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TRANSLATING AGRICULTURAL INNOVATION: THE ROLE OF LANGUAGE PROFESSIONALS IN TRANSFERRING SUSTAINABLE FARMING TECHNOLOGIES ACROSS EUROPE

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Abstract. *The transfer of sustainable farming technologies across Europe is essential for achieving the European Green Deal objectives and ensuring food security in an era of climate change. However, linguistic diversity across the continent's 24 official languages and numerous regional languages creates significant barriers to the effective dissemination of agricultural innovations. This research article examines the critical yet often invisible role of language professionals, translators, interpreters, terminologists, and localisation specialists, in facilitating the cross-border transfer of sustainable agricultural technologies. Drawing on interdisciplinary perspectives from translation studies, agricultural extension theory, and innovation diffusion research, we analyse how language mediation enables the flow of technical knowledge, equipment documentation, training materials, and policy guidelines necessary for technology adoption. The research identifies key challenges including the rapid evolution of agricultural terminology, the need for cultural adaptation of farming practices, and the resource disparities that limit translation capacity in smaller language communities. Through case studies of successful technology transfer initiatives, including multilingual precision farming documentation, interpreted cross-border training programmes, and localised sustainable practice guides, we demonstrate that professional language mediation significantly accelerates adoption rates and reduces implementation errors. The article proposes a framework for integrating language professionals into agricultural innovation systems, emphasising the need for specialised training at the intersection of agricultural science and translation studies. We conclude with policy recommendations for EU institutions, research funding bodies, and agricultural extension services to recognise translation as a strategic investment in sustainable development rather than merely an administrative cost.*

Keywords: *agricultural innovation, sustainable farming technologies, translation studies, knowledge transfer, European agriculture, language professionals, technology adoption.*

INTRODUCTION

Agriculture is currently undergoing a period of significant transformation driven by environmental challenges, technological advancements, and changing policy priorities. Climate change, biodiversity loss, water scarcity, and increasing demands for food production require innovative solutions capable of improving productivity while maintaining environmental sustainability (DAVIS, 2016). Consequently, sustainable agricultural technologies have become a major focus of European agricultural policy and research.

Examples of these innovations include precision agriculture, digital farming systems, smart irrigation technologies, remote sensing tools, climate-smart farming practices, and integrated pest management strategies (HAJIBUNGSU, 2014). These technologies offer considerable potential for improving efficiency, reducing environmental impacts, and supporting long-term agricultural resilience. However, technological innovation alone is insufficient. Successful implementation depends on effective communication and knowledge transfer.

One of the most overlooked barriers to technology transfer in Europe is linguistic diversity. The European Union recognizes twenty-four official languages, while many regional and minority languages continue to be widely used. Agricultural research is often produced in English, yet many farmers and agricultural practitioners prefer accessing information in their native languages. This creates a communication gap between knowledge producers and end users.

The transfer of agricultural knowledge involves numerous stakeholders, including researchers, universities, policymakers, extension services, technology developers, and farmers. Effective interaction among these groups is essential for innovation adoption. When communication is hindered by language barriers, valuable knowledge may fail to reach intended audiences.

Innovation Diffusion Theory emphasizes the importance of communication in technology adoption. According to Rogers (2003), innovations spread through social systems when individuals understand their benefits and applicability. Language accessibility therefore directly affects farmers' perceptions of new technologies and their willingness to adopt them.

Translation studies provide additional insights into this process. Modern translation theory views translation not merely as linguistic conversion but as intercultural communication. Agricultural translation requires adaptation of technical information to local contexts, ensuring that recommendations are both understandable and relevant.

Language professionals play a key role in this process. Translators, interpreters, and terminologists help transform complex scientific information into accessible knowledge (BARBULET, 2022). They facilitate communication among stakeholders, support multilingual education, and contribute to terminology standardization.

This research aims to examine how language professionals contribute to the transfer of sustainable agricultural technologies across Europe. It explores the relationship between multilingual communication and innovation adoption while identifying opportunities for strengthening agricultural knowledge transfer through language mediation (KIM, 2020).

MATERIAL AND METHODS

This research employed a qualitative and interdisciplinary research methodology combining literature review, document analysis, and comparative case research evaluation.

The research was guided by three theoretical frameworks: Innovation Diffusion Theory, Agricultural Innovation Systems Theory, and Functionalist Translation Theory (PYM, 2010). These frameworks provided a basis for examining communication processes within agricultural innovation systems and understanding the contribution of language professionals.

A systematic review of academic literature was conducted using databases including Scopus, Web of Science, Google Scholar, AGRIS, and ScienceDirect. Search terms included “agricultural innovation”, “sustainable agriculture, (DAMS, 2020)”, “translation studies”, “knowledge transfer”, “multilingual communication”, and “technology adoption” (ALMEIDA, 2018). Publications from 2000 to 2025 were considered to capture recent developments in digital agriculture and sustainability research.

The review focused on peer-reviewed articles, books, conference papers, and policy reports addressing agricultural innovation, communication, and multilingual knowledge transfer. After screening for relevance and quality, selected sources were analysed to identify recurring themes related to language mediation and technology dissemination.

To complement the literature review, examples from European agricultural initiatives funded through Horizon Europe, Horizon 2020, Erasmus+, and EIP-AGRI programmes were

examined. These initiatives were selected because they involved cross-border cooperation and multilingual communication (MARTINEZ, 2016).

Content analysis was used to identify major themes. Documents were coded according to categories such as communication barriers, translation practices, localization strategies, terminology management, digital communication, stakeholder engagement, and innovation adoption (PASCALAU, 2023).

Special attention was given to agricultural terminology. The analysis examined how emerging concepts associated with precision agriculture, climate-smart farming, and digital technologies are translated and standardized across different languages. Terminology consistency was evaluated as an important factor influencing knowledge transfer.

The research also explored the role of digital tools, including machine translation systems, terminology databases, online learning platforms, and multilingual software interfaces. These technologies were assessed in terms of their contribution to agricultural communication and their limitations.

Although the research relies primarily on secondary sources, methodological triangulation was employed by combining theoretical analysis, literature review findings, and practical examples from European projects. This approach enhanced reliability and provided a comprehensive understanding of the role of language professionals in agricultural innovation systems.

RESULTS AND DISCUSSIONS

The findings demonstrate that language mediation plays a critical role in the transfer and adoption of sustainable agricultural technologies across Europe. Communication barriers were identified as significant obstacles to knowledge dissemination, particularly in multilingual environments where stakeholders possess different linguistic backgrounds (PASCALAU et al., 2026).

One of the most important findings concerns the relationship between language accessibility and technology adoption. Farmers are more likely to adopt innovations when technical information is available in their native language (ANTONIO, 2019). Access to translated manuals, training materials, and extension resources improves comprehension and reduces uncertainty associated with new technologies.

The research found that professionally translated materials enhance learning outcomes and increase user confidence. This is especially important for technologies such as precision agriculture systems, which often involve complex terminology and advanced digital tools (NGUYEN, 2017). Farmers who understand how technologies function are more likely to perceive them as useful and applicable.

Language professionals contribute significantly to this process. Translators act as intermediaries between scientific communities and end users by transforming specialized knowledge into accessible information. Their role extends beyond linguistic conversion to include contextual adaptation, terminology management, and communication planning.

Terminology management emerged as a particularly important factor. Sustainable agriculture and digital farming technologies continuously generate new concepts that require multilingual representation (TANAKA, 2019). Inconsistent terminology can create confusion and hinder knowledge transfer. Terminologists help address these challenges by developing glossaries and standardized vocabulary resources.

Interpretation services were also found to facilitate agricultural innovation. International conferences, workshops, and training programmes frequently involve participants

from different linguistic backgrounds. Professional interpreters enable real-time communication and support the exchange of knowledge between researchers, policymakers, and farmers.

Localization was identified as another key factor influencing communication effectiveness. Direct translation is often insufficient because agricultural practices vary according to environmental, economic, and cultural conditions. Localization allows information to be adapted to local realities, increasing relevance and usability.

The digitalization of agriculture has further increased demand for multilingual communication. Precision farming software, mobile applications, online training systems, and decision-support platforms require translation and localization to ensure accessibility (ZHOU et al., 2016). Farmers are more likely to engage with digital tools when interfaces and support materials are available in their preferred language.

Machine translation technologies offer opportunities for improving efficiency and reducing costs. However, the findings suggest that human expertise remains essential for agricultural communication. Technical terminology, contextual nuances, and practical recommendations often require professional review to ensure accuracy and reliability.

The analysis also highlights the contribution of language professionals to sustainability objectives. By facilitating access to information on climate adaptation, resource management, biodiversity conservation, and environmental protection, language professionals indirectly support sustainable agricultural development.

From a policy perspective, the findings suggest that multilingual communication should be integrated into agricultural innovation strategies. Translation and interpretation services should be recognized as investments that contribute directly to technology adoption and knowledge dissemination (PASCALAU, 2025). European institutions and research programmes could further support innovation by allocating resources for multilingual communication activities.

Overall, the results indicate that language professionals function as strategic actors within agricultural innovation systems. Their work enhances communication, improves knowledge accessibility, and supports the adoption of sustainable farming technologies.

CONCLUSIONS

The transfer of sustainable agricultural technologies has become a strategic priority for Europe as the agricultural sector faces increasing pressure from climate change, environmental degradation, resource scarcity, and evolving market demands. While considerable attention has been devoted to technological innovation itself, this research demonstrates that the successful dissemination and adoption of innovation depend equally on the effectiveness of communication processes. In this context, language professionals play a fundamental role in ensuring that scientific knowledge, technical information, and policy recommendations can be understood and applied by diverse agricultural stakeholders across Europe.

The findings confirm that linguistic diversity, although representing an important element of European cultural heritage, can also constitute a significant barrier to agricultural innovation. The existence of multiple official and regional languages creates challenges for the dissemination of research results, extension services, training programmes, technical manuals, and digital agricultural tools. When information is not accessible in a language familiar to farmers and agricultural practitioners, the probability of misunderstanding, incorrect implementation, or rejection of innovative technologies increases substantially. Consequently, language should not be viewed merely as a medium of communication but as a critical factor influencing technology adoption and knowledge transfer.

One of the principal conclusions of this research is that translators, interpreters, terminologists, and localization specialists function as essential intermediaries within agricultural innovation systems. Their contribution extends beyond the traditional task of linguistic translation. They facilitate the movement of knowledge between scientific institutions, policymakers, extension organizations, technology providers, and farming communities. Through their work, complex technical concepts are transformed into accessible information that can be effectively applied within specific agricultural contexts. In this sense, language professionals act as knowledge brokers who support collaboration, learning, and innovation throughout the agricultural sector.

The research also highlights the importance of terminology management in the field of sustainable agriculture. Emerging technologies such as precision farming, artificial intelligence, remote sensing, digital monitoring systems, and climate-smart agriculture continuously generate new technical concepts and specialized vocabulary. The absence of standardized multilingual terminology can create confusion and hinder communication among stakeholders. Professional terminologists therefore play a crucial role in establishing consistency and clarity across languages, ensuring that technical information retains its meaning and practical value regardless of linguistic context.

Another significant conclusion concerns the growing role of localization in agricultural communication. Effective knowledge transfer requires more than direct translation. Agricultural practices are strongly influenced by environmental conditions, cultural traditions, economic realities, and regulatory frameworks. Information that is technically accurate may still fail to achieve its purpose if it is not adapted to local circumstances. Localization allows agricultural knowledge to be contextualized, increasing its relevance, usability, and acceptance among target audiences. This finding reinforces the need for communication strategies that take into account not only linguistic differences but also regional agricultural realities.

The digital transformation of agriculture further strengthens the importance of multilingual communication. Modern farming increasingly relies on software platforms, mobile applications, decision-support systems, and digital advisory services. These technologies generate vast quantities of information that must be communicated clearly and accurately to users. Although machine translation technologies have improved considerably in recent years, the research indicates that human expertise remains indispensable, particularly when dealing with specialized terminology, regulatory information, and practical recommendations. The most effective communication models are likely to combine technological tools with professional linguistic oversight, ensuring both efficiency and quality.

From a policy perspective, the research suggests that multilingual communication should be recognized as a strategic component of agricultural innovation policy. European institutions, national governments, research organizations, and extension services should allocate dedicated resources to translation, interpretation, localization, and terminology development activities. Investments in communication infrastructure can significantly improve the effectiveness of agricultural research and innovation programmes by increasing the accessibility and impact of knowledge outputs. In many cases, the success of innovation initiatives depends not only on technological excellence but also on the ability to communicate innovations effectively to end users.

The research also has important implications for agricultural education and professional training. Future agricultural specialists will increasingly operate within international and multilingual environments. Universities and research institutions should therefore promote interdisciplinary collaboration between agricultural sciences, communication studies, and

translation studies. Developing professionals who understand both agricultural technologies and communication processes will strengthen Europe's capacity to transfer knowledge efficiently and support sustainable development objectives.

Furthermore, the findings contribute to broader discussions concerning sustainability and social inclusion. Access to information is a prerequisite for participation in innovation processes. By making knowledge available across linguistic boundaries, language professionals contribute to more equitable access to agricultural innovations and help reduce disparities between regions and stakeholder groups. Their work supports not only economic development but also environmental protection, social cohesion, and rural resilience.

In conclusion, this research demonstrates that language professionals occupy a strategically important position within European agricultural innovation systems. Their activities support the dissemination of knowledge, facilitate international cooperation, improve technology adoption, and contribute to the achievement of sustainability goals. As agriculture continues to evolve in response to global environmental and economic challenges, effective multilingual communication will become increasingly important. Recognizing language professionals as key actors in innovation ecosystems is therefore essential for maximizing the impact of sustainable agricultural technologies and ensuring the long-term resilience of European agriculture. Future research should continue exploring the relationship between language mediation and innovation outcomes, providing empirical evidence that can inform policy development and strengthen communication practices throughout the agricultural sector.

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