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ECONOMIC AND SOCIAL DEVELOPMENTS WITHIN THE AGRICULTURAL ENTERPRISES IN TRANSDANUBIA

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doctoral (Ph.D) dissertation

THESIS

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Contents

1 Background of the study

From an economic perspective, Hungarian agriculture was a key sector in the 1980s, due to the cooperation between large farms and small farmers, which began to decline after the change of government in the early 1990s. Large arable areas were divided into smaller lands and the rise of the supermarkets created uncertainty among Hungarian food producers (Vízvári-Bacsi, 2003). The radical transformation of the ownership structure began with this so-called "spontaneous privatization", when foreign capital began to flow into the country due to cheap labour (Péter et al., 2009). Hungarian small and medium-sized enterprises could not compete with multinational companies. Investors were most attracted to the central and western parts of the country, while labour-intensive tasks were assigned to the less developed eastern part.

Today, creating a competitive European agriculture and meeting new societal needs have made rural development a pillar of the European Union's Common Agricultural Policy. It aims to create a lasting and consistent structure that guarantees the future development of rural areas by maintaining and improving employment. Thus, the long-term interests of the local population are decisive in rural development. Balanced economic development not only helps to raise the living standards of the population, but also shapes the lifestyle, living conditions, and the preservation of the cultural and other values of the locals. Consequently, instead of contrasting the concept of rural development with regional development, it is necessary to emphasize their complementary role (Forgács, 2003).

The 21st century has also brought about new developments in technology, which have led to the emergence of the principles of sustainability, presenting new challenges equally to the farmers, the industry and the service sector. In addition, the COVID-19 pandemic, which started in 2019, became the latest risk factor posing new challenges to industry players. In response to the pandemic, countries shut down one after another causing serious disruptions to international trade. Following the outbreak of the pandemic, the European Commission's view was therefore reaffirmed, claiming that humanity must re-engineer its food production. Food production is responsible for almost a third of greenhouse gas emissions, the use of a large proportion of natural resources, and health problems such as undernutrition and overnutrition. New technologies and scientific discoveries combined with growing producer and consumer awareness, and demand for sustainably produced food can be important for the interested parties.

In addition, the European Commission has published its "Farm to Fork" strategy to support the transition to sustainable agriculture and food industry as part of the European Green Deal, which brings major changes in food production, processing, distribution and consumption, as well as the Biodiversity Strategy to protect biodiversity (European Parliament, 2020). However, the Hungarian National Chamber of Agriculture, which is committed to reducing the environmental impact, considers the Commission's strategy

unacceptable, as its objectives are unachievable and would impose such a heavy burden on agri-food operators that many of them would cease to operate. These conflicts further enhance the significance and relevance of the research topic.

2 Research questions and objectives

With reference to the above-mentioned current and global agrio-economic problems and changes, the objective of this research was to examine the situation of agricultural actors in the face of changes caused by changed production trends and new habits. The research also aims to offer practical solution by using the results and suggestions.

1. In the course of my research, I placed great emphasis on examining the impact of changed production trends on the technological development of agricultural entrepreneurs and their income-generating capacity.

New production trends require agricultural professionals to make constant changes, while agricultural policy issues add further pressure to long-term operations. Moreover, new needs and habits coming to the fore during the pandemic are creating new distribution channels, which can lead to new risks for farmers who depend on the European Union's support system.

2. Further investigation was carried out to explore the job-creating potential of the subjects surveyed, based on their income generated by their activities.

Grants require long-term planning and the expansion of workforce and technology, so the factors inevitably undergo changes side by side.

3. Due to agricultural subsidies, the question arose as to what extent the job creation and the technological development of agricultural entrepreneurs are interrelated.

When agricultural entrepreneurs apply for a scheme, they are required to improve their technology as well as increase the number of employees, which is the principle of growth, therefore the question arises as to how this is realized in the examined Transdanubian businesses.

4. The openness of agricultural entrepreneurs to the changed technological environment was an additional issue.

Based on the literature, I consider it important to incorporate continuous change into the life of a company, regardless of its economic size, as the ability to innovate can also be seen as a requirement for a more successful and secure livelihood.

5. I also surveyed what Hungarian farmers think about stability and vertical and horizontal relations.

Business relationships would serve diversification and stability, as they could help the farmer create an opportunity that would support the business in the long run.

6. In the course of my research, I also put great emphasis on assessing the extent to which the size of the farming area is in line with technological development and the amount of income generated in the Hungarian micro, small and medium-sized agricultural enterprises.

The capital of the enterprises determines the extent of technological developments and employment, which in most cases are also related to the land concentration.

I want to find the answers to the research questions using the literature and my empirical research.

My research model is illustrated in Figure 1.

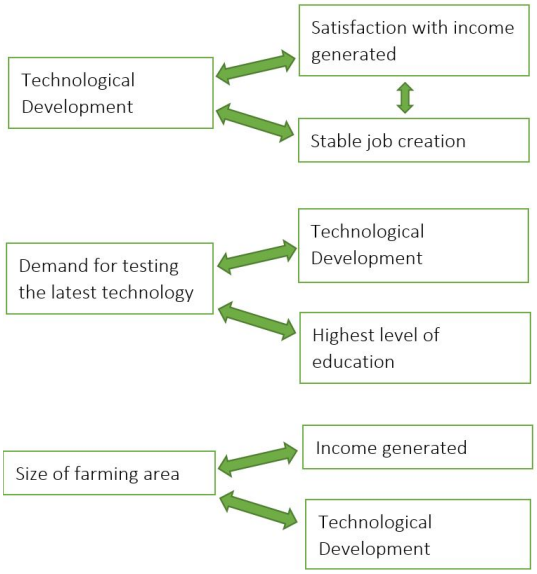

Figure 1: Research model
Source: created by the author

Through the research model, I want to illustrate the factors that affect the activities of agricultural entrepreneurs from an economic and social point of view. The figure also shows the relationship between the factors assumed on the basis of the initial research questions.

3 Research methods

As part of the empirical research, a total of six people were interviewed during the qualitative study, which, in addition to the sense of security and competitiveness of the agricultural economy, also included the assessment of the domestic situation of agriculture. During the survey, respondents from different professional fields were contacted.

In the quantitative study, a questionnaire survey was conducted in the Transdanubian region, especially among agricultural entrepreneurs in Baranya, Fejér, Győr-Moson-Sopron, Tolna, Veszprém and Zala counties. Since I would like to specifically address the opportunities influenced by land quality as part of my research, the listed counties represent land with favourable and less favourable conditions. Comparative land quality assessment was carried out using the De-e-Meter cropland evaluation system and the OTP Agricultural Land Property Value Map. For the initial population the information was provided by the county data of the Hungarian Central Statistical Office for 2017 for agricultural enterprises, within which it was filtered for crop production, animal husbandry, wildlife management and other services.

The sample consists of primary producers and managers of micro, small and medium-sized enterprises operating within agriculture or actively applying its elements. The survey was conducted by a personal visit in 2019 using a multiple-choice questionnaire. Sampling was performed by the snowball method. The questionnaire consisted of four parts, the first half of which included activity-related general questions followed by management-related questions. Then the focus shifts to safety issues, and finally demographic questions close the survey.

I visited a total of 252 agricultural enterprises, of which 252 evaluable responses were received. The sample is made up of farmers raising livestock (23%) and other animals (6%), grape growers and wine producers (18%), beekeepers (12%), fruit growers (10%), horticultural growers (8%), backyard farmers (5%), but the majority of the respondents are engaged in arable crop production (51%).

I summarized the results of the empirical research using the Microsoft Office Professional Plus 2013 Excel software package. Furthermore, I used the Spearman correlation coefficient in the analysis of correlation studies, which was performed using the IBM SPSS Statistics 23 software package. The coefficient (rho) shows the extent to which the magnitude of one variable determines the magnitude of the other variable and the direction and strength of the relationship (Molnár, 2015). In the analysis I calculated the difference in the rank of the variables.

4 Research hypotheses

H-1: The agricultural entrepreneurs' income satisfaction generated by their activities is related to their technological development.

Technological developments are essential in a resource-intensive economic sector such as agriculture, where up-to-date information and knowledge are necessary. However, all this requires significant financial support, as the technology is moving towards full-scale optimization, which requires replacing old devices with newer, more efficient ones, and learning how to apply them.

H-2: The agricultural entrepreneurs' income satisfaction generated by their activities is related to their need to create stable jobs.

The second hypothesis therefore seeks to establish a link between entrepreneurs' income satisfaction and their desire to create stable jobs, assuming that even if a company's technology is advanced, providing a secure livelihood for the employees may not be a priority. Mostly, entrepreneurs care about their own security and income satisfaction.

H-3: The agricultural entrepreneurs' technological development is related to their need to create stable jobs.

The relationship between the first three hypotheses, i.e., technological development, income satisfaction and the need to create stable jobs, reinforces the principle of long-term sustainability, according to which the higher the income is, the more development and stability are needed and, conversely, the higher the desire for development and growth is, the more the income of the business rises.

H-4: The need to try out the latest agricultural technology is negatively related to the current (subjective) level of technological development.

The statement is based on the assumption that innovations and new developments do not necessarily take place in companies that already have a higher level of development, but more likely, at lower levels where there is bigger need for motivation. However, maintaining activity would also be important in the field of developments, because, as I mentioned earlier, innovation has increased in the industry and Hungary is already lagging far behind the Western countries.

H-5: The need to try out the latest agricultural technology is negatively related to the farmer's highest level of education.

The hypothesis is based on the assumption that openness to innovation is not related to the level of education of the given agricultural entrepreneur, as entrepreneurship and risk aversion are mostly individual characteristics and factors related to the sense of security.

H-6: The size of the farming area is related not only to the income generated but also to the technological development.

The larger the farming area is, the more crops can be grown or animals can be kept on it, thus the entrepreneur's income is higher or vice versa, the higher the income is, the bigger land the farmer wants. However, the size of the area is not only related to income, but also to technological development, because as the size of the area increases, so does the demand for more advanced technology.

5 Research results

The thesis can be divided into five sections. In the first part, I examined the significance of agriculture in the national economy, where I covered the economic and social role of agriculture at international and domestic level, the overview of agricultural productivity and employment, and the role of rural development. In the first part, I also described the European Union's Common Agricultural Policy and the impact of the global crisis in 2020 on agriculture. The agricultural land valuation and its economic effects are also presented in the first part, which is closely related to the further development of research.

In the second part, I examined the agricultural business environment, within which the topics of efficiency, competitiveness, sustainability and innovation were highlighted. In addition, domestic agricultural training, interest networks, local opportunities and agricultural risks are explored. The third part contains the evaluation of the empirical research results and the presentation of the qualitative and quantitative research. In this section, the answers to the questionnaire are sorted by topic.

The fourth chapter shows the results of the correlation studies, which specifically address the correlations between the technological development of agricultural entrepreneurs, their income satisfaction and their need to create stable jobs, which helps to find answers to research questions related to stability. An examination of the correlations between the need to try out the latest agricultural technology, the current level of technological development and the highest level of education can also be found in this chapter, which helps to illustrate the development trend in Transdanubia. The correlations between the size of the agricultural area, the income of the agricultural entrepreneur and the technological development were also analyzed, as the land concentration and their evaluation significantly influence the future potential of agricultural enterprises. The final chapter of the thesis contains the summary and suggestions.

5.1 Results of regional segmentation

The research area focused on the Transdanubia region highlighting six counties. These counties represent the more valuable (Győr-Moson-Sopron, Fejér and Tolna counties) and the less valuable (Veszprém, Zala and Baranya counties) areas based on the average price of arable land and the Golden Crown values. Table 1 illustrates how, based on the average price of arable land and the value of the Golden Crown, farmers with more valuable and less valuable areas view the factors that affect the life of the business in the long run.

	Characteristics of more valuable areas	Characteristics of less valuable areas
The number of newly formed businesses is higher		X
The number of businesses with more than five owners is higher		X
Non-work engagement activities are more common	X	
The active role of employees in decision-making is more typical	X	
Income satisfaction is more common	X	
Security plays a key role in the life of the business	X	
Key role of experience and cooperation		X
Long-term planning is more typical		X

Table 1: Comparative table of responses from entrepreneurs operationg in more valuable and less valuable areas based on the average price of arable land and Gold Crown value. *Source: created by the author*

Farmers in counties with less valuable land are more active in starting businesses, even if a given business has more than five owners. They are also more active in collaborations and more open to networking. An interesting result, however, is that regardless of whether security is considered more important by those with more favourable land, long-term planning is still more common in less valuable areas. Clearly, the owners of favourable areas are more satisfied with their income, and the role of workers is also particularly important in the life of businesses in these counties.

The size of the farming areas is certainly determined by the topographic conditions in the area. As there are also more favourably located lands within less-favoured areas, there is a greater dispersion in terms of technological advancement in counties with less valuable areas. In terms of new developments, however, the farmers have similar attitude regardless of location.

5.2 Stakeholder analysis of agricultural enterprises in the counties serving as the site of the empirical research

Table 2 illustrates the stakeholders of the six counties involved in the research (Baranya, Fejér, Győr-Moson-Sopron, Tolna, Veszprém, Zala), who in some way influence or may influence the implementation of the objectives of the examined agricultural enterprises.

Stakeholders	Requirements	Comment
Owners	Profitability, business security	Significant stakeholder
Employees	Job security, adequate wages	Significant stakeholder
Suppliers	Compliance with deadlines	
Customers	Quality products, organic farming, sustainability	Significant stakeholder
Authorities	Compliance with regulations	
Competitors	Fair competition	
Bank	Stable operation	Significant stakeholder
Hungarian State	Ensuring continuous supply increasing productivity	
European Union	Ensuring continuous supply, respecting the interests of the Common Market	

Table 2: Stakeholder analysis of agricultural enterprises involved in the empirical research
Source: created by the author

Nine stakeholders were identified, of which business owners and employees, as well as customers and banks will be given priority. Owners expect long-term survival and profitability from the business, and employees require the same, as they want to earn an adequate wage in the long run.

5.3 SWOT analysis of agricultural enterprises included in the empirical research.

SWOT analysis is a step in the strategy-making process that can provide help in the life of any business. Strengths and weaknesses are internal factors, while opportunities and threats are external factors for the business or even industry. Table 3 shows that the SWOT analysis based on the responses of the six entrepreneurs interviewed during the research predicts more weaknesses than strengths, but accordingly, most opportunities can be generated from the weaknesses, so it is worth paying more attention to them.

STRENGTHS	WEAKNESSES
Existence of areas suitable for agricultural activity	Growing number of dropouts
Advanced technology available globally	Declining workforce
Availability of good quality raw materials	Ageing
Good soil quality	Distrust
Available advanced technology	Demotivation
	Fragmented lands
	Resource-poor management
	Insufficient flow of information
	Neglect of process monitoring
	Liquidity problems
OPPORTUNITIES	**THREATS**
Transformation of the support system	Extreme weather
Establishing an advisory system	Fluctuations in world market prices
Creating sustainability	Termination of tenders
Eliminating waste	Generational renewal
Generational renewal	Competition with multinational trading companies
Updating educational materialsa	Stricter production rules
Starting practice-oriented trainings	Environmental restrictions
Shortening the supply chains	
Utilization of local products	
Knowledge sharing by organizing forums	
Modern producers' cooperatives	
Promoting precision instruments	
Embedding economic and social role in the public awareness	

Table 3: SWOT analysis of agricultural enterprises included in the empirical research
Source: created by the author

For instance, it would be worth sharing the experience and knowledge of the generation close to retirement in professional forums, in smaller circles, so that everything they have built up in recent decades is not lost to the future generations. The growing number of dropouts can reduced in the future with the transformed agricultural training system launched in 2020, which supports trainings based on a more carefully thought-out plan, updates the educational material and helps the implementation of practice-oriented training.

The transformation of the domestic support system may eliminate fragmented lands and resource-poor farms, which can be developed in accordance with the agricultural

policy of the European Union starting in 2020.

The problem of neglecting process monitoring, insufficient information flow and lack of motivation could be solved by knowledge sharing implemented by the advisory system; in many cases farmers are not only unable to carry out the activity, but do not even have information about what can improve the efficiency of their activities.

Modern producers' cooperatives could help with liquidity problems, as farmers could share their valuable assets, land, and also their knowledge. However, experience has shown that the memory of producers' cooperatives before the change of regime still has a negative effect on trust. Generational renewal may ease this problem in the future, but this change may also pose a threat to the industry if information is not passed on properly and in a timely manner.

Today's management and technology tools can help us eliminate waste, create sustainability and a circular economy, shorten supply chains and promote precision instruments. To this end, embedding the economic and social role of agriculture in the public awreness could fundamentally determine the role of farming.

6 Independent, novel scientific results

My empirical research focuses on micro, small and medium-sized agricultural enterprises in Transdanubia, where, among other things, I wanted to find out how the income satisfaction is related to the need to create stable jobs for the employees. Furthermore, I would also like to prove that technological developments do not depend on current developments or the entrepreneur's highest level of education. Technological developments and the retention of employees strongly determine the future situation of the domestic agricultural sector, as the skilled labour is declining and the impact of new developments is growing stronger. Moreover, I wanted to prove that the size of the farming area, in addition to influencing the amount of income generated, also has an impact on current (subjective) technological development.

Thesis statement # 1: The technological development of agricultural entrepreneurs is related to their satisfaction with the income generated by the enterprise.

The relationship between the two variables is shown by Spearman's rank correlation coefficient, where

$$r_{fejlettseg,\ elegedettseg} = 0,397 \text{ és } p = 0,000.$$

Thus, there is a moderately strong correlation between the two variables in the same direction, i.e., there is a relationship between technological development and the farmer's income satisfaction.

As we know from the statistical data that our Transdanubian entrepreneurs play a significant role in agricultural employment and investment in the country, furthermore, they are moderately or even more satisfied with their income (197 responses) and open to new developments (214 responses) and the majority (115 answer) deals with several activities at the same time, we can say that they meet the most important requirement for the long-term survival of enterprise: they carry out developments. They probably do this because they are forced to, but the end result is still technical progress.

According to one of the interviewees of the research, who also has international experience, the competitive advantages of the Hungarian agriculture are the low production costs of labour-intensive processes and cheap labour. Nonetheless, as land prices are also lower than in Western Europe and we can use high-quality machinery and products in Hungary, plus farm sizes can be increased within certain limits, eliminating land fragmentation would improve the national economy. However, this would require the acquisition of land, which has strict regulations, or setting up agricultural cooperatives and farming partnerships.

Both the cultivation area and the labour demand would increase in a given enterprise, and maintaining liquidity is also essential to ensure their stability. All in all, we can say

that improving technology should not be an end in itself, but in order to create economies of scale, it is necessary to increase the land size - and to produce as many products as possible by utilizing advanced technology.

The second hypothesis seeks to establish a link between entrepreneurs' income satisfaction and their desire to create a stable job, assuming that no matter how advanced a company's technology is - it might as well use precision farming -, providing a secure livelihood for the employees may not be a priority. Mostly, entrepreneurs care about their own security and income satisfaction.

Thesis statement # 2: The agricultural entrepreneurs' income satisfaction generated by their activities is related to their need to create stable jobs.

The relationship between the two variables was shown by Spearman's rank correlation coefficient, where

$$r_{elegedettseg,\ stabil\ munkahely\ teremtes} = 0,408 \text{ és } p = 0,000.$$

There is a moderately strong, positive correlation between the two variables.

As there are large areas of agricultural land in Hungary and the quality of arable land is favourable, new technologies and raw materials are available, yet the labour force is constantly decreasing, it is worth establishing long-term liquidity by utilizing production optimization (by increasing capacity or improving technology), which also brings about long-term employment. My third hypothesis seeks to establish a link between technological development and the need to create stable jobs, as the aforementioned technological development entails the creation of long-term thinking and stability.

Thesis statement # 3: The agricultural entrepreneurs' technological development is related to their need to create stable jobs.

The correlation between the technological development of the agricultural entrepreneur and their need to create stable jobs was shown by Spearman's rank correlation coefficient, where

$$r_{technologiai\ fejlettseg,\ stabil\ munkahely\ teremtes} = 0,355 \text{ és } p = 0,000.$$

There is a moderately strong, positive correlation between the two variables.

Technological development is therefore related to income satisfaction, which is also related to the need to create stable jobs. Furthermore, there is a link between technological development and the need to create stable jobs. The combination of these three factors reinforces the principle of long-term sustainability, according to which the higher the income is, the more development and stability are needed and, conversely, the higher the desire for development and growth is, the more the income of the business rises.

If we look at the development of businesses, it is necessary for a smaller business to reach the level where profitability is ensured, and then competition becomes main priority; however, experience has shown that there is a point in the development process where it is not possible to move on to the next level without knowledge and information. In order to eliminate the problem, domestic agricultural training, professional training and demonstrations should transfer knowledge to small and medium-sized entrepreneurs. Furthermore, an optional network of advisors would be extremely useful, which could be complemented with self-organizing cooperatives and circles where experience could be shared in common forums.

In order to test the fourth hypothesis, we need to examine the correlation between the entrepreneurs' own assessment of their technological development and the need to try out new developments in the course of their activities. The statement is based on the assumption that innovations and new developments do not necessarily take place in companies that already have a higher level of development, but more likely, at lower levels where there is bigger need for motivation.

Thesis statement # 4: The need to try out the latest agricultural technology is negatively related to the current (subjective) level of technological development.

The relationship between the two variables is shown by Spearman's rank correlation coefficient, where

$$r_{fejlettseg,\ uj\ fejlesztesek\ kiprobalasa} = -0,343 \text{ és } p = 0,000.$$

Therefore, there is a moderately strong, negative relationship between the two variables. However, maintaining activity would also be important in the field of developments, because, as I mentioned earlier, innovation has increased in the industry and Hungary is already lagging far behind the Western countries.

Consequently, innovation is generated much more likely by the need for motivation at lower levels than by the further development of advanced enterprises. As it has been shown in the past, innovations should aim to establish and sustain economies of scale and profitability in the long term. The idea of precision farming and future opportunities in Hungary may still not be correctly reflected in the public mind.

According to the survey performed by Lencsés et al. in 2004, the farmers who use precision farming are mainly under 40 years of age with a tertiary education and cultivate more than 300 hectares. Consequently, younger, more educated, large farmers prefer new technologies.

The fifth hypothesis therefore seeks a correlation between the agricultural entrepreneur's need for innovation and their highest level of education. The statement is based on the assumption that openness to innovation is not related to the level of education of the given agricultural entrepreneur, as entrepreneurship and risk aversion are mostly individ-

ual characteristics and factors related to the sense of security.

Thesis statement # 5: The need to try out the latest agricultural technology is negatively related to the farmer's highest level of education.

The relationship between the two variables is indicated by Spearman's rank correlation coefficient, where

$$r_{uj\ fejlesztesek\ kiprobalasa,\ vegzettseg} = -0,334 \text{ és } p = 0,000.$$

Tehát a két változó között közepesen erős, ellentétes irányultságú kapcsolat mutatható ki.

Therefore, there is a moderately strong, negative relationship between the two variables. It would be worth organizing more visits to precision farms and presenting the new technologies to the farmers outside the educational setting, in more informal circumstances, so that they do not consider it an obligation but an opportunity. Free flow of information and more confident knowledge would be necessary. Progress has already been made in this direction, because the Hungarian knowledge was concentrated in a new institution called the Hungarian University of Agriculture and Life Sciences in 2021, which may start significant development in agricultural education.

There is a weak, positive relationship between the highest level of education and technological development.

$$r_{vegzettseg,\ technologiai\ fejlettseg} = 0,212 \text{ és } p = 0,000.$$

The result suggests that the agricultural enterprise expects a certain level of knowledge and development, because without these factors it would not be possible to maintain the enterprise in the long run.

The larger the farming area is, the more crops can be grown or animals can be kept on it, and the entrepreneur's income is higher or vice versa, the higher the income is, the bigger land the farmer wants. However, the size of the area is not only related to income, but also to technological development, because as the size of the area increases, so does the demand for more advanced technology. My sixth hypothesis aimed to examine these connections.

Thesis statement # 6: The size of the farming area affects not only the income generated but also the level of technological development.

The relationship between the three variables is indicated by Spearman's rank correlation coefficient, where

$$r_{teruletnagysag,\ technologiai\ fejlettseg} = 0,377 \text{ és } p = 0,000 \text{ és}$$
$$r_{teruletnagysag,\ keletkezett\ jovedelem} = 0,498 \text{ és } p = 0,000, \text{ valamint}$$
$$r_{technologiai\ fejlettseg,\ keletkezett\ jovedelem} = 0,341 \text{ és } p = 0,000.$$

There is, therefore, a moderately strong, positive relationship between the three variables, i.e. the size of the farming area affects both the technological development and the income generated, or vice versa: the income generated influences the size of the farming area and the technological development. These three factors cannot be easily separated from each other, because the performed partial correlation shows that the relationship between the size of the area and the generated income is moderately affected by the technological development.

$$r_{teruletnagysag,\ keletkezett\ jovedelem,\ technologiai\ fejlettsg} = 0,411 \text{ és } p = 0,000.$$

As the literature also states, our agricultural entrepreneurs are happy to increase their farming areas in order to generate higher income or to satisfy their desire for possession, which in turn entails the development of technology, since time and costs are determining factors in farming. For this reason, it is also worth motivating the concentration of arable land and the division of labour, as investment is not a negligible factor besides income.

7 Conclusions and suggestions

The research results confirm that there is a correlation between satisfaction and development and favourable workplace relationships, which is presented by demonstrating the relationship between technological development, income satisfaction, stable jobs, and the need to try out new developments. The results also confirm that the majority of farmers are well capitalized, yet, the more advanced technology the Transdanubian agricultural entrepreneurs have, the less they use new developments. There seems to be an invisible barrier to development in the region involved in the study, which may stem from uncertainty. However, in order to maintain development and learning activity it is crucial that the right knowledge and know-how is available to the business when needed.

Since the results show that there is a lack of openness to new technologies among the farmers in the studied region, and this may pose a problem in the future in terms of meeting the expectations of precision farming, it is recommended to focus on innovation in the agricultural sector in Hungary. Furthermore, it has also been established that farmers with long-term plans tend to struggle due to insecurity and lack of capital, as most five-year plans exist along these development barriers. It is worth rethinking the support system so that vulnerability and dependence can be reduced as much as possible. Indeed, the research revealed that financial stability is necessary to increase the interest in innovation, as innovation does not depend on age and education, but on material goods and a supportive environment.

In 2020, major changes were launched in several priority areas, for example in domestic agricultural training, as well as through the reform of the European Union's support system and other CAP measures. However, further interventions and assistance are essential in the area of cooperation, which can also strengthen diversification. In addition, eliminating waste, creating shorter supply chains and clustering into organizations would reduce costs and centralize revenues that could be reused more economically. Moreover, it is worth drawing the attention of farmers to risk reduction and long-term planning, which could be provided by a professionally established network of advisors.

As I see, the practical implementation of the research results could be used to show the public the importance of the economic and social role of agriculture through the generational renewal facing the sector. Furthermore, I think the development of domestic agricultural training would increase the number of properly qualified workforce and also give the sector a greater role in public awareness, which already started with the reform of agricultural higher education in 2020. Improving leadership attitudes could also be beneficial for all sectors, which could be facilitated by various forums and marketing tools. Establishing the advisory system may also develop Hungary's agriculture into a more profitable industry along with the widespread adoption of precision farming.

These conclusions and recommendations are summarized in Figure 2, which contains the input and output factors important for the development of agricultural enterprises,

as well as the tools and objectives located between them.

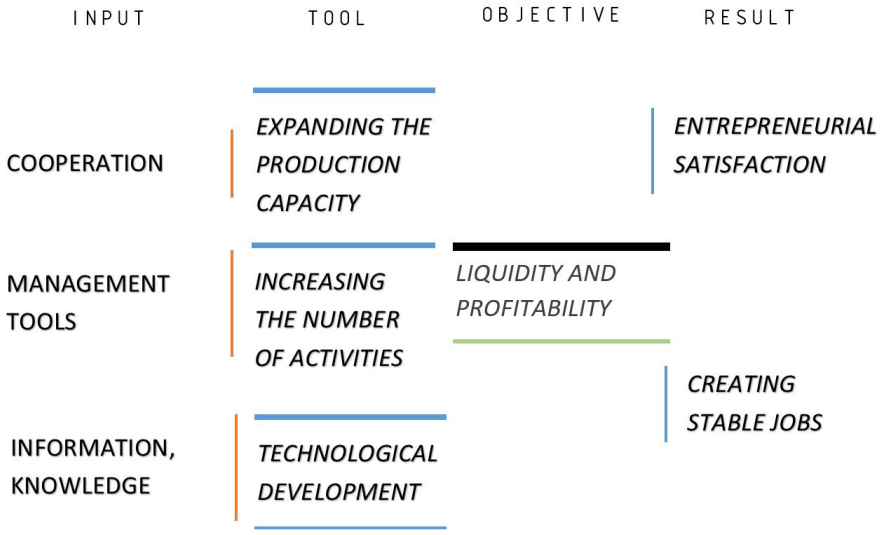

Figure 2: Essential elements for the development of agricultural enterprises.
Source: created by the author

Figure 2 illustrates the essential factors at the beginning of the process, including: the entrepreneurs should see opportunities in cooperation, be able to use management tools important for their activities and look for new information and knowledge. This way, they will be able to expand their production capacity and the scope of their activities, as well as improve the applied technology. As a consequence, liquidity problems may disappear and profitability may become assured in the long run, since economies of scale and a shift towards precision economies represent the future of the sector. It may result in a group of satisfied entrepreneurs and workers who, together, are able to shape the social and economic perception of agriculture in the best possible way.

In addition, I consider it a significant conclusion that agriculture must adapt to the changing environment, in which the following three elements can help: technology, knowledge, and capital. These should assist in the creation of economies of scale in agricultural production, which the farmers can - even by supporting each other - shape and apply to their own farms.

8 List of the author's publications related to the topic

SCIENTIFIC JOURNAL ARTICLE PUBLISHED IN A HUNGARIAN JOURNAL IN A FOREIGN LANGUAGE

1. **Göllény-Kovács, N.** – Németh, K. – Péter, E.: 2020, *Relationship between security and competitiveness in agricultural enterprises in transdanubia*, Georgikon for Agriculture – A Multidisciplinary Journal in Agricultural Sciences, Volume **24**, Issue 3, pp. 16-31

2. Németh, K. - Birkner, Z. - Katona, A. - **Göllény-Kovács, N.** - Bai, A. - Balogh, P. - Gabnai, Z. - Péter, E.: 2020, *Can energy be a "local product" again?: Hungarian case study*, Sustainability, 12 : 3 Paper: 1118 , 21 p.

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