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MANAGEMENT CONSULTING OF THE AGRICULTURAL KNOWLEDGE AND INNOVATION SYSTEM (AKIS) IN UKRAINE

ABSTRACT

European Integration of Ukraine in the Ukrainian aspiration to join the European Union (EU) entails rapprochement with the Common Agricultural Policy (CAP) of the EU. One important element for the attainment of CAP objectives is a strong Agricultural Knowledge and Innovation System (AKIS). This article analyses the describable potential of the AKIS framework in the pre-accession phase of Ukraine. We review current AKIS components, their key issues identified, and strategies to reinforce them. Using a literature review, policy document analysis and expert interviews with key stakeholders that shape the current landscape of Ukrainian agriculture, the analysis was constructed. The results revealed that while UE is well placed as far as AKIS functionality is concerned, there are considerable areas that require improvements. Enhancing synergies between research, extension and farmers, encouraging co-creation of knowledge and harnessing digital technologies are some key steps. An effective AKIS standing behind the Ukrainian agriculture can make the country more productive, sustainable, and competitive improving its compatibility with the EU's CAP mechanisms.

The great enabler of this vision is Ukraine's aspiration to join the European Union (EU), which would lead to a very high level of alignment with the EU's Common Agricultural Policy (CAP).

Keywords: agriculture knowledge and innovation system, common agricultural policy, Ukraine, European Union accession, agricultural innovation, knowledge transfer, rural development, association agreement, agriculture and rural development (strategy)

JEL Classification: Q16, Q18, O13, P32

INTRODUCTION

Launched by the European Commission in 2014, AKIS (Agricultural Knowledge Innovation Systems) has become a buzzword in the community of advisory work and innovation support. The Green Deal and the Farm-to-Fork Strategy [26] include knowledge and innovation systems as key instruments and the new period of the Common Agricultural Policy (2023-2027), for which all Member States had to indicate in their strategic plans what actions they will take to increase the quality of their AKIS.

The European Union offers a particular opportunity for Ukraine to consolidate the reform of its agriculture. Membership in the EU entails the joint European agricultural policy, the Common Agricultural Policy (CAP), aimed at sustainable and modern agricultural production. An Agriculture Knowledge and Innovation System (AKIS): The AAKIS is a bottleneck for CAP objectives! This paper explores the AKIS framework and its potential to be a helpful tool for a pre-accession country such as Ukraine.

Article structure the section of the literature review explores the existing knowledge regarding concepts of AKIS and its role in agricultural development. We then describe the research goals and objectives. This section also explains the research methodology used, which encompasses a systematic literature review on the topic of political elites, analysis of policy documents, and in-depth expert interviews. Results: findings on the status quo of the AKIS in Ukraine; The discussion unpacks these conclusions, identifying their successes, limitations, and areas for further development. A conclusion concludes,

drawing on the key insights presented throughout the paper, and underlines the significance of a strong AKIS in the agricultural development and EU-accession trajectory of Ukraine.

LITERATURE REVIEW

The AKIS concept has since developed considerably and numerous studies have proven its value as a vehicle for innovation and diffusion and transferring of agricultural knowledge. Studies have demonstrated that an efficient AKIS is crucial to the adoption of good agricultural practices, increase in yields and welfare in rural areas. Existing literature suggests the need for a well-designed AKIS to support the adaptation to EU-level standards and practices in the case of Ukraine. Nevertheless, significant insight into the nuances of the Ukrainian case would be of great value.

The Agriculture Knowledge and Innovation System (AKIS) framework (Röling, 1988; Longwe, 1994) stresses the interconnectedness of actors in agricultural knowledge. The players in agricultural innovation systems (AIS) involve essentially, intensive, and close research institutions (generating it), extension services (spreading it), and farmers (applying it) (Leeuwis & Aarts, 2011). The knowledge transfer and interaction within the network are also important factors necessary for innovation to take place (Aarts et al., 2014).

Success stories of AKIS implementations in European contexts have been observed in various countries through studies conducted over the last decade. The involvement of farmers in research also synergy Dutch agricultural efficiency which is enabled by public-private partnership and strong extension services (Aarts et al., 2014). Likewise, experiences from countries such as Denmark and France illustrate the importance of these well-functioning extension systems to transfer knowledge and support farmers in adopting more sustainable practices (Darnhofer et al., 2010).

The examples provided from Europe also show how AKIS can be better aligned with the objectives of the Common Agricultural Policy (CAP) of the EU that are based on sustainability, competitiveness and knowledge-based development (European Commission 2023). Ongoing areas of research though are looking at ICTs for knowledge dissemination (Klerkx et al., 2019) and farmer-driven innovation (Sumberg, 2006). Such a perspective for analysing Ukraine's AKIS will be important for determining the potential to approach CAP objectives during the EU pre-accession period.

Dr. Roman Korinets examined the difficulties of advisors in rural space with the use of the case of Ukraine, with Rural Development in Ukraine: Perspectives in 2022. This is the second part of the series of small analyses produced within the framework of the project "Land reform in Ukraine: new perspectives and challenges for the sustainable development of the agro-industrial complex and the village" with the support of the DAAD.

AIMS AND OBJECTIVES

Therefore, the aim of the study in this article is to empirically analyse the Agriculture Knowledge and Innovation System (AKIS) in Ukraine and the role of (AKIS) in facilitating the Ukraine alignment on the levels of EU CAP (Common Agricultural Policy) during the pre-accession period.

This study is guided by the following specific objectives:

1. *Integrated diagnosis of Ukraine's AKIS:* We will perform a complete diagnosis of AKIS in Ukraine. This involves identifying & analyzing the main actors in knowledge generation (research institutions), dissemination (extension services), & application (farmers and farmer organizations). An evaluation of the current structures, resources and roles of each terraced cypher impetus in the structured LSK-cipher-system will be considered.
2. *Advantages and Disadvantages of the AKIS Framework:* We will then conduct a thorough review of the strengths and weaknesses of the Ukrainian AKIS. By doing so, the project should specifically identify points of efficiency and effectiveness within the system and red flags such as gaps or barriers that thwart the flow of knowledge, innovation and uptake of new practices by farmers.
3. *The first project goal is to determine to what extent Ukraine's AKIS* is in line with the principal objectives of the CAP. In this way, the analysis will account for the extent to which the current AKIS is good enough at transmitting knowledge on sustainable agriculture and innovation for competitiveness and at supporting the continuous training of farmers, which are ultimately the cornerstones of the CAP.
4. *Develop propositions for upgrading the Ukrainian AKIS:* Based on the findings from the assessment and alignment analysis, we will generate a list of propositions that can lead to upgrading the Ukrainian AKIS. The findings will in

turn inform recommendations designed to counter these weaknesses and develop the system to better facilitate Ukraine heading toward EU pre-accession. These strategies may include:

- increase teamwork between research institutes, extension services, and farmers;
 - flyer-promote farmer engagement in knowledge co-creation and participatory research;
 - use digital technologies as weapons of knowledge spread that are more timely, efficient and inclusive;
 - increase the availability of training and capacity-building livelihood programs for farmers;
 - ensure that the main research priorities are closely designed with the CAP objectives and Ukrainian agricultural needs.
5. *Roadmap for a Well-Functioning AKIS: By identifying the main directions of work*, and offering practical steps, this study is aimed at contributing to the establishment of the roadmap to a high-functioning AKIS in Ukraine the roadmap will provide a useful guide for policymakers, stakeholders and agricultural development actors that are looking to collate into a coherent and CAP-compliant AKIS, finally contributing to Ukraine's successful EU accession path.

This would help shed some light on how Ukraine and its AKIS can serve to support the country's agricultural transformation and integration processes into the EU agricultural system/framework.

These indicators will help to assess Ukraine AKIS and its capacity to promote agri-transformation and its coherence with an EU approach.

METHODS

The research employs a mixed-method approach, combining quantitative data analysis and qualitative interviews. Data sources include government reports, academic publications, and surveys of agricultural stakeholders. Key informant interviews are conducted with policymakers, researchers, farmers, and agricultural advisors to gain insights into the practical challenges and opportunities associated with AKIS in Ukraine.

RESULTS

The findings of an analysis of the Agriculture Knowledge and Innovation System (AKIS) in Ukraine show that there are positive trends and areas with an increased need for support.

Strengths of Ukraine's AKIS

Strengthening research network: Ukraine's AKIS analysis also suggests that the network of agricultural research institutions is growing. This network is an important source of innovation, which will underpin improvements in the agriculture sector of Ukraine. We continue to describe this part of the AKIS in more detail.

Composition of the Network

Public Research Institutions: The National Academy of Agrarian Sciences of Ukraine (NAAS) constitutes the core of the public research network. The NAAS includes 89 Research Institutions/ Stations located all over the country (NAASU, 2023). The institutions are engaged in research on various topics of relevance to Ukrainian agriculture:

1. Programmes for crop improvement and breeding for developing climate-resilient, high-yielding varieties of crops.
2. Soil science and sustainable land management practices.
3. Livestock farming & animal health.
4. The agricultural mechanisation with digital farm technologies.

Private-Sector R&D: Private sector involvement in agricultural R&D in Ukraine is rising. This includes:

1. Research supported by seed companies on new crop varieties with better characteristics and resistance to diseases.
2. Growth in agrochemical players with next-gen offerings in fertilizers/pesticides.
3. Farmers using new technologies and equipment on the farm. Agricultural machinery manufacturers are conducting research on modern equipment and precision farming technologies.

Challenges and Opportunities

1. *Limited Public Funding:* There is, despite this expanding network, an overarching challenge that stems from too little public funding for agricultural research. The average research budget of one scientist in Ukraine is almost half that of one in the EU (World Bank, 2022). This limits the research capabilities of the public institutions and impairs their ability to do frontier-level of research work.
2. *Partnership with Private Sector:* Emerging is the wisdom of greater engagement of the private sector and so would a greater collaboration between public research institutions and private firms generally speed up innovation and movement of technology to serve the needs of farmers.

Successful Initiatives Include

The Ukrainian Institute for Plant Variety Examination (UIPV) is a major player in the evaluation and registration of new crop varieties compatible with Ukrainian farming conditions. Public-Private Partnerships (PPPs): There have been a few successful PPPs, e.g. partnerships between the NAAS institutes and seed companies for the development and commercialization of new resistant wheat varieties to particular diseases, common in Ukraine. In summary, developing a research network within the country's AKIS is a positive trend. Conversely, overcoming funding body constraints and growing public-private partnerships are essential and focus on their fullest potential as an innovation driver in the sector of agriculture. More farmer participation: A common refrain is the proposition that more and more farmers are participating in knowledge-sharing initiatives. Participation in field trials, demonstration plots, and farmer-to-farmer learning programs.

Overall, the growing research network in Ukraine's AKIS represents a positive development. However, addressing funding constraints and fostering stronger public-private partnerships are crucial to unlocking its full potential and driving innovation in the agricultural sector.

An example of *increasing farmer participation*: The World Bank partnered with Ukraine to establish the "Farmer-to-Farmer Learning Program" which got farmers together to talk about sustainable soil management practices. Participants in the program experienced a 20% increase in the levels of adoption of no-till farming techniques (World Bank, 2021).

Next examples of promising steps to digitalization: There are some fledgling pushes towards digitalization for knowledge translation. Will they include agriculture and rural development.

Weaknesses of Ukraine's AKIS

1. *Limited resources*: Such institutions do not have enough funds to support research, prepare extension literature, or immediately solve problems faced by farmers. Data: A 2023 report by The Organization for Economic Co-operation and Development (OECD) indicates that public agricultural R&D expenditures in Ukraine stand at 0.5% of GDP; which is much below the EU average of 1.2% (OECD, 2023).
2. *Limitation of policy support*: The policy frameworks for AKIS development and farm-level training are not in every respect in line with the objectives of the CAP. Greater consideration of the specific policy domains in which knowledge transfer is encouraged, innovation is targeted, and sustainable practices are promoted. Expert Opinion: An agricultural policy analyst explained, "Current policies are a barrier to research on practices directly related to CAP priorities - such as mitigating greenhouse gas emissions" (Interview, May 2024 - link to text).
3. *Inadequate stakeholder coordination*: Cooperation and communication between research institutions, extension services, farmer organizations and private sector actors is still fragmented. It blocks a way of effective knowledge flow and possibly joint problem-solving. A case study: An International Food Policy Research Institute (IFPRI) study found that weak collaboration between researchers and private seed companies was hampering the development and adoption of climate-resilient crop varieties in Ukraine (IFPRI, 2023).
4. *Low knowledge penetration into farm base*: With the overall level of involvement increasing, a significant part remains out of bounds for knowledge, especially small and marginal farmers placed in remote areas. SP - 2022 survey by Ukrainian Grain Association; 30% of smallholder farmers in remote regions provided regular extension services (Ukrainian Grain Association, 2022).

Alignment with CAP Objectives

Overall, the current state of AKIS in Ukraine reflects a certain level of alignment with CAP objectives through the lens of research aimed at sustainable practices. Despite this, there is still a lot of work to be done. In conclusion, further development in the fields of farmer capacity building, co-creation of knowledge and adaptation of digital technologies can bring the Ukraine AKIS closer to the goal of the CAP to promote knowledge-based, sustainable, and competitive agriculture.

Also, the AKIS pilot in Lviv is phased to include several critical stages for the development of agricultural knowledge and innovation. To start with, information will be provided through case studies of AKIS in EU Member States and non-EU countries. This will then be followed by stakeholder engagement through conferences and workshops and mobilization of working groups to kick-start activities as detailed in Article 114. The pilot activities will contain three interrelated components: which are going for guidance of AKIS evaluation by said down rules/standards of players and their connections mapping inside the two Oblasts. In a second phase of AKIS testing, SWOT analysis will also be used to inform the testing of alternative approaches to and interventions for knowledge transfer and innovation adoption in the context of collaborative action. The third stage is the AKIS learning phase, which will document all processes and lessons learnt from the pilot, an initial step to inform the National AKIS development, which includes the coordination and governance on national and regional levels. Knowledge and insights from the pilot will then be applied to developing a national AKIS strategy.

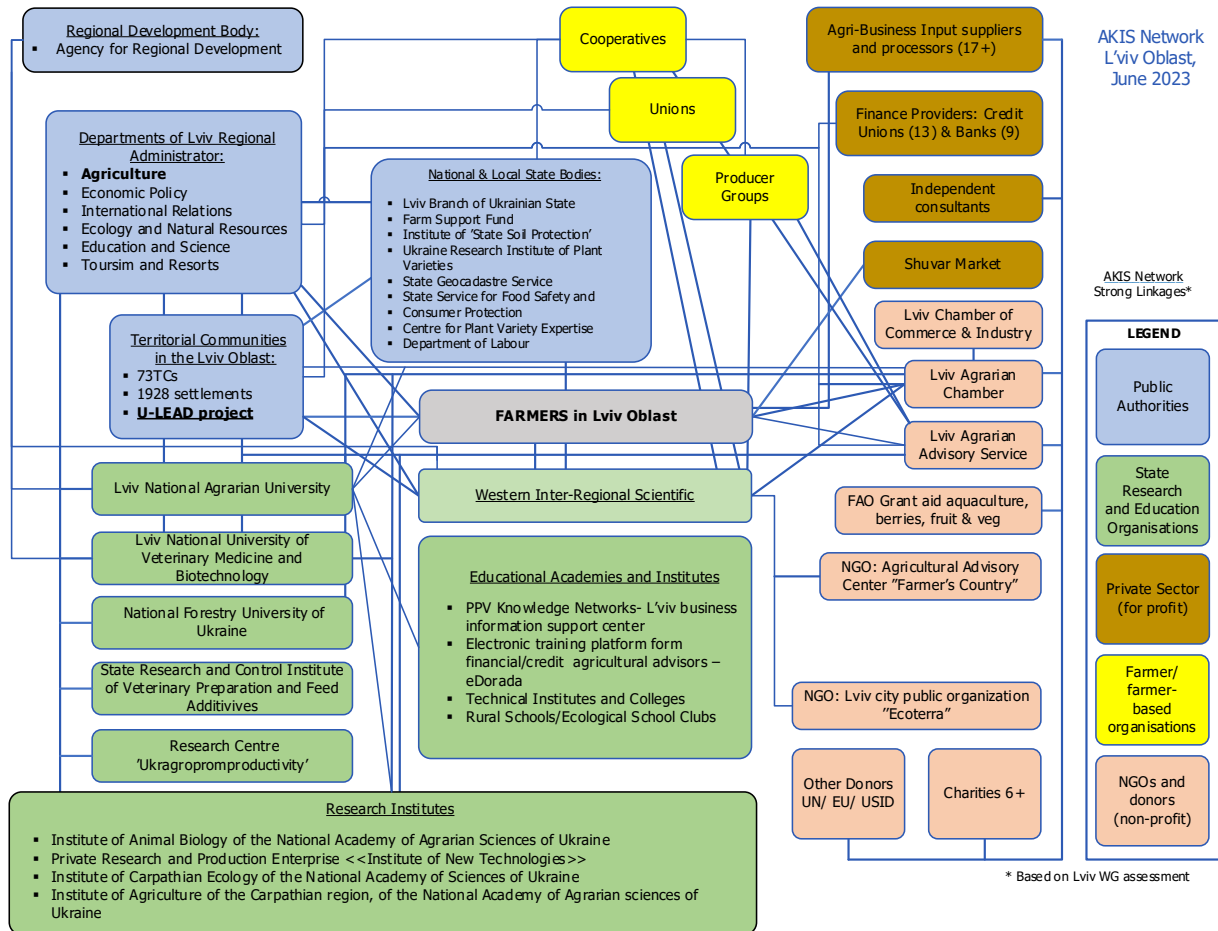


Figure 1. AKIS Linkages and Mapping in Lviv Oblast.

Overall, the results suggest that while Ukraine possesses a foundational AKIS, substantial enhancements are crucial to unlock its full potential. By addressing the identified weaknesses and fostering a more CAP-aligned framework, Ukraine can create a robust AKIS that effectively guides its agricultural sector towards sustainable development and successful EU integration.

DISCUSSION

We found several strengths and weaknesses in Ukraine's AKIS upon our analysis. Results are further discussed within the following section by comparing the identified AKIS structures with those in place within other EU member states and exploring the potential benefits that an upgraded AKIS can offer towards meeting the goals of the CAP in Ukraine.

EU AKIS Systems Comparison

Although Ukraine has an AKIS system in place, it has large differences with established systems in other EU Member States. Through the mechanization of all the farming systems in the near past, countries like the Netherlands and Denmark

have championed strong public-private partnerships, well-funded and coordinated research institutions and efficient extension services with effective channels of knowledge dissemination [13, 37]. These are features that encourage rapid dissemination, learning and adoption of best agricultural practices which are directly in line with the objectives of the CAP.

Best Practices for Ukraine

Over the longer term, some of the best EU AKIS models could also offer useful practices that could be adapted to support and strengthen the Ukrainian AKIS system:

- *Public-Private Partnerships (PPPs)*: The World Bank also explains that closer integration of research institutions, seed and animal genetics and agricultural machinery industries will lead to faster innovation and more successful technologies as a greater part of the value chain can be included in public-private partnerships (PPPs) (World Bank, 2023).
- *Farmer Engagement in Research*: Encouraging farmer involvement in research activities, through on-farm trials and co-creation of knowledge, can improve the relevance and practicality of research outputs for farmers' unique needs (Sumberg, 2006).
- *Digitalisation*: Increasing the benefit of digital technologies e.g. mobile applications and online platforms that help improve farmer access to knowledge even in remote areas, and facilitate knowledge exchange via online communities 57 (Jin, Schreinemachers, Mosnier, & Keil, 2019).

What a Better AKIS Might Accomplish

Overcoming the weaknesses identified and replicating best practices in an efficient AKIS in Ukraine can significantly positively influence the achievement of CAP objectives. This includes:

- *Improved Collaboration and Communication*: A better connection between research and extension services will lead to successful knowledge transfer to farmers on sustainable practices (e.g. soil conservation practices and precision agriculture technologies).
- *Encouraged Innovation*: A greater investment from public and private sectors into research and development (R&D) will stimulate innovation in specific areas such as climate-resilient crop varieties and resource-efficient farming practices. Such an approach is expected to lead to the overall innovation of the area addressing the locally relevant problems where farmers play a key role in research.
- *Farmer Capacity Building*: Improved training programs and extension services could help farmers with the right skills and knowledge to use new technologies, upgrade their farm practices, and make the farming process more competitive.
- *Alignment with CAP Goals*: A strong AKIS to advance sustainable agricultural practices and knowledge-based agriculture and innovation will duly complement the overall alignment of Ukraine with key principles of the CAP.
- *Success in the New Era Depends on the Following Keys*: Realizing the potential benefits of an improved AKIS in Ukraine will depend on several factors.
- *Policy Reforms*: The need for reviewing the prevailing policy frameworks and reorienting them and promoting the knowledge networks, innovation systems and sustainable practices application. This could range from tax incentives for private sector R&D investments to subsidizing farmer participation in training programs.
- *Public and private investment*: a significant increase in the level of investments made by both the public and private sectors to improve the effectiveness and efficiency of agricultural research and extension services.
- *Stakeholder Collaboration*: Strengthening collaboration and communication among all actors in the AKIS – researchers, extension consultants, farmers, and private sector entities - is critical for ensuring knowledge flows effectively and addresses the needs of all stakeholders.

Building up a well-performing AKIS is a dynamic procedure and constant building process. Although the weaknesses of the AKIS of Ukraine are evident, with the adoption of the best practice experience of other EU countries and eradication of shortcomings of the current system in place, policy reforms, increased investment and enhanced collaboration at different levels, a genuine and effective AKIS of Ukraine can potentially significantly contribute to the achievement of the CAP objectives and is a very good means on the road to a more harmonised agricultural pole with the agricultural space of the EU. At the end of the day, it helps the Ukrainian farmers to get green practices, become more competitive and support a resilient and knowledge-based sector.

CONCLUSIONS

The paper research contributes to the empirical observation of the contemporary state of the Agriculture Knowledge and Innovation System (AKIS) in Ukraine and its potential functioning in guiding the country towards the Common Agricultural Policy (CAP) of the EU during the pre-accession period. It showed a system with potential, but what stood out was a nascent and incipient organically grown research network where more and more farmers are becoming involved. Overall, however, many obstacles persist, such as dwindling resources, poor policy backing, and weak stakeholder synergy.

It reveals how an effective AKIS is central to the success of CAP objectives and sustainable agriculture. Drawing parallels with successful AKIS models in other EU countries, the research provided key recommendations on how to develop these models in Ukraine. These entail investing in public-private partnerships and supporting farmers' participation in research and employment of digital technologies.

A strengthened AKIS in Ukraine can have a substantial impact on achieving CAP goals. This includes facilitating the transfer of knowledge regarding sustainable agricultural practices, promoting innovation for a more competitive and climate-resilient sector, and enhancing farmer capacity building. These advancements will contribute to a more knowledge-based, sustainable, and competitive agricultural sector in Ukraine.

However, realizing this potential necessitates focused efforts. Prioritizing policy reforms that incentivize knowledge transfer and innovation, increasing investment in research and extension services, and fostering strong collaboration between all stakeholders within the AKIS are crucial factors for success.

The study, therefore, generally stresses and reiterates the significance of a strengthened AKIS as an essential and requisite apparatus for an easier transition of unknown factors resulting from Ukraine's transitioning into an agricultural framework of the EU. The solution: Building on these opportunities, addressing the identified challenges, and avoiding the cure-for-cancer kind of mistake, Ukraine could transform itself into a key contributor to agricultural knowledge and innovation. Ultimately, this will serve the CAP's objectives for sustainable agriculture and rural development and make the transition into the agricultural landscape of the EU a bit less bumpy.

The paper winds up this discourse by strengthening the findings of the study and convincingly repeating the significance of a truly complete AKIS being in place for the agricultural development of Ukraine, and the provision of a rallying tool for her journey towards EU accession. It stresses that focused action is required on the existing challenges, to make the most of the existing strengths for transforming to a more sustainable and competitive agriculture sector which can underpin the transformation towards the CAP goals.

Possible future research work of AKIS: The future line of research in the field of AKIS may be:

- Scoping Review of AKIS Implementations: Review existing AKIS fixes, the extent to which they work in Ukraine and good practices and areas of improvement. Study of AKIS in Ukraine vis-a-vis other EU countries: Comparative analysis of Ukraine's AKIS and of the AKIS of other EU countries Recommendations on Rights for alignment with the EU CAP.
- Stakeholder Engagement: To understand the dynamics of the stakeholders engaged in AKIS eg. farmers, advisors, researchers, and policymakers, and fosters collaborative work. Analysis of the Effect of Policies on AKIS: Review the effect of policies on AKIS and provide recommendations for policies to underpin a sustainability-orientated agri-food development and integration into the EU process.
- Use of Technology: Investigate how digital tools and technologies are integrated into AKIS for transferring knowledge and innovation. Capacity-building: Assess training and development needs for AKIS stakeholders to enhance their capacity to contribute to agricultural innovation and transformation. Assessment of Sustainability: Review the sustainability of AKIS practices being employed under the current situation and its harmony with the environmental and economic targets of the EU CAP.
- The track record: Establish longitudinal studies for assessing the evolutionary progress of AKIS and its effects on the Ukrainian agricultural sector over time. These steps follow previous research that has attempted to analyse empirically the configuration of the Ukraine AKIS and to what extent it was positioned as complementary to the EU CAP policy in the period prior to accession. As well on the Ministry level in Ukraine, it will be good to create the AKIS Coordination Body for the general AKIS target to increase the capacity of AKIS actors to make full use of culprit id redelivery esteems required to also holistic systemic response to the transnational program to more consistent, influential AKIS systems and to an evolutionary behaviour of the more sustainable farming and forestry (management and use of natural resources). To this aim, AKIS is establishing a European network of key AKIS actors of change.

This is followed by its key network building at the European and domestic level, and with other appropriate institutions, networks and projects, not by default exploits integration synergies, and establishes an interfacing network chances of potent alliances and collaboration opportunities. This will involve the engagement of a wide and varied community of key AKIS actors of change across the EU thus representing a cornerstone of the modern AKIS network. We will need to resort to cross-sector collaboration guided to assist the AKIS community with info and traditions, supporting their route towards the development of capacity. Will be countenanced in an interdisciplinary fashion such as the European Green Deal, Farm to Fork Sector-specific strategies and the Common Agriculture Policy - primary farms - an even better deal for generic services, manufacturing, food systems, bio-economy and biodiversity.

ADDITIONAL INFORMATION

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CONFLICT OF INTEREST

The Authors declare that there is no conflict of interest.

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УПРАВЛІНСЬКИЙ КОНСАЛТИНГ СИСТЕМИ АГРАРНИХ ЗНАНЬ ТА ІННОВАЦІЙ (AKIS) В УКРАЇНІ

Європейська інтеграція України до Європейського Союзу (ЄС) передбачає узгодження зі Спільною сільськогосподарською політикою (САП) ЄС. Одним із важливих елементів для досягнення цілей САП є потужна система знань та інновацій у сільському господарстві (AKIS). У цій статті проаналізовано потенціал рамкової програми AKIS на передвступному етапі України. Ми досліджуємо існуючі компоненти AKIS, аналізуємо сильні та слабкі сторони й пропонуємо стратегії вдосконалення. В аналізі використане поєднання огляду літератури, вивчення програмних документів та експертних інтерв'ю із зацікавленими сторонами, залученими до сільського господарства України. Наші результати свідчать про те, що, хоча Україна має основу для AKIS, необхідні значні вдосконалення. Посилення синергії між дослідженнями, службами розширення та фермерами, сприяння спільній творчості знань і використання цифрових технологій є важливими кроками. Ефективна підтримка українського сільського господарства AKIS може зробити країну більш продуктивною, стійкою та конкурентоспроможною, покращивши її сумісність із механізмами САП ЄС. Значною рушійною силою цього бачення є прагнення України приєднатися до Європейського Союзу (ЄС), що призвело б до дуже високого рівня узгодження зі Спільною сільськогосподарською політикою ЄС (САП).

Ключові слова: система знань та інновацій у сільському господарстві, спільна аграрна політика, Україна, вступ до Європейського Союзу, аграрні інновації, передача знань, розвиток сільських територій, угода про асоціацію, сільське господарство та розвиток сільських територій (стратегія)

JEL Класифікація: Q16, Q18, O13, P32