

**THESES OF DOCTORAL (PhD)
DISSERTATION**

**ZSOLT ÁDÁM ORBÁN
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**Investigating the conditions of an online system for local product
information and sales: focus on the Kecskemét district**

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Theses of doctoral (PhD) dissertation

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1. BACKGROUND AND OBJECTIVES OF THE WORK

At the beginning of my doctoral studies, I set myself the goal of contributing to the sustainability of rural life through my future research. As one of, if not the biggest challenge currently facing rural sustainability is the lack of work/livelihood opportunities, I started my research by looking at how to provide income and greater income opportunities for rural people. Since a significant part of the rural population's income still comes from agriculture, despite the changes in the sector and the countryside, I thought it was natural to start my research with the opportunities offered by agriculture, especially since I and my family are both involved in agriculture.

I first started researching the period before the regime change. As Hungarian agriculture basically performed well from 1960 to 1989, I was particularly interested in research on the reasons for the efficiency of cooperatives, although this was scarce. It turned out that, according to World Bank statistics, there was a period (1968-1983) when Hungary was the fastest growing country in the world in terms of per capita food production, ahead of the Netherlands, which was second. At the same time, some authors argue that the decline in the 1990s - an annual average of -6.2% between 1991-95 and -0.7% between 1996-2000 - can only be compared to the collapse of Hungarian agriculture during the Second World War, while collectivization caused more damage to production than collectivization did at the turn of the 1960s.

After the change of regime, cooperatives typically disappeared due to the circumstances of the time, even though at the beginning of the regime change, Nobel Prize-winning American economist Lester Thurow argued that *"Hungary has the best chance of catching up with Western Europe in the short term among the former socialist countries. All it needs to do is to make good use of the potential of its people: to develop and implement economic policies based on knowledge, creativity, existing scientific achievements and an excellent research and education network"*.

So, with all this in mind, I turned my attention first to cooperatives, as they have been the basis of Hungary's agricultural success. Thirty years on, the question arises as to how Hungarian agriculture, with its current technological advantages and supported by EU and domestic funding, is performing compared to the pre-transition period, and whether efficiency can be improved.

Given that current technological advances add much to agriculture, the evolution of trends raises several questions. How much potential is still left in Hungarian agriculture? Could output still be improved based on past

performance? What opportunities does the current level of agriculture or a possible increase in output offer for people living in rural areas? How can the competitiveness of rural areas be increased along these lines?

And, of course, deciding overall whether there is a form of cooperation that contributes to all this?

1.1. Problem statement

In a global competitive market, one of the alternatives to increase competitiveness is cooperation. By cooperating, producers are more likely to survive in the market and produce profitably. The European Union has also made cooperation a priority area for development. At the beginning of my research, I wondered why the cooperative system was so effective before the change of regime and whether a similar initiative could be implemented today. My research question was to what extent people (as labour) and producers would be willing to co-operate by re-organizing into co-operatives. Since the quantity of goods produced is also greater on a larger farm or cooperative, there is greater bargaining power with buyers or sellers, which means greater income opportunities for farmers. In addition, the presence of a larger farm size means that their ability to attract capital is also greater. On this basis, however, and based on the literature and my own experience, I have come to the following conclusions: with a few exceptions (e.g. Alföldi Tej Kft.), cooperative models have typically not worked in the longer term. In Hungarian agriculture, with its ageing management structure, managers did not trust cooperatives again, perhaps because of the socialist overtones of the pre-reform period. In addition, the younger generation is not fundamentally open to cooperatives. The government also tried to revive cooperatives, but these initiatives eventually fizzled out as well. What is surprising is that the vast majority of both top-down and bottom-up cooperative initiatives disbanded shortly after their launch.

As cooperative models are currently not widely applied, product prices remain depressed, with a lack of cooperation emerging as a decades-old problem. However, it is not only the lack of cooperation that pulls down farmgate prices, but also the fact that buyers and the market know that farmers across the EU receive subsidies - and the amount of extra subsidies also affects farmgate prices.

The problem is that purchase prices are falling because of subsidies, but if subsidies were withdrawn from the agricultural sector, this could cause a number of problems. In the present case, we have an impasse where the buyer of all the players is the one who benefits, because the farmer receives subsidies but his income is lower than it could be. The state and the local infrastructure also suffer from this effect, as farmers spend less, develop less, employ fewer

people, etc. This endless cycle has resulted in a permanent interdependence between producers and the state that seems unstoppable.

As a result, there are also agricultural enterprises that do not even try to be productive, but only wait for subsidies after meeting the minimum support criteria. They continue to survive in the absence of meaningful development or greater competitiveness. They will not be able to raise purchase prices on their own without the opportunity for self-development or without a concerted effort. Smaller agricultural enterprises, which do not have the land or the eligible activities to receive sufficient support, can only cover the maintenance of their farms from the revenue generated by the sale of their products. However, if they do not have enough income due to low purchase prices, it follows directly that the start-up and maintenance opportunities for smaller producers are much more difficult, if not impossible.

From a rural development point of view, it is important to note that new rural movers often move to the countryside only because of cheaper land prices and rural subsidies. These new rural residents are no longer living from agriculture but work in a nearby (large) urban factory or in the service sector. This problem is significant in the Kecskemét district, which I have studied in detail. Commuting on a daily basis does not contribute at all to local value added production, as commuters even do their shopping in the metropolitan - often international - hypermarkets and chain stores (and commuting also causes increased pollution of the environment). However, it should also be noted that in many cases there are currently not many alternative options to finding local work or livelihoods to urban ones. The shrinking opportunities offered by agriculture and the obstacles to starting up agribusinesses reinforce this problem.

I believe that there is an opportunity to create more local value, but first we need to reform agriculture and the market for agricultural products. I believe that it would be possible for more producers to make a decent living than they do at present, while at the same time being able to live side by side. However, this would first require a change of mindset (both among producers and consumers) to understand that selling and buying local produce locally is not only good for them, but also for the whole region where it is produced and sold.

In my opinion, if there is no open alternative - easily accessible to the general public - for selling the products of producers, where they can sell their products with a nearly similar energy investment but at a higher profit than if they sell them to buyers, some will (as they have done so far) prosper, but the majority will slowly decline. In other words, a significant segment of domestic

agriculture will continue to survive on subsidies (while not making any real progress), and will rather slowly erode (in terms of employment, rural economy) as a whole, as it has been doing for the last 30+ years.

1.2. Target badges

After the outbreak of the pandemic COVID-19 and the Russian-Ukrainian conflict, the world had to wake up to the serious food security and food supply issues that have emerged, highlighting the need for technological and social reforms in food supply, as well as innovations in the agri-food sector that require a high degree of flexibility in supply chains.

The researchers propose the following solutions for the future:

- Product storage and distribution networks need to be reassessed to manage changing demand patterns and minimize disruption.
- To take advantage of digital technology to expand supply chain flexibility, the technological resources and information processing capabilities available in agri-food supply chains must be harnessed.
- The advantages of artificial intelligence, including big data analytics, should be exploited to increase transparency and operational efficiency in supply chains.
- Flexible production systems and real-time traceability would also improve the food supply chain.
-

Digitalization is the key word of the century, without exaggeration, and it is present in all areas of human activity. In the case of logistics activities, digitalization means the virtualization of supply chains and the use of IoT¹, which mean greater flexibility, productivity, cost-effectiveness and, in essence, greater efficiency in logistics activities. Digital technologies can create entirely new capabilities in the food supply chain to better plan, design, implement and control the flow of goods, information and value. In essence, a "new" form of food supply chain is needed. This may be particularly important for the younger generation, which already in many respects has a different approach and appreciation of the role of the whole agricultural economy.

The widespread adoption of future internet applications is expected to change the way food supply chains operate in unprecedented ways. The internet will help to reintroduce old services, can be very useful in improving local food supply chains by increasing access to local produce and enabling faster shopping in traditional markets. However, internet-based services not only affect the way customers order and buy food, but also have a significant

¹ Internet of Things (IoT)

impact on business models and the structure of the physical distribution network, which can have a significant capital pull effect.

From the above, my basic question, around which I have built the topic of this thesis, is that if there were an online system where producers and consumers could "collaborate", exchange information and even make purchases, would they be willing to use it (if so, why, and if not, why not). In summary, along the research objective(s), by combining the knowledge acquired during the doctoral studies, the literature background and the practical experience, I aimed to produce tangible research results that, when put into practice, could already serve as an effective solution.

The aim of my research was to investigate a new form of cooperation and the justification of a local product information and sales online system focusing on the Kecskemét district. Furthermore, by exploring the spatial differences of the regions in the country, based on the literature and my experience so far, I will make suggestions on which districts in the country would be suitable for such a system. I will also explore the needs and requirements of potential actors through a questionnaire to consumers and producers and interviews with municipalities in order to produce the most accurate research results.

It should be emphasized that the aim of my thesis is primarily focused on understanding the relevance and justification of the online system in question, rather than its operational functioning. A detailed exploration of the operational conditions of the system is one of my future research objectives. In this context, I have formulated the following research questions and hypotheses.

1.3. Research questions and hypotheses

In summary, the thesis has three main objectives:

1. Exploring a new form of cooperation, investigating the feasibility of a local product information and sales online system in the district of Kecskemét;
2. to make suggestions on which districts in the country would be suitable for the use of a local online product information and sales system;
3. Mapping the needs and requirements of potential participants in the local online product information and sales system.

In this thesis, I seek to confirm or refute the following hypotheses based on the literature, my previous studies, my own empirical experience and my own research history:

Hypothesis 1:

I assume that the role of agriculture is still a demonstrable factor in the development of regional differences, and that statistical methods can clearly delineate and distinguish regions (including the Kecskemét district, which I have studied in particular) where the agricultural character is dominant.

Hypothesis 2:

I assume that the range of consumers who might use the online local product information and sales system, which is the subject of this thesis, can be well distinguished on the basis of my regional studies. In the light of the research on short supply chains, I assume that in this case, too, users with a higher education level are more willing.

Hypothesis 3:

I assume that the municipalities surveyed have a fundamentally positive view of the online system for information and sales of local products, which is the subject of this thesis, and are willing to cooperate with this system. The study clearly identifies the factors that facilitate and hinder the system from a municipal perspective.

Hypothesis 4:

I assume that the study clearly identifies the factors that facilitate and hinder the system from a producer's point of view. In this context, I assume that, in addition to the openness of producers to the online system, a fundamental impediment is the negative willingness to cooperate with each other (between producers).

Hypothesis 5:

I assume that, based on the analysis of the spatial differences and the results of my primary research, I will be able to identify districts where there is relevance for the implementation of the online system I am investigating and for further research on its implementation. At the same time, I assume that the Kecskemét district is also a basic area suitable for this.

2. MATERIAL AND METHOD

In my dissertation, I investigated what would be the opinion of the different actors if an online system existed that would allow them to obtain information about local products and producers and even to make purchases. The research itself was focused on the Kecskemét district for several reasons, the first and most important being that I and my family are farmers in this district. In order to give a more accurate picture of the perception of the key actors involved, I used the following research methods:

- Analysis of literature on all types of cooperation that may be relevant to the topic of the thesis.
- Comparison of the Kecskemét district with other districts, using secondary data and multivariate methods.
- Primer questionnaire survey in the consumer segment. With a total of 499 completed cases concentrated in the Kecskemét district.
- Primer questionnaire survey among agricultural producers in the region. With a total of 36 completed questionnaires, limited to the district of Kecskemét.
- Structured interviews with mayors of the Kecskemét district. I interviewed the mayors of 12 municipalities on this topic.
- Examining the correlation between the results of primary research using statistical methods.

The bulk of the research took place between 2021-2022. Thus, it is important to note that the COVID-19 pandemic made primary research very difficult and mainly online solutions were used. This was compounded by the fact that the willingness to complete the producer questionnaire survey was much lower, so the data obtained there, although representative, is essentially indicative. The following is a brief description of some of the methods used, following an analysis of the literature.

2.1. Multivariate comparative analysis of Hungarian districts

My aim in the study was to work with the most up-to-date data in order to make the most recent comparison. I worked with 85 social, economic, environmental and infrastructure indicators at district level, as justified by the topic of the thesis and by the practices commonly used in the literature. In the indicator construction process, the basic data collected were standardized before starting the analysis. The data sources included the National Spatial Planning and Information System (TeIR), T-STAR, KSH, NAV and the Ministry of Interior databases.

I performed the analysis along the basic indicators formed from the included variables for all districts of the country (except Budapest). At the beginning of the analysis, I omitted standardized basic indicators with low explanatory power in order to increase the explanatory power of the model. After sorting, I finally obtained 78 standardized basic indicators. Finally, the data obtained from the reduction could be used for a comparative analysis of the regions, based on the statistical measures obtained in the analysis. The 6 factors constructed from the standardized input variables were ideal, compressing almost 70% of the total data set.

Using the selected input data as a starting point, I examined where all districts of the country, and the selected district of Kecskemét, are positioned along the factors generated from the standardized basic data and in the clusters formed with their help. My aim and motivation in the analyses was to create factors and clusters focusing on spatial differences, which can be characterized separately, and to highlight which group of factors defines and characterizes the selected and researched area. In addition, it may also provide information for another aim of the thesis: which districts in the country could be the ones where the local product sales and information online system I studied could be applied. For the analysis I used multivariate methods: factor and cluster analysis using the SPSS software package. I used the QGIS software to plot the results on maps.

2.2. Secondary (correlation) analysis of consumer research results

The basis and input data for the study was provided by my online primary consumer data collection. The main aim and inspiration of the research was to investigate general food consumption habits, focusing on local products, and the related justification for an online system where consumers can easily obtain information about and even buy local products. In the context study I wanted to explore the basic drivers for this. I also used cross-tabulation analysis in the context analysis.

For the correlation test, I created two decision trees. I gave the two decision trees two target variables. The two target variables were:

- Which characteristics of consumers would be most likely to use the online system I am investigating to find information about local products/producers/actions.
- Which consumer characteristics would be most likely to use this online system to buy local products.

I used the CHAID learning algorithm to help me build the decision trees. The accuracy of the predictors (the predictors of the final conclusions) was shown by the AUC value. For the consumer primary questionnaire linkage research, I used Microsoft Excel, and IBM SPSS Modeler data mining and text analysis software application to generate the data and results.

2.3. Description of the consumer survey

The main aim and inspiration for my primary consumer questionnaire research was to investigate general food consumption habits, focusing on local products, and the related justification for an online system where consumers can easily find information about local products and even buy them there.

In the consumer questionnaire, I started with traditional questions such as the respondent's gender, age, education and occupation. Other questions included: purchasing habits, consumer preferences and price sensitivity. In the second half of the questionnaire and the survey, I asked questions about local products, their distribution and availability, as well as about available food products and shopping habits.

Finally, I collected responses on the use of the online system that is the subject of this thesis. As a consequence of the COVID-19 situation, an online questionnaire survey was conducted from January to April 2021 in the district of Kecskemét. The population of the district of Kecskemét is 155 686 inhabitants, the area is 1212 km², the settlements belonging to the district are Ágasegyháza, Ballószög, Felsőlajos, Fülöpháza; Fülöpjakab, Helvécia; Jakabszállás, Kecskemét, Kecskemét - Hetényegyháza, Kerekegyháza, Kunbaracs, Kunszállás, Ladánybene, Lajosmizse, Nyárlőrinc, Orgovány, Városföld. The anonymous survey resulted in a total of 499 responses, a sample size that is already sufficient for scientific conclusions.

2.4. Presentation of the producer survey

The primary aim of the producer questionnaire was to find out how all the actors involved in my research - consumers, municipal managers and producers - perceive the marketing and production of their products in their area, and to get an answer to whether producers would use and perceive a local product information and marketing system online.

I used an online anonymous questionnaire for the producer survey. Overall, it can be said that all farmers with all types of farming in the district were interviewed. I also tried to involve the local village farmers and the National Chamber of Agriculture (NAK) in order to get as many questionnaires as possible filled in, but I was less rather than more successful in this respect. As a result of the COVID-19 situation, an online, anonymous questionnaire survey was conducted from March 2021 until September 2021 in the Kecskemét district.

In total, I managed to achieve 36 completed items. Although the low number of items is an obstacle to present a complete producer needs assessment and the results are not suitable for further statistical methods, they are suitable to form a view on the producers' opinion on the topic of this thesis. Thus, descriptive statistics were used to evaluate the data obtained due to the low number of items.

4.2.3. Presentation of the municipal survey

With the structured interviews of the mayors of the Kecskemét district, my aim was to find out how the local government leaders see the sales and consumption opportunities of local products in their settlements and their surroundings, as well as their rural development aspects. In addition, I wanted to investigate the justification for the existence of an online product information and marketing system for local products, which is the subject of this thesis. I managed to interview the mayors of twelve of the sixteen settlements of the Kecskemét district, the interviews were conducted in October 2021. I consider the results to be basically representative due to the 75% participation rate, although it is regrettable that I did not manage to interview the head of the district and county centre or his representative, despite repeated attempts. I believe his opinions and insights/experiences would have been fundamental to the subject and the region. Overall, the data are suitable to form a view on the opinions of local mayors on the subject of this thesis. Descriptive statistics were used to evaluate the data obtained due to the low number of items.

3. RESEARCH RESULTS AND DISCUSSION

3.1. Comparative analysis of Hungarian districts using multivariate methods presentation of the results of the factor analysis

My aim in the factor analysis was to create groups focusing on spatial differences that can be characterized separately, and to highlight where my chosen region falls within this group. In addition, this study could also provide information for another research for this thesis: which districts in the country could be the ones where the local product sales and information online system I am studying could be applied.

Factor 1: Economic status

The first factor includes the following main basic indicators with positive factor weight: total number of registered jobseekers over 180 days, public employment/1000 inhabitants, registered jobseekers with less than 8 years of primary education/1000 inhabitants, registered jobseekers receiving social assistance/1000 inhabitants, etc. The basic indicators with positive signs in this factor mainly show higher rates of unemployment and public employment. The main basic indicators with a negative factor weight were: share of registered jobseekers with vocational secondary school, technical school education, total income taxable under the consolidated tax base for VAT/1000 inhabitants, VAT; total (HUF)/1000 inhabitants, etc. The basic indicators with a negative factor weight were broadly speaking indicators of

economic development. Figure 1 shows the performance of the economic development or underdevelopment factor of the Hungarian districts.

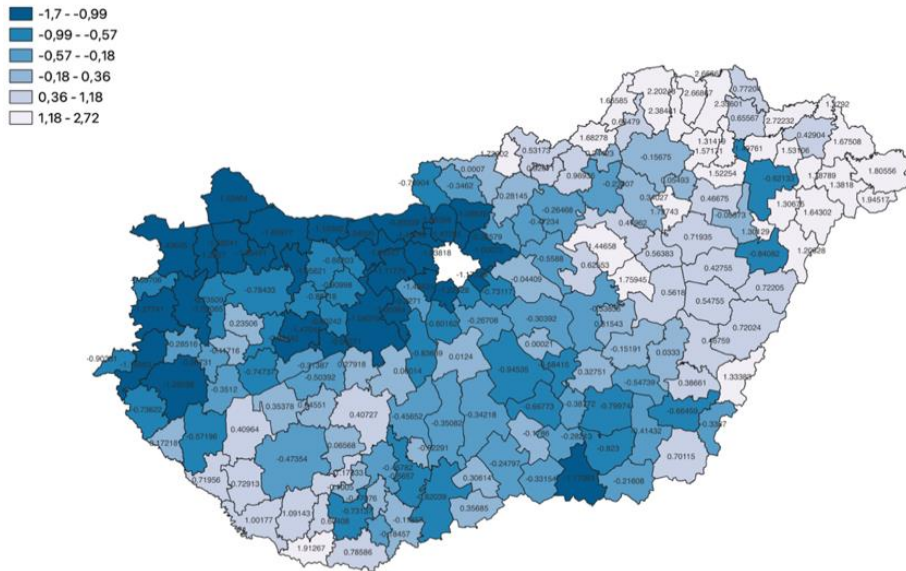


Figure 1: Districts in Hungary along the "economic status" factor
Source: own research and editing, 2023

In the case of the first factor, the most economically developed districts are those with the most negative values of the factor. It can be observed that the county capitals, the agglomeration of Budapest and the North-Western region of the country are the most economically developed. It is also observed that where there is a motorway, the economic development is basically higher. The Kecskemét district is the most developed with a factor value of -0.9, but it is not among the most developed districts.

Factor 2: peripherality/availability

The second factor includes the following main input variables (all of which have positive factor weights): distance of own district headquarters by the fastest road, distance of own regional centre by the fastest road, distance of nearest town of at least 100 000 inhabitants by the fastest road, etc. It can be observed that the weighting coefficients of the basic indicators are only positive in this case and indicate road accessibility, except for two indicators. Using the basic indicators, it is easy to define regional and spatial differences. In Figure 2, we can observe the performance of the peripherality/accessibility factor for Hungarian districts, where the accessibility of the capital is not shown.

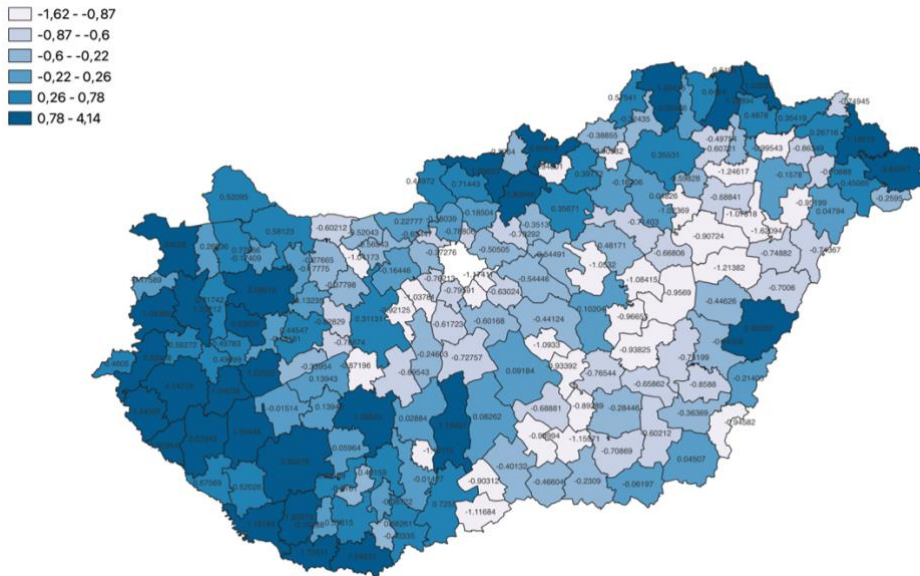


Figure 2: Districts in Hungary along the "peripherality/accessibility" factor

Source: own research and editing, 2023

It can be seen that it is mainly the districts far from small villages and larger cities that have the highest factor values (i.e. the longest accessibility time). In addition, even in the North-Eastern part of the country, the truly peripheral areas have high values. The district of Kecskemét is in the middle of the analysis with a factor value of 0.091.

Factor 3: General tourism

The third factor includes the following main basic indicators, all of which have a positive factor weight: number of guests in commercial accommodation (persons)/1000 inhabitants, total number of nights/1000 inhabitants, gross domestic turnover of commercial accommodation/1000 inhabitants, etc. The basic indicators refer to the general situation of tourism. All variables have a positive factor value. The specific number and proportion of unoccupied dwellings is also included in this factor, indicating that there are many unoccupied dwellings for rent in strong tourist destinations. Figure 3 observes the performance of the overall tourism factor of the Hungarian districts.

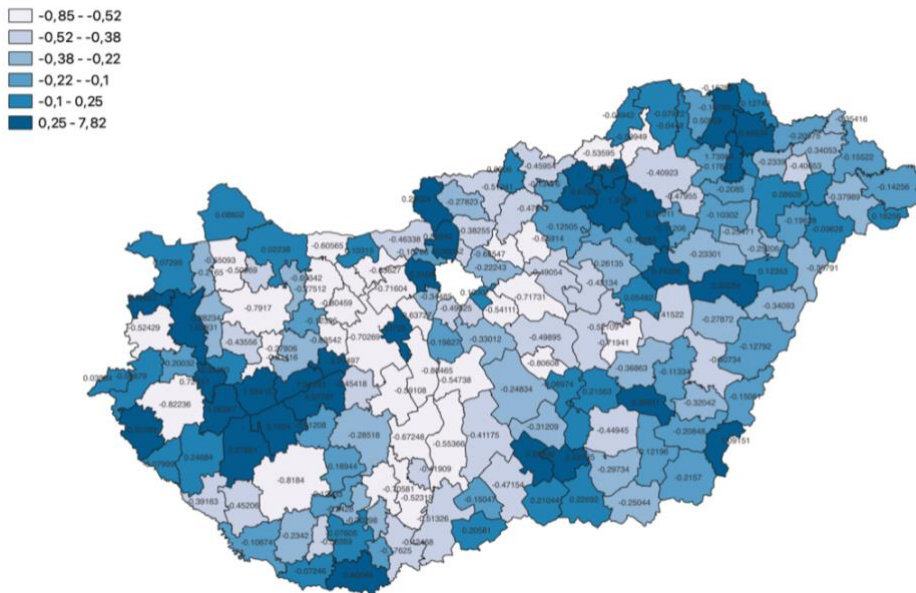


Figure 3: Districts in Hungary according to the "general tourism" factor

Source: own research and editing, 2023

It can be observed that this factor is dominated by the districts around Lake Balaton and the districts with major spas or local attractions. In this case, the district of Kecskemét, with a factor value of -0.248, belongs to the districts that perform less well in general tourism.

Factor 4 Agricultural activity

The fourth factor includes the following main basic indicators which, with one exception, have a positive factor weight: share of small farmers (number) in the total number of small farmers (HUF), income subject to VAT; share of small farmers (HUF), income subject to VAT; small farmers (HUF)/1000 inhabitants, etc. The share of registered jobseekers aged 25-54 has a negative value in this factor, which means that a stronger presence of agriculture is also associated with higher employment. Figure 4 shows the performance of the agricultural activity factor for the Hungarian districts.

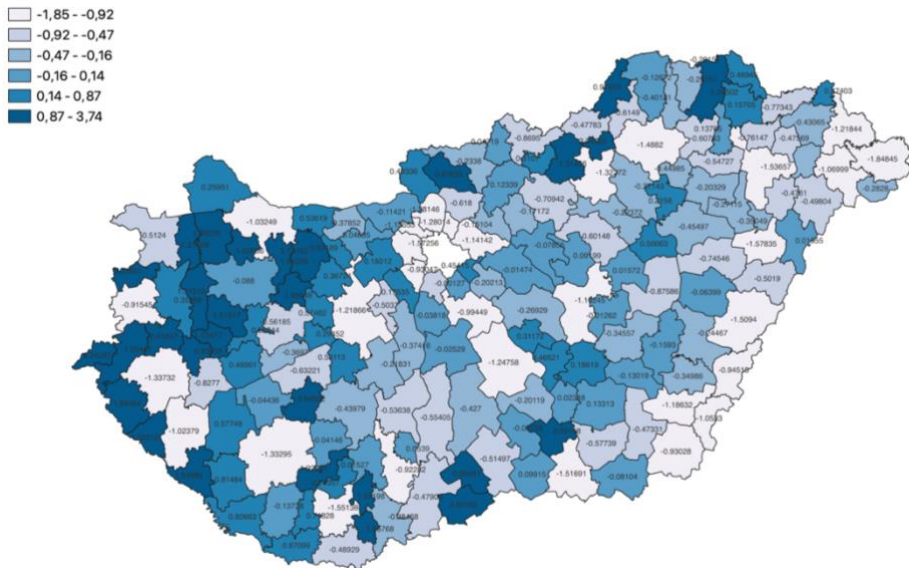


Figure 5: Districts in Hungary along the "rural - rural tourism" factor
Source: own research and editing, 2023

In this case, the Kecskemét district with a factor of -1.247 belongs to the more negative category.

Factor 6: Demographics

The sixth factor includes the following basic indicators, which have a positive factor weight: proportion of people aged sixty-five and over, number of dwellings occupied (number)/1000 inhabitants, proportion of registered jobseekers over 180 days in the total number of jobseekers. The indicators with a negative factor weight were: proportion of persons aged 15-64, natural reproduction and total number of dependent men and women (persons)/1000 inhabitants. Areas with positive factor values indicate areas with an ageing population, negative natural increase, a population that tends to live alone, with few dependents (as there are many retired people) and a lack of sustainable job opportunities for a smaller proportion of the active population. Figure 6 below shows the demographic factor performance of the districts in Hungary.

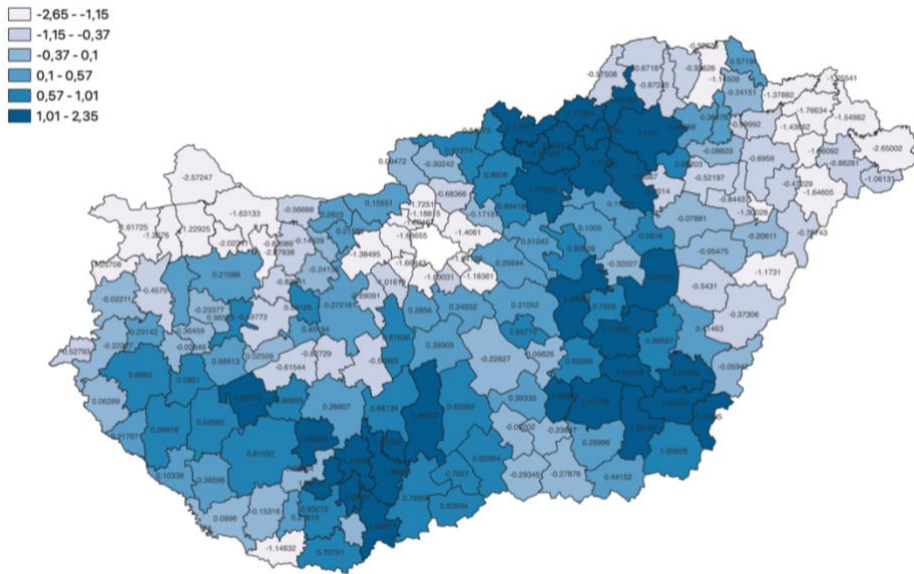


Figure 6: Districts in Hungary by the "demography" factor
Source: own research and editing, 2023

The economically stronger North-Western districts of the country and the Budapest conurbation are the districts where ageing is not a problem. In the north-eastern part of the country, we also find areas with similar situations, but here it is presumably not the strength of economic performance that causes the negative factor values, but the correlation with social problems, segregation and social processes. With a factor value of -0.228, the district of Kecske-mét is one of the districts with a more favorable situation in terms of demographic trends.

3.2. Results of the cluster analysis

My aim was to identify groups focusing on territorial differences, which can be characterized separately, and to highlight where my chosen region lies in the system of territorial differences. It may also provide information for the other purpose of this thesis, namely to identify the districts in the country where the local product sales and information online system I am investigating could be applied. I ran the cluster analysis for both the standardized input variables and the factors. In the end, the seven clustering solutions seemed to make the most sense, using Ward's method of hierarchical clustering. Thus, 7 clusters were eventually formed in the analysis. The characteristics of the cluster structure along the 6 main factors I developed are shown in Figure 7.

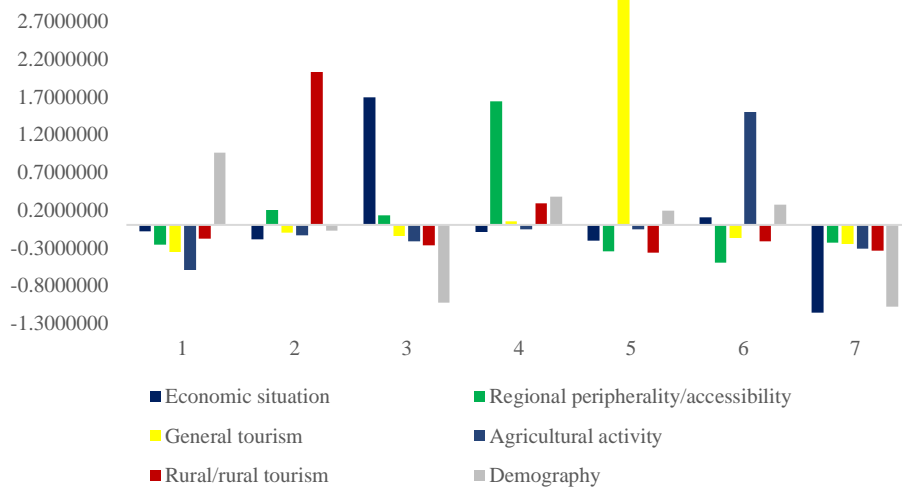


Figure 7: Characteristics of the cluster structure along the average factor values

Source: own research and editing, 2023

Figure 8 below summarizes the cluster groups obtained by my cluster analysis and the classification and distribution of the districts that make them up in the country.

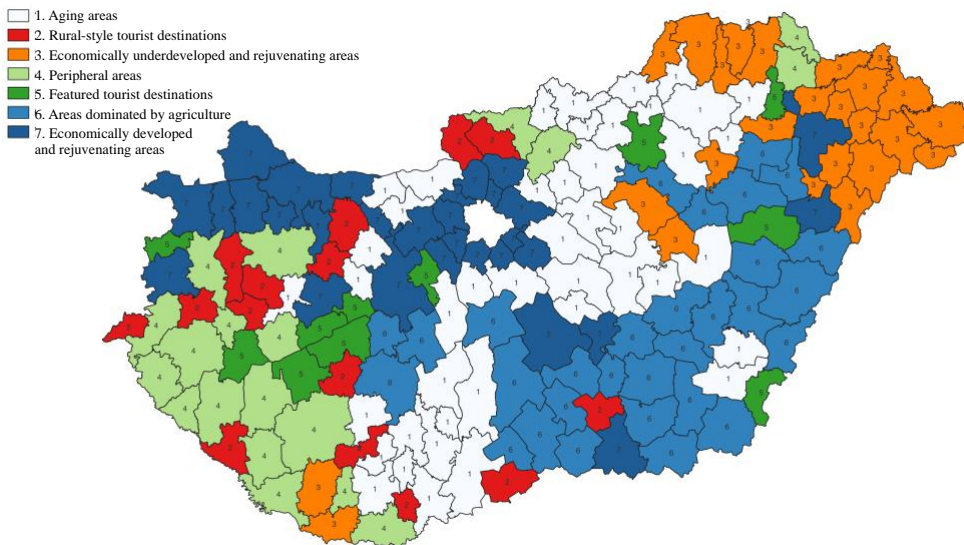


Figure 8: Distribution of cluster groups and their constituent regions in Hungary

Source: own research and editing, 2023

3.3. Results of the consumer survey - presentation of the results of the consumer questionnaire

The main aim and inspiration for the primary consumer research was to investigate general food consumption habits, focusing on local products, and the related justification for an online system where consumers can easily find information about local products and even buy them there.

Among other things, I surveyed attitudes towards the use of an online system that could help to get reliable information about local food products, easier shopping, checking and tracking local products, etc. It is observed (Figure 9) that 27% of respondents consider it a very good idea and would definitely use it. 37% of the sample find it interesting and would be very likely to try it. It can be concluded that 64% of the respondents would be very likely to use this online system to get information about producers and products. 30% of respondents would possibly try it and finally 6% would absolutely not use it.

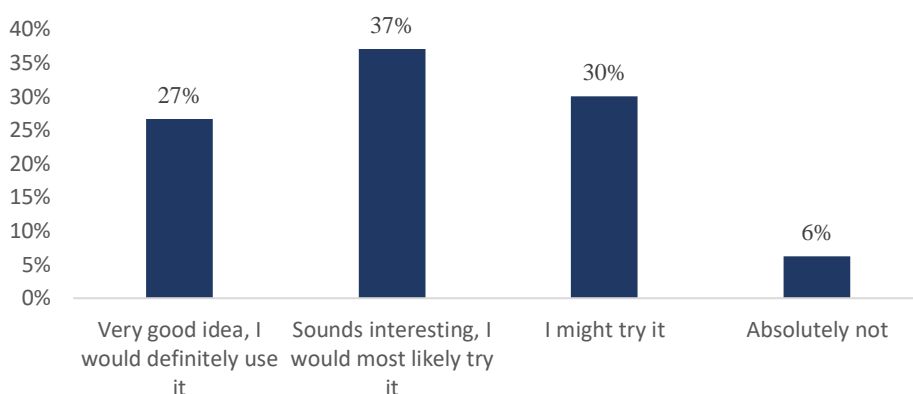


Figure 9: Distribution of respondents by propensity to obtain information on online systems (%)

Source: own research and editing, 2023

I also wondered whether respondents would be willing to buy specifically from local producers through such an online system. Figure 10 shows that 24% of respondents would most definitely use such an online system to buy local products. 38% of respondents found it interesting and would be very likely to try it. So 62% of respondents would be very likely to use this online system to buy local products. 34% of respondents would possibly try this online system. Finally, 4% of those who would definitely not use this system.

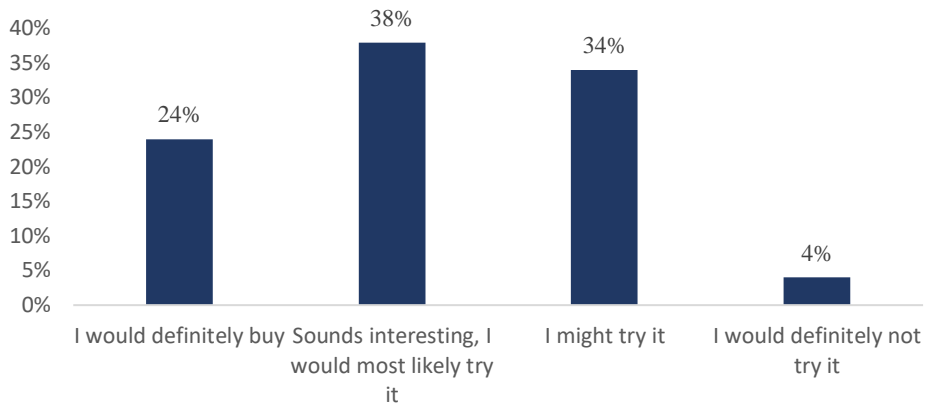


Figure 10: Distribution of respondents by willingness to buy online (%)

Source: own research and editing, 2023

3.4. Correlation analysis of the results of the consumer questionnaire - key findings

My primary aim in conducting the correlation studies was to examine the basic relationships that could be identified in the sample and to analyse what factors could help or influence consumers' consumption of local food and their use of the system I studied. In the following, I present the most relevant research findings.

One of the main topics of the thesis is who would be the potential users of the online system I studied to get information about local products/producers/actions. In other words, to investigate what factors influence consumers' willingness to engage in such a system. Figure 11 shows the importance of the predictors, i.e. the characteristics that would make consumers most likely to use this online system to obtain information. The first and strongest predictor is the willingness to travel for the local product. The next predictor, above 0.2 importance level, is how much the respondent spends on average per month on food. This is followed, with a lower importance value, by the gender of the respondent and how important it is for the respondent to buy a product with a trademark. A lower explanatory power, but still further correlation, is found if the respondent knows that dairy products are produced nearby or if his/her decision is generally influenced by the promotion/discounting. The other correlations are of very low value. The present analysis has an AUC value of 0.75, which means that there is a 75% chance that the model will be able to distinguish between the positive and negative (i.e., those who use the system and those who do not) class.

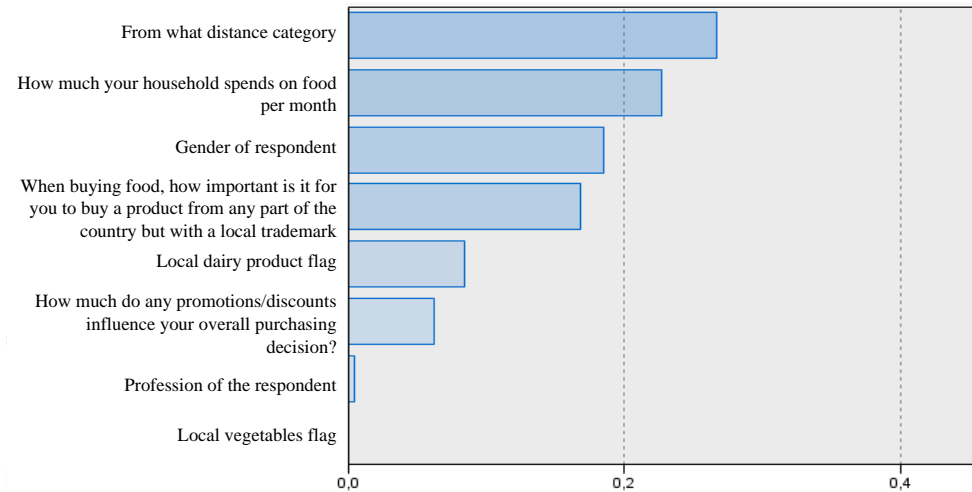


Figure 11: Key factors influencing the use of the online system (information retrieval)

Note: CHAID AUC = 0.75

Source: own research and editing, 2023

In the final, crucial part of the analysis, the decision tree generated by the CHAID learning algorithm can be used to identify the respondents who are most likely to use this online system to obtain information. Based on the data obtained, it can be stated that respondents who are willing to travel for local products (72% willingness), and within this group mainly those with a mental occupation (81% willingness along the decision tree), would be typically more likely to be involved. Within the group showing willingness to travel, those with other occupations, retired or physical, and those for whom a promotion or discount is not very important when shopping, are also more likely to be open.

Of those who would only buy local products in their own town or did not give a meaningful answer, 54% are willing to use this online system to get information about farm products. Within this group, 70% of those who would only buy a local product in their own municipality or did not give a meaningful answer and for whom it is very important that the product is labelled would be willing to use this online system. In other words: it is important that the producer products have a trademark (even a local trademark). The following are the characteristics that would make consumers most likely to use this online system for their purchases. The strongest predictor of propensity to buy (Figure 12), with a significance value of more than 0.2 alone, is the occupation of the respondent. Subsequently, it is observed that the current predictors have weaker explanatory power compared to the previous ones, but also a much less hectic movement. The stronger predictors also include the product being

environmentally friendly/sustainably produced and the price of the product. It is also found that there is a smaller but detectable relationship between whether the respondent would use this online system to buy local products and knowing that dairy products are produced nearby, as well as how much the respondent's household spends on food on average per month and whether the product is labelled. The least strong predictors include the respondent knowing that pickles are produced nearby, the gender of the respondent (female), and finally the respondent knowing that vegetables are produced nearby. The present analysis has an AUC value of 0.72, which means that there is a 72% chance that the model will be able to distinguish between the positive and negative class (i.e. the open and the closed group). Compared to the previous AUC value, the current one shows a lower value, but it is also observed that the input variables explain the target variable in a much more stable way. This is fully acceptable for the analysis. It can be observed that there are significant differences between Figure 11 and Figure 12, as in Figure 11 the most important characteristic is whether the consumer would be willing to travel for a local product, but in Figure 12 this characteristic is no longer found among the predictors.

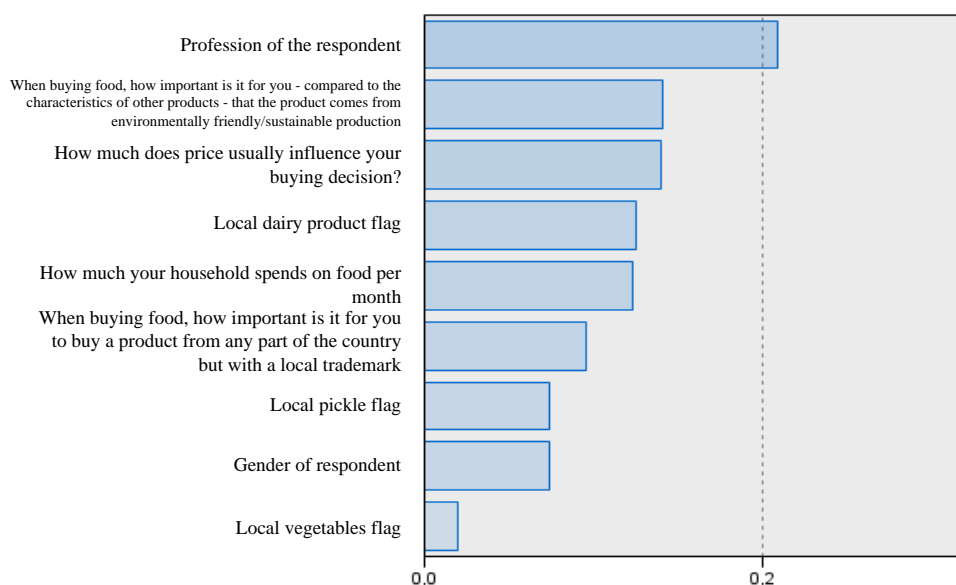


Figure 12: Key factors influencing the use of the online system (shopping)

Note: CHAID AUC = 0.72

Source: own research and editing, 2023

Also in this part of the analysis, I created a decision tree using the CHAID learning algorithm to identify the respondents who would be most likely to use this online system to buy local products. The data shows that respondents

who are not most likely to use this online system to buy produce are those for whom price is not the most important characteristic (64%). Within this, respondents from the intellectual sector show a 71% propensity to use this online system. Those for whom the price of the product is not very important, but who are in a physical occupation or retired, would use this system only 49%. Among those who consider it very important for their purchasing habits that the product be labelled, 73% would be willing to use this system for purchases, but the number of items is low (26). On the other side of the decision tree are those for whom the price of the product is very important - in this case only 46% of respondents would use this system for purchases. Within this group, 64% of those who know a specific place nearby where vegetables are produced would be willing to use the system, influenced by their occupation.

3.5. Results of the producer research

The primary aim of the producer questionnaire was to find out how producers perceive the marketing and production opportunities for their products in their area, and to get an answer to the question whether producers would use and what their perceptions are about a local product information and marketing system online.

I asked where the producers sell their products. The results show that 50% of producers sell their products through a trader or a buyer. The other 50% of the respondents who sell through non-acquirers are mostly described as selling at wholesale markets, farmers' markets, online, or door-to-door.

I checked whether producers have any local cooperation with other producers/producers/producer groups or other companies/regional actors. 50% of respondents have some form of cooperation, the other half do not. I looked at ways to encourage cooperation between producers/producers/producer groups and other companies/regional actors (e.g. municipalities). The biggest problem is found in 90% of the answers: the fact that purchase prices are too low. However, many also note that human nature is a barrier to this issue, as everyone wants to sell their goods at the best price.

58% of respondents have never used any advertising platform, 31% have sold their products through Facebook and 11% have sold their products through other means (municipal website, YouTube, Google, influencer, etc.). I looked at how producers currently sell online. 33% of the producers concerned deliver their goods themselves, 3% through a community of baskets, 3% through farmers' shops and finally 11% by door-to-door selling (the customer comes to the producer).

I looked at what producers would say about an online system that would make it easier for consumers to find information about local products/producers/actions. 47% of the producers surveyed would definitely use the app, 39% of those who might join and finally 14% of those who would not be interested. I also investigated how they would feel if they could even make purchases from this online system, where they could sell their own products. The distribution of respondents who would use this online system to sell their products is as follows: 17% would definitely use it because they think it is a very good idea, 28% think it sounds interesting, 39% would probably be interested, 39% would possibly try it and 17% of respondents would not be interested.

I asked them what positives they could imagine for themselves and their farms from such an online system. 80% of the respondents would expect more stable sales and better prices from this online system. In addition, respondents also mentioned the following potential impacts: speed, buyers would get to know the products better, thus mutual trust could be more easily established, fast and targeted sales, no need to go to the market, it would be an option to always have a buyer, market imbalances resulting from the difference between the profit of the buyer and the producer - its levelling out, no need to search for buyers, direct sales between producer and consumer, easier to bring producers together; and finally easier logistical organization. I have looked at the concerns about this online system. 60% of the respondents said that it is time consuming to keep up to date; furthermore, in many cases personal contact is very important for selling local products (this system does not hinder this: it is possible to use it for information sharing only); the older generation does not use the internet, it cannot reach enough customers; there are also producers who have not received an order from the producercart.com in 1 year; and finally, people are not yet prepared for this in the countryside.

3.6. Results of the municipal research

With a structured interview of the mayors of the Kecskemét district, my aim was to find out how the local government leaders see the sales and consumption opportunities of local products in their localities and surroundings. In addition, to investigate in a related context the justification for an online system of product information and sales in the places that are the subject of this thesis.

From the interview, I would like to highlight some of the most important statements: during the coronavirus pandemic, local produce has become more valuable. Good quality products are produced, but customers want or can pay very low prices because there is little purchasing power. They could produce much more in terms of capacity if there was a market of sufficient size, or if customers would buy more local products. Finally, the problem is that it

doesn't get through to the buyer what product is around, the buyer doesn't know what is new.

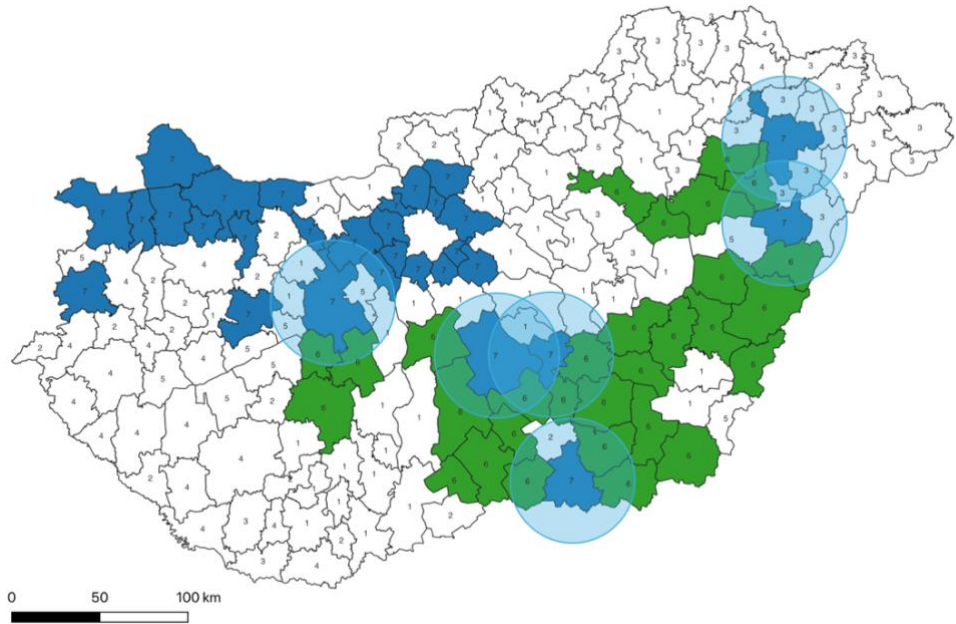
I looked at the biggest problems in the production and marketing of local products in the area. Based on the responses, it can be stated that the biggest problems are: poor and hectic buying-in prices, lack of organization, lack of motivation, animal diseases, lack of irrigation, increasing problems with labour shortages (everything is mechanized wherever possible), climate change, tax and accounting compliance, low demand - compared to what it could be, lack of entrepreneurship, as a large percentage of producers take their products to the wholesale market, which then appear as products for sale in the markets in Szeged, Budapest or again in Kecskemét, or in small shops, and finally, few conscious consumers. Based on the interviewees' responses, it can be said that a completely new approach is needed, both on the part of consumers and producers.

I was curious to see how they see the marketing potential of local products in general, in a national context. In general, the responses indicate that buying-in prices are not good and that, in general, the wholesale market in Pest is the best place to sell products. In addition, it was also mentioned that a pooled system would be better: it would be more beneficial if farmers could sell their products locally, but it is very difficult to do so. Local products should be placed in shopping centres - there was an initiative in the Univer shops, but it was unorganized. The district is in a more fortunate position as Univer is here and Budapest is 30 minutes by motorway.

I looked at what they think about an online system that would make it easier for consumers to find information about local products/producers/actions. The answers indicate that almost all municipalities consider it a very good idea and some have already taken such an initiative. It can be further stated that more organization and sacrifice on the part of farmers is needed. I have looked into what they would say if this online system could even be used to make purchases, where they could sell local products. The answers here, as in the previous question, were very one-sided, i.e. supportive. Furthermore, it could be said that if it is properly developed it could work, but the question is what kind of marketing it will receive, and it could work for larger producers, and it could work online as well as by phone.

3.7. Delimitation of the areas relevant to the system under study

At the end of the analyses, it became clear to me that there are six districts (Figure 13) in the country with high economic indicators (economic potential), and in their immediate vicinity there are districts with significant activity in agriculture (productive potential).



13 Figure: Possible areas for further research on the online system under study in Hungary

Comment: ■ Agricultural dominated areas ■ Economically developed, rejuvenating regions
Source: own research and editing, 2023

The distance of the local product is defined in the Hungarian Regulation 52/2010 (IV. 30.) FVM Decree, which requires the product to come from "within the region", i.e. from the county where the product is produced or from a 40 km radius. According to the definition of local products in the regulation, all six districts can meet the 40 km criterion for local products. Based on the results, it seems realistic to continue further research in the six districts to explore the potential for implementing a similar scheme, which is the focus of this thesis. Potential areas for further research are the districts of Székesfehérvár, Kecskemét, Nyíregyháza, Debrecen, Tiszakécske and Szeged. For each of these districts, it is worth noting that in their immediate vicinity are districts with agricultural potential that are highly capable of producing and marketing local products. The most important finding of the studies is that the Kecskemét district, which is the focus of my study, is also included in the potential group of districts.

4. NEW SCIENTIFIC RESULTS

1. I have used multivariate statistical methods to identify the characteristics that are involved in shaping spatial differentials today. In my research, I have shown that there are fundamental differences between districts in the

country along economic status; peripherality/accessibility; general tourism; agricultural activity; rural/rural tourism; and demography. **I have shown that agriculture continues to be a spatially shaping force in the development of spatial differences. Statistical methods can be used to clearly delineate and distinguish regions where the agricultural character is dominant. I have shown that the Kecskemét district, which I have examined in particular, is one of these areas.**

2. Through primary research, **I explored the general food consumption habits in the study area, focusing on local products, and the conditions for an online system** where customers can easily obtain information about local products and even buy them there.
3. **Using correlation analysis and the CHAID learning algorithm, based on primary data collection from consumers, I identified a target audience who would be most likely to use the online system. These are individuals with better earning potential, younger intellectual occupations and willing to travel longer distances for local products.**
4. **Using correlation studies and the CHAID algorithm, I determined the conditions that the producer product should meet in the system I studied, and what the product itself could most likely be. Based on my research, the product should come from environmentally friendly production, have environmentally friendly packaging and a trademark. The potential products are mainly dairy products and pickled or vegetable products.**
5. **Based on the primary research carried out in the Kecskemét district, I have identified the factors that facilitate and hinder the system I am investigating from a producer's point of view. At the same time, I found that although the vast majority of producers are basically open to the use of the system, a fundamental constraint is the negative willingness to cooperate with each other (between producers).**
6. **In the Kecskemét district, I conducted a primary research to find out how local government leaders perceive the sales and consumption opportunities of local products in their settlements and their surroundings, as well as their rural development aspects. I have shown that the local authorities have a fundamentally positive perception of the online system for information and sales of local products, which is the subject of this thesis, and that they are willing to cooperate with this system. On the basis of the study, I have also identified the factors that facilitate and hinder the system from the municipal perspective.**
7. **Based on the analysis of spatial differences and my primary research findings, I have identified districts where there is relevance for the**

introduction of the online system under study and for further research on its introduction. At the same time, I have shown that the district of Kecskemét can also be basically classified as a suitable region.

Based on my own research, the results of the hypothesis testing are summarized in Table 1.

Table 1: Verification/refutation of the hypotheses of the thesis

Hypothesis	Status
H1: Agriculture continues to be a spatially shaping force in the development of spatial disparities. Statistical methods can clearly identify and distinguish regions (including Kecskemét district) where the agricultural character is dominant.	verified
H2: The range of consumers who may use the online local product information and sales system, which is the subject of this thesis, is well defined on the basis of my regional studies. In the light of research on short supply chains, I assume that in this case users with higher education show a higher propensity.	partially justified
H3: The municipalities surveyed are generally positive about the online information and sales system for local products, which is the subject of this study, and are willing to cooperate with this system. From the point of view of the municipalities, the study clearly identifies the factors that facilitate and hinder the system.	verified
H4: The study clearly identifies the factors that facilitate and hinder the system from a production point of view. In this context, I assume that, in addition to the openness of producers to the online system, a fundamental impediment is the negative willingness to cooperate with each other (between producers).	verified
H5: Based on the analysis of the spatial differences and the results of my primary research, districts can be identified where there is relevance for the implementation of the online system I have studied and for further research on its implementation. At the same time, I assume that the district of Kecskemét can also be classified as a suitable region.	verified

Source: own research and editing, 2023

5. CONCLUSIONS AND PROPOSALS

The food chain/food supply system of Hungarian agriculture is increasingly vulnerable, first as a consequence of COVID-19, and then even more so after the outbreak of the Russian-Ukrainian conflict. One of the biggest challenges for Hungarian agriculture is to move in a direction where it can build up its core value chains and keep them within its borders. This is particularly topical

now, but it is also important in times of crisis. And improving the position of small producers is an ongoing challenge.

As the literature makes clear, vertical integration may be the only means for agricultural producers to achieve financial stability. However, it is far from simple. These are precisely the reasons why I raised the idea of an online information and marketing system for local produce during my doctoral studies. I know for a fact that such systems already exist in our country and around the world, but they have not yet managed to penetrate the 'main stream' world. My initial idea is that producers should have an alternative sales channel for their products, where they can achieve better selling prices with little more energy investment, and also have the opportunity to diversify their portfolio if they want to do so. The benefits could include a unified platform, where the risk, labour and capital invested would be less than if they had to create a completely new stand-alone platform. I do not believe that this idea alone would solve the problem of selling rural products, but the lack of similar solutions will lead to a further shrinking of the pool of small and medium-sized Hungarian producers.

The lack of systems based on local products to serve the needs of the younger generation also inspired me to write this thesis. Based on my own research and the results of the correlation studies, it can be stated that basically, the users with the highest potential could be the people with intellectual occupations, based on the type of occupation. Another important correlation is that as respondents spend more and more money per month on food, their willingness to use the online system to obtain information and make purchases increases. Furthermore, respondents who would be willing to buy produce from a greater distance are more willing to use this online system. In other words, those who are willing to travel greater distances to obtain local produce tend to be more open to such a system. Another important result for the propensity to buy local products through the online system is that 71% of respondents under 35 would use this system. It can be seen that as the age of the respondents has increased, the propensity to use the online system has decreased. This implies that the younger generation is essentially a potential user category.

According to the predictors of the final conclusions, the first priority for information acquisition is the willingness to travel for the local product. The next is how much the respondent spends on average per month on food. The factors influencing willingness to buy are slightly different. Here again, the first in order of importance was whether the consumer was willing to travel for local produce. Next were the occupation of the respondent; then the

environmentally friendly/sustainably produced origin of the product; and the price of the product.

The predictors and the data from the first analysis are very useful, as they describe the conditions that a producer needs to meet in order to have a high chance of selling his products in such a system. In other words, if a producer wants to sell his products with the highest probability, he should advertise to people who are basically young people with a younger intellectual profession and who would be willing to travel for such products anyway (i.e. they are important to them). For the products, it is important that they come from environmentally friendly/sustainable production and preferably also come with a trademark. Within this, my research suggests that the most likely to be successful is dairy, pickles or vegetables. The decision tree data confirmed the above findings.

Another important part of my research was to investigate the feasibility of an online system in the Kecskemét district, where the primary research was conducted. In all districts of the country, except Budapest, using 78 basic indicators at the district level and factor analysis, I obtained the following results: there are fundamental differences between the districts of the country in economic status; peripherality/accessibility; general tourism; agricultural activity; rural/rural tourism; and demography. Using the resulting factors, I also performed a cluster analysis, where I grouped the Hungarian districts into the following seven clusters:

The first cluster includes the ageing regions with 44 districts. The second cluster is called rural tourism destinations and includes 15 districts. The third cluster was named 'economically underdeveloped and rejuvenating areas' and included 25 districts. The fourth cluster is called peripheral areas and includes 19 districts. The fifth cluster is called Priority Tourist Destinations, which includes 11 districts. The sixth cluster is called the agro-dominant areas, which includes 30 districts. The seventh and last cluster is called the economically developed and rejuvenating areas, which includes 30 districts.

The distance of a local product is defined in FVM Decree 52/2010 (IV. 30.) of the Hungarian regulation, which requires the product to come from "within the region", i.e. from the county where the product is produced or from a 40 km radius. Based on my results, it may be realistic to further investigate the possibilities of a similar scheme in six districts, which is the subject of this thesis. These six districts are the districts of Székesfehérvár, Kecskemét, Nyíregyháza, Debrecen, Tiszakécske and Szeged. Near each of these districts there are districts with agricultural potential that are particularly capable of

producing and marketing local products. The most important result is that the district I studied also belongs to this group.

Based on the producer survey, the following conclusions can be drawn: information about producers' products is usually passed on to consumers by word of mouth. However, it is no longer rare for producers to sell on Facebook. It is not uncommon for producers to use the online system to obtain information rather than to sell their products. In the former case, 47% of producers showed a willingness to use it, while 44% of producers showed a willingness to use it for buying.

When I asked what information about consumers would be useful in this online system, 80% of respondents said that information about where they live and their interests would be the most important. In terms of positive impacts, 80% of respondents would expect more stable sales and better prices from this online system.

Concerns about the system can be summarised as follows: 60% of respondents said that it is time-consuming to keep up to date; furthermore, in many cases personal contact is very important for selling local products (this system does not prevent this: it can be used for information sharing only).

I also wanted to look at the broader, complex rural development and territorial impact of the topic under consideration. In this context, I interviewed the mayors of the Kecskemét district. My aim with the structured interviews was to find out how the municipal leaders perceive the sales and consumption opportunities of local products in their settlements and their surroundings. In addition, to investigate from a related, municipal perspective the justification for an online system of product information and sales in the localities that are the subject of this thesis. I was able to interview the mayors of 12 of the 16 municipalities in the Kecskemét district.

Overall, based on the data from the municipal survey, the responses of local government leaders in relation to the online system (both in terms of information gathering and purchasing) were unilaterally supportive. They felt that the system could be facilitated if people were selective about what they consumed; and there was a demand for it; and that there was always a layer of people who would like to order from local producers, plus there would be interoperability from 10-20 km away and farmers could earn more. This kind of marketing works in other areas, so why not here. However, there are more sceptical views on the issue: society is not yet ready for this; people in villages need personal contact; and there should be *mustra*. Overall, however, it would

be convenient; it would save energy and time; and urbanisation is an existing phenomenon, so it could be increasingly important.

More important information came from my question on how local producers could be more competitive according to municipal leaders. Based on the responses, the biggest problem is a lack of cohesion. There is also a statement that this online system could help producers in a concrete way, as it needs to be constantly improved, and that it could be a unique step that is new and helps producers.

In this context, I propose further improvements, including irrigation, water conservation, expansion of processing capacity, infrastructure development. In addition, the processing industry should be developed (small, medium and large), and then its trade should be better organised. In addition, on the basis of interviews with municipal leaders, I would like to point out that a completely new approach is needed, both on the part of buyers and producers.

I would recommend further investigation of the districts that have performed particularly well in the research. I would also suggest piloting the online system in one of the recommended districts. In this way, shortcomings and weaknesses could be filtered out and, of course, it could be tested in real life whether such a system could be viable in a market environment.

I believe that if such an online system were to be launched, even if only in a test farm, it would first need good quality marketing to show the target community why it is necessary to buy locally produced products and why buying locally grown products can be an important part of our future. I suggest promoting this directly to the identified target audience through video materials, and using a strong campaign to reach the target audience, even using promotions and markdowns at the beginning. Funding for this should, in my opinion, be provided by the state in the first instance, supplemented by possible EU funding. The primary focus should not be on the system but on the importance of the local product.

Within this, I would recommend that the online system should work like a traditional shopping experience and be simple and convenient for shoppers. The development of interactive features in the online system, such as live chat functions, customer service support and the possibility to contact producers directly, could play an important role in this. Producers should promote sustainable production methods, while consumers should be encouraged to shop responsibly, for example by buying seasonal products and minimising packaging waste. In addition to implementing the recommendations, it is important to continuously monitor and evaluate the effectiveness and impact of the measures put in place. In my opinion, new technological innovations

such as artificial intelligence, blockchain technology or the use of IoT can help improve the efficiency, security and user experience of the platform. For example, the use of artificial intelligence can help analyse purchasing patterns and generate personalised recommendations, while blockchain technology can help increase transparency in production processes.

I also think that for the online system, only producers who are willing to do so or who already have environmentally friendly packaging, environmentally friendly production and a label should be sought. As producers find it difficult to adapt to this system, I would recommend that they first work with only a few highly committed and capable producers. I am thinking here of larger producers or model farms. It is very important, in my opinion, that producers are able to guarantee a stable production volume, in other words, that they are able to deliver the products they order to their customers continuously and reliably. For producers who sell through the online system, I propose the creation of a common trademark, which would be awarded to those who have already achieved the predefined sales and other criteria that are automatically recorded by the system. This would avoid human intervention. Involving local producers in the decision-making process could help to make the online system more responsive to their needs and help to democratise the local food system. The online platform could also provide an opportunity to strengthen community links. This could include fostering direct contacts between producers and consumers, promoting community events (e.g. local markets, festivals), and creating online community forums where users can share their experiences, recipes and tips. In addition, the platform can be used to develop support schemes, such as Community Supported Agriculture (CSA), which facilitates direct contact between producers and consumers. I would also suggest that the online system should not only include food products, but also other local products, such as handicraft products or tourism services. This could increase the use of the online system and make it more attractive to consumers. I think it would also be very important to ensure the sustainability of the online system. The operation of the system must take into account the environmental impact and manage energy resources properly. Minimising the ecological footprint is key to the long-term viability of such an online system.

I also think it is important to link competitiveness and sustainability, as sustainability goals are not necessarily in conflict with competitiveness. The benefits of local products, such as freshness, high quality, reduced environmental impact and support for the local economy, can all contribute to the competitiveness of the platform in the market space. Flexible payment and delivery options are important for customers. Therefore, different payment methods (e.g. credit card, PayPal, cash on delivery) and delivery options (e.g. home delivery, pick-up points) should be explored. I believe that, in addition

to cooperation, more efficient and innovative use of production factors; activation of local assets/externalities; support for municipal/rural coordination; better policy support could help producers; and thus consumers. In my opinion, if such an online system could be developed, and if it could work in our country, it could then be operational throughout the European Union and help local producers; local infrastructure development; technological development by involving different technologies; the creation of further research trends; the reduction of environmental pollution; sustainability; the ability to be more resilient in crises; and the stability of supply chains.

In summary, the development and operation of the online platform should focus on user needs, while sustainability and support for local producers remain key priorities. All proposals aim to strengthen the link between consumers and producers and to promote local food systems. With successful implementation and continuous improvement, the online platform can contribute to strengthening short supply chains and the local economy (and society).

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