	4	0 %	100 %	4
Csengeri district	5	3	63 %	38 %	8
Fehérgyarmati district	3	4	43 %	57 %	7
Ibrányi district	3	0	100 %	0 %	3
Mátészalkai district	1	4	20 %	80 %	5
Nagykállói district	5	5	50 %	50 %	10
Nyíregyházi district	4	9	31 %	69 %	13
Tiszavasvári district	0	4	0 %	100 %	4
Vásárosnaményi district	1	4	0 %	100 %	5
Total	22	37			59

Opinions on the need for ownership concentration based on relationship closeness studies were mainly influenced by age and agricultural education.

Farmers are more in favor of more concentrated ownership of arable land (Figure 2).

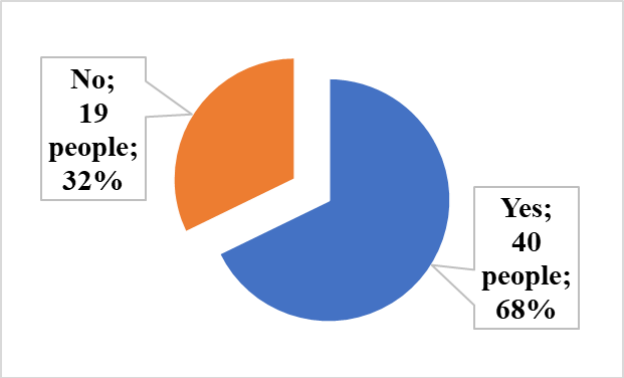

Figure 2. The need for ownership concentration (2019)

The concentration of arable land is supported to a greater extent by those under 40 than by those over 40. There is no significant difference between the opinions of men (68%) and women (67%). Farmers in education-trained groups see it as necessary. With the exception of farmers in the Ibrány and Csengeri districts, farmers support the concentration of arable land (Table 4). Farmers in Baktalórántházi, Mátészalka and Tiszavasvár support this process in full.

Table 4: Concentration of arable land, cell values (sign. p <0.05)

Characteristics	Factor				Total
	No	Yes	No	Yes	
Below 40	2	9	18 %	82 %	11
Above 40	17	31	35 %	65 %	48
Total	19	40			59
Female	4	8	33 %	67 %	12

Male	15	32	32 %	68 %	47
Total	19	40			59

Continued from Table 4.

Do not have	1	2	33 %	67 %	3
Basic	0	7	0 %	100 %	7
Medium level	16	23	41 %	59 %	39
High level	2	8	20 %	80 %	10
Total	19	40			59
Have agricultiral education	18	35	34 %	66 %	53
Do not have agricultural education	1	5	17 %	83 %	6
Total	19	40			59
Baktalórántházi district	0	4	0 %	100 %	4
Csengeri district	5	3	63 %	38 %	8
Fehérgyarmati district	2	5	29 %	71 %	7
Ibrányi district	3	0	100 %	0 %	3
Mátészalkai district	0	5	0 %	100 %	5
Nagykállói district	4	6	40 %	60 %	10
Nyíregyházi district	4	9	31 %	69 %	13
Tiszavasvári district	0	4	0 %	100 %	4
Vásárosnaményi district	1	4	20 %	80 %	5
Total	19	40			59

For the most part, farmers see a more concentrated organization of production as an opportunity (Figure 3). Production concentration is considered important by 71.2% of respondents and ownership concentration by 67.8% of respondents.

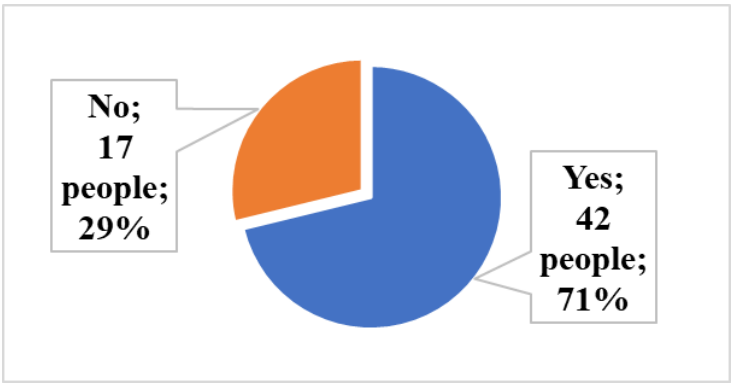

Figure 3. The need for production concentration (2019)

Based on these, the assessment of the two types of concentrations is almost identical. Farmers see a need for change, but it is not clear how the two possible paths will be judged. Based on the 3.4 percentage point difference, farmers in the county would choose

to combine production over concentration of ownership. This is explained by the experience of the production of the times before the change of regime. Based on the high average age of farmers, they remember the socialist system.

The concentration of production is supported by a much higher proportion of young people according to age. There is no significant difference between the opinions of men and women. It is supported by both groups. Farmers in education-trained groups see it as necessary. With the exception of the farmers of the Ibrány district, the agricultural experts of the other districts support the concentration of production (Table 5). They are mainly farmers in the districts of Baktalórántházi, Fehérgyarmat and Mátészalka. Primary and non-educated people see development as most needed in this regard.

Table 5: Production concentration, cell values (sign. p <0.05)

Characteristics	Factor				Total
	No	Yes	No	Yes	
Below 40	2	9	18 %	82 %	11
Above 40	15	33	31 %	69 %	48
Total	17	42			59
Female	4	8	33 %	67 %	12
Male	13	34	28 %	72 %	47
Total	17	42			59
Do not have	1	2	33 %	67 %	3
Basic	0	7	0 %	100 %	7
Medium level	14	25	36 %	64 %	39
High level	2	8	20 %	80 %	10
Total	17	42			59
Have agricultiral education	16	37	30 %	70 %	53
Do not have agricultural education	1	5	17 %	83 %	6
Total	17	42			59
Baktalórántházi district	0	4	0 %	100 %	4
Csengeri district	4	4	50 %	50 %	8
Fehérgyarmati district	0	7	0 %	100 %	7
Ibrányi district	3	0	100 %	0 %	3
Mátészalkai district	0	5	0 %	100 %	5
Nagykállói district	3	7	30 %	70 %	10
Nyíregyházi district	4	9	31 %	69 %	13
Tiszavasvári district	1	3	25 %	75 %	4
Vásárosnaményi district	2	3	40 %	60 %	5
Total	17	42			59

4.3. Evaluation of implemented and planned investments

I present the realized investments in the last 15 years, divided into three periods in the sample (Table 6). The result of my survey was that in all three time intervals, one third of the farms (33.77%) did not make any investments. The largest part following the development value of the fleet, examined in all three time intervals. The need for machine development appears most typically in the short (51.7%), medium (58.3%) and long-term (50%). In all three time periods, the decisive part was accounted for by machine improvements. This is explained by the need to replace obsolete machinery. Processing capacity is listed at very low values according to the survey.

Table 6: Implemented investments (2019)

Time	Investment						
	Did not have	**Fleet develop-ment**	**Storage capacity**	**Diversificat-ion**	**Processing capacity**	**Irrigation capacity**	**Human resource**
1-5 years	33,3 %	51,7 %	15,0 %	11,7 %	6,7 %	5,0 %	1,7 %
6-10 years	30,0 %	58,3 %	8,3 %	8,3 %	1,7 %	5,0 %	3,3 %
11-15 years	35,0 %	50,0 %	11,7 %	3,3 %	6,7 %	5,0 %	1,7 %
Average	32,77%	53,33%	11,67%	7,77%	5,03%	5,00%	2,23%

Planned investments over the next 10 years, divided into four time periods (Table 7). The result of my research is that in each time interval, machine development remains dominant, but the development of irrigation capacity also appears in second place, as a strong goal among the aspirations of the county's farmers. The low values of processing capacity and human resources indicate that the potential problems of the county's agriculture remain unchanged. My result is that the production of raw materials without processing, which represents the low added value typical of Hungarian agriculture, remains the production characteristic.

Table 7: Planned investments (2019)

Time	Planned investment					
	Fleet developm ent	**Irrigation capacity**	**Diversifica tion**	**Storage capacity**	**Processing capacity**	**Human resources**
0-1 years	51,7 %	28,3 %	18,3 %	11,7 %	3,3 %	3,3 %
2-4 years	58,3 %	33,3 %	13,3 %	10,0 %	1,7 %	1,7 %
5-7 years	60,0 %	31,7 %	15,0 %	16,7 %	8,3 %	5,0 %
8-10 years	51,7 %	33,3 %	11,7 %	16,7 %	11,7 %	3,3 %
Average	55,43 %	31,65 %	14,58 %	13,78 %	6,25 %	3,33 %
Increase	+2,10 %	+26,65 %	+6, 81 %	+2,12 %	+1,22 %	+1,10 %

Based on my results, 54% of farmers consider it important to process cereals, increase added value and thus sell them at a higher price even to the final consumer, which is the most profitable activity (Figure 4). The result of my research is that farmers do not want to produce a product with a higher value (46%). They set up for raw material production, they want to make a living from it. This is also confirmed by the change in the sales price of cereals classified as weak in the SWOT analysis, the available processing capacity and the results of producer sales. Only 54.2% of respondents consider it important to increase further processing. In the last 1-15 years, investment to develop processing capacity has been low because farmers are struggling with a lack of capital. For future developments, the processing development rate will be a few percent in the short term. According to the plans for 5-10 years, the increase in processing capacity is expected to increase to 10%, which is still a very modest result. Based on the SWOT analysis, 47.5% of farmers classify the amount of available processing capacity as a weakness.

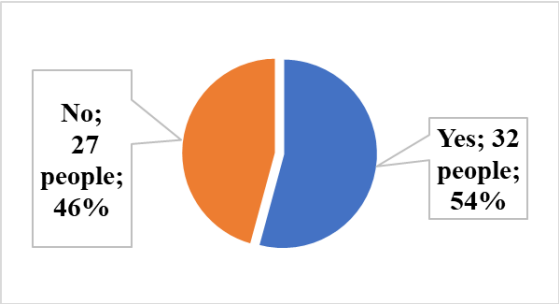

Figure 4. Increasing corn and wheat processing (2019)

The analysis shows the internal indicators of the view of processing. In the age grouping, they were almost identical about the need to improve processing. Men answered yes to this question rather than women, who thought equally. I illustrate the internal ratios of the survey on the need for processing in a table. (Table 8). My result is that, examined by districts, the farmers of Ibrányi district reject the need to increase the processing capacity. The agricultural professionals of the Baktalórántház district fully support the developments in this direction. Producers in the Csengeri district are equally divided in their assessment of this issue. Opinions on this direction of development are divided in the other districts.

Table 8: Increase in processing, cell values (sign. p <0.05)

Characteristics	Factor				Total
	No	Yes	No	Yes	
Below 40	5	6	45 %	55 %	11

Above 40	22	26	46 %	54 %	48
Total	27	32			59
Female	6	6	50 %	50 %	12
Male	21	26	45 %	55 %	47
Total	27	32			59
Do not have	1	2	33 %	67 %	3

Continued from Table 8.

Basic	2	5	29 %	71 %	7
Medium level	18	21	46 %	54 %	39
High level	6	4	60 %	40 %	10
Total	27	32			59
Have agricultiral education	26	27	49 %	51 %	53
Do not have agricultural education	1	5	17 %	83 %	6
Total	27	32			59
Baktalórántházi district	0	4	0 %	100 %	4
Csengeri district	4	4	50 %	50 %	8
Fehérgyarmati district	5	2	71 %	29 %	7
Ibrányi district	3	0	100 %	0 %	3
Mátészalkai district	2	3	40 %	60 %	5
Nagykállói district	7	3	70 %	30 %	10
Nyíregyházi district	2	11	15 %	85 %	13
Tiszavasvári district	3	1	75 %	25 %	4
Vásárosnaményi district	1	4	20 %	80 %	5
Total	27	32			59

4.4. Results for irrigated farming

The results given by the farmers of the county revealed that the farmers consider irrigation farming to be feasible on their own farms. (Figure 5). The SWOT analysis also confirms that it is necessary to trigger the role of extreme and poorly distributed precipitation in crop production, both in terms of climate and weather. The result of my study was that the available irrigation capacity was assessed as almost a weakness and only a possibility for the management of the county. Considering the natural endowments of Hungary, it sheds light on the very frustrating situation of the fresh water supply.

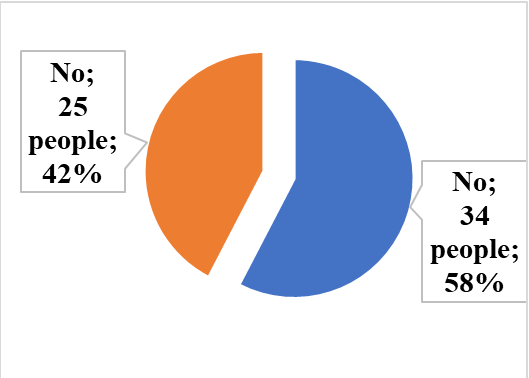

Figure 5. Implementation of irrigation technology in farming (2019)

Based on the results of the "Implementation of Irrigation Management" research, farmers support the greater use of this technology in an age distribution. Men are more supportive, women are almost equally rejected. Those with specialist qualifications also support it, but those with no specialist qualifications agree to a greater extent with the need to develop this cultivation technology (Table 9). Examined by districts, the farmers working in Baktalórántházi, Csengeri, Nagykálló and Nyíregyháza districts consider it important. The other five districts are not considered necessary. The opinion on the feasibility of irrigation technology based on relationship closeness studies was influenced by gender, district, and agricultural education, respectively. My result is that the majority is in favor of greater use of technology, with the exception of women with a basic education. According to the districts, the most rejected are the farmers of the Mátészalka district (80%), as well as the agricultural specialists of the Fehérgyarmat (71%), Ibrányi (67%), Vásárosnamény (60 5) and Tiszavasvár (75%) districts.

Table 9: Feasibility of irrigation technology, cell values (sign. p <0.05)

Characteristics	Factor				Total
	No	Yes	No	Yes	
Below 40	5	6	45 %	55 %	11
Above 40	20	28	42 %	58 %	48
Total	25	34			59
Female	8	4	67 %	33 %	12
Male	17	30	36 %	64 %	47
Total	25	34			59
Do not have	0	3	0 %	100 %	3
Basic	4	3	57 %	43 %	7
Medium level	18	21	46 %	54 %	39
High level	3	7	30 %	70 %	10
Total	25	34			59
Have agricultiral education	23	30	43 %	57 %	53
Do not have agricultural education	2	4	33 %	67 %	6
Total	25	34			59
Baktalórántházi district	0	4	0 %	100 %	4
Csengeri district	2	6	25 %	75 %	8
Fehérgyarmati district	5	2	71 %	29 %	7

Ibrányi district	2	1	67 %	33 %	3
Mátészalkai district	4	1	80 %	20 %	5
Nagykállói district	4	6	40 %	60 %	10
Nyíregyházi district	2	11	15 %	85 %	13
Tiszavasvári district	3	1	75 %	25 %	4
Vásárosnaményi district	3	2	60 %	40 %	5
Total	25	34			59

In the opinion of the responding farmers, the implementation of irrigation farming and the necessary coverage of it were assessed as almost yes and no. In terms of being able to cover it from surplus income (Figure 6). The result of my research is that, given the high costs, they are waiting for central support and tender opportunities to implement developments in this direction. In addition:

- 57.6% consider irrigation farming to be feasible,
- 47.5% would bear the costs,
- those who consider it feasible have a rate of 58.8%.

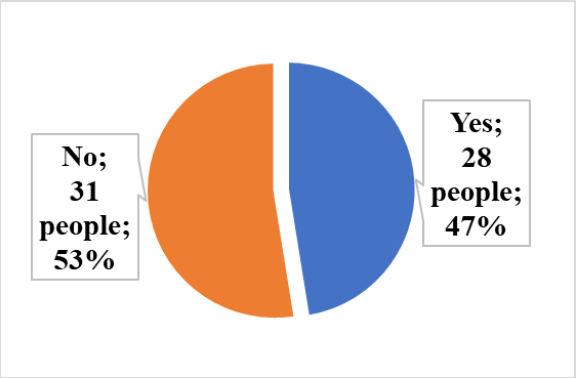

Figure 6. Feasibility of irrigation technology (2019)

The implementation of irrigation farming on one's own, based on the results of the survey, broken down by age, gender, school and specialized degrees, is rather rejected by farmers in Szabolcs-Szatmár-Bereg county. According to the district distribution, the farmers of the Baktalórántházi, Csengeri, Mátészalka and Vásárosnamény districts consider self-sustaining development to be conceivable. Not in the other five districts (Table 10). Opinions on the cost-effectiveness of irrigated farming based on relationship closeness studies were influenced by agricultural education and district, respectively.

Table 10: Implementation of irrigation technology from own resources, cell values (sign. p <0.05)

Characteristics	Factor				Total
	No	Yes	No	Yes	
Below 40	6	5	55 %	45 %	11
Above 40	25	23	52 %	48 %	48
Total	31	28			59
Female	7	5	58 %	42 %	12

Male	24	23	51 %	49 %	47
Total	31	28			59
Do not have	2	1	67 %	33%	3
Basic	3	4	43 %	57%	7
Medium level	23	16	59 %	41 %	39
High level	3	7	30 %	70 %	10
Total	31	28			59
Have agricultiral education	27	26	51 %	49 %	53
Do not have agricultural education	4	2	67 %	33 %	6
Total	31	28			59
Baktalórántházi district	1	3	25 %	75 %	4
Csengeri district	2	6	25 %	75 %	8
Fehérgyarmati district	4	3	57 %	43 %	7
Ibrányi district	2	1	67 %	33 %	3
Mátészalkai district	2	3	40 %	60 %	5
Nagykállói district	6	4	60 %	40 %	10
Nyíregyházi district	9	4	69 %	31 %	13
Tiszavasvári district	3	1	75 %	25 %	4

Continued from Table 10.

Vásárosnaményi district	2	3	40 %	60 %	5
Total	31	28			59

4.5. Results for precision farming

The answers given by the farmers revealed that a significant part of them have knowledge of precision farming and consider it to be applicable in their farm (Figure 7). The high rate of negative response indicates that they do not want to adapt the investment needs of this form of farming to their existing conditions.

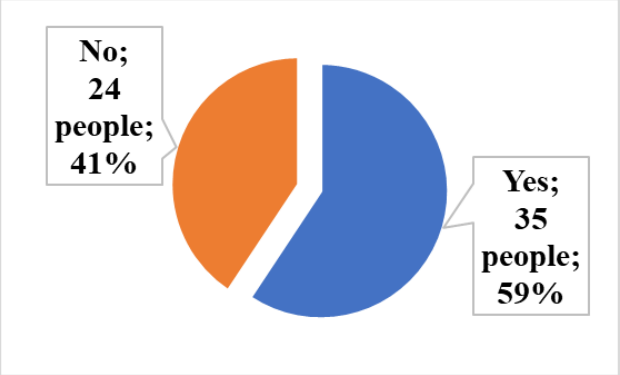

Figure 7. Assessment of precision farming technology (2019)

According to my research results on the implementation of precision farming, they support the introduction of a larger degree into practical farming in all group breakdown divisions. In the district distribution, the farmers of Vásárosnamény and Ibrányi districts consider it more redundant (Table 11). Opinions on the need to introduce this technology are divided in the other districts. The opinion on the feasibility of precision farming, based on relationship closeness studies, was most influenced by agricultural education. In all

groups, the majority supports the spread of technology. Less than half of farmers in Ibrány district support it alone (33%).

Table 11: Feasibility of precision technology, cell values (sign. p <0.05)

Characteristics	Factors				Total
	No	Yes	No	Yes	
Below 40	5	6	45 %	55 %	11
Above 40	19	29	40 %	60 %	48
Total	24	35			59
Female	5	7	42 %	58 %	12
Male	19	28	40 %	60 %	47
Total	24	35			59
Do not have	0	3	0 %	100 %	3
Basic	3	4	43 %	57 %	7
Medium level	17	22	44 %	56 %	39
High level	4	6	40 %	60 %	10
Total	24	35			59
Have agricultiral education	23	30	43 %	57 %	53
Do not have agricultural education	1	5	17 %	83 %	6
Total	24	35			59

Continued from Table 11.

Baktalórántházi district	0	4	0 %	100 %	4
Csengeri district	3	5	38 %	63 %	8
Fehérgyarmati district	3	4	43 %	57 %	7
Ibrányi district	2	1	67 %	33 %	3
Mátészalkai district	2	3	40 %	60 %	5
Nagykállói district	5	5	50 %	50 %	10
Nyíregyházi district	4	9	31 %	69 %	13
Tiszavasvári district	2	2	50 %	50 %	4
Vásárosnaményi district	3	2	60 %	40 %	5
Total	24	35			59

The answers given by the farmers showed that a significant part of them have knowledge about precision farming. He considers it possible to obtain the necessary material conditions if he needs it. In this case, close cooperation is needed between the companies selling the technology, financial institutions, interest groups / producer groups / various associations, or even individual farmers, in order for the development to be a profitable investment. Otherwise, farmers will not develop in this direction (Figure 8).

The result of my study is that:

- 59.3% consider precision farming feasible,
- 54.2% agree to cover the costs of applying precision farming from their surplus income,

- Among those who consider precision farming to be feasible, this ratio is already 68.6% in terms of cost bearing, 75% of those who would bear the costs are also consider itt o be feasible.

Figure 8. Introduction of precision farming on own account (2019)

Based on the results of the answers to the question "Implementation of precision farming on one's own", they prefer to support self-sustaining developments in all group breakdowns. The exception is those without education. In the distribution of districts, the farmers of Vásárosnamény and Mátészalka districts support it the most, in full number (Table 12). Farmers in the Nyíregyháza and Tiszavasvár districts, represented by a large number of people, reject self-sustaining developments. The most dismissive are the agricultural experts of the Nagykálló district. Based on the relationship closeness studies, the opinion on the cost implications of applying precision farming was influenced by age and gait, respectively. The high level of support measured in general acceptance decreases when the need for technology had to be judged in terms of its own strong development. In the district division, support fell below 50% among farmers in Ibrány (33%), farmers belonging to Fehérgyarmat (43%), Nagykálló (30%) and Nyíregyháza (38%).

Table 12: Implementation of precision technology from own power, cell values (sign. p <0.05)

Characteristic	Factors				Total
	No	Yes	No	Yes	
Below 40	4	7	36 %	64 %	11
Above 40	23	25	48 %	52 %	48
Total	27	32			59
Female	6	6	50 %	50 %	12
Male	21	26	45 %	55 %	47
Total	27	32			59
Do not have	2	1	67 %	33 %	3
Basic	2	5	29 %	71 %	7
Medium level	19	20	49 %	51 %	39
High level	4	6	40 %	60 %	10
Total	27	32			59
Have agricultiral education	24	29	45 %	55 %	53

Do not have agricultural education	3	3	50 %	50 %	6
Total	27	32			59
Baktalórántházi district	1	3	25 %	75 %	4
Csengeri district	3	5	38 %	63 %	8
Fehérgyarmati district	4	3	57 %	43 %	7
Ibrányi district	2	1	67 %	33 %	3
Mátészalkai district	0	5	0 %	100 %	5
Nagykállói district	7	3	70 %	30 %	10
Nyíregyházi district	8	5	62 %	38 %	13
Tiszavasvári district	2	2	50 %	50 %	4
Vásárosnaményi district	0	5	0 %	100 %	5
Total	27	32			59

4.6. County-specific association results

The association coefficient indicator illustrates the closeness of the relationship between the factor and the answers to scientific questions. Assuming independence between the criteria, in addition to the Chi-square critical values belonging to the 5% significance level, I obtained the association coefficient values presented in Table 13. In the case of the highlighted values, the value of the test function I calculated was larger than the critical values of the Chi-square, therefore the hypothesis of independence can be rejected for these, the relationship can be considered significant. Based on this, a significant relationship can be found in the sample in terms of geographical affiliation (district), production structure cost and income records, non-subsidized farming, willingness to implement irrigated farming and opinions on the role of age and GMO crop production in production safety.

Table 13: Association values of the sample-specific questions to be decided (sign. p <0.05)

Characteristic	Factors				
	Age	**Gender**	**Formal education**	**Agricultural education**	**District**
Sees the concentration of property (arable land) as necessary	-0,42326	0,03226	0,16884	0,44000	0,19364
Stronger concentration of cultivated areas in their own economy	-0,27197	0,31915	0,19607	0,53285	0,20342
Influence of production structure cost and income records	0,33333	0,58974	0,15817	0,58621	0,47775
Concentration of production	-0,34328	0,13333	0,13795	0,36752	0,16133
Management without subsidies	-0,55556	-0,07011	0,19281	-0,13514	0,32553
Willingness to use "precision farming"	-0,23372	0,10638	0,13557	-0,09434	0,21785

Willingness to implement precision farming (site-specific)	0,11969	0,02564	0,07953	0,58621	0,14034
Evaluation of applications	-0,20623	0,34118	0,24985	na	0,29713
Willingness to use irrigation technology	0,07692	0,55844	0,14388	0,21053	0,33898
Willingness to implement irrigation farming	0,04943	0,14591	0,18832	-0,31646	0,22358
Intention to develop infrastructure	0,53991	0,48148	0,05489	na	0,28706
Do you see dangers in growing genetically modified (GMO) crops?	0,23810	-0,14943	0,09653	0,13402	0,20309
Can crop yields and crop safety be improved by growing genetically modified (GMO) crops?	-0,74582	0,54639	0,11830	0,05660	0,25315
Processing development propensity	-0,00763	0,10638	0,14230	0,65605	0,33629
Separate cost and income records per crop	-0,07692	0,45055	0,11159	0,50588	0,21860

5. NEW SCIENTIFIC RESULTS

1. It was the first time that a complex analysis of the agriculture of Szabolcs-Szatmár-Bereg county had been done, based on deeper, empirical structured and in-depth interview studies, with the involvement of the National Chamber of Agricultural Economics. With their help, a survey was conducted among agricultural enterprises, which assessed and presented the common opinion and situation of a large number of farmers, which is a new approach.

2. A SWOT analysis was carried out for the first time, involving the farmers of the county, which presents their opinion within the framework of the methodology. They had to evaluate and comment on given characteristics according to the four possible categories. This is how the sample-specific SWOT map was created, which shows the external and internal criteria at the district level as well.

3. There is a low willingness to introduce precision farming. 59.3% consider precision farming to be feasible, 54.2% agree to cover the costs of applying precision farming from their extra income. Among those who consider precision farming to be feasible, this ratio is already 68.6% in terms of cost bearing. 75% of those who would bear the costs also consider it to be feasible.

4. I assessed the attitude of the farmers to the application system and supported their usability from the point of view of the producers with data. Farmers are still accepting the 50% aid intensity. The aid intensity of 25% is negligible. Unsurprisingly, higher aid intensities are considered better. 56% of farmers would not apply even with 100% support. 66% of agricultural professionals would not apply for 75% support.

6. RESULTS APPLICABLE IN PRACTICE

The empirical survey of the dissertation provides new information on the following topics:

1. It contributes to the preparation of policy decisions based on professional results through the economic structure survey. The examination of short-, medium- and long-term developments provides a basis for the development characteristics of the host society and summarizes the expected development direction in the future.

2. Based on the survey, it is possible to take stock of the extent and direction of demand that agricultural service industries may face in the future. During the development of the vision of the agricultural economy, it provides knowledge about the expectations of the planned transformation of farming, from the definition of the basic conditions of irrigation farming to the county-level grain production cost-income values.

3. I see it as an important aspect that I also determined the values characteristic of the examined county from the point of view of the interest representation organization and the purchasing and sales side. With this in mind, guidelines can be developed to better serve the interests and achievements of the agricultural sector through a common and organized representation policy.

4. With the help of the criteria of the SWOT analysis, I assessed the external and internal environment of the county's agriculture and determined the typical strengths, weaknesses, opportunities and threats in which farmers have to produce.

5. An unavoidable topic is water management. The public discourse will focus on both political and agricultural research topics. Hungary is also a great freshwater power in the world. The research has assessed and provides a basis for the development of irrigation farming criteria. The first and second parts of the definition of the agricultural public interest must be about the protection and use of arable land and water resources.

7. REFERENCES

1. Antal J. (2005): Növénytermesztés alapjai Gabonafélék. In: Antal J. (szerk.): Növénytermesztéstan 1. Mezőgazda Kiadó, Budapest. 9-18.
2. Baranyi B. – Sinóros-Szabó B. (2013): A Tisza-tér értelmezésének dilemmái regionális dimenziókban. In: Jávor A. (főszerk.): Agrártudományi Közlemények. Acta Agraria Debreceniensis. Debrecen. **52**: 169 -171.
3. Béládi K. – Kertész R. – Szili V. (2017): A főbb mezőgazdasági ágazatok költség- és jövedelemhelyzete 2013-2015. AKI, Budapest. 5-14.
4. Csete L. – Láng I. (2005): A fenntartható agrárgazdaság és vidékfejlesztés. Magyarország az ezredfordulón, Stratégiai tanulmányok a Magyar Tudományos Akadémián, II. Az agrárium helyzete és jövője. MTA Társadalomkutató Központ, Budapest. 313.
5. Dinya L. (2018): Változó hangsúlyok a térségfejlesztésben. In: Nagy J. (szerk.): Hangsúlyok a térfejlesztésben. Kerpely Kálmán Doktori Iskola, Debrecen. 103-114.
6. Engloner A. – Barreto S. – Bártfai B. – Liptay Z. Á. – Vargha M. (2018): A Nemzeti Víztudományi Kutatási Program kihívásai és feladatai. MTA-ÖK, Tihany. 17-94.
7. Guilford, J. P. (1956): Fundamental Statistics in Psychology and Education. McGraw-Hill Book Company, New York. 565.
8. Gyüre A. – Tanczné Ó. Cs. (2018): Az öntözéses gazdálkodás aktualitásai. Agro Napló, Zsigmond Kft, **3**: 17-18.
9. Harsányi E. – Harsányi G. – Nagy A. J. (2005): Területi fejlettségi különbségek Magyarországon és az Észak-Alföldi Régióban. In: Jávor A. (főszerk.): Agrártudományi Közlemények (Acta Agraria Debreceniensis), Debrecen. **18:** 62-71.
10. Harsányi E. – Széles A. – Harsányi G. (2006): A birtokszerkezet alakulása Magyarországon. In: Baranyi B – Nagy J. (szerk.): Területfejlesztés. Agrárium és Regionalitás Magyarországon. MTA RKK, DE ATC, Debrecen. 221-228.
11. Huzsvai L. (2006): Az Észak-Alföldi Régió természeti adottságainak kihasználása az agráriumban. In: Baranyi B – Nagy J. (szerk.): Területfejlesztés, Agrárium és Regionalitás Magyarországon. MTA RKK, DE ATC, Debrecen. 291-302.
12. Kátai J. (2012): Napjaink talajbiológiai kihívásai. In: Jávor A. (főszerk.): Agrártudományi Közlemények (Acta Agraria Debreceniensis), Debrecen. **49**: 193-196.
13. Nagy J. – Nagy A. J. (2018): Mezőgazdaság: tények, tendenciák, teendők. In: Nagy J. (szerk.): Hangsúlyok a térfejlesztésben. Kerpely Kálmán Doktori Iskola, Debrecen. 25-36.
14. Nagy J. (2005a): A föld az élet és a termelés alapja – „a föld szeretete a haza szeretete". In: Fürj Z. – Jávor A. (szerk.): "…a birtokolt föld … a szabadság maga". Debreceni Egyetem ATC, Debrecen. 31-38.
15. Nagy J. (2012): Versenyképes kukoricatermesztés, Mezőgazda Kiadó. Budapest. 15-33; 476-482.
16. Nagy J. (2019): Földhasználat. In: Pepó P. (szerk.): Általános növénytermesztési ismeretek. Integrált növénytermesztés I. Mezőgazda Lap- és Könyvkiadó, Budapest. 168-190.
17. Nagy O. – Kith K. (2014): Az éghajlatváltozás hatásai a mezőgazdaságra. In: Rajnai Z. - Fregan B. - Ozsváth J. (szerk.): Tanulmányok, publikációk és előadások az 5.

Báthory-Brassai Konferencia programjából. 5. Báthory-Brassai Tanulmánykötet 2. Óbudai Egyetem, Budapest. 395-399.

18. Nagy, J. – Sinóros-Szabó, B. (2014): Evalution of technologies and resources from the spartial and social aspects. In: Jávor A. (főszerk.): Agrártudományi Közlemények (Acta Agraria Debreceniensis), Debrecen. **59**: 73-75.
19. Pomázi I. – Szabó E. (2018): A környezetállapot-változás folyamatai Magyarországon. (Main Trends in Changes of Enviromental Quality in Hungary). In: Tóth G. (főszerk.): Területi Statisztika. KSH, Budapest. **58** (3): 319-341.
20. Romány P. (2002): Agrártörténeti tanulságok, agrárpolitikai követelmények. In: Hunyadi L. (főszerk.): Statisztikai Szemle. KSH, Budapest. **80** (7): 663-673.
21. Sinóros-Szabó B. – Dinya L. (2006): A bioenergia előállítás vidékfejlesztési többlethatásai. In: Baranyi B – Nagy J. (szerk.): Területfejlesztés, Agrárium és Regionalitás Magyarországon. MTA RKK, DE ATC, Debrecen. 229-238.
22. Sinóros-Szabó B. – Rátonyi T. – ifj. Sinóros-Szabó B. – Sulyok D. (2005): Bioreaktor a fenntartható fejlődés szolgálatában. In: Jávor A. (főszerk.) Agrártudományi közlemények (Acta Agraria Debreceniensis). Debrecen. **17**.111-118.
23. Sinóros-Szabó B. (2012a): Vidéki térrendszer többletei. In: Jávor A. (főszerk.): Agrártudományi Közlemények (Acta Agraria Debreceniensis), Debrecen. **49**: 271-273.
24. Sinóros-Szabó B. (2012b): Folyó- és térkörnyezet-potenciál hasznosítás. In: Sinóros-Szabó B. (szerk.): Tiszatér-környezet stratégiai fejlesztése. Keleti Háromhatár-Szeglet Kutató-Fejlesztő Központ, Mátészalka. 91-101.
25. Sinóros-Szabó B. (2012c): A Tisza térkörnyezetére alapozott vidékfejlesztés. In: Tóthmérész B. (szerk.): Acta Biologica Debrecina, Debrecen. **27**: 169-176.
26. Sinóros-Szabó B. (2018): A fejlesztés új dimenziói – valóság a mérhető világon túl. In: Nagy J. (szerk.): Hangsúlyok a térfejlesztésben. Kerpely Kálmán Doktori Iskola, Debrecen, 13-24.
27. Soltész M. –Nyéki J. – Szabó Z. (2005): Lokális stratégiai feladatok a magyarországi gyümölcstermelésben a globális gazdasági és éghajlati változások nyomán. In: Jávor A. (főszerk.) Agrártudományi közlemények (Acta Agraria Debreceniensis). Debrecen. **17**. 29-34.
28. Szili V. – Szlovák S. (2018): A főbb mezőgazdasági ágazatok költség- és jövedelemhelyzete 2016. AKI, Budapest. 5-13.
29. Takács I. **–** Sinóros-Szabó B. (2019): Növényvédelmi költségek csökkentése, kutatási eredményekre alapozva. Rurális térségek a 21. században tudományos konferencia, Szent István Egyetem, Gödöllő. 222-230.
30. Várallyay Gy. (2012): Talaj – Környezet – Fenntarthatóság. In: Jávor A. (főszerk.): Agrártudományi Közlemények (Acta Agraria Debreceniensis), Debrecen. **49:** 331-337.

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Subject: PhD Publication List

Candidate: István Takács
Doctoral School: Kálmán Kerpely Doctoral School
MTMT ID: 10070882

List of publications related to the dissertation

Hungarian scientific articles in Hungarian journals (2)

1. **Takács, I.**, Sinóros-Szabó, B.: A búzatermesztés ökonometriája - felmérésre alapozvaSzabolcs-Szatmár-Bereg megyébe.
   Növénytermelés. 69 (3), 137-153, 2020. ISSN: 0546-8191.
2. **Takács, I.**, Sinóros-Szabó, B.: A kukoricatermesztés ökonometriája - felmérésre alapozva Szabolcs-Szatmár-Bereg megyében.
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Foreign language scientific articles in international journals (3)

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Foreign language conference proceedings (1)

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Hungarian abstracts (2)

9. **Takács, I.**: A növénytermesztés eredményeinek értékelése.
In: Tavaszi Szél Konferencia : Nemzetközi multidiszciplináris konferencia : Absztraktkötet. Szerk.: Németh Katalin, Doktoranduszok Országos Szövetsége, Budapest, 86, 2019. ISBN: 9786155586422

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In: XIII. Nyíregyházi Doktorandusz Konferencia : Absztraktfüzet. Szerk.: Rusinné Fedor Anita, Balla Petra, Debreceni Egyetem Egészségügyi Kar, Nyíregyháza, 44, 2019. ISBN: 9789634901655

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In: VI. Kárpát-medencei Környezettudományi Konferencia. Szerk.: Szabó Béla, Tóth Csilla, Szele Tibor, Bessenyei György Könyvkiadó, Nyíregyháza, 97-98, 2010.

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A PhD értekezés alapjául szolgáló közlemények

Magyar nyelvű tudományos közlemények hazai folyóiratban (2)

1. **Takács, I.**, Sinóros-Szabó, B.: A búzatermesztés ökonometriája - felmérésre alapozvaSzabolcs-Szatmár-Bereg megyébe.
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