MULTIDISZCIPLINÁRIS KIHÍVÁSOK
SOKSZÍNŰ VÁLASZOK

GAZDÁLKODÁS- ÉS SZERVEZÉSTUDOMÁNYI FOLYÓIRAT

MULTIDISCIPLINARY CHALLENGES
DIVERSE RESPONSES

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A VIDÉKI TERÜLETEK HOSSZÚ TÁVÚ JÖVŐKÉPE EMPIRIKUS KUTATÁS A MAGYAR AGRÁRTUDÁSMEGOSZTÁSI ÉS INNOVÁCIÓS RENDSZERRE FÓKUSZÁLVA

LONG-TERM VISION FOR RURAL AREAS EMPIRICAL RESEARCH FOCUSING ON AKIS IN HUNGARY

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ÖSSZEFOGLALÓ

A vidéki területekre vonatkozó új, hosszú távú jövőkép kidolgozását az Európai Bizottság kezdeményezte. A folyamat első lépése egy olyan nyilvános konzultáció elindítása volt, amelyhez a Horizont 2020 SHERPA (Fenntartható vidékpolitikai hálózat kialakítása) projektje 20 különböző többszereplős platform segítségével járul hozzá. A hazai platform - a tudományt, a társadalmat és a szakpolitikát képviselők csoportja - az Agrártudásmegosztási és Innovációs Rendszerre (ATIR), pontosabban azon belül is a digitalizációra összpontosít. Magára a rendszerre olyan horizontális rendszerként tekinthetünk, amely még a közös agrárpolitika (KAP) stratégiai tervezési folyamatába is beágyazódik. Annak részeként fejlesztése szoros és intenzív együttműködést igényel a döntéshozók, a kutatók és a gazdálkodók, vagy tágabb értelemben a társadalom és más érdekelt felek között.

Kutatásunk célja az volt, hogy az ATIR szempontjából azonosítsuk a magyar vidéki térségek jelenlegi és 2040-ig várható tendenciáit, valamint feltárjuk a vidékfejlesztés legfontosabb kihívásait, lehetőségeit, segítő és gátló tényezőit.

Az alkalmazott módszertan a Delphi technika volt. Az első szakaszban áttekintettük a főbb trendeket, a számottevő kihívásokat és lehetőségeket, valamint összefoglaltuk a mezőgazdaság digitális transzformációjára vonatkozó előrejelzéseket. Ezt követően arra kértük az ATIR szakértőit, hogy interjúk keretében, fókuszcsoportos találkozókon és kérdőívek segítségével fejtsék ki tapasztalataikat és véleményüket. Végül a felmérés eredményeit konszenzusra jutva vitattuk meg.

Az eredmények között érdemes megemlíteni, hogy a digitalizáció alapvetően fogja megváltoztatni a vidéki területek működését, beleértve a gazdasági, környezeti és társadalmi dimenziókat is. Az ígéretes jövőkép megvalósításához elengedhetetlen a tudás átadásához szükséges képességek fejlesztése, a munkahelyteremtéshez való alkalmazkodás és a jobb életminőség biztosítása, az együttműködésen alapuló erősebb közösségépítés, a kormányzat mélyebb bevonása, és nem utolsósorban a vidéki területeken élők helyi identitásának erősítése.

SUMMARY

The European Commission initiated the preparation of a new long-term vision for rural areas. First step of this process was the launch of a public consultation to which also the Horizon 2020 SHERPA (Sustainable Hub to Engage into Rural Policies with Actors) project is making a contribution on behalf of 20 different Multi-Actor Platforms (MAPs). The Hungarian MAP - a group of science-society-policy actors - focuses on the Agricultural Knowledge and Innovation System (AKIS), more precisely digitalization. The topic of Agricultural Knowledge and Innovation System - is a horizontal issue and it is embedded even into the Common Agricultural Policy's (CAP) strategic planning process. Being part of it, the development of AKIS requires

close and intensive cooperation of policy makers, researchers and farmers or in broader context the society with various stakeholders.
The aim of the Hungarian research was to identify the current and likely trends for the Hungarian rural areas and to point out key challenges, opportunities, enablers and hinderers in rural development in terms of the Agricultural Knowledge and Innovation System (AKIS) up until 2040.
The methodology used was the Delphi technique. In the first phase, a review of key trends, main challenges and opportunities and a summary of existing foresight regarding digital agriculture was written. Then AKIS experts were asked to talk about their experiences and opinions in the framework of interviews, a focus group meeting and a survey. In the end, results of the survey were discussed in a consensus meeting.
Among the results, it is worth mentioning that digitization and digitalization will fundamentally change the way rural areas operate including economic, environmental and social dimensions. The main enablers of a promising future vision are capacity building for knowledge transfer, adaptation for job creation and offering better quality of life, stronger community building for collaborations, deeper government involvement, and last but not least, strengthening the local identity in rural areas.

INTRODUCTION

In 2020, the European Commission initiated the preparation of a new long-term vision for rural areas. The first step of this process was the launch of a public consultation to which also the SHERPA project[i] intends to contribute. SHERPA - Sustainable Hub to Engage into Rural Policies with Actors - is a Horizon 2020 project financed between 2019 and 2023 with the aim of gathering knowledge from science-society-policy actors that contributes to the formulation of recommendations for future policies relevant to EU rural areas. The groups of science-society-policy actors called Multi-Actor Platforms (MAPs) - altogether 20 of them - are invited to discuss their vision for the future of their territory over the next 20 years (SHERPA,2020). One of the Multi-Actor Platforms is the Hungarian MAP. Its focus was narrowed down to the Agricultural Knowledge and Innovation System (AKIS), more precisely to digitalization. The topic of Agricultural Knowledge and Innovation System is a horizontal issue, and it is embedded into the CAP strategic planning process. Member States' CAP strategic plans will combine a wide range of targeted interventions in relation to 9 EU-level specific objectives touching upon environmental, social and economic challenges and a cross-cutting objective on knowledge, innovation, and digitalization, while

contributing to the Green Deal. Being part of it the development of AKIS requires close and intensive cooperation between different subgroups of the target group, i.e. policy makers, researchers and farmers, or in broader context the society with various stakeholders.

METHODOLOGY

The aim of the research was to identify the current and likely trends for the Hungarian rural areas and to point out key challenges and opportunities, enablers and hinderers in rural development in terms of the Agricultural Knowledge and Innovation System (AKIS) up until 2040.

As the Delphi technique (Cunha and Swinbank, 2009; Thangaratinam and Redman 2005) aims at predicting and exploring "alternative future images, possibilities, their probabilities of occurrence, and their desirability by tapping the expertise of respondents" (e.g. Rikkonen et. al 2019; Linstone and Turoff, 2002), a 6-step Delphi method was chosen by the SHERPA consortium thus used also in the Hungarian research. The 6 steps are the following: Step 1: Desk research and context analysis; Step 2: Interviews; Step 3: Interview analysis, writing MAP Discussion Paper and preparation of survey; Step 4: MAP survey; Step 5: Survey analysis; Step 6: Validation of results. Achieving the goals, we have set and answering the questions raised by means of the method chosen is not only easily feasible, but due to its specific feedback mechanisms results can be further detailed, clarified and harmonised. Although consensus was initially essential to the Delphi method according to further methodological developments this restriction was loosened. Thus, we intended to focus on achieving stability in expert responses, obtaining an opinion, agreed at least to some extent, from the panel of experts. The predictions are basically reliable due to the selection of the experts and not because of the degree of consensus obtained. (Abreu and Mesias, 2020)

In the first phase, a review of key trends, main challenges and opportunities and a summary of existing foresight regarding digital agriculture was written. Then, in terms of challenges and opportunities in the next 20 years, desirable future for 2040 and enablers to achieve the vision in Hungary, a panel of AKIS experts were asked to talk about their experiences and opinions in the framework of interviews, a focus group meeting and a survey. In the end, results of the survey were discussed in a consensus meeting.

The desk research carried out in May and June 2020 focused on 'The rise of digitalization and smart ruralities'. Other topics were touched upon indirectly,

only if they were related to digitalization in some aspect (e.g. climate change). The review of key trends, main challenges and opportunities and the summary of existing foresight regarding digital agriculture was embedded into this article as literature review. After the desk research, interviews were conducted, and a focus group meeting was held. The target group was the Hungarian AKIS Multi-actor Platform (MAP), i.e. the panel of AKIS experts that is small in number is composed of highly respected professionals.

The MAP's members are basically members of the AKIS sub-working group established by the Ministry of Agriculture with a general focus on the Agricultural Knowledge and Innovation System, recently it has been involved in the CAP strategic planning process. The AKIS sub-working group officially contains 15 members – mainly highly respected policymakers, representatives of the Paying Agency, researchers and colleagues of the Chamber of Agriculture representing all types of farmers, but occasionally - depending on the topics to be discussed - more experts are invited to the meetings. The number of the extended working group is approximately 40. Number of official MAP members is 12. As regards the stakeholder groups representing science, policy and society, equal balance of power is demonstrated among them (4-4-4 members respectively).

Interviews were carried out basically on phone or through virtual meetings in Hungarian language due to the COVID-19 situation and as the time available was quite short some experts answered the questions per email either in English or in Hungarian. The questions were asked and answered through the lenses of AKIS. 6 MAP members were interviewed individually, and 6 members participated in the focus group meeting. Questions are listed in Table 1.

Table 1. **Questions raised on the 'Long-term vision for rural areas from the aspects of AKIS'**

No.	Questions
1.	Are you aware of any studies, documentation, foresights, initiatives regarding the future of the AKIS (national, regional, local levels)?
2.	According to you, what are the main current theme(s) for rural areas in the MAP region (i.e in Hungary)? "How is it to live in rural areas at the moment". Regarding the impacts of the COVID-19 how do you see the resilience of the country (resilience to acute shocks)?
3.	Opportunities and challenges in the next 20 years: What do you see as the main opportunities and challenges coming up until 2040?
4.	What is your vision for your rural territory by 2040?
5.	What are the challenges in reaching the vision?
6.	How could the MAP contribute to the debate on the long-term vision for rural areas at local, national or EU level?

The AKIS sub-working group was invited to express its opinion on local challenges and opportunities as well as its vision for the future of rural Hungary within the next 20 years. The Survey under the title 'Rural development up until 2040 - Challenges, opportunities, enablers and hinderers' contained 20 mostly 'quick-click' multiple choice questions. The survey was circulated in July and August 2020. It mainly focused on inquiring about how interviewees describe living in rural Hungary, how well rural areas are prepared for and resilient to acute shocks, what needs to be done to improve resilience, how rural areas will look like in 20 years, what are the opportunities and the weaknesses in rural areas and what are the opportunities for implementing smart adaptation policies. For further information individual questions are listed in the endnote (ii).[ii]
Responses were anonymous and confidential. They were analysed and presented to the Multi-Actor Platform as background material for the consensus meeting. 16 experts started to fill in the survey but there were 15 answers that could be analysed. Among the respondents, the group of society was under-represented with 3 experts, but as regards the number of the other two stakeholder groups, they were equal: 6-6 experts represented both public sector and research. Results of the survey were discussed, confirmed and amended in a consensus meeting. It was held on 2nd October 2020 on Microsoft Teams with the participation of 7 experts including the monitor and the facilitator of the MAP. Other MAP members were offered the opportunity to express their opinion in a shared excel file. 4 MAP members answered the following questions: Name of the MAP member; Do you agree with the statements of the Position Paper (Yes/No); If your answer is no to the previous question please explain why. (Which statement is the one you don't agree with?); If your answer is yes to the question in Column2 do you know other (strong) opinions of experts, which are different from the ones introduced in the Position Paper? What are those opinions?; Is there anything missing? If yes, please add your statements.; Do you have any general comments? Please explain!

LITERATURE REVIEW

Review of key trends

Certain demographic factors, such as aging, growing welfare and income gap as well as socio-economic tensions greatly influence the environment which

increasingly requires innovative solutions at all levels (Ministry of Innovation and Technology, 2020).

In Hungary, global trends related to technological development, innovation, digitalisation, and the ongoing fourth industrial revolution (Industry 4.0) have just started to reach the countryside and are still at the beginning of their transformative journey. They are considered by many as unstoppable, irrevocable outside forces, pushing the rural areas towards a new future.

Continuous innovation is a key to competitive businesses in the 21st century. One of its foundations are the research and development (R&D) activities which show an increasing trend over time in Hungary (Figure 1).

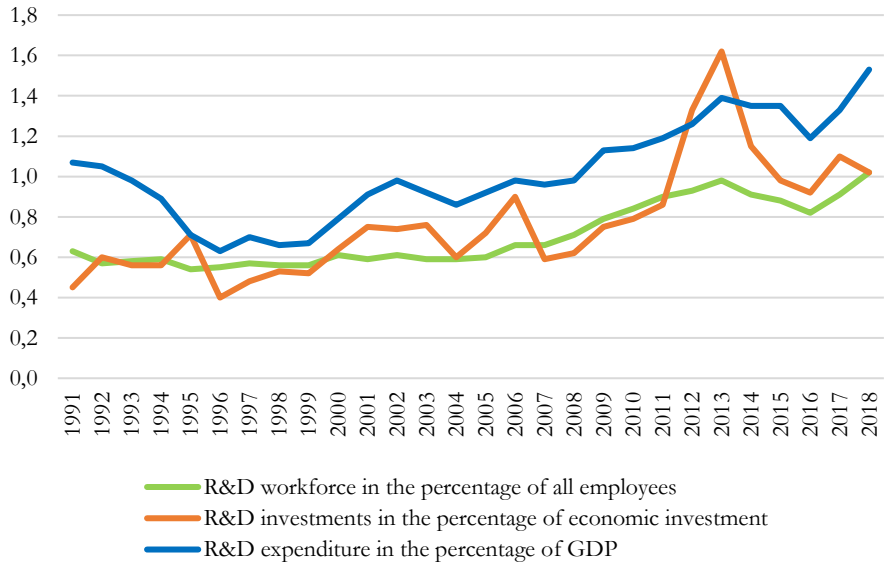

Figure 1. **Main trends of R&D in Hungary, 2000-2018**

Source: National Statistical Office, 2019

At global level, new technologies are becoming widespread, 5G, IoT and Big data transform whole sectors fundamentally, including agriculture. Automatization and the improvement of technologies and management based on data collection is a key to increasing productivity and effectiveness. With the possibility of cost reduction, companies can trade off human workforce.

In Hungary, digital economy accounts for 20 percent of the gross value added of the national economy and provides employment opportunities for 15 percent of the employees (Digital Start-up Strategy of Hungary, 2016). However, economic benefits from the digital development of agriculture are still unutilized (Digital Welfare Program 2.0, 2017).

According to the Digital Economy and Society (DESI) Index (EC, 2020a), Hungary performs well regarding high-speed broadband accessibility, but insufficient digital skills are shown on behalf of the population (Figure 2). The country remained one of the worst performing EU countries regarding the Integration of digital technology in businesses, while poor performance in digital public services further reduces its score.

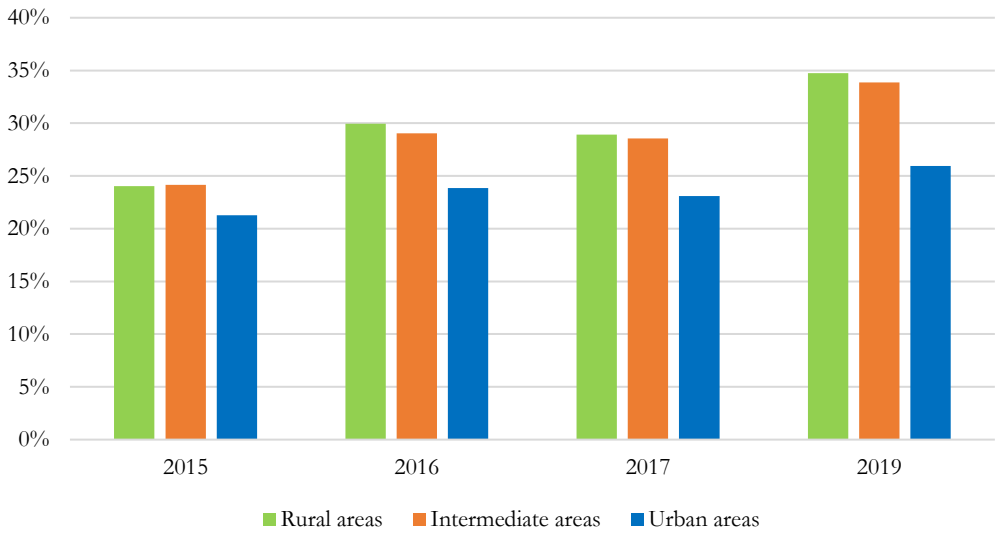

Figure 2. **Share of individuals with low level of digital skills in Hungary**
Source: European Commission, Digital Scoreboard

Majority of the agricultural producers are unable to adapt to the changing climate conditions due to technology gaps and lack of knowledge. Furthermore, available databases are fragmented and difficult to access. The most vulnerable groups are the elderly and people with low qualifications. Especially the latter group is at risk of lagging behind which can intensify social inequalities (Digital Start-up Strategy of Hungary, 2016).

The exponentially increasing amount of available data and information expands the size of the knowledge base extremely and makes the provision of 'access for all' necessary. In the agri-food sector, this will contribute to the economic, environmental, and social sustainability of production.

The new information technologies radically change consumer behaviour as well. There is an increasing demand for healthy food such as quality white meat, fruits and vegetables or products without additives, environmental and animal welfare

aspects as well as traceability issues are strongly emerging (Ministry of Agriculture, 2017).

Review of main challenges and opportunities

The period of the Common Agricultural Policy (CAP) 2021-2027 will play a major role in the infrastructural and organizational coordination of certain elements of the Hungarian AKIS. It is considered a major challenge that the structure and the coherence of the different components have not been fully developed yet. In several cases there is a problem also with the quality of the components themselves. The level of professional, management, digital and language skills of farmers is low. The agricultural education is outdated and/or its infrastructure is of low quality. Furthermore, the sector is characterized by the lack of complex knowledge.

While focusing on digitalization in general, it is to underline that Hungary is facing a number of challenges, such as the digital and management skills shortage, and the companies' weak knowledge about the initiatives available, and how they can best capitalise on them. These issues are also reflected in the Digital Transformation Enablers' Index (EU, 2018: p4; p66.) and the Digital Technology Integration Index (EC, 2020b; EU, 2018: p4)) which ranks Hungary as a country lagging behind. In case of agriculture, it is to emphasize that the mobile network and internet coverage is not adequate on agricultural lands and forest areas. The legal background promoting the exploitation of opportunities created by digitalization (e.g. drones, data management) is not in place.

There is a lack of agricultural consultants with proper knowledge of agricultural informatics and innovation. The information on implemented innovative procedures is unsatisfactory. Certain technologies cannot be adopted to small farms or only to a limited extent and the return on innovative investment is also uncertain. Further challenges that are brewing for the future are as follows: still missing or outdated environmental and economic data required by efficient production needs to be made available; data right related questions need to be clarified and equal access to digitalization and information should be provided to all farmers to avoid the exclusion of some groups.

Besides CAP, a number of strategic and other initiatives are in place to help advance knowledge transfer, digitalization and innovation in the shorter and longer term: EIP - Agri platform, BIOEAST initiative, E-Knowledge, Vocational training 4.0 strategy (Ministry of Innovation and Technology, 2019b), Agricultural vocational training in the 21st century or Medium-term Strategy. Digital

transformation is of course such a comprehensive change that is to be experienced at different levels of the economy. In Hungary, the measures are coordinated by the Digital Success Programme (2015) under the umbrella of which several agriculture related strategies have been developed: Super Fast Internet Program, Digital Export Development Strategy, Digital Education Strategy, Digital Agricultural Strategy, Digital Food Strategy, DigKomp, Artificial Intelligence Strategy, 5G Digital Strategy, etc..

Digital solutions might contribute to more efficient use of resources, risk mitigation in production, reduction of losses, productivity growth, better traceability and quality assurance. In certain cases, they can be solutions for labour shortage. The increase in productivity has favourable impact on both environment and climate. As regards the introduction of digital applications, several challenges seem to appear such as lack of information on new technologies, lack of digital skills and limited access to reliable cost-benefit analyses of the use of technology (EC, 2019a). As to the increase in profitability, it is important to develop digital technologies based on farmers' needs and solving real problems. The National Digital Agriculture Strategy is aimed at developing the digital agricultural innovation environment and start-up ecosystem. Its objectives are to contribute to improving efficiency of agricultural production; to increase domestic and international market share of the Hungarian IT industry, to spread the use of existing ICT solutions and existing R&D results; to create information flow between research and production; to exploit benefits of advancing ICT; to support risk assessment and risk mitigation (Juhász, 2019)

However, digitalization has negative impacts as well. Its costs might cause problems mostly to smaller enterprises. Greater administrative burden might be an additional challenge and without adequate use of available data, sustainability cannot be improved. Digital technologies might have an impact both on vertical and horizontal food chain integration. The latter of which favours large food suppliers. (Pesce et al., 2019)

Summary of existing foresight(s)

In the following decades, a continuous revolution of new technologies will take place. The widespread dissemination of information technology, the digitalisation and automatization of industrial processes will open new dimensions in the agri-food sector. The competitiveness of the Hungarian agri-food economy will be highly influenced by how successfully it can adapt these technologies. That is, it needs to direct its investments, change of technologies and R&D activities into

this direction. Precise understanding of the production process and its environment, collecting data, building databases, development and integration of automatic intervention and decision support tools, in one word: digitalisation, is one of the determining directions of the future. For a future-oriented, efficient Hungarian agriculture (Figure 3) it is essential to develop necessary competencies and to create adequate conditions for education and the dissemination of required knowledge (Ministry of Agriculture, 2017).

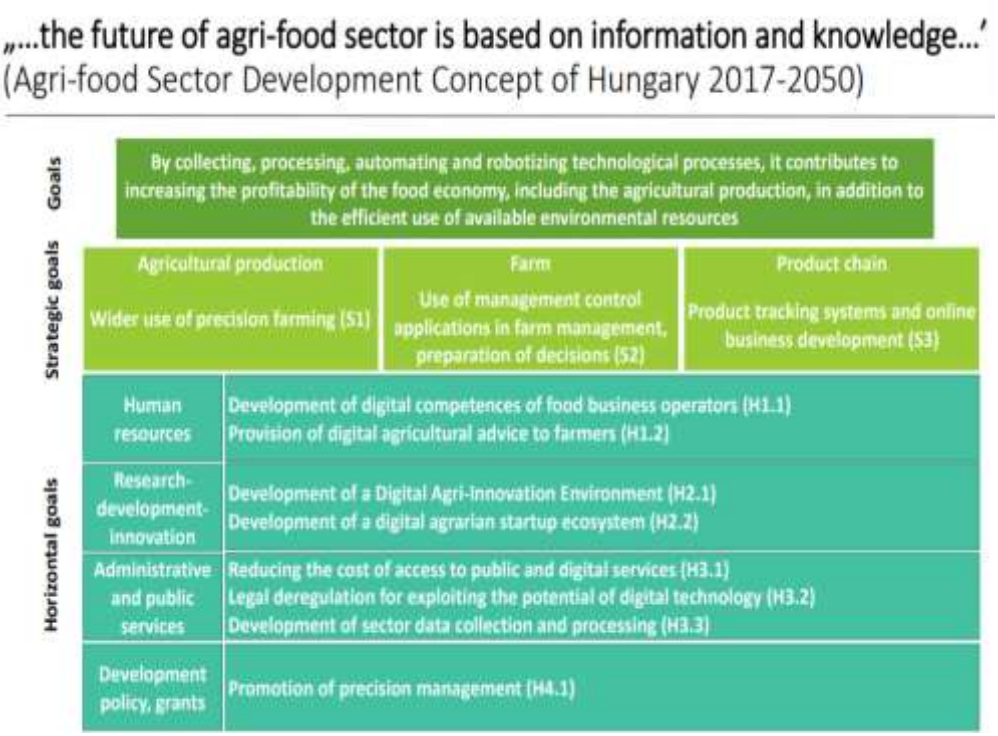

Figure 3. Future-oriented Hungarian agriculture

Source: Juhász, 2019

A prerequisite for strengthening family farms, small and medium farms is to strengthen their market-orientation. They need to be able to supply local and regional markets, provide services and especially create and operate producer cooperation for these purposes. Productivity and effectiveness of these smaller enterprises can be increased by disseminating good practices, providing training and advisory services for them. (With diversification of their activities they will be less exposed to outside economic and environmental impacts). More and more, farm managers should be young, trained professionals devoted to agriculture, have up-to-date knowledge on management and information technology, be open

to modernisation and innovative solutions, as well as to cooperation for development. In the food processing sector knowledge- and innovation-based products and technological developments with high value added should be in the centre (Ministry of Agriculture, 2017).

Technological development, an increase in automatization and the spreading of robotic technologies will support enterprises in handling labour shortage. Due to technological development and innovation, physical work is expected to become easier and thus the judgement (or image) of jobs in the agri-food sector is expected to be improved among young people (Ministry of Agriculture, 2017).

Based on the vision of Hungary, companies will become able to benefit from the challenges caused by digitalisation, most of them by quitting their business model based on cheap labour. An energetic, dynamic, ambitious group of enterprises will emerge with products ready to prevail on both international and domestic markets. SMEs work in a constant search for new opportunities through the utilisation of modern management methods and technologies (Ministry of Innovation and Technology, 2019a).

The operation of enterprises is successfully supported by the money and capital markets as well as by innovation facilitator support organisations and services. Entrepreneurship is appealing and honourable, entrepreneurs have a strong community organising role, their social perception is very positive. A predictable, stable business environment with low bureaucratic costs is established (Ministry of Innovation and Technology, 2019a).

Digital transition for the Hungarian economy can be the new engine for growth in the coming years. Until 2025, it can generate an additional EUR 9 billion in the GDP (Ministry of Innovation and Technology, 2019a).

RESULTS

Challenges and opportunities in the next 20 years

In the Survey, 9 opportunities were listed for the respondents to decide whether they seem to be important for them (Figure 4).

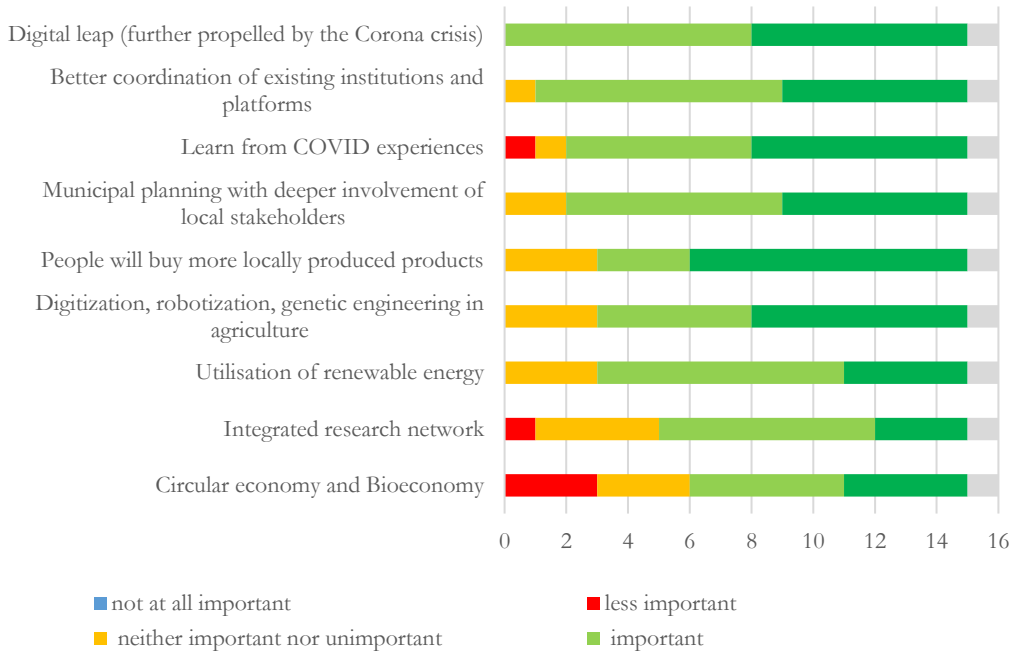

Figure 4. **Importance of opportunities in the next 20 years according to AKIS working group in Hungary, Survey results**

Source: Sherpa Survey for the Hungarian AKIS MAP

As regards the level of importance, based on the summarized answers three big groups can be created. In the first group more than 90% of the respondents considers digital leap (further propelled by the Corona crisis) (100%) and better coordination of existing institutions and platforms (93%) important. In the second group according to 80% or more than 80% of the respondents the following opportunities emerged as important: municipal planning with deeper involvement of local stakeholders (87%); learn from COVID experiences (86%); digitization, robotization, genetic engineering in agriculture (80%); Utilisation of renewable energy (80%) and sale of more locally produced goods (80%). In the third group 66% of the respondents thinks that the integrated research network is important and 60% considers circular economy and bioeconomy to be a major issue. The greater share of those who are not covered by these percentages did

not decide at all whether the issues/opportunities are important or not important. As regards the three stakeholder groups – public sector, society and research – it can be stated that in most cases there were members in each group who could not clearly decide whether the opportunity is important or not and as a result choose the option "neither important nor unimportant."

The interviewees see the opportunity in a competitive agriculture shifting toward a high-tech sustainable agriculture based on innovation, digitization and modernization, in the retention and expansion of the intellectual strata i.e. of highly skilled labour force, in increased demand for local products and strengthened role of short supply chains and in strengthening the role of rural areas in producing goods and providing services.

According to experts, Hungary will be faced with several challenges and weaknesses until 2040 (Figure 5).

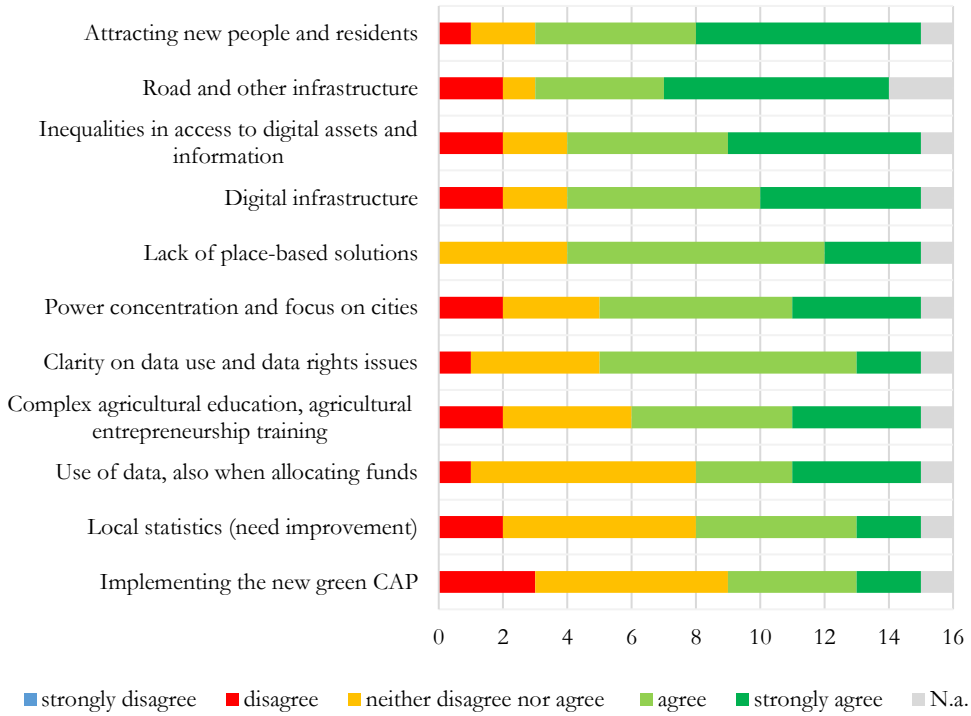

Figure 5. **Challenges & weaknesses according to AKIS working group in Hungary, Survey results**

Source: Sherpa Survey for the Hungarian AKIS MAP

As a result of the Survey's evaluation, there are 3 well-separated groups of challenges Hungarian rural areas should find a solution for. In the first group

approximately three fourth of the respondents consider the challenge listed below a major one: road and other infrastructure (80%); attracting new people and residents (80%); digital infrastructure (74%); lack of place-based solution (74%) and inequalities in access to digital assets and information (73%). In the second group approximately two third of the respondents consider the below listed challenge a major one: power concentration and focus on cities (67%); clarity on data use and data right issues (66%) and complex agricultural education, agricultural entrepreneurship trainings (60%). In the third group less than half of the respondents consider the below listed challenges considerable: use of data, also when allocating funds (47%); local statistics (47%) and implementing the new green CAP (40%). As regards the three stakeholder groups – public sector, society and research – it can be stated that in most cases there were members in each group who could not clearly decide whether they consider the statement as a strength or not and as a result choose the option "neither agree nor disagree." Furthermore, in most cases there were some members of each stakeholder group who basically did not identify the listed statement as a weakness.

The interviews confirm also that it is major challenge to find digital/ smart solutions to help rural living, especially in adapting climate change and extreme weather conditions ; to increase digital knowledge, skills, and competencies and to figure out the proper application and use of technical improvements i.e. to educate and train farmers and consumers to use digital technologies in a proper way, furthermore to find ways how to keep the young generation in the rural areas.

In the consensus meeting, the results of both interviews and the survey were confirmed on one hand and slightly amended and refined on the other. It was emphasised that both the problem of depopulation and the diversity/heterogeneity of rural areas (in terms of e.g. closeness to the capital, density, carrying capacity, capacity for population attraction and retention) should be expressed explicitly. Furthermore, raising awareness about social responsibility and environmental protection and strengthening local identity seemed to be important aspects to be added.

Desirable future for 2040

During the interviews, different themes were raised around which the future vision was built on, but one main element was always mentioned as the 'heart' of these visions, and that is 'sustainability'.

Some of the interviewees approached the vision from the aspect of the Common Agricultural Policy (CAP) and thought that the cessation of the CAP would be a

shock for rural areas since the CAP can help the transition to economic and environmental sustainability. Others pointed out the importance of green policy in shaping sustainability. However, according to this vision, there will always be winning and losing rural areas. To reduce differences, the importance of equal opportunities was emphasized as a solution. Other interviewees placed more emphasis on digital and technological development in their vision as it can convince and motivate young people to become farmers and not to leave rural areas. Furthermore, the popularity of healthy (chemical-free) food production and lifestyle is expected to be higher, just like special consumer demands for specific products. As a vision for 2040, some interviewees highlighted the appreciated role of skilled individuals with digital knowledge in rural areas and the development of the countryside as an innovative space close to nature and utilizing its environmental endowments.

The results of the Survey confirmed the main elements of the vision created during the interviews. When questions were asked about personal priorities concerning different themes and topics, the topic on 'skills, education and education services; knowledge-transfer' was rated as the most important.

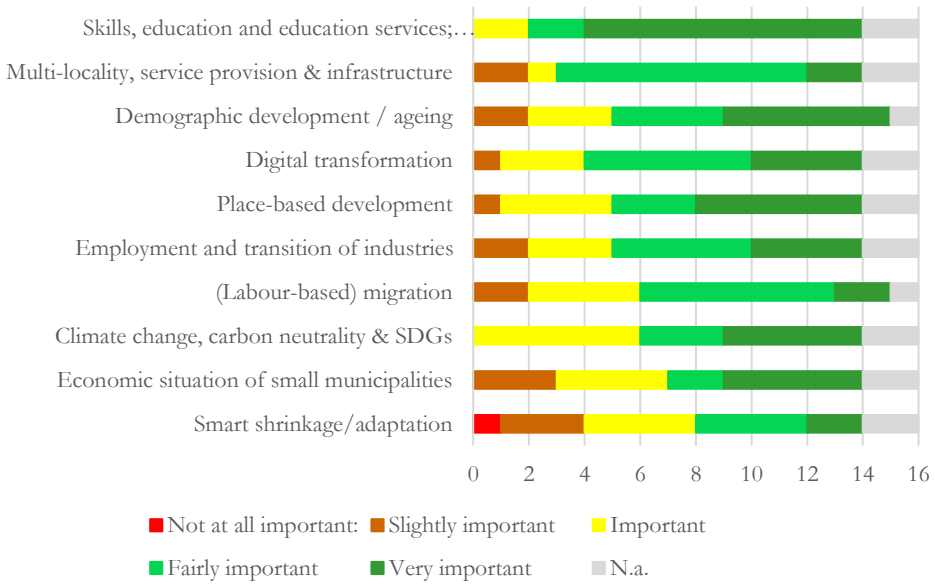

Figure 6. **Importance of different themes and topics according to AKIS working group in Hungary, Survey results**

Source: Sherpa Survey for the Hungarian AKIS MAP

Education, knowledge and skills received the rating of very important by the highest proportion (63%) of the respondents. An additional 12% of them considered this topic as fairly important while nobody evaluated it as slightly important or not at all important. (The other theme without any ratings below important was Climate change, carbon neutrality & SDGs, however it was rated very important by less respondents than the topic on skills and education). More than two-thirds of the respondents (69%) found the topic of multi-locality, service provision & infrastructure very important or fairly important which pushes this topic as the second highly rated in the survey. Almost two-third (63%) of the respondents considered demographic development and aging a very important or fairly important topic. The theme of digital transformation is very important according to 25% of the survey participants, and a further 37% of them thinks it is fairly important. Interestingly 6% of them finds it only slightly important.

Another set of Survey question were asked from the respondents directly about their vision of Hungarian rural areas by 2040. Although all topics were considered as worthy enough to be part of the 2040 vision (all of them received a strongly agree rating at least from one respondent), three themes stand out from the list by receiving the most strongly agree and agree ratings from respondents. These three most highly supported themes are:

1. More innovative and digitalised rural areas (strongly agree: 38%; agree: 35%= supporters: 73%)
2. The presence of new types of teaching methods and tools (strongly agree: 31%; agree: 50%= supporters: 81%)
3. Better connection of rural areas to knowledge economy (strongly agree: 25%; agree: 37%= supporters: 62%)

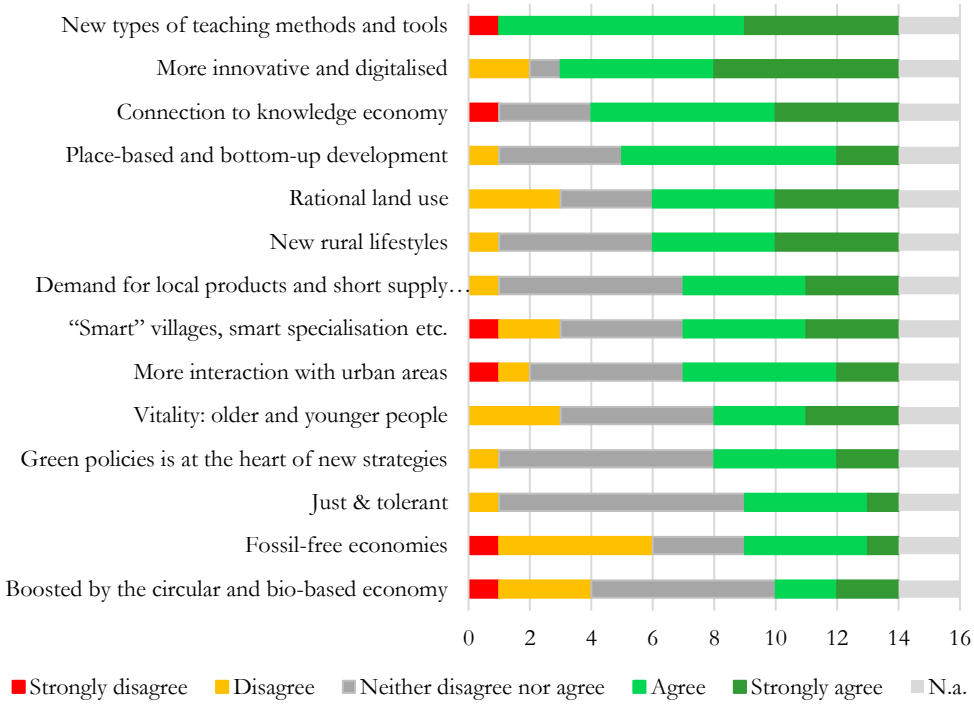

Figure 7. **Acceptance of topics as part of the Rural Vision 2040 of Hungary, Survey results**

Source: Sherpa Survey for the Hungarian AKIS MAP

During the consensus meeting, MAP members were encouraged to express their opinion on the results. Overall, they accepted the results, however there was one specific area which became the main theme of the meeting. When they were asked about the possible reasons of strong disagreement among the ratings of otherwise popular themes (e.g. new types of teaching methods and tools or better connection to knowledge economy) they brought up the issue of different types of rural areas. Based on the differences, two visions were unfolded: one for the remote, lagging-behind, struggling rural areas where aging, lack of skilled individuals and depopulation are typical, and another for the more attractive rural areas with desirable natural resources as well as more promising demographic and economic conditions. According to the latter, rural areas will provide habitation for people moving out from urban areas to enjoy a more peaceful natural environment, as well as a place for home office and for home delivery. For the lagging-behind regions the threatening vision of complete depopulation could be avoided with outside help: with the community building efforts of civil and faith-based organisations, with introducing ecotourism or cross-border cooperation,

where possible. According to a little brighter vision, the entire rural population will be more digitally skilled as today's population by the time we reach 2040.
Regarding agricultural production, digitalization and increased efficiency will require fewer human resources, and lead to less job opportunities in this sector, while through internet connection other sectors will open up for the rural population (e.g. service sector).

Enablers to achieve the vision

According to the answers, Hungarian rural areas are strong mainly because of the availability of natural resources and thanks to certain initiatives that are in place to help advance knowledge-transfer, digitalization and innovation. (These can be considered as enablers.) The former statement was confirmed by 93% of the respondents to the Survey and rejected by none of them and the latter by 60% and 20 % respectively. The availability of knowledge such as grid-level data is considered also a strength by 40% of the respondents, while less than one third of them (27%) do not agree with it. In the respondents' opinion mainly the culture of problem solving (53%) and policy systems enabling good partnerships (47%) should be improved. The former was stated mainly by researchers. Besides these aspects less than half of the respondents (40%-40%) thinks that there is also greater need for widespread use of innovative technologies and digital tools and more effective collaboration among actors and sectors (Figure 8.). As regards the three stakeholder groups – public sector, society and research – it can be stated that in most cases there were members in each group who could not clearly decide whether they consider the statement as a strength or not and as a result choose the option "neither agree nor disagree." Furthermore, in most cases there were some members of each stakeholder group who basically did not identified the listed statement as a strength.

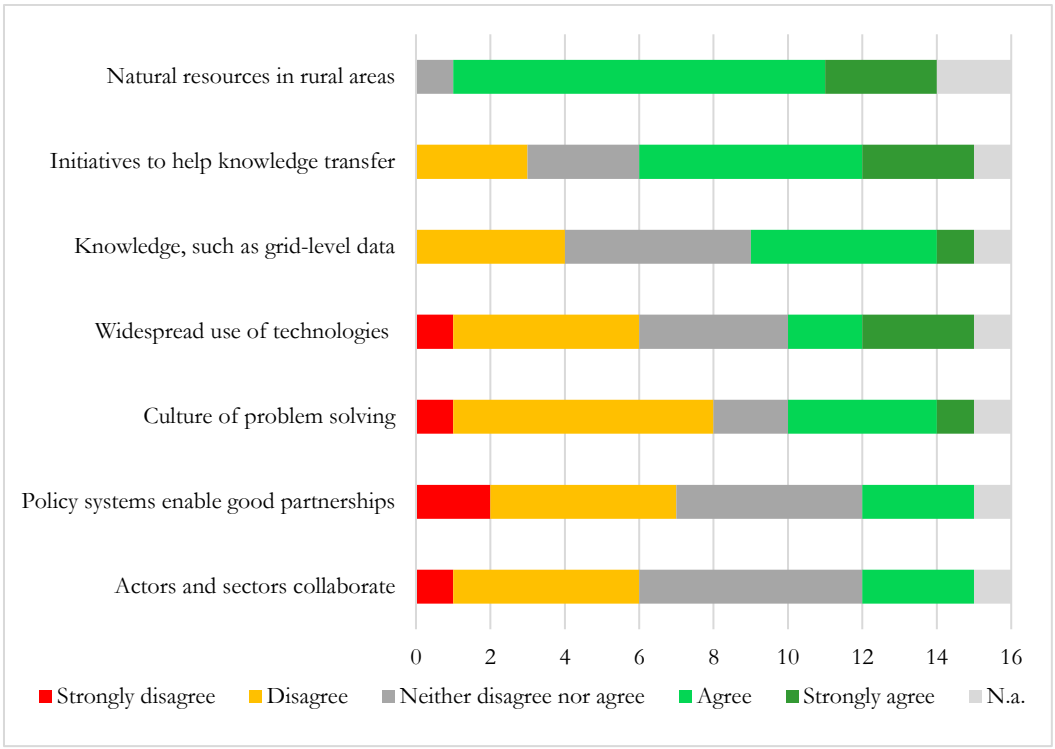

Figure 8. **Acceptance of topics as part of the Enablers to achieve the vision, Survey results**

Source: Sherpa Survey

In the interviews among hinderers, digital and management skills shortage, lack of agricultural consultants with proper knowledge of digital agriculture and innovation were mentioned. Furthermore, missing or outdated environmental and economic data; data ownership and data rights related questions, unequal access to digitalization and information were also listed as limiting factors. According to the Survey's results, the implementation of policies supporting smart adaptation in Hungary is hindered by lack of collaboration between different levels and sectors (agreed by 86% of all the survey respondents); interconnectedness of strategies between policy levels (agreed by 73%); lack of resources and instruments and local knowledge and data availability (60%). Economic and population growth were, however, not considered important (agreed by only 40% of all survey respondents).

Implementation of smart adaptation policies will be supported through opportunities emerging within the national policy framework (agreed by 87% of all the survey respondents), interconnectedness between policy levels, availability of local knowledge and small-scale data (agreed by 80%), and trust between

authorities and society (73%). At the same time existing partnerships and cooperation between different policy levels and networks of local actors were held less important (67% and 53% respectively) by the respondents.

During the consensus meeting, the participants accepted and confirmed the results of the interviews and the questionnaire. They agreed that digitization and digitalization will fundamentally change the way rural areas operate and listed adequate knowledge transfer, adaptability and flexibility, the potential of community building and deeper government involvement as enablers.

The importance of the vision is supported by former studies results (Gaál et al, 2020). The number of Precision Agriculture (PA) adopters was small (less than 9 per cent of among the arable Farm Accountancy Data Network farms) in Hungary in 2018 and the users has not increased considerably compared to FADN PA survey in 2016. There is a lag compared to Western European countries and the USA. Barriers to widespread adoption of digital technologies are the excessive investment cost, lack of proportional capacity and of appropriate knowledge.

CONCLUSION

Among European rural areas with different characteristics, the Hungarian rural areas have undergone significant changes in recent decades and have been affected by general trends such as depopulation, ageing, urbanisation, climate change or digitalization and lately also by the socio-economic impacts caused by COVID-19. EU policies are already facilitating and financially supporting the development of rural areas and they are expected to continue to do so also in the future. Besides the top-down activities there is, however, a great need for bottom-up contributions, too.

As this research aimed at analysing the digitalization aspect of the Hungarian rural areas' future, the following concluding remarks refer to this topic. Digital improvement of rural areas requires both the development of infrastructure and the availability of digitally skilled labour force. Local communities, networks need adequate financial support and educational and training opportunities especially in lagging-behind areas, where without outside help, complete depopulation is expected to occur by 2040. Rural areas with more favourable conditions will, however, attract an increasing number of urban outmigrants. Digitization and digitalization will fundamentally change the way rural areas operate including economic, environmental and social dimensions. The main enablers of a

promising future vision are capacity building for knowledge transfer, adaptation for job creation and offering better quality of life, stronger community building for collaborations, deeper government involvement in creating the necessary framework conditions, and last but not least, strengthening the local identity in rural areas. Digital leap, better coordination of existing institutions and platforms, and the retention and expansion of the intellectual capital are all considered major opportunities to realize the vision.

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[ii] ***List of Survey Questions***

No.	Questions
1.	From the options below, which one describes your background best? Please choose only one option. 1. Public sector national level 2. Public sector regional level 3. Public sector local level 4. NGO/Civil Society 5. Business 6. Research 7. Private person 8. Rural development
2.	On a scale from 1 (not at all important) to 5 (very important) how important are the themes and topics mentioned below for you? 9. Demographic development / ageing 10. Climate change, carbon neutrality & SDGs 11. Digital transformation 12. Economic situation of small municipalities 13. Employment and transition of industries 14. (Labour-based) migration 15. Multi-locality, service provision & infrastructure 16. Place-based development 17. Skills, education and education services; knowledge-transfer 18. Smart shrinkage/adaptation
3.	Do we miss an important topic in this list? (Q.2 and Q.3 belong together)
4.	Please give us 3 to 5 keywords that best describe living in rural Hungary at the moment.
5.	Rural areas are well prepared for and resilient to acute shocks, such as the COVID-19 pandemic. - Please indicate the extent to which you agree or disagree with this statement.
6.	What needs to be done to improve the resilience of rural areas to acute shocks: (essay type)
7.	Rural areas and the next 20 years. Please indicate whether you agree or disagree. Hungarian rural areas are strong because of… 19. Actors and sectors collaborate 20. Culture of problem solving 21. Policy systems enable good partnerships

22. Natural resources in rural areas
23. Knowledge, such as grid-level data
24. Initiatives are in place to help advance knowledge transfer, digitalization and innovation
25. Widespread use of innovative technologies and digital tools

8. Any other important strengths? (Q.7 and Q.8 belong together)

9. Opportunities in the next 20 years. How important are the opportunities below?

1. Digital leap (further propelled by the Corona crisis)
2. Digitization, robotization, genetic engineering in agriculture
3. Circular economy and Bioeconomy
4. Utilisation of renewable energy
5. People will buy more locally produced products
6. Learn from COVID experiences
7. Municipal planning with deeper involvement of local stakeholders
8. Better coordination of existing institutions and platforms
9. Integrated research network

10. Any other important opportunities? (Q.9 and Q.10 belong together)

11. Challenges & weaknesses in the next 20 years. Among the main challenges and weaknesses until 2040 are...

1. Digital infrastructure
2. Lack of place-based solutions
3. Inequalities in access to digital assets and information
4. Clarity on data use and data rights issues
5. Road and other infrastructure
6. Attracting new people and residents
7. Use of data, also when allocating funds
8. Local statistics (need improvement)
9. Power concentration and focus on cities
10. Complex agricultural education, agricultural entrepreneurship training
11. Implementing the new green CAP

12. Any other important challenges? (Q.11 and Q.12 belong together)

13. Rural Vision 2040. Please indicate the extent to which you agree or disagree with the statements below. In 2040, Hungarian rural areas...

1. are better connected to knowledge economy
2. see new types of teaching methods and tools
3. are more innovative and digitalised
4. are "smart" = smart villages, smart specialisation etc.
5. have more interaction with urban areas
6. have fossil-free economies

7. are boosted by the circular economy and bio-based economy
8. are vital: there is a good mix of older and younger people
9. are just & tolerant
10. see new rural lifestyles emerging
11. see place-based development and bottom-up approaches
12. have green policies is at the heart of new strategies
13. see rational land use, strengthened provision of environmental public goods and nature protection is well balanced with industrialized agriculture
14. see strengthened demand for local products and short supply chains

14. What is your vision? (essay type)

15. Please indicate the main challenges and opportunities you see for the implementation of policies supporting smart adaptation. The development of policies, based on the smart adaptation approach, is mainly challenged due to: …

1. Lack of policy framework at national level
2. Lack of collaboration between different levels and sectors
3. Lack of interconnected strategies between policy levels
4. Lack of resources and instruments (different authorities)
5. Economic and population growth is the dominant norm
6. Openness and willingness of municipal authorities to adaptation measures to shrinkage
7. Lack of local knowledge and data availability

16. Other (please specify) (Q.15 and Q.16 belong together)

17. Please indicate the main opportunities for implementing smart adaptation policies.

8. National policy framework (enabling place-based strategies)
9. Interconnectedness between policies on national and regional level
10. Availability of local knowledge and small-scale data
11. Existing partnerships and cooperation between different policy levels
12. Existing networks of local actors
13. Trust between authorities and society

18. Other (please specify) (Q.17 and Q.18 belong together)

19. How much does the idea of smart adaptation / shrinkage match your vision for the future development of Hungary?

20. Anything else you would like to share with us?

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18 57

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